United States Department of Agriculture

Natural Resources Conservation Service

In cooperation with Texas Agricultural Experiment Station

Soil Survey of Hamilton 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.

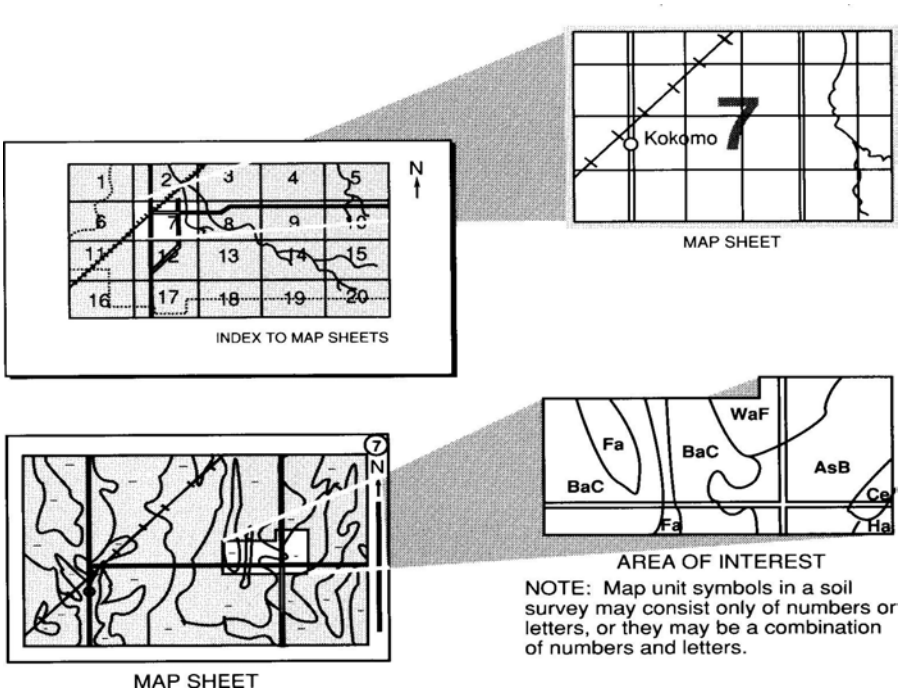
Detailed Soil Maps

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 Stations, 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 1991. Soil names and descriptions were approved in 1994. Unless otherwise indicated, statements in this publication refer to conditions in the survey area in 1991. 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 Hamilton-Coryell Soil and Water Conservation District. The most current official data are available at http://websoilsurvey.nrcs.usda.gov/app/

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

Cover: Spring flowers on display in an area of Nuff silty clay loam, 2 to 6 percent slopes, very stony.

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

Contents

July 2007

Foreword

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

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

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

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

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

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Soil Survey of Hamilton County, Texas

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

Hamilton County is located in central Texas (fig. 1). It has an area of about 836 square miles, or 535,226 acres. Hamilton, the county seat, is near the center of the county. In 1990, according to the Bureau of Census, the population of the county was 8,036. In 2000, the population was 8,229. The largest towns are Hamilton and Hico. Other communities in the county are Aleman, Blue Ridge, Carlton, Fairy, Gentrys Mill, Indian Gap, Lanham, McGirk, Ohio, Olin, Pecan Wells, Pottsville, and Shive. Some of the major streams in Hamilton County are the Bosque, Lampasas, and Leon Rivers, and Cowhouse, Gholson, Honey, Meridian, Mustang, Neils, Partridge, Pecan, Plum, and Warrens Creeks.

Hamilton County is in the Grand Prairie and the West Cross Timbers Major Land Resource Areas of Texas. Topographically the county consists of an undulating, dissected limestone plain, underlain by hard limestone on the higher ridges and softer limestone and calcareous clays on the rolling hills and low ridges.

The major agricultural land uses in Hamilton County are farming and ranching. About 66 percent of the county is in rangeland, 19 percent is cropland, 14 percent is pastureland and hayland, and 1 percent is urban and built-up areas.

There are 33 different kinds of soil in Hamilton County. The soils vary widely in texture, depth, reaction, natural drainage, and other characteristics. Slope, depth to bedrock, stoniness, and natural fertility are the major factors that influence agricultural uses of the soils.

General Nature of the Survey Area

This section provides general information about Hamilton County. It discusses history, farming and ranching, and climate.

History

Hamilton County was originally part of Mexico. Neither the town-to-be nor the county-to-be had a name when pioneer settlers began to move into the area in the early 1850's. In 1858, the seventh Texas Legislature created the county of Hamilton and specified that both the county and county seat be named Hamilton in honor of General James Hamilton, a governor of South Carolina, who put up $216,000 in gold to finance the Texas struggle for independence from Mexico. The county was created from parts of Bosque, Comanche, and Lampasas Counties.

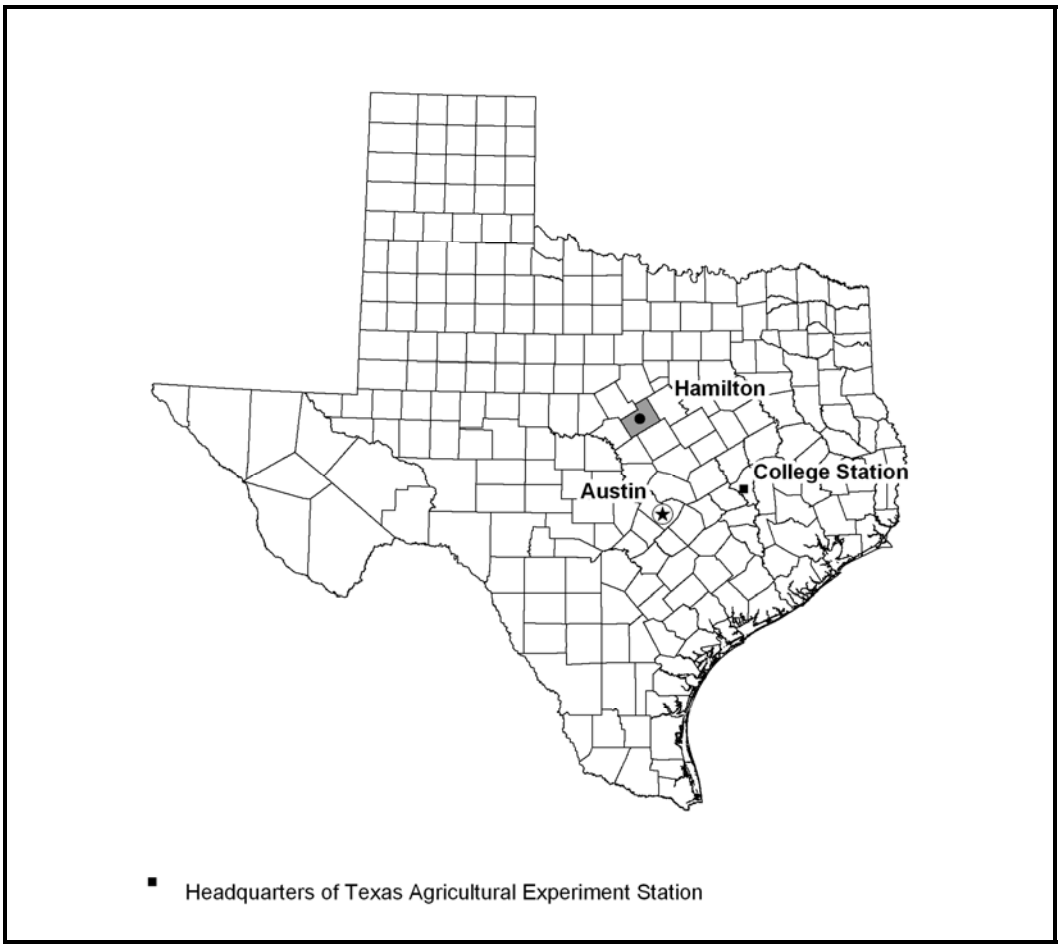

Figure 1.—Location of Hamilton County, Texas.

In the early days, it was not unusual for herds of cattle to be driven across the town square. Some of these cattle were on their way up a feeder route of the Chisholm Trail.

Farming conditions changed in the late nineteenth century, and cultivated crops, such as cotton, corn, grain sorghum, and wheat, began to be as important as the livestock industry had been in the past.

Farming and Ranching

The main crops grown today are wheat, oats, corn, grain sorghum, and forage sorghum. The major livestock products are beef, milk, sheep, and goats. Peaches and pecans are grown commercially on a limited scale. Coastal bermudagrass and kleingrass are grown as improved pastures for haying and grazing.

In farming and ranching, erosion control, brush control, range seeding, no-till farming, deferred grazing, cross fencing, and providing water for livestock are the main conservation objectives.

Climate

Table 1 provides data on temperature and precipitation for the survey area as recorded at Hico in the period 1971 to 2000. Table 2 provides 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 47 degrees F and the average daily minimum temperature is 34 degrees. The lowest temperature on record, which occurred at Hico on January 31, 1949, is -11 degrees. In summer, the average temperature is 82 degrees and the average daily maximum temperature is 94 degrees. The highest temperature on record, which occurred at Hico on August 11, 1936, is 113 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 34 inches. Of this, about 23 inches, or 67 percent, usually falls in April through October. The growing season for most crops falls within this period. The heaviest 1-day rainfall during the period of record was 6.9 inches at Hico on May 31, 1988. Thunderstorms occur on about 46 days each year, and most occur in May.

The average seasonal snowfall is 2.1 inches. The greatest snow depth at any one time during the period of record is 12 inches recorded on January 16, 1964. On an average, 1 day per year has at least 1 inch of snow on the ground. The heaviest 1-day snowfall on record is 12.5 inches recorded on January 16, 1964.

The average relative humidity in mid-afternoon is about 57 percent. Humidity is higher at night, and the average at dawn is about 86 percent. The sun shines 80 percent of the time in summer and 59 percent in winter. The prevailing wind is from the south. Average wind speed is highest, 12.6 miles per hour, in April.

How This Survey Was Made

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

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

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

Soil scientists recorded the characteristics of the soil profiles that they studied. They noted color, texture, size and shape of soil aggregates, kind and amount of rock

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

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

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

After soil scientists located and identified the significant natural bodies of soil in the survey area, they drew the boundaries of these bodies on aerial photographs and identified each as a specific map unit. Aerial photographs show trees, buildings, fields, roads, and 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 in the intensity of mapping or in the extent of the soils in the survey areas.

General Soil Map Units

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

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

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

Dominantly Very Shallow to Very Deep, Gently Sloping to Steep, Loamy to Clayey Soils on Uplands

The total area of these soils is 485,604 acres, or about 91 percent of the county. The major soils are those in the Brackett, Bolar, Cho, Cisco, Cranfill, Denton, Doss, Eckrant, Evant, Nuff, Pedernales, Pidcoke, Real, Slidell, and Topsey series.

These soils generally have a moderate potential for most agricultural uses. Most areas are used as rangeland. A part of this acreage is used for forage sorghum, grain sorghum, oats, and wheat. Some areas are used as pasture and hayland. The main pasture grasses planted are improved varieties of bermudagrass and kleingrass.

1. Brackett-Slidell-Pidcoke

Shallow and very deep, gently sloping to undulating, loamy and clayey soils; on uplands

The total area of this unit is 145,863 acres, or about 27 percent of the county. The unit is about 27 percent Brackett soils, 18 percent Slidell soils, 14 percent Pidcoke soils, and 41 percent other soils.

This map unit occurs on broad, smooth plains dissected by drainageways. Brackett and Pidcoke soils are on the plains. Slidell soils are in drainageways.

Brackett soils are very deep, well drained, and moderately permeable. Typically, the surface layer is grayish brown, gravelly clay loam about 6 inches thick. The upper part of the subsoil, from 6 to 16 inches, is pale yellow loam; below 16 inches is a yellow marl with silty clay texture.

Slidell soils are very deep, moderately well drained, and very slowly permeable. Typically, the surface layer is very dark gray silty clay about 24 inches thick. The upper part of the subsoil, from 24 to 33 inches, is dark gray silty clay. The lower part of the subsoil, from 33 to 80 inches, is grayish brown silty clay.

Pidcoke soils are shallow, well drained, and moderately slowly permeable. Typically, the surface layer is a dark grayish brown, gravelly clay loam about 11 inches thick. The upper part of the subsoil, from 11 to 18 inches, is dark brown gravelly clay loam. The lower part of the subsoil, from 18 inches is indurated fossiliferous limestone.

The soils of minor extent are Cranfill, Denton, Krum, Lampasas, Nuff, Oglesby, Real, San Saba, Topsey, and Venus soils. Cranfill, Denton, Lampasas, Nuff, Oglesby, and Real soils are on similar landscapes. Krum, San Saba, and Topsey soils are on landscapes slightly lower than those of Brackett and Pidcoke soils. Venus soils are on terraces along streams.

The major soils, Brackett and Pidcoke, are used mostly for rangeland. The climax plant community consists of open grassland plants interspersed with ashe juniper and occasional motts of live oak trees. A few areas are used for improved pasture grasses, such as improved varieties of bermudagrass and kleingrass. Some areas of the Pidcoke soil are used for cropland. Crops grown are small grains and forage sorghum.

The Brackett soils are not suited to cultivated crops, because of the hazard of water erosion, low available water capacity, and high lime content of the soil.

The Pidcoke soils are marginally suited to cultivated crops. Depth to rock, low available water capacity, and high lime content of the soil are the main limitations for cultivated crops.

The other major soil, Slidell, is well suited to cultivated crops. The major crops grown are corn, forage sorghum, grain sorghum, and small grains.

The major soils in this unit can be used for most urban and recreational uses. The major limitations are high and very high shrink-swell potential, slow permeability, depth to rock, small stones on the surface, low strength, corrosivity to uncoated steel, sloughing of excavated pit walls, and the clayey nature of the soil. Most of these limitations can be partially overcome by proper design and installation.

2. Nuff-Real-Cho

Very shallow to deep, gently sloping to undulating, gravelly and stony, loamy soils; on uplands

The total area of this unit is 125,631 acres, or about 23 percent of the county. The unit is about 48 percent Nuff soils, 11 percent Real soils, 7 percent Cho soils, and 34 percent other soils (fig. 2).

This map unit occurs on broad, low ridgetops and stream divides.

Nuff soils are very deep, well drained, and moderately slowly permeable. Typically, the surface layer is grayish brown, very stony silty clay loam about 10 inches thick. The subsurface layer, from 10 to 18 inches, is grayish brown silty clay loam. The upper part of the subsoil, from 18 to 25 inches, is brown silty clay loam. The lower part of the subsoil, from 25 to 80 inches, is light gray and interbedded white shale that has a silty clay loam texture.

Real soils are shallow, well drained, and moderately permeable. Typically, the surface layer is brown gravelly clay loam about 5 inches thick. The upper part of the subsurface layer, from 5 to 12 inches, is brown extremely gravelly clay loam. The lower part of the subsurface layer, from 12 to 14 inches, is strongly cemented caliche. The underlying material, from 14 to 60 inches, is white weakly cemented limestone and marl.

Cho soils are very shallow and shallow, well drained, and moderately permeable. Typically, the surface layer is dark grayish brown gravelly clay loam about 14 inches thick. The upper part of the subsoil, from 14 to 19 inches, is pinkish white indurated caliche. The lower part of the subsoil, from 19 to 62 inches, is pink gravelly loam.

Soils of minor extent are Brackett, Cisco, Krum, Lampasas, Oglesby, Slidell, and Wise soils. Brackett, Lampasas, and Oglesby soils are on landscape positions similar to those of Nuff and Real. Cisco and Wise soils are on the side slopes of low ridges. Krum and Slidell soils are in depressions or small drainageways.

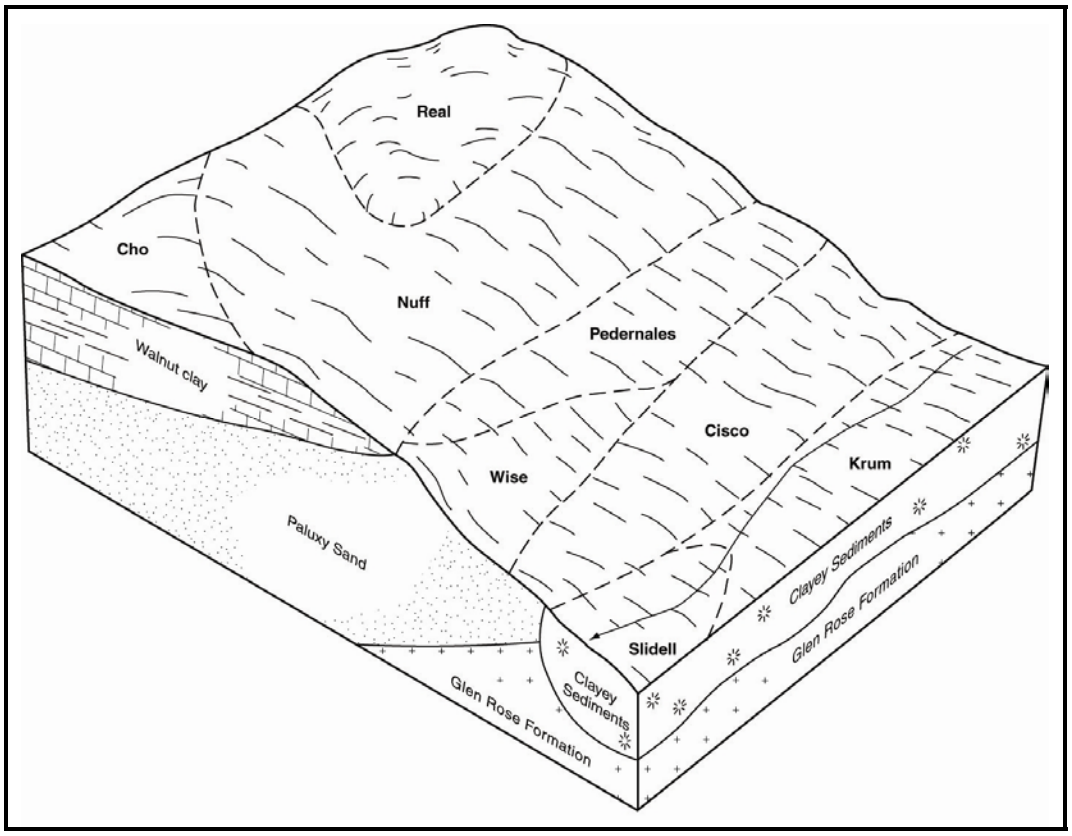

Figure 2.—Pattern of soils and underlying material in the Nuff-Real-Cho and Cisco-Pedernales general soil map units.

The major soils are used mainly for rangeland. The climax plant community is mid and tall grasses with scattered live oak trees on Real soils.

The Nuff, Cho, and Real soils are not suited to cultivated crops. The main limitations are large stones on the surface, depth to cemented pan or rock, low available water capacity, and high lime content of soil. A few areas of Cho are cultivated because the cemented pan has been broken up. Some areas of the Nuff soil are used for cultivated crops and pastureland, where the stones have been removed.

The major soils in this unit can be used for most urban and recreational purposes. The major limitations are large stones, low strength, slow permeability, seepage, and depth to cemented pan or rock. These limitations can be partially overcome by proper design and careful installation.

3. Real-Doss

Shallow, undulating, gravelly, loamy soils; on uplands.

The total area of this unit is 8,415 acres or about 16 percent of the county. The unit is about 61 percent Real and Doss soils, and 39 percent other soils.

This map unit occurs on broad, smooth, undulating plains dissected by small drainageways.

Real soils are shallow, well drained, and moderately permeable. Typically, the surface layer is very dark grayish brown gravelly clay loam about 6 inches thick. The upper part of the subsoil, from 6 to 12 inches, is very dark grayish brown extremely

gravelly clay loam. The middle part of the subsoil, from 12 to 13 inches, is strongly cemented caliche. The lower part of the subsoil, from 13 to 60 inches, is white limestone and yellow marl.

Doss soils are shallow, well drained, and moderately slowly permeable. Typically, the surface layer is dark brown clay loam about 8 inches thick. The upper part of the subsoil, from 8 to 17 inches, is pale brown clay loam. The lower part of the subsoil, from 17 to 60 inches, is yellow clay loam interbedded with weakly consolidated limestone.

Soils of minor extent are Bolar, Bosque, Brackett, Cisco, Krum, Nuff, Pedernales, Slidell, and Wise soils. Bolar, Cisco, Nuff, and Pedernales soils are on landscape positions similar to those of the major soils. Brackett soils are on higher and steeper positions on the landscape. Bosque, Krum, and Slidell soils are on lower positions in drainageways.

The major soils are used mainly for rangeland. The climax plant community consists of mid and tall grasses with a few motts of live oak trees.

Some of the soils are used for cropland and pastureland. The main crops grown are forage sorghum and small grains. The main pasture grasses are improved varieties of bermudagrass and kleingrass.

The major soils in this unit can be used for most urban and recreational uses. The main limitations are corrosivity to uncoated steel, depth to rock or cemented pan, moderate shrink-swell potential, low strength, and small stones on the surface. These limitations can be partially overcome by proper design and installation.

4. Real-Cranfill-Brackett

Shallow and very deep, hilly to steep, gravelly, loamy soils on steep breaks; on uplands

The total area of this unit is 53,698 acres, or about 10 percent of the county. The unit is about 28 percent Real soils, 27 percent Cranfill soils, 14 percent Brackett soils, and 31 percent other soils.

This map unit occurs on steep side slopes of high divides and ridges.

Real soils are shallow, well drained, and moderately permeable. Typically, the surface layer is brown gravelly clay loam about 5 inches thick. The upper part of the subsoil, from 5 to 12 inches, is extremely gravelly clay loam. The middle part of the subsoil, from 12 to 14 inches, is strongly cemented caliche. The lower part of the subsoil, from 14 to 60 inches, is white weakly cemented limestone and marl.

Cranfill soils are very deep, well drained, and moderately permeable. Typically, the surface layer is pale brown gravelly clay loam about 10 inches thick. The upper part of the subsoil, from 10 to 45 inches, is brown gravelly clay loam. The lower part of the subsoil, from 45 to 80 inches, is yellowish brown gravelly clay loam.

Brackett soils are very deep, well drained, and moderately permeable. Typically, the surface layer is grayish brown gravelly clay loam about 6 inches thick. The upper part of the subsoil, from 6 to 16 inches, is pale yellow loam. The lower part of the subsoil, from 16 to 60 inches, is yellow marl that has silty clay texture.

Soils of minor extent are Eckrant, Evant, Krum, Oglesby, and Slidell soils. Eckrant, Evant, and Oglesby soils are on higher positions in the landscape. Krum and Slidell soils are in lower positions, in drainageways.

The Real and Brackett soils are used only for rangeland. The climax plant community consists of mid and tall grasses interspersed with ashe juniper and scattered motts of live oak trees. A few small areas of the Cranfill soils are planted to small grains.

The Real and Brackett soils are not suited to cropland or pastureland. The main limitations are steep slopes, hazard of water erosion, depth to rock, low available water capacity, and high lime content of soil.

The major soils are severely limited as sites for most urban and recreational uses. The main limitations are slope, small stones, depth to rock or cemented pan, seepage, high corrosivity to uncoated steel, and slow permeability.

5. Eckrant-Evant

Very shallow and shallow, gently sloping, cobbly and gravelly, clayey soils; on uplands

The total area of this unit is 39,237 acres or about 7 percent of the county. The unit is about 49 percent Eckrant soils, 25 percent Evant soils, and 26 percent other soils (fig. 3).

This map unit occurs on ridgetops, on tops of high divides, and on broad, smooth, gently sloping areas.

Eckrant soils are very shallow and shallow, well drained, and moderately slowly permeable. Typically, the surface layer is dark grayish brown very cobbly silty clay about 8 inches thick. The underlying material is fractured, indurated limestone bedrock.

Evant soils are shallow, well drained, and slowly permeable. Typically, the surface layer is dark brown, gravelly silty clay about 5 inches thick. The upper part of the subsoil, from 5 to 14 inches, is reddish brown clay. The middle part of the subsoil, from 14 to 18 inches, is pinkish white strongly cemented caliche. The lower part of the subsoil, from 18 to 50 inches, is interbedded white silt loam and chalky limestone stratified with dark brown loam.

Soils of minor extent are Bolar, Cranfill, Denton, Krum, Oglesby, Real, and Tarpley soils. Bolar, Denton, Oglesby, and Tarpley soils are on landscape positions similar to those of the major soils. Cranfill and Real soils are along escarpments, cliffs, and slope breaks. Krum soils are in drainageways.

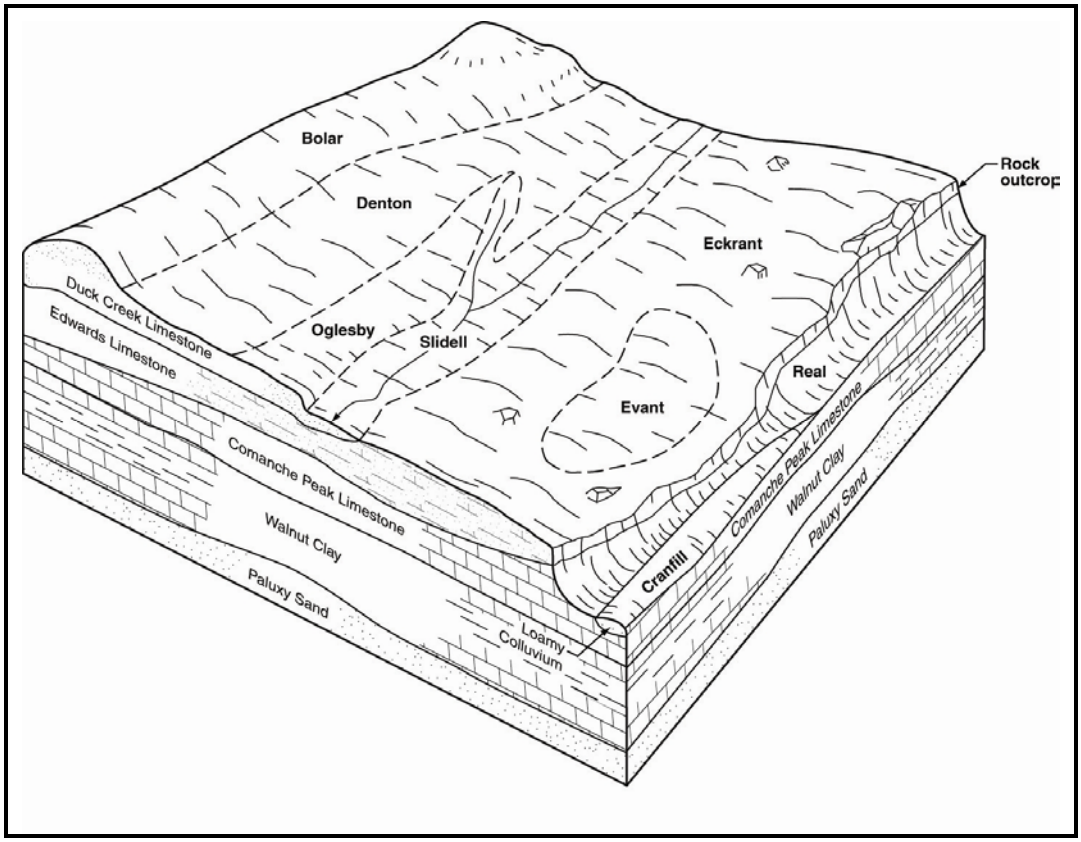

Figure 3.—Pattern of soils and underlying material in the Denton-Bolar-Oglesby and Eckrant-Evant general soil map units.

The major soils are used mostly for rangeland. The vegetation is mid and tall grasses in a post oak savannah. A few small areas of Evant soils are planted to small grains or forage sorghum. A few areas are used as pastureland of improved varieties of bermudagrass or kleingrass.

The major soils in this unit can be used for most urban and recreational uses. The main limitations are depth to rock or cemented pan, stones and gravel on the surface, high corrosivity to uncoated steel, slow permeability, high shrink-swell potential, low strength, and rock outcrops. Some areas provide scenic vistas, making them valuable as homesites.

6. Cisco-Pedernales

Very deep, gently sloping, loamy soils; on uplands

The total area of this unit is 29,793 acres or about 6 percent of the county. The unit is about 49 percent Cisco soils, 20 percent Pedernales soils, and 31 percent other soils (fig. 2).

This map unit occurs on the side slopes of low hills and smooth, gently sloping footslopes.

Cisco soils are very deep, well drained, and moderately permeable. Typically, the surface layer is brown fine sandy loam about 12 inches thick. The upper part of the subsoil, from 12 to 51 inches, is reddish brown and yellowish red sandy clay loam. The lower part of the subsoil, from 51 to 80 inches, is light gray fine sandy loam.

Pedernales soils are very deep, well drained, and moderately slowly permeable. Typically, the surface layer is yellowish red fine sandy loam about 9 inches thick. The upper part of the subsoil, from 9 to 29 inches, is red and yellowish red sandy clay. The middle part of the subsoil, from 29 to 35 inches, is yellowish red sandy clay loam. The lower part of the subsoil, from 35 to 80 inches, is very pale brown clay loam.

Soils of minor extent are Denton, Krum, Nuff, Real, Slidell, Venus, and Wise soils. Denton, Nuff, and Real soils are in higher positions on the landscape. Krum, Slidell, and Venus soils are in lower positions on the landscape. Wise soils are on landscape positions similar to those of the major soils.

The major soils are used mainly as pastureland. Adapted pasture grasses are improved varieties of bermudagrass and kleingrass. The soils are also suited to cropland. Forage sorghum, small grains, and grain sorghum are the main crops grown. A few areas are planted to peach orchards.

These soils are suited to rangeland. The vegetation is typically mid and tall grasses in a post oak savannah.

The major soils in this unit are suited to most urban and recreational uses. The main limitations are corrosivity to uncoated steel, moderate shrink-swell potential, low strength, sloughing of excavated pit walls, and slow permeability.

7. Denton-Bolar-Oglesby

Shallow to deep, gently sloping, loamy and clayey soils; on uplands

The total area of this unit is 3,967 acres or about 1 percent of the county. The unit is about 34 percent Denton soils, 21 percent Bolar soils, 12 percent Oglesby soils, and 33 percent other soils (fig. 3).

This map unit occurs on mid slopes of low knolls and low ridges.

Denton soils are deep, well drained, and slowly permeable. Typically, the surface layer is dark grayish brown silty clay about 13 inches thick. The upper part of the subsoil, from 13 to 24 inches, is reddish brown silty clay. The middle part of the subsoil, from 24 to 38 inches, is brown and light brown silty clay loam. The lower part of the subsoil, from

38 to 54 inches, is brownish yellow marl with a silty clay loam texture; below 54 inches is indurated limestone bedrock interbedded with marl.

Bolar soils are moderately deep, well drained, and moderately permeable. Typically, the surface layer is dark brown gravelly clay loam about 8 inches thick. The upper part of the subsoil, from 8 to 17 inches, is yellowish brown gravelly clay loam. The lower part of the subsoil, from 17 to 36 inches, is very pale brown clay loam; below 36 inches to a depth of 55 inches is indurated limestone interbedded with marl.

Oglesby soils are shallow, well drained, and slowly permeable. Typically, the surface layer is very dark grayish brown, gravelly silty clay about 8 inches thick. The subsoil, from 8 to 17 inches, is very dark grayish brown gravelly silty clay; below 17 inches is indurated limestone bedrock.

Soils of minor extent are Eckrant, Real, San Saba, Slidell, and Tarpley soils.

The major soils are used mainly as cropland. Small grains, forage sorghum, and grain sorghum are the main crops grown. The soils are also suited to pastureland. Improved varieties of bermudagrass and kleingrass are the main grasses grown.

The major soils are suited to rangeland. The vegetation is typically mid and tall grasses with motts of live oak trees.

The major soils in this unit are suited to most urban and recreational uses. The main limitations are corrosivity to uncoated steel, depth to rock, high shrink-swell potential, low strength, slow permeability, the clayey nature of the soil, and small stones on the surface.

Dominantly Very Deep, Nearly Level, Rarely and Occasionally Flooded, Loamy to Clayey Soils on Bottomlands

The total area of these soils is 36,734 acres, or about 7 percent of the county. The major soils are those in the Bosque, Frio, and Venus series.

These soils generally have a moderate potential for most agricultural uses. Most areas are used as pasture and hayland. The main pasture grasses planted are improved varieties of bermudagrass and kleingrass. A part of this acreage is used for forage sorghum, oat, wheat, and grain sorghum. A few areas are used for rangeland.

8. Bosque-Frio-Venus

Very deep, nearly level, rarely and occasionally flooded, loamy and clayey soils; on bottomlands

The total area of this unit is 36,734 acres or about 7 percent of the county. The unit is about 52 percent Bosque soils, 9 percent Frio soils, 8 percent Venus soils, and 31 percent other soils (fig. 4).

This map unit occurs along the major and minor streams in the county. Flooding ranges from rare to occasional.

Bosque soils are very deep, well drained, and moderately permeable. Typically, the surface layer is dark grayish brown clay loam about 14 inches thick. The upper part of the subsoil, from 14 to 52 inches, is dark brown clay loam. The lower part of the subsoil, from 52 to 80 inches, is yellowish brown clay loam.

Frio soils are very deep, well drained, and moderately slowly permeable. Typically, the surface layer is very dark grayish brown silty clay about 37 inches thick. The subsoil, from 37 to 70 inches, is grayish brown silty clay.

Venus soils are very deep, well drained, and moderately permeable. Typically, the surface layer is dark grayish brown loam about 15 inches thick. The upper part of the

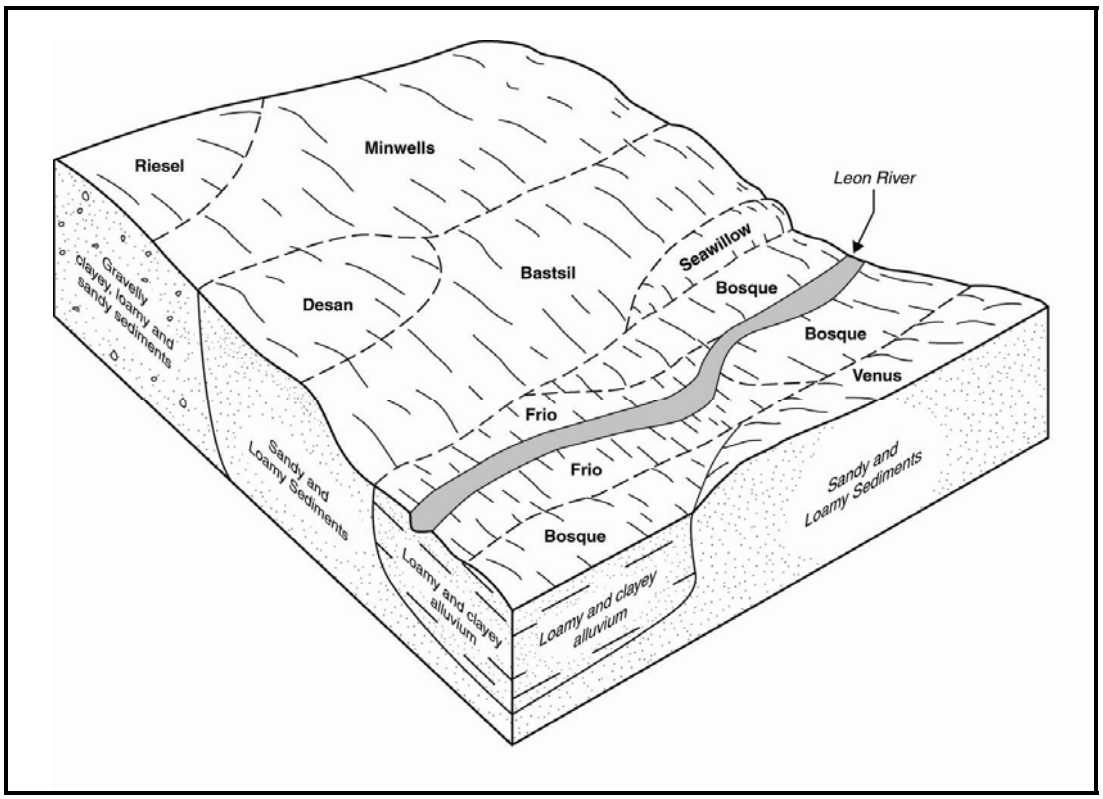

Figure 4.—Pattern of soils and underlying material in the Minwells-Bastsil and Bosque-Frio-Venus general soil map units.

subsoil, from 15 to 35 inches, is brownish loam. The lower part of the subsoil, from 35 to 80 inches, is light yellowish brown loam.

Soils of minor extent are Bastsil, Brackett, Lamkin, Nuff, Real, Rumley, and Seawillow soils. Lamkin soils are on landscape positions similar to those of the major soils. Bastsil, Rumley, and Seawillow soils are on terraces above the major soils. Brackett, Nuff, and Real soils are on the steeper uplands along the outer edges of the flood plains.

The major soils in this unit are well suited to cropland and pastureland. The main crops grown are grain sorghum and small grains. The main pasture grasses are improved varieties of bermudagrass and kleingrass. This unit is also used for pecan orchards. The hazard of flooding is the main limitation of this unit.

These soils are well suited to rangeland. This unit has short and mid grasses with a tree canopy of pecan, elm, hackberry, oak, and cottonwood.

These soils are not suited to urban use due to the severe hazard of flooding.

Dominantly Very Deep, Gently Sloping Sandy to Loamy Soils on Terraces

The total area of these soils is 12,888 acres, or about 2 percent of the county. The major soils are those in the Bastsil, Minwells, and Venus series.

These soils generally have a moderate potential for most agricultural uses. Most areas are used as pasture and hayland. The main pasture grasses planted are improved varieties of bermudagrass and kleingrass. A few areas are planted to forage sorghum, oats, and wheat.

9. Minwells-Bastsil

Very deep, gently sloping, sandy and loamy, soils; on terraces

The total area of this unit is 8,789 acres, or about 2 percent of the county. The unit is about 26 percent Minwells soils, 21 percent Bastsil soils, and 53 percent other soils (fig. 4).

This map unit occurs on smooth, gently sloping terraces along the Leon River.

Minwells soils are very deep, well drained, and slowly permeable. Typically, the surface layer is dark brown fine sandy loam about 9 inches thick. The upper part of the subsoil, from 9 to 20 inches, is reddish brown clay. The middle part of the subsoil, from 20 to 46 inches, is red sandy clay. The lower part of the subsoil, from 46 to 63 inches, is reddish yellow gravelly sandy clay loam; below 63 inches to a depth of 80 inches is red very gravelly sand.

Bastsil soils are very deep, well drained, and moderately permeable. Typically, the surface layer is brown loamy fine sand about 17 inches thick. The subsoil, from 17 to 80 inches, is yellowish red sandy clay loam.

Soils of minor extent are Brackett, Bosque, Cisco, Desan, Frio, Krum, Pedernales, Real, Riesel, Rumley, Seawillow, and Venus soils. Brackett, Cisco, Desan, Krum, Pedernales, Real, and Riesel soils are in higher positions on the landscape. Rumley, Seawillow, and Venus soils are on landscape positions similar to those of the major soils. Bosque and Frio soils are in lower positions, on the flood plains.

The major soils are used as pastureland. The main grasses grown on these soils are improved varieties of bermudagrass and kleingrass.

These soils are suited to cropland. The main crops grown are forage sorghum and small grains. A few areas are planted to orchards.

These soils are suited to rangeland. The vegetation is mid and tall grasses in a post oak savannah.

The soils in this unit are suited to most urban and recreational uses. The main limiting factors are shrink-swell potential, slow permeability, sloughing of excavated pit walls, and low strength. Careful design and installation can partially overcome some of these limitations.

10. Venus

Very deep, gently sloping, loamy soils; on terraces

The total area of this unit is 3,967 acres or about 1 percent of the county. The unit is about 61 percent Venus soils and 39 percent other soils.

This map unit occurs on terraces of Cowhouse Creek and the Leon River.

Venus soils are very deep, well drained, and moderately permeable. Typically, the surface layer is dark grayish brown loam about 6 inches thick. The subsurface layer, from 6 to 18 inches, is dark brown loam. The upper part of the subsoil, from 18 to 38 inches, is brown loam. The lower part of the subsoil, from 38 to 60 inches, is yellowish brown loam.

Soils of minor extent are Bosque, Brackett, Frio, Krum, Lampasas, Minwells, Nuff, Real, Rumley, and Seawillow soils. Minwells, Rumley, and Seawillow soils are on landscape positions similar to those of the major soil. Brackett, Krum, Lampasas, Nuff, and Real soils are on higher positions on the landscape. Bosque and Frio soils are on lower positions, on flood plains.

The major soil in this unit is used mainly as cropland. Forage sorghum, grain sorghum, and small grains are the main crops grown.

This unit is suited to pasture and hayland. The main pasture grasses grown are improved varieties of bermudagrass and kleingrass.

This unit is suited to rangeland. The vegetation is typically mid and tall grass with elm, hackberry, oaks, and pecan.

The major soil in this unit is suited to most urban and recreational uses. The main limitation is the corrosivity to uncoated steel.

Detailed Soil Map Units

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

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

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

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

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

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

Soils of one series can differ in texture of the surface layer, slope, stoniness, salinity, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly

indicates a feature that affects use or management. For example, Cranfill gravelly clay loam, 3 to 8 percent slopes, is a phase of the Cranfill series.

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

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. Real-Doss complex, 1 to 8 percent slopes, is an example.

This survey includes some map units that are *miscellaneous areas*. Such areas have little or no soil material and support little or no vegetation. Rock outcrop is an example.

Table 4 gives the acreage and proportionate extent of each map unit. Other tables (see “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.

BaB—Bastsil loamy fine sand, 1 to 3 percent slopes

Setting

Landscape: River valley
Shape: Long and narrow
Size: 50 to 350 acres

Composition

Bastsil and similar soils: 85 percent
Contrasting inclusions: 15 percent

Contrasting Inclusions

Contrasting inclusions in this map unit are the Desan and Minwells soils. Desan soils are on similar positions. Minwells soils are on higher positions. Also included in this map unit are Bastsil soils with fine sandy loam surfaces.

Soil Description

Position on landform: Tread on stream terrace
Parent material: Loamy alluvium

Typical Profile

Surface layer:
0 to 6 inches—slightly acid, brown loamy fine sand

Subsurface layer:
6 to 17 inches—slightly acid, light brown loamy fine sand

Subsoil:
17 to 80 inches—slightly acid, yellowish red sandy clay loam

Soil Properties and Qualities

Slope: 1 to 3 percent
Depth to restrictive feature: Very deep (60 to 80 inches)
Drainage class: Well drained
Water table: None within a depth of 60 inches
Flooding: None
Permeability: Moderate
Surface runoff: Low

Shrink-swell potential: Low in the surface layer; moderate in the subsoil
Available water capacity: Mainly 7.4 inches or moderate
Water erosion hazard: Slight
Wind erosion hazard: Severe

Land Uses

Major land uses: Rangeland, Cropland
Other land uses: Pasture, Hayland, Wildlife Habitat, Urban, Recreation

Management Concerns

Rangeland

This climax plant community is a tall grass savannah with scattered post oak and blackjack oak trees.

Major limitations:
The major limitation is the severe wind erosion hazard.

Cropland

The main crops are small grains and grain sorghum. A few areas are used as peach orchards (fig 5).

Major limitations:
The major limitation is the severe wind erosion hazard.

Pasture and Hayland

The major grasses grown are coastal bermudagrass and kleingrass.

Figure 5.—Peaches require a well drained soil. These trees are growing in an area of Bastsil loamy fine sand, 1 to 3 percent slopes.

Major limitations:
The major limitation is the severe wind erosion hazard.

Wildlife Habitat

This soil provides habitat for deer, quail, dove, and turkey.

Major limitations:
There are no major limitations that affect this soil for this use.

Urban and Recreation

Major limitations:
The major limitation is low strength.

Minor limitations:
The minor limitations are the moderate shrink-swell potential, seepage, and corrosivity to uncoated steel. Slope is a limitation for some recreational uses.

Interpretive Groups

Land capability class: 3e
Ecological site: Loamy Sand

BaC2—Bastsil fine sandy loam, 2 to 5 percent slopes, eroded

Setting

Landscape: River valley
Shape: Oblong
Size: 50 to 200 acres

Composition

Bastsil and similar soils: 85 percent. Erosion has removed approximately 50 percent of the original surface layer. There are a few gullies, and they are crossable with farm equipment.
Contrasting inclusions: 15 percent

Contrasting Inclusions

Contrasting inclusions in this map unit are the Desan and Minwells soils. Desan soils are on similar positions. Minwells soils are on slightly higher positions. Some areas are strip mined for sand and gravel in the deep underlying layers.

Soil Description

Position on landform: Tread on stream terrace
Parent material: Loamy alluvium

Typical Profile

Surface layer:
0 to 5 inches—slightly acid, brown and light brown fine sandy loam

Subsoil:
5 to 80 inches—slightly acid, yellowish red and red sandy clay loam

Soil Properties and Qualities

Slope: 2 to 5 percent
Depth to restrictive feature: Very deep (60 to 80 inches)
Drainage class: Well drained
Water table: None within a depth of 60 inches
Flooding: None
Permeability: Moderate
Surface runoff: Low
Shrink-swell potential: Low in the surface layer; moderate in the subsoil
Available water capacity: Mainly 8.2 inches or moderate
Water erosion hazard: Severe
Wind erosion hazard: Severe

Land Uses

Major land uses: Rangeland, Cropland
Other land uses: Pasture, Hayland, Wildlife Habitat, Urban, Recreation

Management Concerns

Rangeland

The climax plant community is a tall grass savannah with scattered post oak and blackjack oak trees.

Major limitations:
The major limitation that affects this use is the severe erosion hazard.

Cropland

Major limitations:
The major limitation for this use is the severe erosion hazard.

Pasture and Hayland

The major grasses used are coastal bermudagrass and kleingrass.

Major limitations:
The major limitation that affects this use is the severe erosion hazard.

Wildlife Habitat

This soil provides habitat for deer, quail, dove, and turkey.

Major limitations:
There are no major limitations that affect this soil for this use.

Urban and Recreation

Major limitations:
The major limitation is low strength.

Minor limitations:
The minor limitations are the moderate shrink-swell potential, corrosivity to uncoated steel, and seepage. Slope is a limitation for recreational uses.

Interpretive Groups

Land capability class: 3e
Ecological site: Sandy Loam

BgB—Bolar gravelly clay loam, 1 to 4 percent slopes

Setting

Landscape: Hills
Shape: Irregular
Size: 20 to 100 acres

Composition

Bolar and similar soils: 80 percent
Contrasting inclusions: 20 percent

Contrasting Inclusions

Contrasting inclusions are the Denton, Doss, and Real soils. Denton soils are on lower positions. Doss and Real soils are on higher positions.

Soil Description

Position on landform: Shoulder on ridge
Parent material: Loamy residuum weathered from limestone

Typical Profile

Surface layer:
0 to 8 inches—moderately alkaline, dark brown gravelly clay loam

Subsoil:
8 to 17 inches—moderately alkaline, yellowish brown gravelly clay loam
17 to 36 inches—moderately alkaline, very pale brown clay loam

Underlying material:
36 to 55 inches—hard limestone interbedded with marl that has clay texture

Soil Properties and Qualities

Slope: 1 to 4 percent
Depth to restrictive feature: Moderately deep (20 to 40 inches) to bedrock; lithic
Drainage class: Well drained
Water table: None within a depth of 60 inches
Flooding: None
Permeability: Moderate
Surface runoff: Medium
Shrink-swell potential: Moderate
Available water capacity: Mainly 4.2 inches or low
Water erosion hazard: Moderate
Wind erosion hazard: Slight

Land Uses

Major land uses: Rangeland, Cropland
Other land uses: Pasture, Hayland, Wildlife Habitat, Urban, Recreation

Management Concerns

Rangeland

The climax plant community is a tall grass prairie with scattered motts of live oak trees.

Major limitations:
There are no major limitations that affect this soil for this use.

Minor limitations:
The minor limitation is the moderate hazard of water erosion.

Cropland

Crops grown on this soil include small grains and forage and grain sorghums.

Major limitations:
The major limitations are the low available water capacity, the moderately deep root zone, and the small rocks on the surface.

Minor limitations:
The minor limitation is the moderate hazard of water erosion.

Pasture and Hayland

The major grasses grown are coastal bermudagrass and kleingrass.

Major limitations:
There are no major limitations that affect this soil for this use.

Minor limitations:
The minor limitation is the moderate hazard of water erosion.

Wildlife Habitat

This soil provides habitat for quail, dove, and rabbits.

Major limitations:
There are no major limitations that affect the soil for this use.

Urban and Recreation

Major limitations:
The major limitations that affect this soil for this use are the depth to bedrock, corrosivity to uncoated steel, and low strength.

Minor limitations:
The minor limitations are slope, moderate shrink-swell potential, and small rocks on the surface.

Interpretive Groups

Land capability class: 4e
Ecological site: Clay Loam

Bo—Bosque clay loam, rarely flooded

Setting

Landscape: River valley
Shape: Long and narrow
Size: 50 to 600 acres

Composition

Bosque and similar soils: 85 percent
Contrasting inclusions: 15 percent

Contrasting Inclusions

Contrasting inclusions are the Frio and Venus soils. Frio soils are in depressional areas. Venus soils are along the stream channels.

Soil Description

Position on landform: Shoulder of depression on flood plain
Parent material: Loamy alluvium

Typical Profile

Surface layer:
0 to 14 inches—moderately alkaline, dark grayish brown clay loam

Subsurface layer:
14 to 52 inches—moderately alkaline, dark brown clay loam

Subsoil:
52 to 80 inches—moderately alkaline, yellowish brown clay loam

Soil Properties and Qualities

Slope: 0 to 1 percent slopes
Depth to restrictive feature: Very deep (60 to 80 inches)
Drainage class: Well drained
Water table: None within a depth of 60 inches
Flooding: Rare—most areas are subject to flooding once every 20 years.
Permeability: Moderate
Surface runoff: Negligible
Shrink-swell potential: Low
Available water capacity: Mainly 10.4 inches or high
Water erosion hazard: Slight
Wind erosion hazard: Slight

Land Uses

Major land uses: Rangeland, Cropland
Other land uses: Pasture, Hayland, Wildlife Habitat

Management Concerns

Rangeland

The climax plant community is mid and tall grasses with pecan, elm, and bur oak trees along water courses.

Major limitations:
There are no major limitations that affect this soil for this use.

Cropland

Crops grown on this soil include small grains, forage and grain sorghums, and pecans.

Major limitations:
The major limitation that affects this soil for this use is the hazard of flooding.

Pasture and Hayland

The major grasses grown on this soil are coastal bermudagrass and kleingrass.

Major limitations:
The major limitation that affects this soil for this use is the hazard of flooding.

Wildlife Habitat

This soil provides habitat for quail, dove, small furbearers, deer, and turkey.

Major limitations:
There are no major limitations that affect this soil for this use.

Urban and Recreation

This soil is not suited to this use because of the severe hazard of flooding.

Major limitations:
The major limitations are low strength, seepage, and corrosivity to uncoated steel.

Interpretive Groups

Land capability class: 1
Ecological site: Loamy Bottomland

Bs—Bosque clay loam, occasionally flooded

Setting

Landscape: River valley
Shape: Long and narrow, and continuous along major streams
Size: 20 to several hundred acres

Composition

Bosque and similar soils: 85 percent
Contrasting inclusions: 15 percent

Contrasting Inclusions

Contrasting inclusions in this map unit are the Frio and Venus soils. The Frio and Venus soils occur on positions similar to those of the Bosque soils.

Soil Description

Position on Landform: Shoulder of depression on flood plain
Parent material: Loamy alluvium

Typical Profile

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

Subsurface layer:
5 to 25 inches; moderately alkaline, dark brown clay loam

Subsoil:
25 to 80 inches; moderately alkaline, dark grayish brown clay loam

Soil Properties and Qualities

Slope: 0 to 1 percent
Depth to restrictive feature: Very deep (60 to 80 inches)

Drainage class: Well drained
Water table: None within a depth of 60 inches
Flooding: Occasional—most areas are subject to flooding about once every 2 to 10 years.
Permeability: Moderate
Surface runoff: Negligible
Shrink-swell potential: Low
Available water capacity: Mainly 9.6 inches or high
Water erosion hazard: Slight
Wind erosion hazard: Slight

Land Uses

Major land uses: Rangeland, Cropland
Other land uses: Pasture, Hayland, Wildlife Habitat

Management Concerns

Rangeland

The climax plant community is mid and tall grasses with pecan, elm, and bur oak trees along water courses.

Major limitations:
There are no major limitations that affect this soil for this use.

Cropland

Crops grown on this soil include small grains, forage and grain sorghums, and pecans.

Major limitations:
The major limitation that affects this soil for this use is the hazard of flooding.

Pasture and Hayland

The major grasses grown on this soil are coastal bermudagrass and kleingrass (fig. 6).

Major limitations:
The major limitation that affects this soil for this use is the hazard of flooding.

Wildlife Habitat

This soil provides habitat for quail, dove, small furbearers, deer, and turkey.

Major limitations:
There are no major limitations that affect this soil for this use.

Urban and Recreation

This soil is not suited to this use because of the severe hazard of flooding.

Major limitations:
The major limitations are low strength, seepage, and corrosivity to uncoated steel.

Interpretive Groups

Land capability class: 2w
Ecological site: Loamy Bottomland

Figure 6.—Hay production in an area of Bosque clay loam, occasionally flooded.

BtC—Brackett gravelly clay loam, 1 to 5 percent slopes

Setting

Landscape: Hills
Shape: Irregular
Size: 10 to 100 acres

Composition

Brackett and similar soils: 80 percent
Contrasting inclusions: 20 percent

Contrasting Inclusions

Contrasting inclusions in this map unit are the Bolar, Eckrant, Krum, Pidcoke, and Topsey soils. The Bolar and Topsey soils are on similar positions. The Eckrant and Pidcoke soils are on higher positions. The Krum soils are on lower positions.

Soil Description

Position on landform: Backslope on ridge
Parent material: Loamy residuum weathered from shale and siltstone

Typical Profile

Surface layer:
0 to 6 inches—moderately alkaline, grayish brown gravelly clay loam

Subsoil:
6 to 16 inches—moderately alkaline, pale yellow loam

Underlying material:
16 to 60 inches—moderately alkaline, yellow marl that has a silty clay texture

Soil Properties and Qualities

Slope: 1 to 5 percent
Depth to restrictive feature: Very deep (60 to 80 inches)
Drainage class: Well drained
Water table: None within a depth of 60 inches
Flooding: None
Permeability: Moderate
Surface runoff: Medium
Shrink-swell potential: Low
Available water capacity: Mainly 7.6 inches or moderate
Water erosion hazard: Moderate
Wind erosion hazard: Slight

Land Uses

Major land uses: Rangeland, Cropland
Other land uses: Pasture, Hayland, Wildlife Habitat, Urban, Recreation

Management Concerns

Rangeland

The climax plant community is a tall grass savannah with scattered motts of live oak and Texas oak trees.

Major limitations:
There are no major limitations that affect this soil for this use.

Minor limitations:
The minor limitations are the moderate hazard of water erosion and the moderate available water capacity.

Cropland

The main crops grown are small grains and forage sorghum.

Major limitations:
The major limitation is the high content of lime in the soil.

Minor limitations:
The minor limitations are the moderate hazard of water erosion, the moderate available water capacity, and small stones on the surface.

Pasture and Hayland

The main grasses grown are kleingrass and Old World bluestem.

Major limitations:
There are no major limitations that affect this soil for this use.

Minor limitations:
The minor limitations are the moderate hazard of water erosion and the moderate available water capacity.

Wildlife Habitat

This soil provides habitat for deer, dove, and quail.

Major limitations:
There are no major limitations that affect this soil for this use.

Urban and Recreation

Major limitations:
The major limitations are seepage, low strength, the moderate permeability, small stones on the surface, and corrosivity to uncoated steel.

Minor limitations:
The minor limitations are small stones on the surface and slope that limit some recreational uses.

Interpretive Groups

Land capability class: 4e
Ecological site: Adobe

BtE—Brackett gravelly clay loam, 8 to 30 percent slopes

Setting

Landscape: Hills
Shape: Irregular
Size: 50 to 900 acres

Composition

Brackett and similar soils: 80 percent
Contrasting inclusions: 20 percent

Contrasting Inclusions

Contrasting inclusions in this map unit are the Bolar, Cisco, Doss, Lampasas, Real, and Wise soils. The Bolar, Doss, and Lampasas soils are on higher positions. Real soils are on similar positions. Cisco and Wise soils are on lower positions. Also included, on the steeper slopes, are rock ledges and large, flat stones mainly along the bluffs on the upper Leon River.

Soil Description

Position on landform: Backslope on ridge
Parent material: Loamy residuum weathered from shale and siltstone

Typical Profile

Surface layer:
0 to 6 inches—moderately alkaline, light yellowish brown gravelly clay loam

Subsoil:
6 to 11 inches—moderately alkaline, very pale brown gravelly clay loam
11 to 31 inches—moderately alkaline, yellowish brown clay loam

Underlying material:
31 to 60 inches—moderately alkaline, interbedded marl that has silty clay texture and clay loam

Soil Properties and Qualities

Slope: 8 to 30 percent
Depth to restrictive feature: Very deep (60 to 80 inches)
Drainage class: Well drained
Water table: None within a depth of 60 inches
Flooding: None
Permeability: Moderate
Surface runoff: 8 to 20 percent slopes—medium; 20 to 30 percent slopes—high
Shrink-swell potential: Low
Available water capacity: Mainly 7.5 inches or moderate
Water erosion hazard: Severe
Wind erosion hazard: Slight

Land Uses

Major land uses: Rangeland
Other land uses: Wildlife Habitat, Urban, Recreation

Management Concerns

Rangeland

The climax plant community is a tall grass savannah with scattered motts of live oak and Texas oak trees.

Major limitations:
The major limitation is slope.

Wildlife Habitat

This soil provides habitat for deer, dove, and quail.

Major limitations:
There are no major limitations that affect this soil for this use.

Urban and Recreation

Although many areas have outstanding views for homesites, this soil is not suited to this use.

Major limitations:
The major limitations are the steep slope, seepage, low strength, small stones on the surface, high runoff rate, and corrosivity to uncoated steel.

Interpretive Groups

Land capability class: 7s
Ecological site: Steep Adobe

BxD—Brackett-Maloterre complex, 2 to 12 percent slopes

Setting

Landscape: Hills
Shape: Irregular
Size: 20 to 650 acres

Composition

Brackett and similar soils: 60 percent
Maloterre and similar soils: 30 percent
Contrasting inclusions: 10 percent

Contrasting Inclusions

Contrasting inclusions in this map unit are the Cho, Cranfill, Krum, Pidcoke, and Topsey soils. The Cho and Pidcoke soils are on positions similar to those of Maloterre. The Cranfill and Topsey soils are on positions similar to those of Brackett. The Krum soils are on lower positions, in drainageways.

Soil Description—Brackett

Position on landform: Backslope on ridge
Parent material: Loamy residuum weathered from shale and siltstone

Typical Profile

Surface layer:
0 to 5 inches—moderately alkaline, brown gravelly clay loam

Subsoil:
5 to 22 inches—moderately alkaline, light yellowish brown clay loam

Underlying material:
22 to 60 inches—moderately alkaline, brownish yellow, yellowish brown, and gray stratified marl and silty clay loam

Soil Properties and Qualities

Slope: 2 to 12 percent
Depth to restrictive feature: Very deep (60 to 80 inches)
Drainage class: Well drained
Water table: None within a depth of 60 inches
Flooding: None
Permeability: Moderate
Surface runoff: 2 to 5 percent slopes—low; 5 to 12 percent slopes—medium
Shrink-swell potential: Low
Available water capacity: Mainly 7.7 inches or moderate
Water erosion hazard: Severe
Wind erosion hazard: Slight

Soil Description—Maloterre

Position on landform: Summit or shoulder on low ridge
Parent material: Loamy residuum weathered from limestone

Typical Profile

Surface layer:
0 to 5 inches—moderately alkaline, brown gravelly clay loam

Underlying material:
5 to 7 inches—indurated limestone bedrock

Soil Properties and Qualities

Slope: 2 to 12 percent
Depth to restrictive feature: Very shallow (3 to 10 inches) to bedrock; lithic
Drainage class: Somewhat excessively drained
Water table: None within a depth of 60 inches
Flooding: None
Permeability: Moderate
Surface runoff: Very high
Shrink-swell potential: Low
Available water capacity: Mainly 0.8 inch or very low
Water erosion hazard: Moderate
Wind erosion hazard: Slight

Land Uses

Major land uses: Rangeland
Other land uses: Wildlife Habitat, Urban, Recreation

Management Concerns

Rangeland

The climax plant community is a tall and short grass savannah with scattered motts of live oak trees.

Major limitations:
The major limitation is the very shallow depth to bedrock and the severe hazard of erosion of the Brackett soils.

Wildlife Habitat

This complex provides little habitat for wildlife because of the lack of vegetative cover and food.

Major limitations:
The major limitation is the severe hazard of erosion of the Brackett soils.

Urban and Recreation

Major limitations:
The major limitations for this use are the very shallow and shallow depth to bedrock, low strength, slope, small stones on the surface, and the high corrosivity to uncoated steel.

Interpretive Groups

Land capability class: Brackett—7s, Maloterre—7s
Ecological site: Brackett—Adobe, Maloterre—Very Shallow

ByC—Brackett-Pidcoke complex, 1 to 5 percent slopes

Setting

Landscape: Hills
Shape: Irregular
Size: 40 to 250 acres

Composition

Brackett and similar soils: 65 percent
Pidcoke and similar soils: 25 percent
Contrasting inclusions: 10 percent

Contrasting Inclusions

Contrasting inclusions in this map unit are the Cho, Cranfill, Krum, Maloterre, and Topsey soils. The Cho, Cranfill, and Maloterre soils are on similar positions. The Topsey soils are on lower positions. The Krum soils are lower on the landscape in drainageways.

Soil Description—Brackett

Position on landform: Backslope on ridge
Parent material: Loamy residuum weathered from shale and siltstone

Typical Profile

Surface layer:
0 to 4 inches—moderately alkaline, brown gravelly clay loam

Subsoil:
4 to 26 inches—moderately alkaline, light yellowish brown clay loam

Underlying material:
26 to 60 inches—moderately alkaline, stratified marl and clay loam

Soil Properties and Qualities

Slope: 1 to 5 percent
Depth to restrictive feature: Very deep (60 to 80 inches)
Drainage class: Well drained
Water table: None within a depth of 60 inches
Flooding: None
Permeability: Moderate
Surface runoff: Low
Shrink-swell potential: Low
Available water capacity: Mainly 7.8 inches or moderate
Water erosion hazard: Moderate
Wind erosion hazard: Slight

Soil Description—Pidcoke

Position on landform: Shoulder on low ridge
Parent material: Loamy residuum weathered from fossiliferous limestone of Cretaceous age in the Walnut Formation

Typical Profile

Surface layer:
0 to 10 inches—moderately alkaline, very dark grayish brown gravelly clay loam

Subsoil:
10 to 18 inches—moderately alkaline, yellowish brown gravelly clay loam

Underlying material:
18 to 25 inches—indurated fossiliferous limestone bedrock

Soil Properties and Qualities

Slope: 1 to 5 percent
Depth to restrictive feature: Shallow (10 to 20 inches) to bedrock; lithic
Drainage class: Well drained
Water table: None within a depth of 60 inches
Flooding: None
Permeability: Moderately slow
Surface runoff: High
Shrink-swell potential: Moderate
Available water capacity: Mainly 2.1 inches or very low
Water erosion hazard: Moderate
Wind erosion hazard: Slight

Land Uses

Major land uses: Rangeland, Cropland
Other land uses: Pasture, Hayland, Wildlife Habitat, Urban, Recreation

Management Concerns

Rangeland

The climax plant community is a tall and mid grass community with scattered motts of live oak trees.

Major limitations:
The major limitations are the very low available water capacity and the high runoff rate of the Pidcoke soils.

Minor limitations:
The minor limitation is the moderate hazard of water erosion.

Cropland

The main crops grown are small grains and forage sorghum.

Major limitations:
The major limitation is the very low available water capacity of the Pidcoke soils.

Minor limitations:
The minor limitation is the moderate hazard of water erosion.

Pasture and Hayland

The main grasses grown are coastal bermudagrass, kleingrass, and Old World bluestem.

Major limitations:
There are no major limitations that affect this soil for this use.

Minor limitations:
The minor limitation is the moderate hazard of water erosion and the very low available water capacity of the Pidcoke soil.

Wildlife Habitat

This complex provides habitat for dove, quail, and deer.

Major limitations:
There are no major limitations that affect this soil for this use.

Urban and Recreation

Major limitations:
The major limitations that affect this use are the slope, shallow depth to bedrock, low strength, and corrosivity to uncoated steel.

Minor limitations:
The minor limitations are small stones on the surface for Pidcoke soils and seepage in the Brackett soils.

Interpretive Groups

Land capability class: Brackett—4e; Pidcoke—4s
Ecological site: Brackett—Adobe; Pidcoke—Shallow

CdB—Caradan silty clay, 1 to 3 percent slopes

Setting

Landscape: River valley
Shape: Irregular
Size: 20 to 50 acres

Composition

Caradan and similar soils: 80 percent
Contrasting inclusions: 20 percent

Contrasting Inclusions

Contrasting inclusions in this map unit are the Evant, Nuff, and Topsey soils. The Evant soils are on similar positions. The Nuff and Topsey soils are on lower positions.

Soil Description

Position on landform: Tread on high stream terrace (paleoterrace)
Parent material: Clayey alluvium

Typical Profile

Surface layer:
0 to 4 inches—neutral, very dark grayish brown silty clay

Subsoil:
4 to 19 inches—neutral, dark brown clay
19 to 26 inches—slightly alkaline, dark brown silty clay
26 to 63 inches—moderately alkaline, reddish yellow silt loam
63 to 80 inches—moderately alkaline, yellowish red silty clay loam

Soil Properties and Qualities

Slope: 1 to 3 percent
Depth to restrictive feature: Very deep (60 to 80 inches)
Drainage class: Well drained
Water table: None within a depth of 60 inches
Flooding: None
Permeability: Very slow
Surface runoff: Very high
Shrink-swell potential: High in the surface layer; high and very high in the subsoil

Available water capacity: Mainly 9.0 inches or high
Water erosion hazard: Moderate
Wind erosion hazard: Slight

Land Uses

Major land uses: Rangeland, Cropland
Other land uses: Pasture, Hayland, Wildlife Habitat, Urban, Recreation

Management Concerns

Rangeland

The climax plant community is a tall grass savannah with post oak and live oak trees.

Major limitations:
There are no major limitations that affect this soil for this use.

Minor limitations:
The minor limitation is the moderate hazard of water erosion.

Cropland

The main crops grown are small grains and forage and grain sorghums.

Major limitations:
There are no major limitations that affect this soil for this use.

Minor limitations:
The minor limitation is the moderate hazard of water erosion.

Pasture and Hayland

The main grasses grown are coastal bermudagrass, kleingrass, and King Ranch bluestem.

Major limitations:
There are no major limitations that affect this soil for this use.

Minor limitations:
The minor limitation is the moderate hazard of water erosion.

Wildlife Habitat

This soil provides habitat for dove, quail, and deer.

Major limitations:
There are no major limitations that affect this soil for this use.

Urban and Recreation

Major limitations:
The major limitations that affect this use are the very slow permeability, high and very high shrink-swell potential, low strength, and the corrosivity to uncoated steel. The slope, clayey surface layer, and very slow permeability limit some recreational uses.

Interpretive Groups

Land capability class: 3e
Ecological site: Deep Redland

ChB—Cho gravelly clay loam, 1 to 3 percent slopes

Setting

Landscape: Hills
Shape: Irregular
Size: 10 to 450 acres

Composition

Cho and similar soils: 80 percent
Contrasting inclusions: 20 percent

Contrasting Inclusions

Contrasting inclusions in this map unit are the Brackett and Topsey soils. The Brackett and Topsey soils are on lower positions. Also included are soils underlain by indurated limestone and deeper soils where the caliche layer was destroyed through plowing practices.

Soil Description

Position on landform: Summit or shoulder on low ridge
Parent material: Loamy residuum weathered from limestone of Cretaceous age

Typical Profile

Surface layer:
0 to 14 inches—moderately alkaline, dark grayish brown gravelly clay loam

Subsoil:
14 to 19 inches—moderately alkaline, pinkish white indurated caliche

Underlying material:
19 to 62 inches—moderately alkaline, pink gravelly loam

Soil Properties and Qualities

Slope: 1 to 3 percent
Depth to restrictive feature: Very shallow and shallow (7 to 20 inches) to petrocalcic layer
Drainage class: Well drained
Water table: None within a depth of 60 inches
Flooding: None
Permeability: Moderate in upper 14 inches, very slow in caliche layer
Surface runoff: High
Shrink-swell potential: Low
Available water capacity: Mainly 1.4 inches or very low
Water erosion hazard: Moderate
Wind erosion hazard: Slight

Land Uses

Major land uses: Rangeland
Other land uses: Pasture, Hayland, Urban, Recreation

Management Concerns

Rangeland

The climax plant community is a mid and short grass savannah.

Major limitations:
There are no major limitations that affect this soil for this use.

Minor limitations:
The minor limitation is the moderate hazard of water erosion.

Pasture and Hayland

The main grasses grown are kleingrass and Old World bluestem.

Major limitations:
The major limitations are the very low available water capacity and shallow rooting depth.

Minor limitations:
The minor limitation is the moderate hazard of water erosion.

Urban and Recreation

Major limitations:
The major limitations that affect this use are the very shallow and shallow depth to a cemented pan and corrosivity to uncoated steel.

Minor limitations:
Small stones on the surface limit some recreational uses.

Interpretive Groups

Land capability class: 4s
Ecological site: Shallow

CoC—Cisco fine sandy loam, 1 to 5 percent slopes

Setting

Landscape: Hills
Shape: Irregular
Size: 10 to 80 acres

Composition

Cisco and similar soils: 80 percent
Contrasting inclusions: 20 percent

Contrasting Inclusions

Contrasting inclusions in this map unit are the Pedernales and Wise soils. The Pedernales and Wise soils are on positions similar to those of the Cisco soil.

Soil Description

Position on landform: Summit on low ridge
Parent material: Loamy residuum weathered from sandstone

Typical Profile

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

Subsurface layer:
6 to 12 inches—neutral, brown fine sandy loam

Subsoil:
12 to 18 inches—neutral, reddish brown sandy clay loam
18 to 51 inches—neutral, yellowish red sandy clay loam

Underlying material:
51 to 80 inches—moderately alkaline, light gray fine sandy loam

Soil Properties and Qualities

Slope: 1 to 5 percent
Depth to restrictive feature: Very deep (60 to 80 inches)
Drainage class: Well drained
Water table: None within a depth of 60 inches
Flooding: None
Permeability: Moderate
Surface runoff: Low
Shrink-swell potential: Low in surface layer; moderate in subsoil
Available water capacity: Mainly 8.3 inches or moderate
Water erosion hazard: Severe
Wind erosion hazard: Slight

Land Uses

Major land uses: Rangeland, Cropland
Other land uses: Pasture, Hayland, Wildlife Habitat, Urban, Recreation

Management Concerns

Rangeland

The climax plant community is a tall grass savannah with post oak and blackjack oak trees.

Major limitations:
The major limitation is the severe hazard of water erosion.

Cropland

The main crops grown are small grains and forage sorghum.

Major limitations:
The major limitation is the severe hazard of water erosion.

Pasture and Hayland

The main grasses grown are kleingrass and coastal bermudagrass.

Major limitations:
The major limitation is the severe hazard of water erosion.

Wildlife Habitat

This soil provides habitat for deer, quail, dove, turkey, and rabbits.

Major limitations:
There are no major limitations that affect this soil for this use.

Urban and Recreation

Major limitations:
The major limitations that affect this soil for this use are seepage and sloughing of excavated pit walls.

Minor limitations:
The minor limitations are the moderate shrink-swell potential, low strength, and the corrosivity to uncoated steel. Slope limits some recreational uses.

Interpretive Groups

Land capability class: 3e
Ecological site: Sandy Loam

CoC2—Cisco fine sandy loam, 2 to 5 percent slopes, eroded

Setting

Landscape: Hills
Shape: Irregular
Size: 10 to 80 acres

Composition

Cisco and similar soils: 80 percent. Water erosion has removed part of the surface layer in about 20 to 40 percent of most map units. Gullies are about 2 to 6 feet deep, 4 to 20 feet wide, 100 to 500 feet apart, and make up about 20 to 30 percent of most map units.
Contrasting inclusions: 20 percent

Contrasting Inclusions

Contrasting inclusions in this map unit are the Pedernales and Wise soils. The Pedernales and Wise soils are on positions similar to those of the Cisco soil.

Soil Description

Position on landform: Backslope on low ridge
Parent material: Loamy residuum weathered from sandstone

Typical Profile

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

Subsoil:
5 to 40 inches—neutral, yellowish red sandy clay loam
40 to 51 inches—moderately alkaline, yellowish red sandy clay loam

Underlying material:
51 to 80 inches—moderately alkaline, strong brown loamy fine sand

Soil Properties and Qualities

Slope: 2 to 5 percent
Depth to restrictive feature: Very deep (60 to 80 inches)
Drainage class: Well drained
Water table: None within a depth of 60 inches
Flooding: None
Permeability: Moderate
Surface runoff: Low
Shrink-swell potential: Low in surface layer; moderate in subsoil
Available water capacity: Mainly 8.3 inches or moderate
Water erosion hazard: Severe
Wind erosion hazard: Slight

Land Uses

Major land uses: Rangeland, Cropland
Other land uses: Pasture, Hayland, Wildlife Habitat, Urban, Recreation

Management Concerns

Rangeland

The climax plant community is a tall grass savannah with post oak and blackjack oak trees.

Major limitations:
The major limitation is the severe hazard of water erosion.

Cropland

The main crops grown are small grains and forage sorghum.

Major limitations:
The major limitation is the severe hazard of water erosion.

Pasture and Hayland

The main grasses grown are kleingrass and coastal bermudagrass.

Major limitations:
The major limitation is the severe hazard of water erosion.

Wildlife Habitat

This soil provides habitat for deer, quail, dove, turkey, and rabbits.

Major limitations:
There are no major limitations that affect this soil for this use.

Urban and Recreation

Major limitations:

The major limitations that affect this soil for this use are sloughing of excavated pit walls and seepage.

Minor limitations:
The minor limitations are the moderate shrink-swell potential, the corrosivity to uncoated steel, and low strength. Slope limits some recreational uses.

Interpretive Groups

Land capability class: 3e
Ecological site: Sandy Loam

CrD—Cranfill gravelly clay loam, 3 to 8 percent slopes

Setting

Landscape: Hills
Shape: Irregular
Size: 20 to 300 acres

Composition

Cranfill and similar soils: 75 percent
Contrasting inclusions: 25 percent

Contrasting Inclusions

Contrasting inclusions in this map unit are the Lampasas, Real, and Topsey soils. The Lampasas and Real soils are on higher positions. Topsey soils are on lower positions.

Soil Description

Position on landform: Backslope on ridge
Parent material: Loamy residuum weathered from limestone

Typical Profile

Surface layer:
0 to 10 inches—moderately alkaline, pale brown gravelly clay loam

Subsoil:
10 to 17 inches—moderately alkaline, light yellowish brown gravelly clay loam
17 to 45 inches—moderately alkaline, very pale brown gravelly clay loam
45 to 80 inches—moderately alkaline, light yellowish brown gravelly clay loam

Soil Properties and Qualities

Slope: 3 to 8 percent
Depth to restrictive feature: Very deep (60 to 80 inches)
Drainage class: Well drained
Water table: None within a depth of 60 inches
Flooding: None
Permeability: Moderate
Surface runoff: 3 to 5 percent slopes—low; 5 to 8 percent slopes—medium
Shrink-swell potential: Moderate
Available water capacity: Mainly 6.6 inches or moderate
Water erosion hazard: Moderate
Wind erosion hazard: Slight

Land Uses

Major land uses: Rangeland, Cropland
Other land uses: Pasture, Hayland, Wildlife Habitat, Urban, Recreation

Management Concerns

Rangeland

The climax plant community is a tall grass prairie.

Major limitations:
There are no major limitations that affect this soil for this use.

Minor limitations:
The minor limitation is the moderate hazard of water erosion.

Cropland

The main crops grown are small grains and forage sorghum.

Major limitations:
The major limitations are the low natural fertility and slope.

Minor limitations:
The minor limitation is the moderate hazard of water erosion.

Pasture and Hayland

The main grasses grown are kleingrass, Old World bluestem, and coastal bermudagrass.

Major limitations:
The major limitations are the low natural fertility and slope.

Minor limitations:
The minor limitation is the moderate hazard of water erosion.

Wildlife Habitat

This soil provides habitat for deer, turkey, dove, and quail.

Major limitations:
There are no major limitations that affect this soil for this use.

Urban and Recreation

Major limitations:
The major limitation is corrosivity to uncoated steel.

Minor limitations:
The minor limitations are the moderate shrink-swell potential, seepage, low strength, and slope. Small stones on the surface and slope limit some recreational uses.

Interpretive Groups

Land capability class: 4e
Ecological site: Adobe

CrE—Cranfill gravelly clay loam, 8 to 20 percent slopes

Setting

Landscape: Hills
Shape: Long and narrow
Size: 20 to 300 acres

Composition

Cranfill and similar soils: 80 percent
Contrasting inclusions: 20 percent

Contrasting Inclusions

Contrasting inclusions in this map unit are the Brackett, Lampasas, Real, and Topsey soils. The Brackett soils are on similar positions. Topsey soils are on lower positions. The Lampasas and Real soils are on higher positions.

Soil Description

Position on landform: Backslope on ridge
Parent material: Loamy residuum weathered from limestone

Typical Profile

Surface layer:
0 to 12 inches—moderately alkaline, brown gravelly clay loam

Subsoil:
12 to 28 inches—moderately alkaline, pale brown gravelly clay loam
28 to 49 inches—moderately alkaline, very pale brown gravelly clay loam

Underlying material:
49 to 80 inches—moderately alkaline, pink gravelly clay loam

Soil Properties and Qualities

Slope: 8 to 20 percent
Depth to restrictive feature: Very deep (60 to 80 inches)
Drainage class: Well drained
Water table: None within a depth of 60 inches
Flooding: None
Permeability: Moderate
Surface runoff: Medium
Shrink-swell potential: Moderate
Available water capacity: Mainly 6.6 inches or moderate
Water erosion hazard: Severe
Wind erosion hazard: Slight

Land Uses

Major land uses: Rangeland
Other land uses: Wildlife Habitat, Urban, Recreation

Management Concerns

Rangeland

The climax plant community is a tall grass prairie with live oak and Texas oak trees.

Major limitations:
The major limitation is the severe hazard of water erosion.

Wildlife Habitat

This soil provides habitat for deer, turkey, dove, and quail.

Major limitations:
There are no major limitations that affect this soil for this use.

Urban and Recreation

Major limitations:
The major limitations are the corrosivity to uncoated steel and slope. Small stones and slope limit most recreational uses.

Minor limitations:
The minor limitations are the moderate shrink-swell potential, seepage, and low strength.

Interpretive Groups

Land capability class: 6e
Ecological site: Steep Adobe

DnB—Denton silty clay, 1 to 3 percent slopes

Setting

Landscape: Hills
Shape: Irregular
Size: 20 to 100 acres

Composition

Denton and similar soils: 80 percent
Contrasting inclusions: 20 percent

Contrasting Inclusions

Contrasting inclusions in this map unit are the Bolar and Slidell soils. The Bolar soils are on higher positions. The Slidell soils are lower positions. Also included is a soil that is less than 20 inches to limestone bedrock.

Soil Description

Position on landform: Summit on ridge
Parent material: Clayey residuum weathered from limestone

Typical Profile

Surface layer:
0 to 13 inches—moderately alkaline, dark grayish brown silty clay

Subsoil:
13 to 24 inches—moderately alkaline, reddish brown silty clay
24 to 38 inches—moderately alkaline, brown and light brown silty clay loam

Underlying material:
38 to 54 inches—moderately alkaline, brownish yellow marl that has gravelly silty clay loam texture
54 to 60 inches—indurated limestone bedrock interbedded with marl

Soil Properties and Qualities

Slope: 1 to 3 percent
Depth to restrictive feature: Deep (40 to 60 inches) to limestone bedrock; lithic
Drainage class: Well drained
Water table: None within a depth of 60 inches
Flooding: None
Permeability: Slow
Surface runoff: High
Shrink-swell potential: High in the upper part; moderate in the lower part
Available water capacity: Mainly 6.6 inches or moderate
Water erosion hazard: Moderate
Wind erosion hazard: Slight

Land Uses

Major land uses: Rangeland, Cropland
Other land uses: Pasture, Hayland, Wildlife Habitat, Urban, Recreation

Management Concerns

Rangeland

The climax plant community is a tall grass prairie with scattered motts of live oak trees.

Major limitations:
There are no major limitations that affect this soil for this use.

Minor limitations:
The minor limitation is the moderate hazard of water erosion.

Cropland

The main crops grown are small grains and forage and grain sorghums.

Major limitations:
There are no major limitations that affect this soil for this use.

Minor limitations:
The minor limitation is the moderate hazard of water erosion.

Pasture and Hayland

The main grasses grown are kleingrass and coastal bermudagrass.

Major limitations:
There are no major limitations that affect this soil for this use.

Minor limitations:
The minor limitation is the moderate hazard of water erosion.

Wildlife Habitat

This soil provides habitat for deer, quail, and dove.

Major limitations:
There are no major limitations that affect this soil for this use.

Urban and Recreation

Major limitations:
The major limitations are the high shrink-swell potential, slow permeability, corrosivity to uncoated steel, and low strength.

Minor limitations:
The minor limitations are slope, seepage, depth to rock, and the clayey surface texture which limits recreational uses.

Interpretive Groups

Land capability class: 2e
Ecological site: Clay Loam

DsB—Desan fine sand, 1 to 3 percent slopes

Setting

Landscape: Upland
Shape: Oval
Size: 20 to 175 acres

Composition

Desan and similar soils: 80 percent
Contrasting inclusions: 20 percent

Contrasting Inclusions

Contrasting inclusions in this map unit are the Bastsil and Minwells soils. The Bastsil and Minwells soils are on similar positions.

Soil Description

Position on landform: Backslope on high stream terrace (paleoterrace)
Parent material: Sandy and loamy alluvium

Typical Profile

Surface layer:
0 to 5 inches—neutral, pale brown fine sand

Subsurface layer:
5 to 20 inches—neutral, light yellowish brown fine sand
20 to 55 inches—neutral, reddish yellow fine sand

Subsoil:
55 to 69 inches—slightly acid, yellowish red sandy clay loam
69 to 80 inches—slightly acid, reddish yellow fine sandy loam

Soil Properties and Qualities

Slope: 1 to 3 percent slopes
Depth to restrictive feature: Very deep (60 to 80 inches)
Drainage class: Somewhat excessively drained
Water table: None within a depth of 60 inches
Flooding: None
Permeability: Moderate
Surface runoff: Negligible
Shrink-swell potential: Low
Available water capacity: Mainly 4.4 inches or low
Water erosion hazard: Slight
Wind erosion hazard: Severe

Land Uses

Major land uses: Rangeland, Cropland
Other land uses: Pasture, Hayland, Wildlife Habitat, Urban, Recreation

Management Concerns

Rangeland

The climax plant community is a tall and mid grass savannah with scattered post oak and blackjack oak trees.

Major limitations:
The major limitation is the severe hazard of wind erosion.

Minor Limitations:
The minor limitation is the low available water capacity.

Cropland

The main crops grown are small grains.

Major limitations:
The major limitation is the severe hazard of wind erosion.

Minor limitations:
The minor limitation is the low available water capacity.

Pasture and Hayland

The main grass grown is coastal bermudagrass.

Major limitations:
The major limitation is the severe hazard of wind erosion.

Minor limitations:
The minor limitation is the low available water capacity.

Wildlife Habitat

This soil provides habitat for deer, turkey, dove, quail, and songbirds.

Major limitations:
There are no major limitations that affect this soil for this use.

Urban and Recreation

This soil is a poor filter for septic tank absorption fields.

Major limitations:
The major limitations are seepage and sloughing of pit walls during excavations.

Minor limitations:
The minor limitation is corrosivity to uncoated steel and concrete. The deep, loose sandy surface limits recreational uses.

Interpretive Groups

Land capability class: 3s
Ecological site: Deep Sand

EcB—Eckrant very cobbly silty clay, 1 to 3 percent slopes

Setting

Landscape: Hills
Shape: Irregular
Size: 30 to 200 acres

Composition

Eckrant and similar soils: 75 percent
Contrasting inclusions: 25 percent

Contrasting Inclusions

Contrasting inclusions in this map unit are the Evant, Oglesby, and Tarpley soils. These soils are on positions similar to those of the Eckrant soil.

Soil Description

Position on landform: Summit on ridge
Parent material: Loamy residuum weathered from limestone

Typical Profile

Surface layer:
0 to 8 inches—moderately alkaline, dark grayish brown very cobbly silty clay

Underlying material:
8 to 20 inches—fractured, indurated limestone bedrock

Soil Properties and Qualities

Slope: 1 to 3 percent
Depth to restrictive feature: Very shallow and shallow (8 to 20 inches) to limestone bedrock; lithic
Drainage class: Well drained
Water table: None within a depth of 60 inches
Flooding: None
Permeability: Moderately slow
Surface runoff: High
Shrink-swell potential: Moderate
Available water capacity: Mainly 0.7 inch or very low
Water erosion hazard: Moderate
Wind erosion hazard: Slight

Land Uses

Major land uses: Rangeland
Other land uses: Wildlife Habitat

Management Concerns

Rangeland

The climax plant community is a tall grass savannah with scattered motts of live oak trees.

Major limitations:
The major limitation is the very shallow to shallow rooting zone, and the very low available water capacity.

Minor limitations:
The minor limitation is the moderate hazard of water erosion.

Wildlife Habitat

This soil provides habitat for deer, quail, and dove.

Major limitations:
There are no major limitations that affect this soil for this use.

Urban and Recreation

This complex is not suited to these uses.

Major limitations:
The major limitations are the corrosivity to uncoated steel, the very shallow depth to limestone bedrock, rock outcrops, and large stones on the surface. Excavation is difficult in the hard limestone.

Interpretive Groups

Land capability class: 7s
Ecological site: Low Stony Hill

ErB—Eckrant-Rock outcrop complex, 1 to 5 percent slopes

Setting

Landscape: Hills
Shape: Irregular
Size: 75 to 500 acres

Composition

Eckrant and similar soils: 50 to 60 percent, but averages 55 percent
Rock outcrop: 10 to 30 percent, but averages 20 percent
Contrasting inclusions: 10 to 40 percent, averages about 25 percent

Contrasting Inclusions

Contrasting inclusions in this complex are the Evant, Lampasas, Oglesby, Real, and Tarpley soils. The Evant, Lampasas, Oglesby, and Tarpley soils are on positions similar to those of the Eckrant soil. Real soils are on lower positions. Rock outcrops are typically long and narrow. The areas range from 2 to 15 feet across, and 4 to 50 feet long. In some areas, the rock outcrop is 6 inches higher than the Eckrant soils.

Soil Description—Eckrant

Position on landform: Summit on ridge
Parent material: Loamy residuum weathered from limestone

Typical Profile

Surface layer:
0 to 3 inches; neutral, very dark gray very cobbly clay

Subsurface layer:
3 to 9 inches; neutral, very dark gray very cobbly clay

Underlying material:
9 to 15 inches; coarsely fractured indurated limestone bedrock

Soil Properties and Qualities

Slope: 1 to 5 percent
Depth to restrictive feature: Very shallow and shallow (8 to 20 inches) to limestone bedrock, lithic
Drainage class: Well drained
Water table: None within a depth of 60 inches
Flooding: None

Permeability: Moderately slow
Surface runoff: High
Shrink-swell potential: High
Available water capacity: Mainly 0.8 inch or very low
Water erosion hazard: Severe
Wind erosion hazard: Slight

Soil Description—Rock outcrop

Position on Landform: Shoulder on ridge
Parent material: Limestone

Typical Profile

Surface and underlying material:
0 to 2 inches; indurated limestone bedrock

Land Uses

Major land uses: Rangeland
Other land uses: Wildlife Habitat

Management Concerns

Rangeland

The climax plant community is a tall grass savannah with motts of live oak trees.

Major limitations:
The major limitations are the severe hazard of water erosion, the very low available water capacity, and the very shallow depth to bedrock.

Wildlife Habitat

This complex provides habitat for deer, dove, and quail.

Major limitations:
There are no major limitations that affect this soil for this use.

Urban and Recreation

This complex is not suited to these uses.

Major limitations:
The major limitations are the corrosivity to uncoated steel, the very shallow depth to limestone bedrock, rock outcrops, and large stones on the surface. Excavation is difficult in the hard limestone.

Interpretive Groups

Land capability class: Eckrant—7s; Rock outcrop—8s
Ecological site: Eckrant—Low Stony Hill; Rock outcrop—not rated

EvB—Evant gravelly silty clay, 1 to 3 percent slopes

Setting

Landscape: Hills
Shape: Irregular
Size: 20 to 1,000 acres

Composition

Evant and similar soils: 80 percent
Contrasting inclusions: 20 percent

Contrasting Inclusions

Contrasting inclusions in this map unit are the Caradan, Eckrant, Oglesby, and Tarpley soils. These soils are on positions similar to those of the Evant soil.

Soil Description

Position on landform: Ridge
Parent material: Clayey alluvium over limestone

Typical Profile

Surface layer:
0 to 5 inches; neutral, dark brown gravelly silty clay

Subsoil:
5 to 14 inches; neutral, reddish brown clay
14 to 18 inches; moderately alkaline, strongly cemented pinkish white caliche

Underlying material:
18 to 50 inches; moderately alkaline, white silt loam stratified with dark brown loam, interbedded with weakly cemented layers of chalky limestone

Soil Properties and Qualities

Depth to restrictive feature: Shallow (14 to 20 inches) to petrocalcic layer
Drainage class: Well drained
Water table: None within a depth of 60 inches
Flooding: None
Permeability: Slow
Surface runoff: High
Shrink-swell potential: Moderate in the surface layer; high in the upper part of the subsoil.
Available water capacity: Mainly 1.4 inches or very low
Water erosion hazard: Moderate
Wind erosion hazard: Slight

Land Uses

Major land uses: Rangeland, Cropland
Other land uses: Pasture, Hayland, Wildlife Habitat, Urban, Recreation

Management Concerns

Rangeland

The climax plant community is a tall grass savannah with post oak and blackjack oak trees.

Major limitations:
The major limitation is the very low available water capacity and the shallow rooting zone.

Minor limitations:
The minor limitation is the moderate hazard of water erosion.

Cropland

The main crops grown are small grains and forage sorghum.

Major limitations:
The major limitation is the very low available water capacity and the shallow rooting zone.

Minor limitations:
The minor limitation is the moderate hazard of water erosion.

Pasture and Hayland

The main grasses grown are improved varieties of bermudagrass and kleingrass.

Major limitations:
The major limitation is the very low available water capacity and the shallow rooting zone.

Minor limitations:
The minor limitation is the moderate hazard of water erosion.

Wildlife Habitat

This soil provides habitat for deer, dove, quail, and furbearing animals.

Major limitations:
There are no major limitations that affect this soil for this use.

Urban and Recreation

Major limitations:
The major limitations are the shallow depth to a cemented pan, slow permeability, corrosivity to uncoated steel, low strength, and the high shrink-swell potential.

Interpretive Groups

Land capability class: 4s
Ecological site: Redland

Fr—Frio silty clay, occasionally flooded

Setting

Landscape: River valley
Shape: Longer than they are wide, and continuous along the drainageways
Size: 30 to 400 acres

Composition

Frio and similar soils: 85 percent
Contrasting inclusions: 15 percent

Contrasting Inclusions

Contrasting inclusions in this map unit are the Bosque, Rumley, and Venus soils. These soils are on higher positions.

Soil Description

Position on landform: Flood plain
Parent material: Loamy alluvium derived from limestone and shale

Typical Profile

Surface layer:
0 to 7 inches—moderately alkaline, very dark grayish brown silty clay

Subsurface layer:
7 to 37 inches—moderately alkaline, very dark grayish brown silty clay

Subsoil:
37 to 54 inches—moderately alkaline, grayish brown silty clay
54 to 70 inches—moderately alkaline, grayish brown silty clay

Soil Properties and Qualities

Slope: 0 to 1 percent
Depth to restrictive feature: Very deep (60 to 80 inches)
Drainage class: Well drained
Water table: None within a depth of 60 inches
Flooding: Occasional; this soil floods once every 2 to 10 years for a duration of less than 3 days.
Permeability: Moderately slow
Surface runoff: Low
Shrink-swell potential: Moderate
Available water capacity: Mainly 10.2 inches or high
Water erosion hazard: Slight
Wind erosion hazard: Slight

Land Uses

Major land uses: Rangeland, Cropland
Other land uses: Pasture, Hayland, Wildlife Habitat

Management Concerns

Rangeland

The climax plant community is tall and mid grasses with pecan, elm, hackberry, and cottonwood trees along the water courses.

Major limitations:
There are no major limitations that affect this soil for this use.

Cropland

The main crops grown are small grains, forage and grain sorghums, and pecans (fig. 7).

Major limitations:
There are no major limitations that affect this soil for this use.

Minor limitations:
The minor limitation is the hazard of flooding.

Pasture and Hayland

The main grasses grown are coastal bermudagrass, kleingrass, and switchgrass.

Major limitations:
There are no major limitations that affect this soil for this use.

Minor limitations:
The minor limitation is the hazard of flooding.

Figure 7.—The best soils for pecan growth are well drained and very deep. This pecan orchard occurs in an area of Frio silty clay, occasionally flooded.

Wildlife Habitat

This soil provides habitat for quail, dove, squirrel, and raccoon.

Major limitations:
There are no major limitations that affect this soil for this use.

Urban and Recreation

This soil is not suited to urban use because of the severe hazard of flooding.

Major limitations:
The major limitation is the severe hazard of flooding, low strength, moderately slow permeability, and corrosivity to uncoated steel.

Minor limitations:
The hazard of flooding and the clayey surface layer limit some recreational uses.

Interpretive Groups

Land capability class: 2w
Ecological site: Loamy Bottomland

KrB—Krum silty clay, 1 to 5 percent slopes

Setting

Landscape: Hills
Shape: Long and narrow
Size: 40 to more than 200 acres

Composition

Krum and similar soils: 80 percent
Contrasting inclusions: 20 percent

Contrasting Inclusions

Contrasting inclusions in this map unit are the Bosque, Frio, Nuff, Rumley, and Slidell soils. The Bosque and Frio soils are in lower positions, on flood plains. The Nuff soils are on slightly higher positions. The Rumley and Slidell soils are on positions similar to those of the Krum soil.

Soil Description

Position on landform: Draw
Parent material: Clayey alluvium

Typical Profile

Surface layer:
0 to 8 inches—moderately alkaline, very dark grayish brown silty clay

Subsurface layer:
8 to 36 inches—moderately alkaline, very dark grayish brown silty clay

Subsoil:
36 to 48 inches—moderately alkaline, grayish brown silty clay
48 to 62 inches—moderately alkaline, pale brown silty clay

Soil Properties and Qualities

Slope: 1 to 5 percent
Depth to restrictive feature: Very deep (60 to 80 inches)
Drainage class: Well drained
Water table: None within a depth of 60 inches
Flooding: None
Permeability: Moderately slow
Surface runoff: Medium
Shrink-swell potential: High
Available water capacity: Mainly 8.9 inches or high
Water erosion hazard: Moderate
Wind erosion hazard: Slight

Land Uses

Major land uses: Rangeland, Cropland
Other land uses: Pasture, Hayland, Wildlife Habitat, Urban, Recreation

Management Concerns

Rangeland

The climax plant community is a tall grass prairie with scattered motts of live oak trees.

Major limitations:
There are no major limitations that affect this soil for this use.

Minor limitations:
The minor limitation is the moderate hazard of water erosion.

Cropland

The main crops grown are small grains and forage and grain sorghums.

Major limitations:
There are no major limitations that affect this soil for this use.

Minor limitations:
The minor limitation is the moderate hazard of water erosion.

Pasture and Hayland

The main grasses grown are coastal bermudagrass and kleingrass.

Major limitations:
There are no major limitations that affect this soil for this use.

Minor limitations:
The minor limitation is the moderate hazard of water erosion.

Wildlife Habitat

This soil provides habitat for turkey, dove, and quail.

Major limitations:
There are no major limitations that affect this soil for this use.

Urban and Recreation

Major limitations:
The major limitations are the high shrink-swell potential, the moderately slow permeability, corrosivity to uncoated steel, and low strength.

Minor limitations:
The slope and clayey surface limit some recreational uses.

Interpretive Groups

Land capability class: 3e
Ecological site: Clay Loam

La—Lamkin clay loam, occasionally flooded

Setting

Landscape: River valley
Shape: Long and narrow
Size: 10 to 60 acres

Composition

Lamkin and similar soils: 85 percent
Contrasting inclusions: 15 percent

Contrasting Inclusions

Contrasting inclusions in this map unit are the Bosque and Venus soils. These soils are on similar positions.

Soil Description

Position on landform: Flood plain
Parent material: Loamy alluvium

Typical Profile

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

Underlying material:
10 to 34 inches—moderately alkaline, pale brown very fine sandy loam
34 to 80 inches—moderately alkaline, dark brown silty clay loam

Soil Properties and Qualities

Slope: 0 to 1 percent
Depth to restrictive feature: Very deep (60 to 80 inches)
Drainage class: Well drained
Water table: None within a depth of 60 inches
Flooding: Occasional; this soil floods once every 10 years
Permeability: Moderate
Surface runoff: Negligible
Shrink-swell potential: Moderate
Available water capacity: Mainly 9.5 inches or high
Water erosion hazard: Slight
Wind erosion hazard: Slight

Land Uses

Major land uses: Rangeland, Cropland
Other land uses: Pasture, Hayland, Wildlife Habitat

Management Concerns

Rangeland

The climax plant community is tall and mid grasses with pecan, cottonwood, elm, and hackberry trees along the water courses.

Major limitations:
There are no major limitations that affect this soil for this use.

Cropland

The main crops grown are small grains, forage and grain sorghums, and pecans.

Major limitations:
There are no major limitations that affect this soil for this use.

Minor limitations:
The minor limitation is the hazard of flooding.

Pasture and Hayland

The main grasses grown are coastal bermudagrass and kleingrass.

Major limitations:
There are no major limitations that affect this soil for this use.

Minor limitations:
The minor limitation is the hazard of flooding.

Wildlife Habitat

This soil provides habitat for dove, quail, and turkey.

Major limitations:
There are no major limitations that affect this soil for this use.

Urban and Recreation

This soil is not suited to urban uses because of the severe hazard of flooding.

Major limitations:
The major limitation is the severe hazard of flooding and low strength.

Minor limitations:
The minor limitations are the moderate shrink-swell potential and corrosivity to uncoated steel. The hazard of flooding limits some recreational uses.

Interpretive Groups

Land capability class: 2w
Ecological site: Loamy Bottomland

LpB—Lampasas gravelly clay, 1 to 3 percent slopes

Setting

Landscape: Hills
Shape: Irregular
Size: 24 to 400 acres

Composition

Lampasas and similar soils: 80 percent
Contrasting inclusions: 20 percent

Contrasting Inclusions

Contrasting inclusions in this map unit are the Brackett, Cho, Eckrant, Nuff, Pidcoke, and Real soils. The Cho, Eckrant, Pidcoke, and Real soils are on positions similar to those of the Lampasas soil. The Brackett and Nuff soils are on lower positions.

Soil Description

Position on landform: Summit on ridge
Parent material: Clayey residuum weathered from limestone

Typical Profile

Surface layer:
0 to 3 inches—neutral, dark grayish brown gravelly clay

Subsurface layer:
3 to 11 inches—neutral, dark grayish brown very gravelly clay

Underlying material:
11 to 60 inches—fragmental white limestone or claystone

Soil Properties and Qualities

Slope: 1 to 3 percent
Depth to restrictive feature: Very shallow and shallow (9 to 20 inches) to fragmental limestone
Drainage class: Well drained
Water table: None within a depth of 60 inches
Flooding: None

Permeability: Moderately slow
Surface runoff: Medium
Shrink-swell potential: Moderate
Available water capacity: Mainly 1.4 inches or very low
Water erosion hazard: Moderate
Wind erosion hazard: Slight

Land Uses

Major land uses: Rangeland
Other land uses: Wildlife Habitat, Recreation

Management Concerns

Rangeland

The climax plant community is a mid and tall grass prairie with scattered live oak trees.

Major limitations:
The major limitation is the very low available water capacity.

Minor limitations:
The minor limitation is the moderate hazard of water erosion.

Wildlife Habitat

This soil provides habitat for quail, dove, and deer.

Major limitations:
There are no major limitations that affect this soil for this use.

Urban and Recreation

Septic systems must be specially constructed in raised beds or large fields, so effluent will not seep downslope through underlying material into the underground water. The underlying material is valued for use as roadfill, for it is easily excavated and crushed by machinery.

Major limitations:
The major limitations are the very low available water capacity, and the very shallow and shallow depth to fragmental limestone bedrock. Small stones on the surface and very shallow and shallow depth to limestone bedrock limit most recreational uses.

Minor limitations:
The minor limitations are seepage and the moderate shrink-swell potential

Interpretive Groups

Land capability class: 6s
Ecological site: Shallow

MnB—Minwells fine sandy loam, 1 to 3 percent slopes

Setting

Landscape: River valley
Shape: Oblong
Size: 75 to 300 acres

Composition

Minwells and similar soils: 80 percent
Contrasting inclusions: 20 percent

Contrasting Inclusions

Contrasting inclusions in this map unit are the Bastsil, Bosque, Nuff, and Slidell soils. The Bastsil soils are on similar positions. The Bosque and Slidell soils are on lower positions in drainageways and depressions. The Nuff soils are on higher positions. Also included are areas with slopes greater than 3 percent.

Soil Description

Position on landform: Tread or riser on high stream terrace
Parent material: Gravelly sandy alluvium

Typical Profile

Surface layer:
0 to 9 inches—neutral, dark brown fine sandy loam

Subsoil:
9 to 20 inches—neutral, reddish brown clay
20 to 46 inches—neutral, red sandy clay
46 to 63 inches—moderately alkaline, reddish yellow gravelly sandy clay loam

Underlying material:
63 to 80 inches—moderately alkaline, red very gravelly sand

Soil Properties and Qualities

Slope: 1 to 3 percent
Depth to restrictive feature: Very deep (60 to 80 inches)
Drainage class: Well drained
Water table: None within a depth of 60 inches
Flooding: None
Permeability: Slow
Surface runoff: High
Shrink-swell potential: Low in surface layer; moderate in subsoil
Available water capacity: Mainly 7.8 inches or moderate
Water erosion hazard: Moderate
Wind erosion hazard: Slight

Land Uses

Major land uses: Rangeland, Cropland
Other land uses: Pasture, Hayland, Wildlife Habitat, Urban, Recreation

Management Concerns

Rangeland

The climax plant community is a tall grass savannah with scattered post oak and blackjack oak trees.

Major limitations:
There are no major limitations that affect this soil for this use.

Minor limitations:
The minor limitation is the moderate hazard of water erosion.

Cropland

The main crops grown are small grains and forage and grain sorghums.

Major limitations:
There are no major limitations that affect this soil for this use.

Minor limitations:
The minor limitation is the moderate hazard of water erosion.

Pasture and Hayland

The main grasses grown are kleingrass and coastal bermudagrass.

Major limitations:
There are no major limitations that affect this soil for this use.

Minor limitations:
The minor limitation is the moderate hazard of water erosion.

Wildlife Habitat

This soil provides habitat for deer, dove, quail, and turkey.

Major limitations:
There are no major limitations that affect this soil for this use.

Urban and Recreation

Major limitations:
The major limitations are seepage, corrosivity to uncoated steel, sloughing of excavated pit walls, low strength, and the slow permeability.

Minor limitations:
The minor limitation is the moderate shrink-swell potential. Slope limits some recreational uses.

Interpretive Groups

Land capability class: 2e
Ecological site: Sandy Loam

NuB—Nuff silty clay loam, 1 to 3 percent slopes

Setting

Landscape: Hills
Shape: Irregular
Size: 15 to 75 acres

Composition

Nuff and similar soils: 80 percent. Large stones, common to this soil, have been removed to allow for cultivation
Contrasting inclusions: 20 percent

Contrasting Inclusions

Contrasting inclusions in this map unit are the Cho, Cisco, Slidell, and Wise soils. The Cho soils are on higher positions. The Cisco and Wise soils are on lower positions. The Slidell soils are on lower positions, in drainageways.

Soil Description

Position on landform: Footslope on ridge
Parent material: Clayey residuum weathered from shale in the Walnut Clay

Typical Profile

Surface layer:
0 to 9 inches—moderately alkaline, very dark gray silty clay loam

Subsoil:
9 to 26 inches—moderately alkaline, grayish brown silty clay loam

Underlying material:
26 to 62 inches—moderately alkaline, grayish brown shale and marl with silty clay texture

Soil Properties and Qualities

Slope: 1 to 3 percent
Depth to restrictive feature: Very deep (60 to 80 inches)
Drainage class: Well drained
Water table: None within a depth of 60 inches
Flooding: None
Permeability: Moderately slow
Surface runoff: Medium
Shrink-swell potential: Moderate
Available water capacity: Mainly 10.3 inches or high
Water erosion hazard: Moderate
Wind erosion hazard: Slight

Land Uses

Major land uses: Rangeland, Cropland
Other land uses: Pasture, Hayland, Wildlife Habitat, Urban, Recreation

Management Concerns

Rangeland

The climax plant community is a tall grass prairie with scattered motts of live oak trees.

Major limitations:
There are no major limitations that affect this soil for this use.

Minor limitations:
The minor limitation is the moderate hazard of water erosion.

Cropland

The main crops grown are small grains and forage and grain sorghums.

Major limitations:
There are no major limitations that affect this soil for this use.

Minor limitations:
The minor limitation is the moderate hazard of water erosion.

Pasture and Hayland

The main grasses grown are coastal bermudagrass and kleingrass.

Major limitations:
There are no major limitations that affect this soil for this use.

Minor limitations:
The minor limitation is the moderate hazard of water erosion.

Wildlife Habitat

This soil provides habitat for dove, quail, songbirds, and rabbits.

Major limitations:
There are no major limitations that affect this soil for this use.

Urban and Recreation

Major limitations:
The major limitation is low strength.

Minor limitations:
The minor limitations are the corrosivity to uncoated steel, seepage, moderate shrink-swell potential, and the moderately slow permeability. Slope and the clayey surface limit some recreational uses.

Interpretive Groups

Land capability class: 2e
Ecological site: Clay Loam

NuC—Nuff silty clay loam, 2 to 6 percent slopes, very stony

Setting

Landscape: Hills
Shape: Irregular
Size: 50 to several hundred acres

Composition

Nuff and similar soils: 80 percent. Commonly 1 to 3 percent of the soil surface is covered by limestone fragments. Surface fragments are 6 to 24 inches across and 0.5 inch to 6 inches thick. Many of the rocks are tilted at a 30- to 50-degree angle.
Contrasting inclusions: 20 percent

Contrasting Inclusions

Contrasting inclusions in this map unit are the Cho, Cisco, Slidell, and Wise soils. The Cho soils are on higher positions. The Cisco and Wise soils are on lower positions. The Slidell soils are on lower positions, in drainageways.

Soil Description

Position on landform: Backslope on ridge
Parent material: Clayey residuum weathered from shale in the Walnut Clay

Typical Profile

Surface layer:
0 to 10 inches—moderately alkaline, grayish brown very stony silty clay loam

Subsurface layer: 10 to 18 inches—moderately alkaline, grayish brown silty clay loam

Subsoil:
18 to 25 inches—moderately alkaline, brown silty clay loam

Underlying material:
25 to 80 inches—moderately alkaline, light gray and white interbedded shale with a texture of silty clay loam

Soil Properties and Qualities

Slope: 2 to 6 percent
Depth to restrictive feature: Very deep (60 to 80 inches)
Drainage class: Well drained
Water table: None within a depth of 60 inches
Flooding: None
Permeability: Moderately slow
Surface runoff: Medium
Shrink-swell potential: Moderate
Available water capacity: Mainly 9.7 inches or high
Water erosion hazard: Moderate
Wind erosion hazard: Slight

Land Uses

Major land uses: Rangeland
Other land uses: Wildlife Habitat, Urban, Recreation

Management Concerns

Rangeland

The climax plant community is a tall grass prairie with a few scattered motts of live oak trees.

Major limitations:
There are no major limitations that affect this soil for this use.

Minor limitations:
The minor limitation is the moderate hazard of water erosion.

Wildlife Habitat

This soil provides habitat for quail, dove, songbirds, and rabbits.

Major limitations:
There are no major limitations that affect this soil for this use.

Urban and Recreation

Major limitations:
The major limitations are low strength and large stones on the surface. Large surface stones limit most recreational uses.

Minor limitations:
The minor limitation is the corrosivity to uncoated steel, seepage, slope, moderate shrink-swell potential, and the moderately slow permeability.

Interpretive Groups

Land capability class: 6s
Ecological site: Stony Clay Loam

OgB—Oglesby gravelly silty clay, 1 to 3 percent slopes

Setting

Landscape: Hills
Shape: Oblong
Size: 20 to 60 acres

Composition

Oglesby and similar soils: 80 percent
Contrasting inclusions: 20 percent

Contrasting Inclusions

Contrasting inclusions in this map unit are the Bolar, Eckrant, Krum, San Saba, and Tarpley soils. Bolar soils are higher in the landscape. Eckrant and Tarpley soils are on positions similar to those of the Oglesby soil. Krum and San Saba soils are on lower positions.

Soil Description

Position on Landform: Summit on ridge
Parent material: Clayey residuum weathered from shale and limestone

Typical Profile

Surface layer:
0 to 8 inches—slightly alkaline, very dark grayish brown gravelly silty clay

Subsurface layer:
8 to 17 inches—slightly alkaline, very dark grayish brown gravelly silty clay

Underlying material:
17 to 35 inches—indurated, fractured limestone bedrock

Soil Properties and Qualities

Slope: 1 to 3 percent
Depth to restrictive feature: Shallow (10 to 20 inches) to bedrock; lithic
Drainage class: Well drained
Water table: None within a depth of 60 inches
Flooding: None
Permeability: Slow
Surface runoff: High
Shrink-swell potential: High
Available water capacity: Mainly 1.9 inches or very low
Water erosion hazard: Moderate
Wind erosion hazard: Slight

Land Uses

Major land uses: Rangeland, Cropland
Other land uses: Pasture, Hayland, Wildlife Habitat, Urban, Recreation

Management Concerns

Rangeland

The climax plant community is open grassland with scattered motts of live oak trees.

Major limitations:
The major limitations are the very low available water capacity and the shallow rooting zone.

Minor limitations:
The moderate hazard of water erosion is a minor limitation.

Cropland

The main crops grown are small grains and forage sorghum.

Major limitations:
The major limitations are the very low available water capacity and the shallow rooting zone.

Minor limitations:
The moderate hazard of water erosion is a minor limitation.

Pasture and Hayland

The main grasses grown are coastal bermudagrass, kleingrass, and Old World bluestem.

Major limitations:
The major limitations are the very low available water capacity and the shallow rooting zone.

Minor limitations:
The moderate hazard of water erosion is a minor limitation.

Wildlife Habitat

This soil provides habitat for quail, dove, and deer.

Major limitations:
There are no major limitations that affect this soil for this use.

Urban and Recreation

Major limitations:
The major limitations are the corrosivity to uncoated steel, high shrink-swell potential, low strength, and the shallow depth to limestone bedrock. Excavations are difficult in the hard bedrock.

Interpretive Groups

Land capability class: 4s
Ecological site: Shallow

PdB—Pedernales fine sandy loam, 1 to 3 percent slopes

Setting

Landscape: Hills
Shape: Irregular
Size: 20 to 80 acres

Composition

Pedernales and similar soils: 85 percent
Contrasting inclusions: 15 percent

Contrasting Inclusions

Contrasting inclusions in this map unit are the Cisco and Desan soils. These soils are on landscape positions similar to those of the Pedernales soil.

Soil Description

Position on landform: Backslope on ridge
Parent material: Loamy residuum weathered from sandstone and shale

Typical Profile

Surface layer:
0 to 9 inches—neutral, yellowish red fine sandy loam

Subsoil:
9 to 24 inches—neutral, red sandy clay
24 to 29 inches—slightly alkaline, yellowish red sandy clay
29 to 35 inches—moderately alkaline, yellowish red sandy clay loam
35 to 80 inches—moderately alkaline, very pale brown clay loam

Soil Properties and Qualities

Slope: 1 to 3 percent
Depth to restrictive feature: Very deep (60 to 80 inches)
Drainage class: Well drained
Water table: None within a depth of 60 inches
Flooding: None
Permeability: Moderately slow
Surface runoff: Medium
Shrink-swell potential: Low in the surface layer; moderate in the subsoil
Available water capacity: Mainly 9.3 inches or high
Water erosion hazard: Moderate
Wind erosion hazard: Slight

Land Uses

Major land uses: Rangeland, Cropland
Other land uses: Pasture, Hayland, Wildlife Habitat, Urban, Recreation

Management Concerns

Rangeland

The climax plant community is a mid grass savannah with scattered post oak and blackjack oak trees.

Major limitations:
There are no major limitations that affect this soil for this use.

Minor limitations:
The minor limitation is the moderate hazard of water erosion.

Cropland

The main crops grown are small grains and forage and grain sorghums.

Major limitations:
There are no major limitations that affect this soil for this use.

Minor limitations:
The minor limitation is the moderate hazard of water erosion.

Pasture and Hayland

The main grasses grown are coastal bermudagrass and kleingrass.

Major limitations:
There are no major limitations that affect this soil for this use.

Minor limitations:
The minor limitation is the moderate hazard of water erosion.

Wildlife Habitat

This soil provides habitat for quail, dove, and deer.

Major limitations:
There are no major limitations that affect this soil for this use.

Urban and Recreation

Major limitations:
The major limitations are the corrosivity to uncoated steel, moderately slow permeability, and low strength.

Minor Limitations:
The minor limitations are the moderate shrink-swell potential and slope.

Interpretive Groups

Land capability class: 2e
Ecological site: Tight Sandy Loam

PdC2—Pedernales fine sandy loam, 3 to 5 percent slopes, eroded

Setting

Landscape: Hills
Shape: Irregular
Size: 20 to 80 acres

Composition

Pedernales and similar soils: 80 percent. Water erosion has removed the surface layer in about 20 to 40 percent of most delineations. Gullies are about 2 to 6 feet deep, 4 to 20 feet wide, and 100 to 500 feet apart. The gullies comprise about 25 to 30 percent of most mapped areas.
Contrasting inclusions: 20 percent

Contrasting Inclusions

Contrasting inclusions in this map unit are the Cisco, Desan, and Wise soils. Cisco and Desan soils are on positions similar to those of the Pedernales soil. The Wise soils are in lower positions on the landscape.

Soil Description

Position on landform: Backslope on ridge
Parent material: Loamy residuum weathered from sandstone and shale

Typical Profile

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

Subsoil:
5 to 15 inches—neutral, yellowish red sandy clay
15 to 37 inches—neutral, red sandy clay

Underlying material:
37 to 62 inches—moderately alkaline, mottled yellow and red sandy clay loam

Soil Properties and Qualities

Slope: 3 to 5 percent
Depth to restrictive feature: Very deep (60 to 80 inches)
Drainage class: Well drained
Water table: None within a depth of 60 inches
Flooding: None
Permeability: Moderately slow
Surface runoff: Medium
Shrink-swell potential: Low in the surface layer; moderate in subsoil
Available water capacity: Mainly 9.3 inches or high
Water erosion hazard: Severe
Wind erosion hazard: Slight

Land Uses

Major land uses: Rangeland, Cropland
Other land uses: Pasture, Hayland, Wildlife Habitat, Urban, Recreation

Management Concerns

Rangeland

The climax plant community is a mid grass savannah with scattered post oak and blackjack oak trees.

Major limitations:
The major limitation is the severe hazard of water erosion.

Cropland

The main crops grown are small grains and forage sorghum.

Major limitations:
The major limitation is the severe hazard of water erosion.

Pasture and Hayland

The main grasses grown are coastal bermudagrass and kleingrass.

Major limitations:
The major limitation is the severe hazard of water erosion.

Wildlife Habitat

This soil provides habitat for quail, dove, and deer.

Major limitations:
The major limitation is the severe hazard of water erosion.

Urban and Recreation

Major limitations:
The major limitations are the corrosivity to uncoated steel, moderately slow permeability, and low strength.

Minor limitations:
The minor limitations are slope and the moderate shrink-swell potential.

Interpretive Groups

Land capability class: 3e
Ecological site: Tight Sandy Loam

PkB—Pidcoke gravelly clay loam, 1 to 3 percent slopes

Setting

Landscape: Hills
Shape: Irregular
Size: 20 to 100 acres

Composition

Pidcoke and similar soils: 80 percent
Contrasting inclusions: 20 percent

Contrasting Inclusions

Contrasting inclusions in this map unit are the Brackett, Cho, Nuff, Oglesby, and Topsey soils. Cho and Oglesby soils are on positions similar to those of the Pidcoke soil. Brackett, Nuff, and Topsey soils are on lower positions.

Soil Description

Position on landform: Shoulder on low ridge
Parent material: Loamy residuum weathered from fossiliferous limestone of Cretaceous age in the Walnut Formation

Typical Profile

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

Subsoil:
11 to 18 inches—moderately alkaline, dark brown gravelly clay loam

Underlying material:
18 to 24 inches—indurated, fossiliferous limestone

Soil Properties and Qualities

Slope: 1 to 3 percent
Depth to restrictive feature: Shallow (10 to 20 inches) to limestone bedrock; lithic
Drainage class: Well drained
Water table: None within a depth of 60 inches
Flooding: None
Permeability: Moderately slow
Surface runoff: High
Shrink-swell potential: Moderate
Available water capacity: Mainly 1.9 inches or very low
Water erosion hazard: Moderate
Wind erosion hazard: Slight

Land Uses

Major land uses: Rangeland, Cropland
Other land uses: Pasture, Hayland, Wildlife Habitat, Urban, Recreation

Management Concerns

Rangeland

The climax plant community is open grassland with scattered motts of live oak trees.

Major limitations:
There are no major limitations that affect this soil for this use.

Minor limitations:
The minor limitation is the very low available water capacity and the moderate hazard of water erosion.

Cropland

The main crops grown are small grains and forage sorghum.

Major limitations:
The major limitations are the shallow rooting depth and the very low available water capacity.

Minor limitations:
The minor limitation is the moderate hazard of water erosion.

Pasture and Hayland

The main grasses grown are coastal bermudagrass, kleingrass, and Old World bluestem.

Major limitations:
The major limitations are the shallow rooting depth and the very low available water capacity.

Minor limitations:
The minor limitation is the moderate hazard of water erosion.

Wildlife Habitat

This soil provides poor habitat for quail and dove because of the lack of cover and food.

Major limitations:
The major limitations are the shallow rooting depth and the very low available water capacity.

Minor limitations:
The minor limitation is the moderate hazard of water erosion.

Urban and Recreation

This soil is poorly suited to urban uses.

Major limitations:
The major limitations are the shallow depth to bedrock and small stones on the surface. Excavations are difficult in the hard rock.

Minor limitations:
The minor limitation is the corrosivity to uncoated steel.

Interpretive Groups

Land capability class: 4s
Ecological site: Shallow

ReB—Real gravelly clay loam, 1 to 3 percent slopes

Setting

Landscape: Hills
Shape: Irregular
Size: 20 to 100 acres

Composition

Real and similar soils: 80 percent
Contrasting inclusions: 20 percent

Contrasting Inclusions

Contrasting inclusions in this map unit are the Brackett, Cho, Cranfill, and Lampasas soils. The Brackett and Cranfill soils are on lower positions. Cho and Lampasas soils are on positions similar to those of the Real soil.

Soil Description

Position on landform: Backslope on ridge
Parent material: Loamy residuum weathered from limestone

Typical Profile

Surface layer:
0 to 5 inches—moderately alkaline, brown gravelly clay loam

Subsurface layer:
5 to 12 inches—moderately alkaline, brown extremely gravelly clay loam

Subsoil:
12 to 14 inches—strongly cemented caliche

Underlying material:
14 to 60 inches—moderately alkaline, white weakly cemented limestone and marl

Soil Properties and Qualities

Slope: 1 to 3 percent
Depth to restrictive feature: Shallow (10 to 20 inches) to petrocalcic layer
Drainage class: Well drained
Water table: None within a depth of 60 inches
Flooding: None
Permeability: Moderate
Surface runoff: Medium
Shrink-swell potential: Low
Available water capacity: Mainly 0.9 inch or very low
Water erosion hazard: Slight
Wind erosion hazard: Slight

Land Uses

Major land uses: Rangeland
Other land uses: Wildlife Habitat, Urban, Recreation

Management Concerns

Rangeland

The climax plant community is a tall grass savannah with scattered motts of live oak and Texas oak trees.

Major limitations:
The major limitation is the very low available water capacity.

Wildlife Habitat

This soil provides habitat for dove, quail, deer, and turkey.

Major limitations:
The major limitation is the very low available water capacity.

Urban and Recreation

Major limitations:
The major limitations are the corrosivity to uncoated steel and the shallow depth to bedrock or cemented pan. Small stones on the surface limit recreational uses.

Interpretive Groups

Land capability class: 6s
Ecological site: Adobe

ReC—Real clay loam, 1 to 5 percent slopes, very stony

Setting

Landscape: Hills
Shape: Irregular
Size: 10 to 50 acres

Composition

Real and similar soils: 80 percent. Commonly 1 to 3 percent of the surface is covered by limestone fragments, most of which are from 6 to 48 inches across and 0.5 inch to 6 inches thick.
Contrasting inclusions: 20 percent

Contrasting Inclusions

Contrasting inclusions in this map unit are the Brackett, Cho, Cranfill, and Lampasas soils. The Brackett and Cranfill soils are on lower positions. The Cho and Lampasas soils are on landscape positions similar to those of the Real soil.

Soil Description

Position on landform: Backslope on ridge
Parent material: Loamy residuum weathered from limestone

Typical Profile

Surface layer:
0 to 8 inches—moderately alkaline, brown very stony clay loam

Subsurface layer:
8 to 16 inches—moderately alkaline, brown very gravelly clay loam

Subsoil:
16 to 18 inches—strongly cemented caliche

Underlying material:
18 to 60 inches—moderately alkaline, weakly cemented limestone interbedded with yellowish marl that has a clay loam texture

Soil Properties and Qualities

Slope: 1 to 5 percent
Depth to restrictive feature: Shallow (10 to 20 inches) to petrocalcic layer
Drainage class: Well drained
Water table: None within a depth of 60 inches
Flooding: None
Permeability: Moderate
Surface runoff: Medium
Shrink-swell potential: Low
Available water capacity: Mainly 1.0 inch or very low
Water erosion hazard: Moderate
Wind erosion hazard: Slight

Land Uses

Major land uses: Rangeland
Other land uses: Wildlife Habitat, Urban, Recreation

Management Concerns

Rangeland

The climax plant community is a tall grass savannah with scattered motts of live oak and Texas oak trees.

Major limitations:
The major limitations are the shallow rooting depth and the very low available water capacity.

Minor limitations:
The minor limitation is the moderate hazard of water erosion.

Wildlife Habitat

This soil provides habitat for quail, dove, and deer.

Major limitations:
The major limitation is the very low available water capacity.

Urban and Recreation

Major limitations:
The major limitations are the corrosivity to uncoated steel, the shallow depth to bedrock or cemented pan, and large stones on the surface.

Interpretive Groups

Land capability class: 6s
Ecological site: Adobe

ReD—Real-Doss complex, 1 to 8 percent slopes

Setting

Landscape: Hills
Shape: Irregular
Size: 100 to 1,000 acres

Composition

Real and similar soils: 45 percent
Doss and similar soils: 30 percent
Contrasting inclusions: 25 percent

Contrasting Inclusions

Contrasting inclusions in this map unit are the Bolar, Bracket, Krum, and Lampasas soils. The Bolar and Brackett soils are on landscape positions similar to those of the Real soil. Krum soils are on lower positions. The Lampasas soils are on higher positions. Also included is a soil similar to Real, except that it is underlain by indurated limestone.

Soil Description—Real

Position on landform: Backslope on ridge
Parent material: Loamy residuum weathered from limestone

Typical Profile

Surface layer:
0 to 6 inches—moderately alkaline, very dark grayish brown gravelly clay loam

Subsurface layer:
6 to 12 inches—moderately alkaline, very dark grayish brown extremely gravelly clay loam

Subsoil:
12 to 13 inches—strongly cemented caliche

Underlying material:
13 to 60 inches—weakly cemented limestone and yellowish marl that has clay loam texture

Soil Properties and Qualities

Slope: 1 to 8 percent
Depth to restrictive feature: Very shallow and shallow (7 to 19 inches) petrocalcic layer; very shallow and shallow (8 to 20 inches) to bedrock; paralithic
Drainage class: Well drained
Water table: None within a depth of 60 inches
Flooding: None
Permeability: Moderate
Surface runoff: 1 to 5 percent—medium; 5 to 8 percent—high
Shrink-swell potential: Low
Available water capacity: Mainly 0.9 inch or very low
Water erosion hazard: Moderate
Wind erosion hazard: Slight

Soil Description—Doss

Position on landform: Backslope on ridge
Parent material: Loamy residuum weathered from limestone

Typical Profile

Surface layer:
0 to 8 inches—moderately alkaline, dark brown clay loam

Subsoil:
8 to 17 inches—moderately alkaline, pale brown clay loam

Underlying material:
17 to 60 inches—moderately alkaline, yellowish brown clay loam interbedded with thin weakly consolidated platy limestone

Soil Properties and Qualities

Slope: 1 to 8 percent
Depth to restrictive feature: Shallow (11 to 20 inches) to bedrock; paralithic
Drainage class: Well drained
Water table: None within a depth of 60 inches
Flooding: None
Permeability: Moderately slow
Surface runoff: 1 to 5 percent slopes—high; 5 to 8 percent slopes—very high
Shrink-swell potential: Moderate
Available water capacity: Mainly 2.2 inches or very low
Water erosion hazard: Moderate
Wind erosion hazard: Slight

Land Uses

Major land uses: Rangeland
Other land uses: Wildlife Habitat, Urban, Recreation

Management Concerns

Rangeland

The climax plant community is a tall grass prairie with scattered motts of live oak and Texas oak trees.

Major limitations:
The major limitation is the very low available water capacity.

Minor limitations:
The minor limitation is the moderate hazard of erosion.

Wildlife Habitat

This soil provides habitat for dove, quail, deer, and turkey.

Major limitations:
There are no major limitations that affect this soil for this use.

Urban and Recreation

Major limitations:
The major limitations are corrosivity to uncoated steel, the very shallow and shallow depth to bedrock or cemented pan, stones on the surface, and low strength.

Minor limitations:
The minor limitations are the moderate shrink-swell potential and the moderate hazard of erosion.

Interpretive Groups

Land capability class: Real—6s; Doss—6e
Ecological site: Real—Adobe; Doss—Shallow

ReF—Real-Rock outcrop complex, 8 to 30 percent slopes

Setting

Landscape: Hills
Shape: Irregular
Size: 50 to several hundred acres

Composition

Real and similar soils: 70 percent
Rock outcrop and similar areas: 20 percent
Contrasting inclusions: 10 percent

Contrasting Inclusions

Contrasting inclusions in this map unit are the Brackett, Cranfill, and Topsey soils. Brackett soils are on side slopes in positions similar to those of the Real soil. Cranfill and Topsey soils are at the base of steep slopes. Also included in this map unit are soils with less than 35 percent coarse fragments in the soil, and soils deeper than 20 inches.

Soil Description—Real

Position on Landform: Backslope on ridge
Parent material: Loamy residuum weathered from limestone

Typical Profile

Surface layer:
0 to 9 inches—moderately alkaline, dark grayish brown very gravelly clay loam

Subsoil:
9 to 10 inches—strongly cemented caliche

Underlying material:
10 to 60 inches—white nodular limestone interbedded with loamy marl

Soil Properties and Qualities

Slope: 8 to 30 percent
Depth to restrictive feature: Very shallow and shallow (7 to 19 inches) to petrocalcic layer; very shallow and shallow (8 to 20 inches) to bedrock; paralithic
Drainage class: Well drained
Water table: None within a depth of 60 inches
Flooding: None
Permeability: Moderate
Surface runoff: 8 to 20 percent slopes—medium; 20 to 30 percent slopes—high
Shrink-swell potential: Low
Available water capacity: Mainly 0.7 inch or very low
Water erosion hazard: Severe
Wind erosion hazard: Slight

Soil Description—Rock outcrop

Rock outcrops are generally long and narrow horizontal bands 6 to 36 inches thick, but may be as much as 15 feet thick in some areas. These outcrops are mainly along edges of escarpments and abrupt slope breaks. Some areas contain large boulders that have broken away from escarpments and moved downslope.
Position on landform: Shoulder on ridge
Parent material: Limestone

Land Uses

Major land uses: Rangeland
Other land uses: Wildlife Habitat

Management Concerns

Rangeland

The climax plant community is a tall grass savannah with live oak and Texas oak trees.

Major limitations:
The major limitation is the very low available water capacity, shallow rooting depth, and the severe hazard of water erosion.

Wildlife Habitat

This soil provides habitat for dove, quail, turkey, and deer.

Major limitations:
The major limitation is the very low available water capacity, shallow rooting depth, and the severe hazard of water erosion.

Urban and Recreation

This soil is not suited to urban uses because of the steep slopes, shallow depth to bedrock, and areas of rock outcrop.

Major limitations:
The major limitations are the corrosivity to uncoated steel, steep slopes, small stones on the surface, very shallow and shallow depth to bedrock and cemented pan, and rock outcrops.

Interpretive Groups

Land capability class: Real—7s; Rock outcrop—8s
Ecological site: Real—8 to 20 percent slopes; Adobe—20 to 30 percent slopes; Steep Adobe Rock outcrop—not assigned

RsC—Riesel gravelly fine sandy loam, 1 to 5 percent slopes

Setting

Landscape: River valley
Shape: Irregular
Size: 15 to 70 acres

Composition

Riesel and similar soils: 85 percent
Contrasting inclusions: 15 percent

Contrasting Inclusions

Contrasting inclusions in this map unit are the Bastsil and Minwells soils. The Bastsil and Minwells soils are on positions similar to those of the Riesel soils.

Soil Description

Position on landform: Riser or tread on high stream terrace
Parent material: Gravelly and loamy alluvium

Typical Profile

Surface layer:
0 to 3 inches—neutral, dark grayish brown gravelly fine sandy loam

Subsurface layer:
3 to 9 inches—neutral, brown very gravelly fine sandy loam

Subsoil:
9 to 43 inches—neutral, red gravelly and very gravelly clay
43 to 52 inches—neutral, red clay
52 to 59 inches—slightly alkaline, red gravelly clay loam

Underlying material:
59 to 70 inches—slightly alkaline, strong brown gravelly loamy sand

Soil Properties and Qualities

Slope: 1 to 5 percent
Depth to restrictive feature: Very deep (60 to 80 inches)
Drainage class: Well drained
Water table: None within a depth of 60 inches

Flooding: None
Permeability: Slow
Surface runoff: High
Shrink-swell potential: Low in the surface layer; moderate in the subsoil; low in underlying material
Available water capacity: Mainly 5.7 inches or low
Water erosion hazard: Moderate
Wind erosion hazard: Slight

Land Uses

Major land uses: Rangeland
Other land uses: Wildlife Habitat, Urban, Recreation

Management Concerns

Rangeland

The climax plant community is a tall grass savannah with scattered post oak and blackjack oak trees.

Major limitations:
There are no major limitations that affect this soil for this use.

Minor limitations:
The moderate hazard of water erosion is a minor limitation.

Wildlife Habitat

This soil provides habitat for dove, quail, turkey, and deer.

Major limitations:
There are no major limitations that affect this soil for this use.

Urban and Recreation

Major limitations:
The major limitations are the corrosivity to uncoated steel, sloughing of excavated pit walls, small stones, seepage, and the slow permeability.

Minor limitations:
The minor limitation is the moderate shrink-swell potential.

Interpretive Groups

Land capability class: 6s
Ecological site: Gravelly

RuB—Rumley clay loam, 1 to 3 percent slopes

Setting

Landscape: River valley
Shape: Long and narrow
Size: 15 to 100 acres

Composition

Rumley and similar soils: 80 percent
Contrasting inclusions: 20 percent

Contrasting Inclusions

Contrasting inclusions in this map unit are the Bosque, Denton, Seawillow, and Venus soils. Bosque and Venus soils are on lower positions, in drainageways. Denton and Seawillow soils are on higher landscape positions.

Soil Description

Position on landform: Tread on stream terrace
Parent material: Loamy alluvium

Typical Profile

Surface layer:
0 to 7 inches—moderately alkaline, dark grayish brown clay loam

Subsurface layer:
7 to 16 inches—moderately alkaline, dark grayish brown clay loam

Subsoil:
16 to 28 inches—moderately alkaline, brown silty clay
28 to 35 inches—moderately alkaline, yellowish brown silty clay
35 to 70 inches—moderately alkaline, yellow clay loam

Soil Properties and Qualities

Slope: 1 to 3 percent
Depth to restrictive feature: Very deep (60 to 80 inches)
Drainage class: Well drained
Water table: None within a depth of 60 inches
Flooding: None
Permeability: High in upper part; moderate in lower part
Surface runoff: Low
Shrink-swell potential: Moderate
Available water capacity: Mainly 9.7 inches or high
Water erosion hazard: Moderate
Wind erosion hazard: Slight

Land Uses

Major land uses: Rangeland, Cropland
Other land uses: Pasture, Hayland, Wildlife Habitat, Urban, Recreation

Management Concerns

Rangeland

The climax plant community is a tall grass prairie with scattered motts of live oak and hackberry trees.

Major limitations:
There are no major limitations that affect this soil for this use.

Minor limitations:
The moderate hazard of water erosion is a minor limitation.

Cropland

The main crops grown are small grains and forage and grain sorghums.

Major limitations:
There are no major limitations that affect this soil for this use.

Minor limitations:
The moderate hazard of water erosion is a minor limitation.

Pasture and Hayland

The main grasses grown are coastal bermudagrass and kleingrass.

Major limitations:
There are no major limitations that affect this soil for this use.

Minor limitations:
The moderate hazard of water erosion is a minor limitation.

Wildlife Habitat

This soil provides habitat for quail, dove, and turkey.

Major limitations:
There are no major limitations that affect this soil for this use.

Urban and Recreation

Major limitations:
The major limitations are the corrosivity to uncoated steel, high shrink-swell potential, and low strength.

Minor limitations:
The minor limitations are seepage and slope.

Interpretive Groups

Land capability class: 2e
Ecological site: Clay Loam

SaB—San Saba clay, 0 to 3 percent slopes

Setting

Landscape: Hills
Shape: Irregular
Size: 10 to 100 acres

Composition

San Saba and similar soils: 85 percent
Contrasting inclusions: 15 percent

Contrasting Inclusions

Contrasting inclusions in this map unit are the Evant, Krum, Oglesby, and Slidell soils. Evant soils are on higher positions. Oglesby and Krum soils are on landscape positions similar to those of the San Saba soil. Slidell soils are on lower positions.

Soil Description

Position on landform: Footslope on ridge
Parent material: Clayey residuum weathered from shale over limestone

Typical Profile

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

Subsoil:
6 to 29 inches—moderately alkaline, very dark gray clay
29 to 36 inches—moderately alkaline, dark grayish brown clay

Underlying material:
36 to 40 inches—indurated, fractured limestone

Soil Properties and Qualities

Slope: 0 to 3 percent
Depth to restrictive feature: Moderately deep (24 to 40 inches) to bedrock; lithic
Parent Material: Indurated, fractured limestone
Drainage class: Moderately well drained
Water table: None within a depth of 60 inches
Flooding: None
Permeability: Very slow
Surface runoff: Very high
Shrink-swell potential: High
Available water capacity: Mainly 4.8 inches or moderate
Water erosion hazard: Slight to moderate
Wind erosion hazard: Slight

Land Uses

Major land uses: Rangeland, Cropland
Other land uses: Pasture, Hayland, Wildlife Habitat, Urban, Recreation

Management Concerns

Rangeland

The climax plant community is a tall and mid grass prairie with scattered motts of live oak trees.

Major limitations:
There are no major limitations that affect this soil for this use.

Cropland

The main crops grown are small grains and forage and grain sorghums.

Major limitations:
There are no major limitations that affect this soil for this use.

Minor limitations:
The minor limitations are the moderately deep depth to limestone bedrock, the moderate available water capacity, and the moderate hazard of water erosion.

Pasture and Hayland

The main grasses grown are coastal bermudagrass, kleingrass, and Old World bluestem.

Major limitations:
There are no major limitations that affect this soil for this use.

Minor limitations:
The minor limitations are the moderately deep depth to limestone bedrock, the moderate available water capacity, and the moderate hazard of water erosion.

Wildlife Habitat

This soil provides habitat for dove, quail, and deer.

Major limitations:
There are no major limitations that affect this soil for this use.

Urban and Recreation

Major limitations:
The major limitations are the corrosivity to uncoated steel, the high shrink-swell potential, the depth to limestone bedrock, low strength, sloughing of excavated pit walls, and the very slow permeability. The clayey surface texture of the soil limits some recreational uses.

Interpretive Groups

Land capability class: 3e
Ecological site: Blackland

SeC—Seawillow clay loam, 3 to 8 percent slopes

Setting

Landscape: River valley
Shape: Elongated
Size: 20 to 70 acres

Composition

Seawillow and similar soils: 80 percent
Contrasting inclusions: 20 percent

Contrasting Inclusions

Contrasting inclusions in this map unit are the Bosque, Brackett, Real, Rumley, and Venus soils. The Brackett, Real, and Rumley soils are on higher positions. Bosque and Venus soils are lower in the landscape in drainageways.

Soil Description

Position on landform: Riser on stream terrace
Parent material: Loamy alluvium

Typical Profile

Surface layer:
0 to 6 inches—moderately alkaline, dark brown clay loam

Subsoil:
6 to 14 inches—moderately alkaline, brown clay loam
14 to 44 inches—moderately alkaline, light brown clay loam
44 to 62 inches—moderately alkaline, light brown clay loam

Soil Properties and Qualities

Depth to restrictive feature: Very deep (60 to 80 inches)
Parent material: Loamy alkaline sediments
Drainage class: Well drained
Water table: None within a depth of 60 inches
Flooding: None
Permeability: Moderate
Surface runoff: 3 to 5 percent slopes—low; 5 to 8 percent slopes—medium
Shrink-swell potential: Moderate
Available water capacity: Mainly 8.4 inches or moderate
Water erosion hazard: Severe
Wind erosion hazard: Slight

Land Uses

Major land uses: Rangeland, Cropland
Other land uses: Pasture, Hayland, Wildlife Habitat, Urban, Recreation

Management Concerns

Rangeland

The climax plant community is a tall grass prairie with scattered motts of live oak trees.

Major limitations:
The major limitation is the severe hazard of water erosion.

Cropland

The main crops grown are small grains and forage sorghum.

Major limitations:
The major limitation is the severe hazard of water erosion.

Pasture and Hayland

The main grasses grown are coastal bermudagrass, kleingrass, and Old World bluestem.

Major limitations:
The major limitation is the severe hazard of water erosion.

Wildlife Habitat

This soil provides habitat for quail, dove, turkey, and deer.

Major limitations:
The major limitation is the severe hazard of water erosion.

Urban and Recreation

Major limitations:
The major limitations are seepage, low strength, and slope.

Minor limitations:
The minor limitations are the moderate shrink-swell potential and the corrosivity to uncoated steel.

Interpretive Groups

Land capability class: 4e
Ecological site: Clay Loam

SsB—Slidell silty clay, 1 to 3 percent slopes

Setting

Landscape: Hills
Shape: Irregular
Size: 20 to 100 acres

Composition

Slidell and similar soils: 85 percent
Contrasting inclusions: 15 percent

Contrasting Inclusions

Contrasting inclusions in this map unit are the Denton, Krum, San Saba, and Topsey soils. The Denton and Topsey soils are on higher landscape positions. The Krum and San Saba soils are on positions similar to those of the Slidell soil.

Soil Description

Position on landform: Toe slope on ridge
Parent material: Clayey slope alluvium

Typical Profile

Surface layer:
0 to 8 inches—moderately alkaline, very dark gray silty clay

Subsurface layer:
8 to 24 inches—moderately alkaline, very dark gray silty clay

Subsoil:
24 to 33 inches—moderately alkaline, dark gray silty clay
33 to 65 inches—moderately alkaline, grayish brown silty clay
65 to 80 inches—moderately alkaline, grayish brown silty clay

Soil Properties and Qualities

Slope: 1 to 3 percent
Depth to restrictive feature: Very deep (60 to 80 inches)
Drainage class: Moderately well drained
Water table: None within a depth of 60 inches
Flooding: None
Permeability: Very slow
Surface runoff: Very high
Shrink-swell potential: High
Available water capacity: Mainly 10.0 inches or high
Water erosion hazard: Moderate
Wind erosion hazard: Slight

Land Uses

Major land uses: Rangeland, Cropland
Other land uses: Pasture, Hayland, Wildlife Habitat, Urban, Recreation

Management Concerns

Rangeland

The climax plant community is a tall grass prairie.

Major limitations:
There are no major limitations that affect this soil for this use.

Minor limitations:
The minor limitation is the moderate hazard of water erosion.

Cropland

The main crops grown are small grains and forage and grain sorghums.

Major limitations:
There are no major limitations that affect this soil for this use.

Minor limitations:
The minor limitation is the moderate hazard of water erosion.

Pasture and Hayland

The main grasses grown are coastal bermudagrass and kleingrass (fig. 8).

Major limitations:
There are no major limitations that affect this soil for this use.

Minor limitations:
The minor limitation is the moderate hazard of water erosion.

Wildlife Habitat

This soil provides habitat for dove and quail.

Major limitations:
There are no major limitations that affect this soil for this use.

Urban and Recreation

Major limitations:
The major limitations are the high shrink-swell potential, low strength, sloughing of excavated pit walls, and the very slow permeability. The clayey surface and very slow permeability limit some recreational uses.

Minor limitations:
The minor limitation is the corrosivity to uncoated steel.

Interpretive Groups

Land capability class: 2e
Ecological site: Blackland

Figure 8.—Ponds like this one in an area of Slidell silty clay, 1 to 3 percent slopes, provide water for livestock and wildlife.

TaB—Tarpley clay loam, 1 to 3 percent slopes

Setting

Landscape: Hills
Shape: Irregular
Size: 20 to 60 acres

Composition

Tarpley and similar soils: 85 percent
Contrasting inclusions: 15 percent

Contrasting Inclusions

Contrasting inclusions in this map unit are the Evant and Oglesby soils. The Evant and Oglesby soils are on landscape positions similar to those of the Tarpley soil.

Soil Description

Position on landform: Summit on ridge
Parent material: Clayey alluvium over limestone

Typical Profile

Surface layer:
0 to 7 inches—neutral, dark reddish gray clay loam

Subsoil:
7 to 18 inches—neutral, reddish brown clay

Underlying material:
18 to 24 inches—indurated, fractured limestone

Soil Properties and Qualities

Slope: 1 to 3 percent
Depth to restrictive feature: Shallow (13 to 20 inches) to bedrock; lithic
Drainage class: Well drained
Water table: None within a depth of 60 inches
Flooding: None
Permeability: Slow
Surface runoff: High
Shrink-swell potential: High in surface layer; very high in subsoil
Available water capacity: Mainly 2.3 inches or very low
Water erosion hazard: Moderate
Wind erosion hazard: Slight

Land Uses

Major land uses: Rangeland, Cropland
Other land uses: Pasture, Hayland, Wildlife Habitat, Urban, Recreation

Management Concerns

Rangeland

The climax plant community is a tall grass savannah with scattered post oak, blackjack oak, and live oak trees.

Major limitations:
There are no major limitations that affect this soil for this use.

Minor limitations:
The minor limitations are the very low available water capacity, the shallow rooting depth, and the moderate hazard of water erosion.

Cropland

The main crops grown are small grains and forage sorghum.

Major limitations:
The major limitations are the shallow rooting depth and the very low available water capacity.

Minor limitations:
The minor limitation is the moderate hazard of water erosion.

Pasture and Hayland

The main grasses grown are coastal bermudagrass and kleingrass.

Major limitations:
The major limitations are the shallow rooting depth and the very low available water capacity.

Minor limitations:
The minor limitation is the moderate hazard of water erosion.

Wildlife Habitat

This soil provides habitat for deer, dove, quail, and songbirds.

Major limitations:
There are no major limitations that affect this soil for this use.

Urban and Recreation

Major limitations:
The major limitations are the shallow depth to bedrock, corrosivity to uncoated steel, the high shrink-swell potential, low strength, and slow permeability.

Interpretive Groups

Land capability class: 4e
Ecological site: Redland

ToC—Topsey clay loam, 1 to 5 percent slopes

Setting

Landscape: Hills
Shape: Irregular
Size: 10 to 80 acres

Composition

Topsey and similar soils: 80 percent
Contrasting inclusions: 20 percent

Contrasting Inclusions

Contrasting inclusions in this map unit are the Brackett, Cho, Krum, Pidcoke, and Slidell soils. The Brackett, Cho, and Pidcoke soils are on higher positions. The Krum and Slidell soils are on lower positions. Slidell soils are adjacent to drainageways.

Soil Description

Position on landform: Backslope on ridge
Parent material: Loamy residuum weathered from shale and siltstone

Typical Profile

Surface layer:
0 to 6 inches—moderately alkaline, dark grayish brown clay loam

Subsurface layer:
6 to 12 inches—moderately alkaline, dark brown clay loam

Subsoil:
12 to 18 inches—moderately alkaline, light olive brown clay loam
18 to 32 inches—moderately alkaline, light olive brown clay loam

Underlying material:
32 to 62 inches—moderately alkaline, pale yellow marl and gray shale that has silty clay loam texture

Soil Properties and Qualities

Slope: 1 to 5 percent
Depth to restrictive feature: Very deep (60 to 80 inches)
Drainage class: Well drained
Water table: None within a depth of 60 inches
Flooding: None

Permeability: Moderately slow
Surface runoff: Low
Shrink-swell potential: Moderate
Available water capacity: Mainly 8.3 inches or moderate
Water erosion hazard: Moderate
Wind erosion hazard: Slight

Land Uses

Major land uses: Rangeland, Cropland
Other land uses: Pasture, Hayland, Wildlife Habitat, Urban, Recreation

Management Concerns

Rangeland

The climax plant community is a mid and tall grass prairie with scattered live oak trees.

Major limitations:
There are no major limitations that affect this soil for this use.

Minor limitations:
The minor limitation is the moderate hazard of water erosion.

Cropland

The main crops grown are small grains and forage and grain sorghums.

Major limitations:
There are no major limitations that affect this soil for this use.

Minor limitations:
The minor limitation is the moderate hazard of water erosion.

Pasture and Hayland

The main grasses grown are coastal bermudagrass, kleingrass, and Old World bluestem.

Major limitations:
There are no major limitations that affect this soil for this use.

Minor limitations:
The minor limitation is the moderate hazard of water erosion.

Wildlife Habitat

This soil provides habitat for quail and dove.

Major limitations:
There are no major limitations that affect this soil for this use.

Minor limitations:
The minor limitation is the moderate hazard of water erosion. The lack of cover is a limitation for deer.

Urban and Recreation

Major limitations:
The major limitation is low strength.

Minor limitations:
The minor limitations are the moderate shrink-swell potential, the corrosivity to uncoated steel, seepage, and slope.

Interpretive Groups

Land capability class: 3e
Ecological site: Clay Loam

ToD—Topsey clay loam, 5 to 8 percent slopes

Setting

Landscape: Hills
Shape: Long and narrow
Size: 15 to 40 acres

Composition

Topsey and similar soils: 80 percent
Contrasting inclusions: 20 percent

Contrasting Inclusions

Contrasting inclusions in this map unit are the Brackett, Bolar, Krum, Pidcoke, and San Saba soils. The Brackett, Bolar, and Pidcoke soils are on higher positions. The Krum and San Saba soils are on lower positions.

Soil Description

Position on landform: Backslope or footslope on ridge
Parent material: Loamy residuum weathered from shale and siltstone

Typical Profile

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

Subsoil:
10 to 31 inches—moderately alkaline, light yellowish brown clay loam

Underlying material:
31 to 60 inches—yellow marl and gray shale that has silty clay loam texture

Soil Properties and Qualities

Slope: 5 to 8 percent
Depth to restrictive feature: Very deep (60 to 80 inches)
Drainage class: Well drained
Water table: None within a depth of 60 inches
Flooding: None
Permeability: Moderately slow
Surface runoff: Medium
Shrink-swell potential: Moderate
Available water capacity: Mainly 8.4 inches or moderate
Water erosion hazard: Severe
Wind erosion hazard: Slight

Land Uses

Major land uses: Rangeland, Cropland
Other land uses: Pasture, Hayland, Wildlife Habitat, Urban, Recreation

Management Concerns

Rangeland

The climax plant community is a mid and tall grass prairie with scattered motts of live oak trees.

Major limitations:
The major limitation is the severe hazard of water erosion.

Cropland

The main crops grown are small grains and forage sorghum.

Major limitations:
The major limitation is the severe hazard of water erosion.

Pasture and Hayland

The main grasses grown are coastal bermudagrass and kleingrass.

Major limitations:
The major limitation is the severe hazard of water erosion.

Wildlife Habitat

This soil provides habitat for quail, dove, and deer.

Major limitations:
The major limitation is the severe hazard of water erosion.

Urban and Recreation

Major limitations:
The major limitations are low strength and slope.

Minor limitations:
The minor limitations are the moderate shrink-swell potential, the corrosivity to uncoated steel, and seepage.

Interpretive Groups

Land capability class: 4e
Ecological site: Clay Loam

VnB—Venus loam, 1 to 3 percent slopes

Setting

Landscape: River valley
Shape: Long and narrow
Size: 10 to 70 acres

Composition

Venus and similar soils: 80 percent
Contrasting inclusions: 20 percent

Contrasting Inclusions

Contrasting inclusions in this map unit are the Bosque, Rumley, and Seawillow soils. The Bosque soils are located along flood plains. Rumley and Seawillow soils are located on higher positions.

Soil Description

Position on landform: Tread on stream terrace
Parent material: Loamy alluvium

Typical Profile

Surface layer:
0 to 6 inches—moderately alkaline, dark grayish brown loam

Subsurface layer:
6 to 18 inches—moderately alkaline, dark brown loam

Subsoil:
18 to 38 inches—moderately alkaline, brown loam
38 to 60 inches—moderately alkaline, yellowish brown loam

Soil Properties and Qualities

Slope: 1 to 3 percent
Depth to restrictive feature: Very deep (60 to 80 inches)
Drainage class: Well drained
Water table: None within a depth of 60 inches
Flooding: None
Permeability: Moderate
Surface runoff: Low
Shrink-swell potential: Low
Available water capacity: Mainly 10.4 inches or high
Water erosion hazard: Moderate
Wind erosion hazard: Slight

Land Uses

Major land uses: Rangeland, Cropland
Other land uses: Pasture, Hayland, Wildlife Habitat, Urban, Recreation

Management Concerns

Rangeland

The climax plant community is a tall grass prairie with scattered live oak trees.

Major limitations:
There are no major limitations that affect this soil for this use.

Cropland

The main crops grown are small grains and forage sorghum.

Major limitations:
There are no major limitations that affect this soil for this use.

Pasture and Hayland

The main grasses grown are coastal bermudagrass, kleingrass, and switchgrass.

Major limitations:
There are no major limitations that affect this soil for this use.

Wildlife Habitat

This soil provides habitat for dove, quail, deer, turkey, and small furbearing animals.

Major limitations:
There are no major limitations that affect this soil for this use.

Urban and Recreation

Major limitations:
The major limitation is the corrosivity to uncoated steel.

Minor limitations:
The minor limitations are the moderate permeability, seepage, and low strength.

Interpretive Groups

Land capability class: 2e
Ecological site: Clay Loam

Vs—Venus loam, rarely flooded

Setting

Landscape: River valley
Shape: Long and narrow
Size: 10 to 200 acres

Composition

Venus and similar soils: 90 percent
Contrasting inclusions: 10 percent

Contrasting Inclusions

Contrasting inclusions in this map unit are the Bosque, Frio, Krum, and Rumley soils. The Bosque and Frio soils are on landscape positions similar to those of the Venus soil. The Krum and Rumley soils are on higher positions.

Soil Description

Position on landform: Tread on stream terrace
Parent material: Loamy alluvium

Typical Profile

Surface layer:
0 to 7 inches—moderately alkaline, dark grayish brown loam

Subsurface layer:
7 to 15 inches—moderately alkaline, dark grayish brown loam

Subsoil:
15 to 24 inches—moderately alkaline, grayish brown loam
24 to 35 inches—moderately alkaline, pale brown loam
35 to 80 inches—moderately alkaline, light yellowish brown loam

Soil Properties and Qualities

Slope: 0 to 1 percent
Depth to restrictive feature: Very deep (60 to 80 inches)
Drainage class: Well drained
Water table: None within a depth of 60 inches
Flooding: Rarely flooded; this soil floods 1 to 5 times per 100 years.
Permeability: Moderate
Surface runoff: Negligible
Shrink-swell potential: Low
Available water capacity: Mainly 10.3 inches or high
Water erosion hazard: Slight
Wind erosion hazard: Slight

Land Uses

Major land uses: Rangeland, Cropland
Other land uses: Pasture, Hayland, Wildlife Habitat

Management Concerns

Rangeland

The climax plant community is mid and tall grasses with an overstory of pecan, elm, and cottonwood trees along water courses.

Major limitations:
There are no major limitations that affect this soil for this use.

Cropland

The main crops grown are small grains and forage and grain sorghums.

Major limitations:
The major limitation is the hazard of flooding.

Pasture and Hayland

The main grasses grown are coastal bermudagrass and kleingrass.

Major limitations:
The major limitation is the hazard of flooding.

Wildlife Habitat

This soil provides habitat for quail, dove, squirrel, turkey, and deer.

Major limitations:
The major limitation is the hazard of flooding.

Urban and Recreation

This soil is not suited to urban uses because of the severe hazard of flooding.

Major limitations:
The major limitations are the severe hazard of flooding and corrosivity to uncoated steel.

Minor limitations:
The minor limitations are seepage and low strength.

Interpretive Groups

Land capability class: 1
Ecological site: Loamy Bottomland

WsC—Wise clay loam, 3 to 5 percent slopes

Setting

Landscape: Hills
Shape: Long and narrow
Size: 20 to 75 acres

Composition

Wise and similar soils: 80 percent
Contrasting inclusions: 20 percent

Contrasting Inclusions

Contrasting inclusions in this map unit are the Cisco and Krum soils. The Cisco soils are on positions similar to those of the Wise soil. The Krum soils are in drainageways and depressions.

Soil Description

Position on landform: Backslope on ridge
Parent material: Loamy residuum weathered from sandstone and shale

Typical Profile

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

Subsoil:
5 to 11 inches—moderately alkaline, light brownish gray clay loam
11 to 26 inches—moderately alkaline, pale brown clay loam

Underlying material:
26 to 62 inches—moderately alkaline, stratified layers of light gray silt loam and pale brown sandy loam

Soil Properties and Qualities

Slope: 3 to 5 percent
Depth to restrictive feature: Very deep (60 to 80 inches)
Drainage class: Well drained
Water table: None within a depth of 60 inches
Flooding: None
Permeability: Moderate
Surface runoff: Low
Shrink-swell potential: Moderate
Available water capacity: Mainly 6.4 inches or moderate
Water erosion hazard: Moderate
Wind erosion hazard: Slight

Land Uses

Major land uses: Rangeland, Cropland
Other land uses: Pasture, Hayland, Wildlife Habitat, Urban, Recreation

Management Concerns

Rangeland

The climax plant community is a tall grass prairie with scattered motts of live oak trees.

Major limitations:
There are no major limitations that affect this soil for this use.

Minor limitations:
The minor limitation is the moderate hazard of water erosion.

Cropland

The main crops grown are small grains and forage sorghum.

Major limitations:
There are no major limitations that affect this soil for this use.

Minor limitations:
The minor limitation is the moderate hazard of water erosion.

Pasture and Hayland

The main grasses grown are coastal bermudagrass, kleingrass, and switchgrass.

Major limitations:
There are no major limitations that affect this soil for this use.

Minor limitations:
The minor limitation is the moderate hazard of water erosion.

Wildlife Habitat

This soil provides habitat for dove, quail, turkey, and deer.

Major limitations:
There are no major limitations that affect this soil for this use.

Minor limitations:
The minor limitation is the moderate hazard of water erosion.

Urban and Recreation

Major limitations:
The major limitations are low strength and seepage.

Minor limitations:
The minor limitations are the moderate shrink-swell potential and the corrosivity to uncoated steel. Slope limits some recreational uses.

Interpretive Groups

Land capability class: 4e
Ecological site: Clay Loam

Prime Farmland

Prime farmland is one of several kinds of important farmland defined by the U.S. Department of Agriculture. It is of major importance in meeting the Nation's short- and long-range needs for food and fiber. Because the supply of high-quality farmland is limited, the U.S. Department of Agriculture recognizes that responsible levels of government, as well as individuals, should encourage and facilitate the wise use of our Nation's prime farmland.

Prime farmland, as defined by the U.S. Department of Agriculture, is land that has the best combination of physical and chemical characteristics for producing food, feed, forage, fiber, and oilseed crops and is available for these uses. It could be cultivated land, pastureland, forest land, or other land, but it is not urban or built-up land or water areas. The soil qualities, growing season, and moisture supply are those needed for the soil to economically produce sustained high yields of crops when proper management, including water management, and acceptable farming methods are applied. In general, prime farmland has an adequate and dependable supply of moisture from precipitation or irrigation, a favorable temperature and growing season, acceptable acidity or alkalinity, an acceptable salt and sodium content, and few or no rocks. It is permeable to water and air. It is not excessively erodible or saturated with water for long periods, and it either is not frequently flooded during the growing season or is protected from flooding. 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 or online at http://www.tx.nrcs.usda.gov.

About 165,465 acres in the survey area, or nearly 31 percent of the total acreage, meets the requirements for prime farmland. Scattered areas of this land are throughout the county. These areas occur mainly in general soil map units 2, 6, 7, 8, 9, and 10, which are described under the heading “General Soil Map Units.”

A recent trend in land use in some parts of the survey area has been the loss of some prime farmland to industrial and urban uses. The loss of prime farmland to other uses puts pressure on marginal lands, which generally are more erodible, droughty, and less productive and cannot be easily cultivated.

The map units in the survey area that are considered prime farmland are listed at the end of this section. This list does not constitute a recommendation for a particular land use. The extent of each listed map unit is shown in table 4. The location is shown on the detailed soil maps. The soil qualities that affect use and management are described under the heading "Detailed Soil Map Units."

The map units that meet the requirements for prime farmland are:

Bastsil loamy fine sand, 1 to 3 percent slopes
Bolar gravelly clay loam, 1 to 4 percent slopes
Bosque clay loam, rarely flooded
Bosque clay loam, occasionally flooded
Cisco fine sandy loam, 1 to 5 percent slopes
Denton silty clay, 1 to 3 percent slopes
Frio silty clay, occasionally flooded
Krum silty clay, 1 to 5 percent slopes
Lamkin clay loam, occasionally flooded
Minwells fine sandy loam, 1 to 3 percent slopes
Nuff silty clay loam, 1 to 3 percent slopes

Pedernales fine sandy loam, 1 to 3 percent slopes
Rumley clay loam, 1 to 3 percent slopes
San Saba clay, 0 to 3 percent slopes
Slidell silty clay, 1 to 3 percent slopes
Topsey clay loam, 1 to 5 percent slopes
Venus loam, 1 to 3 percent slopes
Venus loam, rarely flooded

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 woodland; as sites for buildings, sanitary facilities, highways and other transportation systems, and parks and other recreational facilities; and for wildlife habitat. It can be used to identify the 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.

Crops and Pasture

General management needed for crops and pasture is suggested in this section. The crops and pasture plants best suited to the soils, including some not commonly grown in the survey area, are identified; the system of land capability classification used by the Natural Resources Conservation Service is explained; and the estimated yields of the main crops and hay and pasture plants are listed for each soil.

Planners of management systems for individual fields or farms should consider the detailed information given in the description of each soil under 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.

According to records of the local office of the Natural Resources Conservation Service, about 176,550 acres in Hamilton County is used for crops and pasture. The main crops are corn, grain sorghum, oats, forage sorghum, and wheat.

Soil erosion is the major problem on nearly all of the cropland in the county. Water erosion is a hazard where slopes are more than 1 percent. Contour farming, terraces, grassed waterways, and a permanent cover of plants minimize the risk of water erosion. Wind erosion is a hazard, especially during droughty periods and during windstorms that occur in winter and spring. Leaving crop residue on the surface minimizes wind erosion.

Loss of the surface layer through erosion is damaging for two reasons. First, productivity is reduced as the surface layer is lost and part of the subsoil is incorporated into the plow layer. Loss of the surface layer is especially damaging if the soil is shallow. Second, water erosion on farmland results in sedimentation of streams. Controlling water erosion minimizes the pollution of streams by sediment and improves the quality of water for urban and recreational uses and for wildlife. Erosion-control practices provide a protective surface cover, help control runoff, and increase the rate of water infiltration. A cropping system that keeps a plant cover on the soil for long periods can hold soil erosion losses to amounts that do not reduce yields.

Crop residue management is an effective erosion-control practice. Leaving crop residue on the surface helps to protect the soil against crusting and the impact of raindrops and reduces the runoff rate. It also provides shade for the soil and thus reduces the soil temperature and evaporation rate. Crop residue increases the content of organic matter, improves tilth, and minimizes compaction caused by farm machinery. It should be protected from overgrazing and burning. Using tillage equipment that leaves residue on the surface is effective in controlling erosion and minimizing compaction.

Minimizing tillage is effective in controlling erosion on sloping land. This practice is appropriate on most of the soils in the county.

Diversion terraces and field terraces reduce the length of the slope and reduce the runoff rate. They are most practical in areas of deep and moderately deep soils that have smooth slopes. All terraces require suitable outlets to dispose of excess water. If natural grassed drainageways are not available as outlets, grassed waterways should be constructed before the terraces are built.

Information regarding the design of erosion-control measures for each kind of soil is available in local offices of the Natural Resources Conservation Service.

Soil tilth is important in the germination of seeds and in the infiltration rate. Soils that have good tilth are granular, porous, and friable. Tilth can be improved by adding large amounts of organic matter, such as crop residue. The clayey Slidell soils sometimes remain wet until late in spring. If these soils are wet when plowed, they tend to become cloddy when dry, which makes preparing a good seedbed difficult. Plowing in the fall generally results in good tilth in spring.

Yields Per Acre

The average yields per acre that can be expected of the principal crops under a high level of management are shown in table 5. In any given year, yields may be higher or lower than those indicated in the table because of variations in rainfall and other climatic factors. The land capability classification of each map unit also is shown in the table.

The yields are based mainly on the experience and records of farmers, conservationists, and extension agents. Available yield data from nearby counties and results of field trials and demonstrations are also considered.

The management needed to obtain the indicated yields of the various crops depends on the kind of soil and the crop. Management can include drainage, erosion control, and protection from flooding; the proper planting and seeding rates; suitable high-yielding crop varieties; appropriate and timely tillage; control of weeds, plant diseases, and harmful insects; favorable soil reaction and optimum levels of nitrogen, phosphorus, potassium, and trace elements for each crop; effective use of crop residue, barnyard manure, and green manure crops; and harvesting that ensures the smallest possible loss.

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

Crops other than those shown in table 5 are grown in the survey area, but estimated yields are not listed because the acreage of such crops is small. The local office of the

Natural Resources Conservation Service or of Texas Cooperative Extension can provide information about the management and productivity of the soils for those crops.

Land Capability Classification

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

In the capability system, soils are generally grouped at three levels—capability class, subclass, and unit *(22)*. Only class and subclass are used in this survey.

Capability classes, the broadest groups, are designated by numerals 1 through 8. The numerals indicate progressively greater limitations and narrower choices for practical use. The classes are defined as follows:

Class 1 soils have few limitations that restrict their use.

Class 2 soils have moderate limitations that reduce the choice of plants or that require moderate conservation practices.

Class 3 soils have severe limitations that reduce the choice of plants or that require special conservation practices, or both.

Class 4 soils have very severe limitations that reduce the choice of plants or that require very careful management, or both.

Class 5 soils are not likely to erode but have other limitations, impractical to remove, that limit their use.

Class 6 soils have severe limitations that make them generally unsuitable for cultivation.

Class 7 soils have very severe limitations that make them unsuitable for cultivation.

Class 8 soils and miscellaneous areas have limitations that nearly preclude their use for commercial crop production.

Capability subclasses are soil groups within one class. They are designated by adding a small letter, *e, w, s*, or *c*, to the class numeral, for example, 2e. The letter *e* shows that the main hazard is the risk of erosion unless close-growing plant cover is maintained; *w* shows that water in or on the soil interferes with plant growth or cultivation (in some soils the wetness can be partly corrected by artificial drainage); *s* shows that the soil is limited mainly because it is shallow, droughty, or stony; and *c*, used in only some parts of the United States, shows that the chief limitation is climate that is very cold or very dry.

In class 1 there are no subclasses because the soils of this class have few limitations. Class 5 contains only the subclasses indicated by *w, s*, or *c* because the soils in class 5 are subject to little or no erosion. They have other limitations that restrict their use to pasture, rangeland, woodland, wildlife habitat, or recreation.

The capability classification of each map unit is given in the section "Detailed Soil Map Units" and in table 5.

Rangeland

Stanley L. Ellison, Area Resource Conservationist, Soil Conservation Service, helped prepare this section.

Rangeland is land on which native vegetation consists of a wide variety of grasses, grasslike plants, forbs, shrubs and trees. Rangeland receives no regular or frequent cultural treatment. The composition and production of the plant community is determined by soil, climate, topography, overstory canopy, and grazing management. Management

to conserve soil and water, and improve production is accomplished through balancing livestock numbers to forage production and rotating livestock to allow desirable plants to improve vigor, produce seed, and establish seedlings.

The native forage of Hamilton County is rangeland. About 66 percent, or 353,000 acres is currently used as rangeland. The Major Land Resource Areas are Grand Prairie, 90 percent and West Cross Timbers, 10 percent.

The Grand Prairie area of Hamilton County, when first settled, was a tall grass prairie interspersed with widely scattered trees or motts of trees occurring mainly along waterways. The Cross Timbers was a post oak savannah with tall to mid grasses. Dominant vegetative plants were indiangrass, big bluestem, switchgrass, little bluestem, native legumes, and forbs. Wildfire was a natural part of the rangeland ecosystem, repeatedly burning areas to inhibit the spread and thickening of oaks and underbrush, thus perpetuating the production of tall grasses, legumes, and forbs.

After settlement, a number of events occurred that caused a change in vegetation on the county's rangeland. Wildfires were suppressed, fences were constructed, and domestic livestock were confined at very heavy stocking rates, thereby overgrazing productive tall grasses, legumes, and forbs. This led to a rapid increase in the canopy of trees and associated brush species that shaded the understory plant community, thereby reducing sun-loving tall grasses and increasing shade-tolerant forage plants, such as purpletop tridens, and cool-season plants like Texas wintergrass. Today, forage production is very limited on the areas that have thick stands of post oak that once were lush savannah grasslands. Forage production is also reduced on the tall grass prairie where thick stands of cedar and mesquite occur.

In order to return the rangeland of Hamilton County to their once natural productive state, the woody canopy must be reduced. This can be done by using prescribed burning, herbicides, or by mechanical means. Reduction of the canopy will release suppressed tall grasses, as they will once again have the necessary sunlight for growth. A good grazing management program is essential along with brush management to allow reestablishment of the once productive rangeland.

Ecological Sites and Condition Classes

An ecological site is a distinctive kind of rangeland that produces a characteristic vegetation that differs from the climax vegetation on other ecological sites in kind, amount, and proportion of range plants. Soils that produce about the same kinds and amounts of forage make up an ecological site. Soil properties that affect moisture supply and plant nutrients have the most influence on productivity. Soil reaction, salt content, and a seasonal high water table are also important.

Climax vegetation on the ecological site is the stabilized plant community that reproduces itself and changes very little so long as the environment remains unchanged. Throughout the area, the climax vegetation consists of the plants that grew there when it was first settled. The most productive combination of forage plants on an ecological site is generally the climax vegetation.

Range management requires a knowledge of the kinds of soil and of the climax vegetation. It also requires an evaluation of the present range condition.

Range condition is determined by comparing the present plant community with the climax vegetation on a particular ecological site. The more closely the existing community resembles the climax vegetation, the better the range condition.

Four range condition classes are used to indicate the degree of departure from the potential, or climax, vegetation brought about by grazing or other uses. The classes show the present condition of the native vegetation on an ecological site in relation to the native vegetation that could grow there. A range is in excellent condition if 76 to 100 percent of the vegetation is of the same kind as that in the climax stand; in good

condition if the percentage is 51 to 75; in fair condition if the percentage is 26 to 50; and in poor condition if the percentage is 25 or less.

Potential forage production depends on the ecological site. Current forage production depends on the range condition and the moisture available to plants during their growing season.

A primary objective of good range management is to keep range in excellent or good condition so as to conserve water, improve yields, and protect the soil. The main management concern is recognizing important changes in the kind of cover on an ecological site. These changes take place gradually and can be misinterpreted or overlooked. Growth encouraged by heavy rainfall may lead to the conclusion that the range is in good condition, when actually the cover is weedy and the long term trend is toward lower production. On the other hand, some rangeland that has been closely grazed for short periods, under careful supervision, may have a degraded appearance that temporarily conceals its quality and ability to recover.

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; brush control, range seeding, fencing, water development, or other mechanical treatment 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.

Good management generally results in the optimum production of vegetation, conservation of water, and control of erosion. Sometimes, however, a range condition somewhat below the potential meets grazing needs.

Table 6 shows, for each soil, the ecological site and the total dry-weight production of vegetation in favorable, normal, and unfavorable years. Only those soils that are suited to rangeland are listed.

Total dry-weight production is the amount of vegetation that can be expected to grow annually on well managed rangeland that is in excellent condition. 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 an unfavorable year, growing conditions are well below average, generally because of low available soil moisture.

There are 17 ecological sites in the survey area. They are: Adobe, Blackland, Clay Loam, Deep Redland, Deep Sand, Gravelly, Loamy Bottomland, Loamy Sand, Low Stony Hill, Redland, Sandy, Sandy Loam, Shallow, Steep Adobe, Stony Clay Loam, Tight Sandy Loam, and Very Shallow.

Adobe ecological site. The Brackett, Cranfill, and Real soils (map units BtC, BxD, ByC, CrD, ReB, ReC, and ReD) are in this site. The climax vegetation is a tall grass prairie with motts of live oak and Texas oak scattered throughout. The composition by weight is 80 percent grasses, 10 percent forbs, and 10 percent woody plants. Little bluestem produces 40 percent of the forage in climax condition. Indiangrass, sideoats grama, and tall grama make up 20 percent. Other short to mid grasses such as seep muhly, silver bluestem, tall dropseeds, and perennial threeawns make up 20 percent. Many forbs grow on this site, including Engelmanndaisy, Maximilian sunflower, prairie-clovers, gayfeather, wild alfalfa, bigtop dalea, white milkwort, and trailing ratany. Woody plants include live oak, Texas oak, juniper, flameleaf sumac, and skunkbush sumac.

Overgrazing slowly eliminates little bluestem, indiangrass, sideoats grama, and palatable forbs. They are replaced by increasers such as seep muhly, silver bluestem, threeawn, hairy grama, dropseed, and less palatable forbs. If destructive grazing continues, these plants are grazed out and the site deteriorates to a plant population of blueberry juniper, live oak, Texas persimmon, Texas grama, hairy tridens, red grama, prairie coneflower, ragweed, broomweed, and queen’s delight.

The nutritional quality of the forage produced on this site is limited because of high lime content of the soil which inhibits the amount of phosphate and iron available to the plants.

Blackland ecological site. The San Saba and Slidell soils (map units SaB and SsB) are in this site. The climax vegetation is a tall grass prairie with a few live oak, elm, and hackberry along draws and in occasional motts. The composition by weight is 90 percent grasses, 10 percent forbs, and a trace amount of woody plants. This site has high natural fertility and is very productive. Indiangrass, big bluestem, switchgrass, and little bluestem combined produce 75 percent of the forage in climax condition. Many other grasses make up the other 15 percent, but the most important are sideoats grama, Texas wintergrass, Texas cupgrass, tall dropseed, silver bluestem, and Virginia wildrye. Many forbs grow on this site and compose 10 percent of the production. Maximilian sunflower, Engelmanndaisy, halfshrub sundrop, gaura, and bundleflower are important to livestock.

Overgrazing depletes big bluestem, indiangrass, switchgrass, eastern gamagrass, little bluestem, and palatable forbs. They are replaced by silver bluestem, Texas wintergrass, sideoats grama, tall dropseeds, less palatable forbs, and other mid grasses. If overgrazing continues, these increaser plants give way to invaders such as buffalograss, Texas grama, red grama, tumblegrass, threeawn, ragweed, annual forbs, prickly pear, mesquite, elm, bois d'arc, and honeylocust.

Many acres have a history as cropland which destroyed seed sources of the native plants.

Clay Loam ecological site. The Bolar, Denton, Krum, Nuff, Rumley, Seawillow, Topsey, Venus, and Wise soils (map units BgB, DnB, KrB, NuB, RuB, SeC, ToC, ToD, VnB, and WsC) are in this site. The climax plant community is a tall grass prairie with occasional motts of live oak. The composition by weight is 90 percent grasses, 5 percent forbs, and 5 percent woody plants.

Little bluestem, big bluestem, indiangrass, and switchgrass produce 70 percent of the forage in climax condition. Canada and Virginia wildrye, eastern gamagrass, sideoats grama, and Texas wintergrass make up 15 percent. Other short to mid grasses such as tall dropseeds, vine-mesquite, Texas cupgrass, plains lovegrass, white tridens, silver bluestem, seep muhly, buffalograss, and sedges make up 5 percent. Forbs (many important to livestock) include Engelmanndaisy, Maximilian sunflower, yellow neptunia, catclaw sensitivebriar, scurfpea, prairie-clover, gaura, heath aster, blue salvia, trailing ratany, golden dalea, blacksamson, bigtop dalea, wildbean, tickclover, dotted gayfeather, bushsunflower, and bundleflowers. Woody plants include live oak, hackberry, elm, pecan, and plum.

Overgrazing by livestock will eventually delete little bluestem, big bluestem, indiangrass, switchgrass, eastern gamagrass, and palatable forbs. They are replaced by increasers such as sideoats grama, Texas wintergrass, tall dropseed, silver bluestem, plains lovegrass, and less palatable forbs. If overgrazing continues, these plants give way to invaders such as Texas grama, red grama, tumblegrass, buffalograss, threeawn, windmillgrass, hairy tridens, prairie coneflower, western ragweed, annual forbs, mesquite, juniper, sumac, and honeylocust.

Deep Redland ecological site. The Caradan soil (map unit CdB) occurs in this site. The climax plant community is a tall grass prairie interspersed with mid grasses. The composition by weight is 90 percent grasses, 5 percent forbs, and 5 percent woody plants.

Indiangrass, big and little bluestem combined produce 55 percent of the forage in climax condition. Sideoats grama, tall dropseeds, cane and silver bluestem, and vine mesquite comprise 15 percent. Texas cupgrass, plains lovegrass, white tridens add 5 percent. Texas wintergrass and Canada wildrye produce 10 percent. Other grasses including buffalograss, fall witchgrass, and Wright’s threeawn total 5 percent. Many forbs such as Maximilian sunflower, Engelmanndaisy, bush sunflower, gayfeather, black

samson, bundleflower, Mexican sagewort, prairie-clovers, picture sage, halfshrub sundrop, trailing wildbean, least snoutbean, tickclover, scurfpea, heath aster, western indigo, knotweed, leafflower, ruellia, gaura, and western ragweed produce 5 percent of the composition. Woody plants contribute 5 percent by weight and include live oak, Texas oak, hackberry, bush honeysuckle, greenbriar, and sumac.

Indiangrass, big and little bluestem, and wildrye are preferred by livestock, and they are grazed out first if grazing is not controlled. These plants are replaced by sideoats grama, tall dropseed, silver bluestem, Texas wintergrass, and vine mesquite. Cessation of fire and continued overgrazing cause a decline in these plants with an increase in woody plants such as oaks, hackberry, elm, and elbowbush, as well as an invasion of mesquite, juniper, persimmon, pricklypear, lotebush, prairie coneflower, horehound, eryngo, western ragweed, weedy forbs, Texas and red grama, hairy tridens, tumblegrass, and windmillgrass.

Deep Sand ecological site. The Desan soil (map unit DsB) occurs in this site. The climax plant community is a post oak, blackjack oak savannah with a 20 to 25 percent canopy. The composition by weight is 65 percent grasses, 5 percent forbs, and 30 percent woody plants.

Indiangrass, big and sand bluestem, sand lovegrass, and purpletop tridens combined produce 40 percent of the forage in climax condition. Switchgrass, sand dropseed, sand paspalum, Scribner's panicum, and little bluestem comprise 20 percent. Red lovegrass and perennial threeawn add 5 percent. Forbs such as trailing wildbean, lespedeza, dayflower, evening primrose, bundleflowers, sand lily, bullnettle, snoutbean, snakecotton, prairie senna, and tickclovers make up 5 percent of the total production. Post oak and blackjack oak contribute 25 percent composition. Other woody plants such as wax myrtle, bumelia, greenbriar, and skunkbush sumac add 5 percent.

Indiangrass, big and sand bluestem, and sand lovegrass are preferred by livestock. They are grazed out first if grazing is not controlled. These plants are replaced by sand dropseed, sand and fringeleaf paspalum, Scribner's panicum, red lovegrass, and purpletop tridens. Cessation of fire and continued overgrazing result in a decline of these forage plants with an increase in woody plants such as oaks, greenbriar, bumelia and skunkbush sumac as well as an invasion of pricklypear, crabgrass, sandbur and weedy forbs. Oaks increase to form a dense canopy and forage production is reduced to nothing.

Gravelly ecological site. The Riesel soil (map unit RsC) occurs in this site. The climax vegetation is a post oak and blackjack oak savannah with mid and tall grasses. Oaks shade 15 to 20 percent of the ground. The composition by weight is 80 percent grasses, 5 percent forbs, and 15 percent woody plants.

Little bluestem is the dominant grass, producing 30 percent of the forage in climax condition. Indiangrass, sand bluestem, switchgrass, and sideoats grama produce 30 percent. Purpletop tridens, wildrye, plains lovegrass, sand lovegrass, tall dropseed, fringeleaf paspalum, and silver bluestem make up 20 percent. Forbs include Engelmanndaisy, sensitivebriar, and native legumes. The main woody plants are oak. Elm, hawthorn, and greenbriar also occur.

If this site is overgrazed for a long period of time and natural fires do not occur, the woody canopy increases and palatable grasses and forbs decrease. Poor quality grasses and forbs, including annuals, take their place. If abuse persists, oak and increaser woody plants form dense thickets, and mesquite, juniper, and pricklypear invade. Forage for livestock is reduced to small amounts.

Loamy Bottomland ecological site. The Bosque, Frio, Lamkin, and Venus soils (map units Bo, Bs, Fr, La, and Vs) are in this site. The climax plant community is a tall grass savannah with trees shading 20 to 25 percent of the ground. The composition by weight is 75 percent grasses, 5 percent forbs, and 20 percent woody plants.

Indiangrass, switchgrass, eastern gamagrass, Canada and Virginia wildrye, big and little bluestem, and purpletop tridens combined produce 70 percent of the forage in

climax condition. Tall and meadow dropseed, vine mesquite, plains lovegrass, Texas bluegrass, beaked panicum, sideoats grama, silver bluestem, Texas wintergrass, and sedges add 5 percent. Forbs such as Maximilian sunflower, wildbean, snoutbean, lespedeza, gaura, Engelmanndaisy, penstemon, dale, and tickclover produce 5 percent. Oaks, elms, hackberry, greenbriar, pecan, walnut, mulberry, cottonwood, sumac, sycamore, ash, honeysuckle, and grapes produce 20 percent of the production.

This is a preferred site by livestock. Overgrazing and fire suppression cause a reduction in warm-season grasses and forbs, and an increase in tree and brush canopy. Shade tolerant grasses and forbs then dominate the herbaceous production and forage production is drastically reduced. In poor condition, woody species dominate. Mesquite, milkweed, tumblegrass, Texas grama, persimmon, pricklypear, threeawn, and common bermudagrass invade.

Loamy Sand ecological site. The Bastsil soil (map unit BaB) occurs in this site. The climax plant community is a post oak savannah with mid and tall grasses. The composition by weight is 80 percent grasses, 5 percent forbs, and 15 percent woody plants.

Little and big bluestem, indiangrass, and sand lovegrass combined produce 55 percent of the forage in climax condition. Purpletop tridens, cane and silver bluestem, sand and tall dropseed, and sideoats grama comprise 20 percent. Texas wintergrass, Texas bluegrass, Canada wildrye, Scribner's panicum, switchgrass, and plains lovegrass add 5 percent. Forbs such as Engelmanndaisy, Maxmilian sunflower, sagewort, ragweed, dalea, yellow neptunia, sensitivebriar, wildbean, primrose, gaura, and partridge pea make up 5 percent. Post oak produces 10 percent of the woody production. Other woody plants combined, adding 5 percent, include blackjack oak, greenbriar, bumelia, sumac, prickly ash, hackberry, shin oak, plum, and grapes.

Overgrazing and suppression of fire cause a reduction in mid and tall grasses, and palatable forbs with an increase in silver bluestem, dropseed, oak, and other woody plants. Continued abuse results in an invasion of fall witchgrass, windmillgrass, red lovegrass, tumble lovegrass, gummy lovegrass, and threeawn. In the poorest condition, the site is dominated by post oak, blackjack oak, greenbriar, and shin oak. Grass production is eliminated when the canopy closes.

Low Stony Hill ecological site. The Eckrant soil (map unit EcB and ErB) occurs in this site. The climax plant community is a mid to tall grass live oak savannah. These motts have less than 20 percent tree canopy. The composition by weight is 85 percent grasses, 5 percent forbs, and 10 percent woody plants.

Little and big bluestem, and indiangrass combined produce 40 percent of the forage in climax condition. Sideoats grama, tall dropseed, vine mesquite, and cane bluestem comprise 15 percent. Texas wintergrass, and Canada and Virginia wildrye add 10 percent. Texas cupgrass, plains lovegrass, green sprangletop, perennial threeawn, buffalograss, and others contribute 20 percent. Forbs such as Maximilian sunflower, gayfeather, bushsunflower, penstemon, sensitivebriar, bundleflower, and prairie-clover produce 5 percent. Live oak, cedar elm, Texas oak, Texas ash, hackberry, evergreen sumac, elbowbush, redbud, and white honeysuckle produce 10 percent of the woody production.

Overgrazing and suppression of fire results in a reduction of big bluestem, indiangrass, little bluestem, and palatable forbs. Woody plants, sideoats grama, silver bluestem, wildrye, and less palatable forbs increase.

With continued heavy grazing these forage plants give way to Texas wintergrass, buffalograss, and invaders such as hairy tridens, Texas grama, red threeawn, tumblegrass, other annual grasses and forbs, shin oak, ashe juniper, Texas persimmon, mesquite, and pricklypear.

Redland ecological site. The Evant and Tarpley soils (map units EvB and TaB) are in this site. The climax plant community is a prairie of mid and tall grasses interspersed with widely scattered motts of live oak, post oak, cedar elm, hackberry, and shin oak.

Canopy is less than 10 percent. The composition by weight is 85 percent grasses, 10 percent forbs, and 5 percent woody plants.

Little bluestem, sideoats grama, and indiangrass combined produce 65 percent of the forage in climax condition. Canada wildrye, switchgrass, and big bluestem add 5 percent. Texas wintergrass, plains lovegrass, cane and silver bluestem, and tall dropseed comprise 10 percent. Vine mesquite, hairy grama, white tridens, Texas cupgrass, and others contribute 5 percent. Forbs include Engelmanndaisy, yellow neptunia, bundleflower, sensitivebriar, wildbean, daleas, prairie-clover, gaura, ruellia, bush sunflower, scurfpea, and western ragweed to total 10 percent of the annual production. Live oak, elm, hackberry, and post oak account for 5 percent. Other woody plants in small amounts include greenbriar, elbowbush, blackjack oak, shin oak, bumelia, and sumac.

Overgrazing and suppression of fire cause woody plants to increase with a decrease in palatable grasses and forbs. Continued abuse results in a loss of tall and mid grasses except Texas wintergrass. Curly mesquite, buffalograss, Wright's threeawn along with invaders such as Texas grama, hairy tridens, red grama, tumblegrass, other annual grasses and forbs, curlycup gumweed, prairie coneflower, nightshade, juniper, mesquite, catclaw, Texas persimmon, and pricklypear dominate the site in poor condition. Indiangrass, big and sand bluestem, and switchgrass are replaced by fringeleaf paspalum, tall dropseed, silver bluestem, and other increasing species.

Sandy Loam ecological site. The Bastsil, Cisco, and Minwells soils (map units BaC2, CoC, CoC2, and MnB) are in this site. The climax vegetation is a post oak-blackjack oak savannah with mid to tall grasses filling the open areas. Post oak and other woody plants shade 20 to 25 percent of the ground. The composition by weight is 75 percent grasses, 5 percent forbs, and 20 percent woody plants.

Little bluestem is the dominant grass, producing 35 percent of the forage in climax condition. Indiangrass, switchgrass, and purpletop tridens combined produce 20 percent. Canada and Virginia wildrye, big and sand bluestem, sand lovegrass, Carolina jointtail, and sideoats grama comprise 15 percent. Numerous other grasses make up the rest. Important forbs such as Engelmanndaisy, Maximilian sunflower, sensitivebriar, gaura, and native legumes produce 5 percent of the total. Post oak and blackjack oak produce 15 percent of the total annual production, with many other woody species such as elm, plum, grape, hawthorn, and greenbriar adding 5 percent.

With continuous overgrazing and lack of natural fire, woody canopy increases and palatable grasses and forbs decrease. Poor quality grasses and forbs, including annuals take their place. If abuse persists, oaks, and increaser woody plants form dense thickets along with an invasion of mesquite, juniper, catclaw, and pricklypear. Forage for livestock is reduced to small amounts.

Shallow ecological site. The Cho, Doss, Lampasas, Oglesby, and Pidcoke soils (map units ChB, ReD, LpB, OgB, PkB, and ByC) are in this site. The climax vegetation is a prairie of mid and tall grasses with many forbs. Live oak, hackberry, and elm occur rarely. The composition by weight is 95 percent grasses and 5 percent forbs.

Little bluestem is the dominant grass, producing 45 percent of the forage in climax condition. Indiangrass, big bluestem, switchgrass, sideoats grama, and tall dropseed combined comprise 45 percent. Numerous other grasses contribute 5 percent. Over 25 forbs including Engelmanndaisy, gaura, Maximilian sunflower, black samson, compass plant, heath aster, halfshrub sundrop, and native legumes make up 5 percent.

Because of overgrazing regression occurs, big bluestem decreases rapidly followed by switchgrass and indiangrass. If overgrazing continues, little bluestem, sideoats grama, and tall dropseed increase initially and then decrease. If abuse persists, vegetation is reduced to invaders such as Texas grama, hairy tridens, tumblegrass, buffalograss, red threeawn, Hall's panicum, curlycup gumweed, queen's delight, milkweed, nightshade, ragweed, gray goldaster, chalkhill woolywhite, mesquite, juniper, agarito, prickly pear, and yucca.

Steep Adobe ecological site. The Brackett, Cranfill, and Real soils (map units BtE, CrE, and ReF) are in this site. The climax vegetation is mid and tall grasses with scattered live oak, Texas oak, and juniper. The composition by weight is 85 percent grasses, 5 percent forbs, and 10 percent woody plants.

Little bluestem is the dominant grass, producing 30 percent of the forage in climax condition. Indiangrass, sideoats grama, tall grama combined, comprise 30 percent. Other mid grasses including hairy dropseed, silver bluestem, seep muhly, slim tridens, perennial threeawn, and rough tridens total 25 percent. Forbs include wild alfalfa, bigtop dalea, white milkwort, trailing ratany, bundleflower, gayfeather, and queen's delight. Texas oak, live oak, and juniper comprise most of the woody production at 10 percent. Flameleaf and skunkbush sumac, and redbud also occur.

Because of overgrazing regression occurs, little bluestem, indiangrass, and sideoats grama decrease first because they are preferred species. Tall dropseed, silver bluestem, and hairy grama initially increase. If abuse continues, Texas grama, threeawn, hairy tridens, red grama, agarito, and queen's delight increase and/or invade. Juniper and oaks also increase to create a dense canopy in poor condition. Forage plants are reduced to almost nothing.

The nutritional quality of the forage produced on this site is limited because of the high lime content of the soil which inhibits the amount of phosphate and iron available to the plant.

Stony Clay Loam ecological site. The Nuff soil (map unit NuC) occurs in this site (fig. 9). The climax plant community is tall grass prairie with occasional live oak motts. The composition by weight is 90 percent grasses, 5 percent forbs, and 5 percent woody plants. Limestone fragments 3 to 20 inches across and 0.5 inch to 4 inches thick cover about 20 percent of the ground.

Indiangrass, little bluestem, and big bluestem produce 70 percent of the forage in climax condition. Indiangrass is dominant. Texas wintergrass, sideoats grama, meadow and tall dropseed, cane and silver bluestem, and vine-mesquite add 20 percent. Important forbs include Engelmanndaisy, Maximilian sunflower, heath aster, gaura, bundleflower, prairie-clover, and gayfeather.

Figure 9.—Stones in this area of Nuff silty clay loam, 2 to 6 percent slopes, very stony, limit the use of the map unit to rangeland and wildlife habitat.

Overgrazing by livestock slowly eliminates big bluestem, Engelmanndaisy, indiangrass, and little bluestem. These plants are replaced by increasers such as sideoats grama, dropseed, silver bluestem, vine-mesquite, and less palatable forbs. If destructive grazing continues, the site deteriorates to a plant population of buffalograss, Texas wintergrass, threeawn, Texas grama, hairy tridens, red grama, prairie coneflower, ragweed, mesquite, juniper, and annual weeds.

Tight Sandy Loam ecological site. The Pedernales soil (map unit PdB and PdC2) occurs in this site. The climax vegetation is a mid grass post oak and blackjack oak savannah. Oaks shade about 20 percent of the ground. The composition by weight is 75 percent grasses, 10 percent forbs, and 15 percent woody plants.

Sideoats grama and little bluestem are the dominant grasses, producing 35 percent of the forage in climax condition. Arizona cottontop, vine-mesquite, and silver bluestem produce 25 percent. Other mid and short grasses including Texas wintergrass, hooded windmillgrass, and buffalograss total 15 percent. Forbs such as bushsunflower, western ragweed, primrose, heath aster, orange zexmenia, and native legumes produce 10 percent. Post oak, the most abundant woody plant and blackjack oak produce 10 percent of annual production. Bumelia, greenbriar, hackberry, plum, sumac, prickly ash, and lotebush also occur.

As regression occurs because of overgrazing, sideoats grama, Arizona cottontop, vine-mesquite, and little bluestem decrease. Buffalograss, silver bluestem, and hairy grama increase initially. If abuse continues, tumble lovegrass, tumble windmillgrass, hairy tridens, Texas grama, threeawn, gummy lovegrass, curlycup gumweed, tasajillo, whitebrush, Texas persimmon, mesquite, juniper, and pricklypear invade. In poor condition, trees and shrubs dominate. Forage plants are reduced to almost nothing.

Very Shallow ecological site. The Maloterre soil (map unit BxD) occurs in this site. The climax vegetation is a mid grass prairie. There are many forbs. Live oak and hackberry occur rarely. The composition by weight is 90 percent grasses and 10 percent forbs.

Sideoats grama and little bluestem are dominant grasses, producing 50 percent of the forage in climax condition. Other grasses include Texas wintergrass, silver bluestem, perennial threeawn, slim and rough tridens, tall dropseed, and buffalograss. Many forbs include Engelmanndaisy, yellow neptunia, plains blackfoot, gayfeather, trailing ratany, scurfpea, black samson, compass plant, heath aster, halfshrub sundrop, bundleflower, and orange zexmenia.

Because of overgrazing regression occurs, sideoats grama, little bluestem, and climax forbs decrease rapidly. If overgrazing continues, tall dropseed, slim tridens, Texas wintergrass, silver bluestem, and buffalograss increase initially and then decrease. If abuse persists, vegetation is reduced to invaders such as Texas grama, red grama, hairy tridens, threeawn, Hall’s panicum, tumblegrass, curlycup gumweed, queen's delight, milkweed, ragweed, nightshade, gray goldaster, tasajillo, mesquite, juniper, agarito, lotebush, prickly pear, and broomweed.

Recreation

The soils of the survey area are rated in table 7 according to limitations that affect their suitability for recreation. The ratings are based on restrictive soil features, such as wetness, slope, and texture of the surface layer. Susceptibility to flooding is considered. Not considered in the ratings, but important in evaluating a site, are the location and accessibility of the area, the size and shape of the area and its scenic quality, vegetation, access to water, potential water impoundment sites, and access to public sewer lines. The capacity of the soil to absorb septic tank effluent and the ability of the soil to support vegetation are also important. Soils subject to flooding are limited for recreational uses by the duration and intensity of flooding and the season when flooding occurs. In planning recreational facilities, onsite assessment of the height, duration, intensity, and frequency of flooding is essential.

In table 7, the degree of soil limitation is expressed as slight, moderate, or severe. *Slight* means that soil properties are generally favorable and that limitations are minor and easily overcome. *Moderate* means that limitations can be overcome or alleviated by planning, design, or special maintenance. *Severe* means that soil properties are unfavorable and that limitations can be offset only by costly soil reclamation, special design, intensive maintenance, limited use, or a combination of these measures.

The information in table 7 can be supplemented by other information in this survey, for example, interpretations for septic tank absorption fields in table 10 and interpretations for dwellings without basements and for local roads and streets in table 9.

Camp areas require site preparation, such as shaping and leveling the tent and parking areas, stabilizing roads and intensively used areas, and installing sanitary facilities and utility lines. Camp areas are subject to heavy foot traffic and some vehicular traffic. The best soils have mild slopes and are not wet or subject to flooding during the period of use. The surface has few or no stones or boulders, absorbs rainfall readily but remains firm, and is not dusty when dry. Strong slopes and stones or boulders can greatly increase the cost of constructing campsites.

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

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

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

Golf course fairways are subject to heavy foot traffic and some light vehicular traffic. Cutting or filling may be required. The best soils for use as golf course fairways are firm when wet, are not dusty when dry, and are not subject to prolonged flooding during the period of use. They have moderate slopes and no stones or boulders on the surface. The suitability of the soil for tees or greens is not considered in rating the soils.

Wildlife Habitat

Hamilton County has habitat that is suitable for a diverse and plentiful wildlife population. The primary wildlife species include white-tailed deer, turkey, bobwhite quail, dove, fox squirrel, jackrabbit, and cottontail rabbit. Nongame species such as songbirds, hawks, owls, and numerous species of reptiles inhabit areas throughout the county. Also, fox, raccoon, opossum, skunk, ringtail cat, nutria, bobcat, and coyote are furbearers found in the area.

Numerous livestock ponds, ranging from 0.5 acre to more than 4 acres, are throughout the county. Many ponds are stocked with catfish, bass, and sunfish and provide good opportunities for fishing. There are fishing opportunities in the major rivers and creeks in the county. Waterfowl use the water areas for resting, feeding, and roosting during their fall and spring migrations.

Leasing private land for the hunting of deer, dove, turkey, and quail is a common practice in the county. The income from commercial hunting makes up a significant portion of the total agricultural income.

Soils affect the kinds and amount of vegetation available to wildlife as food and cover. Soils also affect the construction of water impoundments. The kind and abundance of wildlife depend largely on the amount and distribution of food, cover, and water. Wildlife habitat can be created or improved by planting appropriate vegetation,

maintaining existing plant cover, or promoting the natural establishment of desirable plants.

In table 8, the soils in the survey area are rated according to their potential for providing habitat for various kinds of wildlife. This information can be used in planning parks, wildlife refuges, nature study areas, and other developments for wildlife; in selecting soils that are suitable for establishing, improving, or maintaining specific elements of wildlife habitat; and in determining the intensity of management needed for each element of the habitat.

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

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

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

Grasses and legumes are domestic perennial grasses and herbaceous legumes. Soil properties and features that affect the growth of grasses and legumes are depth of the root zone, texture of the surface layer, available water capacity, wetness, surface stoniness, flooding, and slope. Soil temperature and soil moisture are also considerations. Examples of grasses and legumes are lovegrass, kleingrass, clover, and alfalfa.

Wild herbaceous plants are native or naturally established grasses and forbs, including weeds. Soil properties and features that affect the growth of these plants are depth of the root zone, texture of the surface layer, available water capacity, wetness, surface stoniness, and flooding. Soil temperature and soil moisture are also considerations. Examples of wild herbaceous plants are little bluestem, sideoats grama, indiangrass, Englemanndaisy, and Maximilian sunflower.

Shrubs are bushy woody plants that produce fruit, buds, twigs, bark, and foliage. Soil properties and features that affect the growth of shrubs are depth of the root zone, available water capacity, salinity, and soil moisture. Examples of shrubs are elbowbush, skunkbush, greenbriar, and sumac.

Wetland plants are annual and perennial wild herbaceous plants that grow on moist or wet sites. Submerged or floating aquatic plants are excluded. Soil properties and features affecting wetland plants are texture of the surface layer, wetness, reaction, salinity, slope, and surface stoniness. Examples of wetland plants are wild millet, rushes, sedges, and cattails.

Shallow water areas have an average depth of less than 5 feet. Some are naturally wet areas. Others are created by dams, levees, or other water-control structures. Soil properties and features affecting shallow water areas are depth to bedrock, wetness, surface stoniness, slope, and permeability. Examples of shallow water areas are marshes, waterfowl feeding areas, and ponds.

The habitat for various kinds of wildlife is described in the following paragraphs.

Habitat for openland wildlife consists of cropland, pasture, meadows, and areas that are overgrown with grasses, herbs, shrubs, and vines. These areas produce grain and

seed crops, grasses and legumes, and wild herbaceous plants. Wildlife attracted to these areas include bobwhite quail, mourning dove, field sparrow, cottontail rabbit, coyote, and red fox.

Habitat for wetland wildlife consists of open, shallow water areas. Some of the wildlife attracted to such areas are ducks, geese, herons, shore birds, muskrat, and beaver.

Habitat for rangeland wildlife consists of areas of shrubs and wild herbaceous plants. Wildlife attracted to rangeland include white-tailed deer, meadowlark, robin, and cedar waxwing.

Engineering

This section provides information for planning land uses related to urban development and to water management. Soils are rated for various uses, and the most limiting features are identified. Ratings are given for building site development, sanitary facilities, construction materials, and water management. The ratings are based on observed performance of the soils and on the estimated data and test data in the "Soil Properties" section.

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

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

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

Soil properties, site features, and observed performance were considered in determining the ratings in this section. During the fieldwork for this soil survey, determinations were made about 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, reclamation material, roadfill, and topsoil; plan structures for water management; and predict performance of proposed small structures and pavements by comparing the performance of existing similar structures on the same or similar soils.

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

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

Building Site Development

Table 9 shows the degree and kind of soil limitations that affect shallow excavations, dwellings with and without basements, small commercial buildings, local roads and streets, and lawns and landscaping. The limitations are considered *slight* if soil properties and site features are generally favorable for the indicated use and limitations are minor and easily overcome; *moderate* if soil properties or site features are not favorable for the indicated use and special planning, design, or maintenance is needed to overcome or minimize the limitations; and *severe* if soil properties or site features are so unfavorable or so difficult to overcome that special design, significant increases in construction costs, and possibly increased maintenance are required. Special feasibility studies may be required where the soil limitations are severe.

Shallow excavations are trenches or holes dug to a maximum depth of 5 or 6 feet for basements, graves, utility lines, open ditches, and other purposes. The ratings are based on soil properties, site features, and observed performance of the soils. The ease of digging, filling, and compacting is affected by the depth to bedrock, a cemented pan, or a very firm dense layer; stone content; soil texture; and slope. The time of the year that excavations can be made is affected by the depth to a seasonal high water table and the susceptibility of the soil to flooding. The resistance of the excavation walls or banks to sloughing or caving is affected by soil texture and depth to the water table.

Dwellings and *small commercial buildings* are structures built on shallow foundations on undisturbed soil. The load limit is the same as that for single-family dwellings no higher than three stories. Ratings are made for small commercial buildings without basements, for dwellings with basements, and for dwellings without basements. The ratings are based on soil properties, site features, and observed performance of the soils. A high water table, flooding, shrinking and swelling, and organic layers can cause the movement of footings. A high water table, depth to bedrock or to a cemented pan, large stones, slope, and flooding affect the ease of excavation and construction. Landscaping and grading that require cuts and fills of more than 5 or 6 feet are not considered.

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

Lawns and landscaping require soils on which turf and ornamental trees and shrubs can be established and maintained. The ratings are based on soil properties, site features, and observed performance of the soils. Soil reaction, a high water table, depth to bedrock or to a cemented pan, the available water capacity in the upper 40 inches, and the content of salts, sodium, and sulfidic materials affect plant growth. Flooding, wetness, slope, stoniness, and the amount of sand, clay, or organic matter in the surface layer affect trafficability after vegetation is established.

Sanitary Facilities

Table 10 shows the degree and kind of soil limitations that affect septic tank absorption fields, sewage lagoons, and sanitary landfills. The limitations are considered *slight* if soil properties and site features are generally favorable for the indicated use and limitations are minor and easily overcome; *moderate* if soil properties or site features are not favorable for the indicated use and special planning, design, or maintenance is

needed to overcome or minimize the limitations; and *severe* if soil properties or site features are so unfavorable or so difficult to overcome that special design, significant increases in construction costs, and possibly increased maintenance are required.

Table 10 also shows the suitability of the soils for use as daily cover for landfill. A rating of *good* indicates that soil properties and site features are favorable for the use and good performance and low maintenance can be expected; *fair* indicates that soil properties and site features are moderately favorable for the use and one or more soil properties or site features make the soil less desirable than the soils rated good; and *poor* indicates that one or more soil properties or site features are unfavorable for the use and overcoming the unfavorable properties requires special design, extra maintenance, or costly alteration.

Septic tank absorption fields are areas in which effluent from a septic tank is distributed into the soil through subsurface tiles or perforated pipe. Only that part of the soil between depths of 24 and 72 inches is evaluated. The ratings are based on soil properties, site features, and observed performance of the soils. Permeability, a high water table, depth to bedrock or to a cemented pan, and flooding affect absorption of the effluent. Large stones and bedrock or a cemented pan interfere with installation.

Unsatisfactory performance of septic tank absorption fields, including excessively slow absorption of effluent, surfacing of effluent, and hillside seepage, can affect public health. Ground water can be polluted if highly permeable sand and gravel or fractured bedrock is less than 4 feet below the base of the absorption field, if slope is excessive, or if the water table is near the surface. There must be unsaturated soil material beneath the absorption field to filter the effluent effectively. Many local ordinances require that this material be of a certain thickness.

Sewage lagoons are shallow ponds constructed to hold sewage while aerobic bacteria decompose the solid and liquid wastes. Lagoons should have a nearly level floor surrounded by cut slopes or embankments of compacted soil. Lagoons generally are designed to hold the sewage within a depth of 2 to 5 feet. Nearly impervious soil material for the lagoon floor and sides is required to minimize seepage and contamination of ground water.

Table 10 gives ratings for the natural soil that makes up the lagoon floor. The surface layer and, generally, 1 or 2 feet of soil material below the surface layer are excavated to provide material for the embankments. The ratings are based on soil properties, site features, and observed performance of the soils. Considered in the ratings are slope, permeability, a high water table, depth to bedrock or to a cemented pan, flooding, large stones, and content of organic matter.

Excessive seepage resulting from rapid permeability in the soil or a water table that is high enough to raise the level of sewage in the lagoon causes a lagoon to function unsatisfactorily. Pollution results if seepage is excessive or if floodwater overtops the lagoon. A high content of organic matter is detrimental to proper functioning of the lagoon because it inhibits aerobic activity. Slope, bedrock, and cemented pans can cause construction problems, and large stones can hinder compaction of the lagoon floor.

Sanitary landfills are areas where solid waste is disposed of by burying it in soil. There are two types of landfill—trench and area. In a trench landfill, the waste is placed in a trench. It is spread, compacted, and covered daily with a thin layer of soil excavated at the site. In an area landfill, the waste is placed in successive layers on the surface of the soil. The waste is spread, compacted, and covered daily with a thin layer of soil from a source away from the site.

Both types of landfill must be able to bear heavy vehicular traffic. Both types involve a risk of ground-water pollution. Ease of excavation and revegetation should be considered.

The ratings in table 10 are based on soil properties, site features, and observed performance of the soils. Permeability, depth to bedrock or to a cemented pan, a high

water table, slope, and flooding affect both types of landfill. Texture, stones and boulders, highly organic layers, soil reaction, and content of salts and sodium affect trench landfills. Unless otherwise stated, the ratings apply only to that part of the soil within a depth of about 6 feet. For deeper trenches, a limitation rated slight or moderate may not be valid. Onsite investigation is needed.

Daily cover for landfill is the soil material that is used to cover compacted solid waste in an area sanitary landfill. The soil material is obtained offsite, transported to the landfill, and spread over the waste.

Soil texture, wetness, coarse fragments, and slope affect the ease of removing and spreading the material during wet and dry periods. Loamy or silty soils that are free of large stones or excess gravel are the best cover for a landfill. Clayey soils are sticky or cloddy and are difficult to spread; sandy soils are subject to wind erosion.

After soil material has been removed, the soil material remaining in the borrow area must be thick enough over bedrock, a cemented pan, or the water table to permit revegetation. The soil material used as the final cover for a landfill should be suitable for plants. The surface layer generally has the best workability, more organic matter, and the best potential for plants. Material from the surface layer should be stockpiled for use as the final cover.

Construction Materials

Table 11 provides information about the soils as a source of roadfill, sand, gravel, and topsoil. The soils are rated *good, fair,* or *poor* as a source of roadfill and topsoil. They are rated as a *probable* or *improbable* source of sand and gravel. The ratings are based on soil properties and site features that affect the removal of the soil and its use as construction material. Normal compaction, minor processing, and other standard construction practices are assumed. Each soil is evaluated to a depth of 5 or 6 feet.

Roadfill is soil material that is excavated in one place and used in road embankments in another place. In this table, the soils are rated as a source of roadfill for low embankments, generally less than 6 feet high and less exacting in design than higher embankments.

The ratings are for the soil material below the surface layer to a depth of 5 or 6 feet. It is assumed that soil layers will be mixed during excavating and spreading. Many soils have layers of contrasting suitability within their profile. The table showing engineering index properties provides detailed information about each soil layer. This information can help to determine the suitability of each layer for use as roadfill. The performance of soil after it is stabilized with lime or cement is not considered in the ratings.

The ratings are based on soil properties, site features, and observed performance of the soils. The thickness of suitable material is a major consideration. The ease of excavation is affected by large stones, a high water table, and slope. How well the soil performs in place after it has been compacted and drained is determined by its strength (as inferred from the engineering classification of the soil) and shrink-swell potential.

Soils rated *good* contain significant amounts of sand or gravel or both. They have at least 5 feet of suitable material, a low shrink-swell potential, few cobbles and stones, and slopes of 15 percent or less. Depth to the water table is more than 3 feet. Soils rated *fair* are more than 35 percent silt- and clay-sized particles and have a plasticity index of less than 10. They have a moderate shrink-swell potential, slopes of 15 to 25 percent, or many stones. Depth to the water table is 1 to 3 feet. Soils rated *poor* have a plasticity index of more than 10, a high shrink-swell potential, many stones, or slopes of more than 25 percent; or they are wet and have a water table at a depth of less than 1 foot. They may have layers of suitable material, but the material is less than 3 feet thick.

Sand and *grave*l 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 11, only the probability of finding material in suitable quantity is

evaluated. The suitability of the material for specific purposes is not evaluated, nor are factors that affect excavation of the material.

The properties used to evaluate the soil as a source of sand or gravel are gradation of grain sizes (as indicated by the engineering classification of the soil), the thickness of suitable material, and the content of rock fragments. Kinds of rock, acidity, and stratification are given in the soil series descriptions. Gradation of grain sizes is given in the table on engineering index properties.

A soil rated as a probable source has a layer of clean sand or gravel or a layer of sand or gravel that is up to 12 percent silty fines. This material must be at least 3 feet thick and less than 50 percent, by weight, large stones. All other soils are rated as an improbable source. Coarse fragments of soft bedrock, such as shale and siltstone, are not considered to be sand and gravel.

Topsoil is used to cover an area so that vegetation can be established and maintained. The upper 40 inches of a soil is evaluated for use as topsoil. Also evaluated is the reclamation potential of the borrow area.

Plant growth is affected by toxic material and by such properties as soil reaction, available water capacity, and fertility. The ease of excavating, loading, and spreading is affected by rock fragments, slope, a water table, soil texture, and thickness of suitable material. Reclamation of the borrow area is affected by slope, a water table, rock fragments, bedrock, and toxic material.

Soils rated *good* have friable, loamy material to a depth of at least 40 inches. They are free of stones and cobbles, have little or no gravel, and have slopes of less than 8 percent. They are low in content of soluble salts, are naturally fertile or respond well to fertilizer, and are not so wet that excavation is difficult.

Soils rated *fair* are sandy soils, loamy soils that have a relatively high content of clay, soils that have only 20 to 40 inches of suitable material, soils that have an appreciable amount of gravel, stones, or soluble salts, or soils that have slopes of 8 to 15 percent. The soils are not so wet that excavation is difficult.

Soils rated *poor* are very sandy or clayey, have less than 20 inches of suitable material, have a large amount of gravel, stones, or soluble salts, have slopes of more than 15 percent, or have a seasonal high water table at or near the surface.

The surface layer of most soils is generally preferred for topsoil because of its organic matter content. Organic matter greatly increases the absorption and retention of moisture and nutrients for plant growth.

Water Management

Table 12 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 limitations are considered *slight* if soil properties and site features are generally favorable for the indicated use and limitations are minor and are easily overcome; *moderate* if soil properties or site features are not favorable for the indicated use and special planning, design, or maintenance is needed to overcome or minimize the limitations; and *severe* if soil properties or site features are so unfavorable or so difficult to overcome that special design, significant increase in construction costs, and possibly increased maintenance are required.

This table also gives for each soil the restrictive features that affect irrigation, terraces and diversions, and grassed waterways.

Pond reservoir areas hold water behind a dam or embankment. Soils best suited to this use have low seepage potential in the upper 60 inches. The seepage potential is determined by the permeability of the soil and the depth to fractured bedrock or other permeable material. The underlying material is not rated and should be evaluated during an onsite investigation. Excessive slope can affect the storage capacity of the reservoir area.

Embankments, dikes, and levees are raised structures of soil material, generally less than 20 feet high, constructed to impound water or to protect land against overflow. In this table, the soils are rated as a source of material for embankment fill. The ratings apply to the soil material below the surface layer to a depth of about 5 feet. It is assumed that soil layers will be uniformly mixed and compacted during construction.

The ratings do not indicate the ability of the natural soil to support an embankment. Soil properties to a depth even greater than the height of the embankment can affect performance and safety of the embankment. Generally, deeper onsite investigation is needed to determine these properties.

Soil material in embankments must be resistant to seepage, piping, and erosion and have favorable compaction characteristics. Unfavorable features include less than 5 feet of suitable material and a high content of stones or boulders, organic matter, or salts or sodium. A high water table affects the amount of usable material. It also affects trafficability.

Aquifer-fed excavated ponds are pits or dugouts that extend to a ground-water aquifer or to a depth below a permanent water table. Excluded are ponds that are fed only by surface runoff and embankment ponds that impound water 3 feet or more above the original surface. Excavated ponds are affected by depth to a permanent water table, permeability of the aquifer, and quality of the water as inferred from the salinity of the soil. Depth to bedrock and the content of large stones affect the ease of excavation.

Drainage is the removal of excess surface and subsurface water from the soil. How easily and effectively the soil is drained depends on the depth to bedrock, to a cemented pan, or to other layers that affect the rate of water movement; permeability; depth to a high water table or depth of standing water if the soil is subject to ponding; slope; susceptibility to flooding; subsidence of organic layers; and the potential for frost action. Excavating and grading and the stability of ditchbanks are affected by depth to bedrock or to a cemented pan, large stones, slope, and the hazard of cutbanks caving. The productivity of the soil after drainage is adversely affected by extreme acidity or by toxic substances in the root zone, such as salts, sodium, and sulfur. Availability of drainage outlets is not considered in the ratings.

Irrigation is the controlled application of water to supplement rainfall and support plant growth. The design and management of an irrigation system are affected by depth to the water table, the need for drainage, flooding, available water capacity, intake rate, permeability, erosion hazard, and slope. The construction of a system is affected by large stones and depth to bedrock or to a cemented pan. The performance of a system is affected by the depth of the root zone, the amount of salts or sodium, and soil reaction.

Terraces and diversions are embankments or a combination of channels and ridges constructed across a slope to control erosion and conserve moisture by intercepting runoff. Slope, wetness, large stones, and depth to bedrock or to a cemented pan affect the construction of terraces and diversions. A restricted rooting depth, a severe hazard of wind erosion or water erosion, an excessively coarse texture, and restricted permeability adversely affect maintenance.

Grassed waterways are natural or constructed channels, generally broad and shallow, that conduct surface water to outlets at a nonerosive velocity. Large stones, wetness, slope, and depth to bedrock or to a cemented pan affect the construction of grassed waterways. A hazard of wind erosion, low available water capacity, restricted rooting depth, toxic substances such as salts and sodium, and restricted permeability adversely affect the growth and maintenance of the grass after construction.

Soil Properties

Data relating to soil properties are collected during the course of the soil survey.

Soil properties are determined by field examination of the soils and by laboratory index testing of some benchmark soils. Established standard procedures are followed. During the survey, many shallow borings are made and examined to identify and classify the soils and to delineate them on the soil maps. Samples are taken from some typical profiles and tested in the laboratory to determine grain-size distribution, plasticity, and compaction characteristics.

Estimates of soil properties are based on field examinations, on laboratory tests of samples from the survey area, and on laboratory tests of samples of similar soils in nearby areas. Tests verify field observations, verify properties that cannot be estimated accurately by field observation, and help to characterize key soils.

The estimates of soil properties are shown in tables. They include the range of grain-size distribution and Atterberg limits, the engineering classification, and the physical and chemical properties of the major layers of each soil. Pertinent soil and water features also are given.

Engineering Index Properties

Table 13 provides estimates of the engineering classification and of the range of index properties for the major layers of each soil in the survey area. Most soils have layers of contrasting properties within the upper 5 or 6 feet.

Depth to the upper and lower boundaries of each layer is indicated. The range in depth and information on other properties of each layer are given for each soil series under the heading "Soil Series and Their Morphology."

Texture is given in the standard terms used by the U.S. Department of Agriculture. These terms are defined according to percentages of sand, silt, and clay in the fraction of the soil that is less than 2 millimeters 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 as much as about 15 percent, an appropriate modifier is added, for example, "gravelly." Textural terms are defined in the "Glossary."

Classification of the soils is determined according to the Unified soil classification system *(3)* and the system adopted by the American Association of State Highway and Transportation Officials *(2)*.

The Unified system classifies soils according to properties that affect their use as construction material. Soils are classified according to grain-size distribution of the fraction less than 3 inches 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 grain-size distribution, liquid limit, and plasticity index. Soils in group A-1 are coarse grained and low in content of fines (silt and clay). At the other extreme,

soils in group A-7 are fine grained. Highly organic soils are classified in group A-8 on the basis of visual inspection.

If laboratory data are available, the A-1, A-2, and A-7 groups are further classified as A-1-a, A-1-b, A-2-4, A-2-5, A-2-6, A-2-7, A-7-5, or A-7-6. As an additional refinement, the suitability of a soil as subgrade material can be indicated by a group index number. Group index numbers range from 0 for the best subgrade material to 20 or higher for the poorest.

Rock fragments larger than 10 inches 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 grain-size distribution, liquid limit, and plasticity index are generally rounded to the nearest 5 percent. Thus, if the ranges of gradation and Atterberg limits extend a marginal amount (1 or 2 percentage points) across classification boundaries, the classification in the marginal zone is omitted in the table.

Physical Properties

Table 14 provides 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 across. In table 14, 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 across.

The clay content 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 across. 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 14, the estimated content of organic matter is expressed as a percentage, by weight, of the soil material that is less than 2 millimeters across.

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 14 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.

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 coarse 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 Properties

Table 15 provides 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.

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. 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. 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 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 16 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.

If a soil is assigned to a dual hydrologic group (A/D, B/D, or C/D), the first letter is for drained areas and the second is for undrained areas.

The *months* in the table indicate the portion of the year in which the feature is most likely to be a concern.

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 16 indicates *frequency* of ponding. 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 are local information about the extent and levels of flooding and the relation of each soil on the landscape to historic floods. Information on the extent of flooding based on soil data is less specific than that provided by detailed engineering surveys that delineate flood-prone areas at specific flood frequency levels.

Soil Features

Table 17 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 restricts 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 and Chemical Analyses of Selected Soils

The results of physical analysis of several typical pedons in the survey area are given in table 18 and the results of chemical analysis in table 19. The data are for soils sampled at carefully selected sites. Unless otherwise indicated, the pedons are typical of the series. They are described in the section "Soil Series and Their Morphology." Soil samples were analyzed by The National Soil Survey Laboratory, Lincoln, Nebraska, and the Soil Characterization Laboratory at Texas A&M University, College Station, Texas.

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 (*24*).

*Coarse materials—(*2-75 mm fraction) weight estimates of the percentages of all material less than 75 mm (3B1).

Sand—(0.05 to 2.0 mm fraction) weight percentages of material less than 2 mm (3A1).

Silt—(0.002 to 0.05 mm fraction) pipette extraction, weight percentages of all material less than 2 mm (3A1).
Clay—(fraction less than 0.002 mm) pipette extraction, weight percentages of material less than 2 mm (3A1).
Bulk density—of less than 2 mm material, saran-coated clods field moist (4A1a), 1/3 bar (4A1d), ovendry (4A1h).
Linear extensibility—change in clod dimension based on whole soil (4D1).
Water content—pressure extraction, percentage of ovendry weight of less than 2 mm material; 1/3- or 1/10-bar (4B1), 15 bars (4B2a).
Organic carbon—wet combustion. Walkley-Black modified acid-dichromate, ferric sulfate titration (6A1c).
Extractable cations—ammonium acetate pH 7.0; atomic absorption; calcium (6N2e), magnesium (6O2d), sodium (6P2b), potassium (6Q2b).
Cation-exchange capacity—ammonium acetate, pH 7.0, steam distillation (5A8b).
Base saturation—sum of cations, TEA, pH 8.2 (5C3).
Reaction (pH)—1:1 water dilution (8C1f).
Electrical conductivity—saturation extract (8A3a).
Sodium adsorption ratio (5E).
Carbonate as calcium carbonate—(fraction less than 2 mm [80 mesh]) manometric (6E1h).

Classification of the Soils

The system of soil classification used by the National Cooperative Soil Survey has six categories (18,19). 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 20 provides 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, plus *alf*, from Alfisol).

GREAT GROUP. Each suborder is divided into great groups on the basis of close similarities in kind, arrangement, and degree of development of pedogenic horizons; soil moisture and temperature regimes; type of saturation; and base status. Each great group is identified by the name of a suborder and by a prefix that indicates a property of the soil. An example is Haplustalfs (*Hapl*, meaning minimal horizonation, plus *ustalf*, the suborder of the Alfisols that has an ustic moisture regime).

SUBGROUP. Each great group has a typic subgroup. Other subgroups are intergrades or extragrades. The typic subgroup is the central concept of the great group; it is not necessarily the most extensive. Intergrades are transitions to other orders, suborders, or great groups. Extragrades have some properties that are not representative of the great group but do not indicate transitions to any other taxonomic class. Each subgroup is identified by one or more adjectives preceding the name of the great group. An example is Udic 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, mineral content, soil temperature regime, soil depth, and reaction. A family name consists of the name of a subgroup preceded by terms that indicate soil properties. An example is fine-loamy, siliceous, superactive, thermic Udic 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" (18*)*. Many of the technical terms used in the descriptions are defined in "Soil Taxonomy" *(19)* and in "Keys to Soil Taxonomy" *(20,21)*. 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.

Bastsil Series

The Bastsil series consists of very deep, well drained, gently sloping soils on stream terraces. They formed in loamy alluvial sediments. Slopes are 1 to 5 percent.

Typical pedon of Bastsil loamy fine sand, 1 to 3 percent slopes; from the intersection of Texas Highway 36 and U.S. Highway 281 in Hamilton, 4.8 miles north on U.S. Highway 281, 0.8 mile northeast on paved county road, 1.1 miles east on gravel county road, 0.3 mile north on private road, and 400 feet east in field.

Ap—0 to 6 inches; brown (10YR 5/3) loamy fine sand, dark brown (10YR 4/3) moist; weak fine granular structure; loose, very friable; common fine and medium roots; slightly acid; abrupt smooth boundary.

E—6 to 17 inches; light brown (7.5YR 6/4) loamy fine sand, brown (7.5YR 5/4) moist; weak fine granular structure; loose, friable; few fine and medium roots; slightly acid; abrupt smooth boundary.

Bt1—17 to 27 inches; yellowish red (5YR 5/6) sandy clay loam, yellowish red (5YR 4/6) moist; moderate medium subangular blocky structure; very hard, friable; few thin discontinuous clay films on faces of peds; slightly acid; gradual smooth boundary.

Bt2—27 to 80 inches; yellowish red (5YR 5/6) sandy clay loam, yellowish red (5YR 5/6) moist; moderate medium prismatic structure parting to moderate fine subangular blocky; very hard, friable; few thin discontinuous clay films on faces of peds; some prism faces have uncoated sand grains; few siliceous pebbles; slightly acid.

Solumn thickness ranges from 60 to more than 80 inches. The clay content of the control section ranges from 20 to 30 percent. The content of siliceous pebbles ranges from none to 15 percent throughout the soil. Most pedons have beds of gravel and sand below a depth of 80 inches.

The A horizon has hue of 7.5YR or 10YR, value of 4 to 6, and chroma of 2 to 6. It is loamy fine sand or fine sandy loam. Reaction is moderately acid to neutral.

The E horizon has hue of 7.5YR or 10YR, value of 5 or 6, and chroma of 2 to 4. The combined thickness of the A and E horizons is less than 20 inches. Reaction is moderately acid and slightly acid.

The Bt horizon has hue of 2.5YR to 7.5YR, value of 4 to 6, and chroma of 4 to 8. Some pedons have a few red or yellow masses of oxidized iron. It is sandy clay loam or clay loam. Reaction ranges from moderately acid to slightly alkaline.

The Bt/E horizon, where present, has matrix colors in shades of red or brown. It is sandy loam, sandy clay loam, or clay loam. The E horizon material is gray uncoated sand grains that are on the surface of peds, in streaks, or in small pockets. The E horizon material comprises about 2 to 10 percent by volume of this horizon. Reaction ranges from moderately acid to slightly alkaline.

Bolar Series

The Bolar series consists of moderately deep, well drained, gently sloping soils on uplands. They formed in interbedded limestone and marl. Slopes are 1 to 4 percent.

Typical pedon of Bolar gravelly clay loam, 1 to 4 percent slopes; from the intersection of Texas Highway 36 and Texas Highway 22 in Hamilton, 10.0 miles northeast on Texas Highway 36, 9.4 miles southeast on Farm Road 1602, 2.0 miles north on gravel county road, 2.1 miles south on gravel county road, and 300 feet southwest in cropland.

Ap—0 to 8 inches; dark brown (7.5YR 4/2) gravelly clay loam, dark brown (7.5YR 3/2) moist; moderate fine subangular blocky structure; hard, friable; few medium roots; common fine and medium pores; few fine concretions of calcium carbonate; about 20 percent by volume limestone fragments less than 3 inches across; calcium carbonate equivalent is about 35 percent; strongly effervescent; moderately alkaline; clear smooth boundary.

Bk1—8 to 17 inches; yellowish brown (10YR 5/4) gravelly clay loam, dark yellowish brown (10YR 4/4) moist; weak fine subangular blocky structure; hard, friable; common fine roots; common fine pores; common films, threads and concretions of calcium carbonate; 20 percent by volume limestone fragments less than 3 inches across; calcium carbonate equivalent is about 45 percent; violently effervescent; moderately alkaline; clear smooth boundary.

Bk2—17 to 26 inches; very pale brown (10YR 7/4) clay loam, light yellowish brown (10YR 6/4) moist; weak fine subangular blocky structure; slightly hard, very friable; common very fine and fine roots; common masses and concretions of calcium carbonate; 10 percent by volume limestone fragments less than 3 inches across; violently effervescent; moderately alkaline; clear smooth boundary.

Bk3—26 to 36 inches; very pale brown (10YR 7/4) clay loam, light yellowish brown (10YR 6/4) moist; weak fine subangular blocky structure; slightly hard, very friable; few very fine and fine roots; common masses and concretions of calcium carbonate; 10 percent by volume limestone fragments less than 3 inches across; calcium carbonate equivalent is about 60 percent; violently effervescent; moderately alkaline; gradual smooth boundary.

R—36 to 55 inches; indurated limestone bedrock interbedded with marl that has a clay texture.

Solumn thickness ranges from 20 to 40 inches. The silicate clay content of the control section ranges from 20 to 35 percent. The calcium carbonate equivalent of the control section ranges from 40 to 70 percent. Fragments of limestone in the solum up to 10 inches across range from 3 to 30 percent by volume.

The A horizon has hue of 7.5YR or 10YR, value of 3 or 4, and chroma of 2 or 3. It is gravelly clay loam.

The Bk horizon has hue of 7.5YR or 10YR, value of 4 to 7, and chroma of 2 to 6. It is loam, clay loam, silty clay loam, or their gravelly counterparts.

The R layer is indurated limestone bedrock that is interbedded with marl or chalky limestone at vertical intervals of 4 to 20 inches. There are cracks or fractures spaced about 6 to 30 inches apart. Fractures are tight, mainly less than 1 inch in width.

Bosque Series

The Bosque series consists of very deep, well drained, nearly level soils on flood plains. They formed in calcareous, loamy alluvial sediments. Slopes are 0 to 1 percent.

Typical pedon of Bosque clay loam, rarely flooded; from the intersection of U.S. Highway 281 and Texas Highway 36 in Hamilton, 5.3 miles north of U.S. Highway 281, 0.5 mile west on private road, and 0.3 mile west of house on pasture road in pecan grove.

A1—0 to 14 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 fine granular; hard, friable; many fine and medium roots; common fine pores; common wormcasts; violently effervescent; moderately alkaline; clear smooth boundary.

A2—14 to 34 inches; dark brown (10YR 4/3) clay loam, dark brown (10YR 3/3) moist; moderate fine subangular blocky structure parting to weak fine granular; hard, friable; many fine and medium, common coarse roots; common fine pores; violently effervescent; moderately alkaline; gradual wavy boundary.

A3—34 to 52 inches; dark brown (10YR 4/3) clay loam, dark brown (10YR 3/3) moist; weak medium and coarse subangular blocky structure parting to weak fine granular; hard, friable; few fine roots; few films and threads of calcium carbonate; few limestone pebbles; violently effervescent; moderately alkaline; gradual wavy boundary.

Bw—52 to 80 inches; yellowish brown (10YR 5/4) clay loam, dark yellowish brown (10YR 4/4) moist; weak medium and coarse subangular blocky structure; hard, firm; few medium and coarse roots; common films, threads, and masses of calcium carbonate; moderately alkaline; violently effervescent.

Depth to sand, gravel, or limestone ranges from 5 to about 30 feet. The clay content ranges from 20 to 35 percent. The calcium carbonate equivalent ranges from 15 to 40 percent. Some pedons have light colored discontinuous loamy or sandy strata less than 3 inches thick. The reaction is slightly alkaline or moderately alkaline throughout. The mollic epipedon is more than 20 inches thick.

The A horizon has hue of 7.5YR or 10YR, value of 3 to 5, and chroma of 2 or 3. It is loam or clay loam.

The Bw horizon has hue of 7.5YR or 10YR, value of 5 or 6, and chroma of 2 to 4. It is loam or clay loam.

Some pedons have a buried A horizon below 40 inches with clayey textures. Colors are same as the A horizon.

Brackett Series

The Brackett series consists of very deep, well drained, gently sloping to steep soils on erosional uplands. They formed in marl and limestone. Slopes are 1 to 30 percent.

Typical pedon of Brackett gravelly clay loam, 1 to 5 percent slopes; from the intersection of Texas Highway 36 and Farm Road 932 in Hamilton, 1.5 miles south on Farm Road 932 to Farm Road 1241, 12.8 miles south on Farm Road 1241, 0.2 mile north on county road, and 50 feet east in cropland field.

Ap—0 to 6 inches; grayish brown (10YR 5/2) gravelly clay loam, dark grayish brown (10YR 4/2) moist; moderate fine granular and subangular blocky structure; hard, friable; many very fine and fine roots; about 20 percent fossil shells less than 1 inch across; few fine concretions of calcium carbonate; calcium carbonate equivalent is about 40 percent; violently effervescent; moderately alkaline; abrupt smooth boundary.

Bk—6 to 16 inches; pale yellow (2.5Y 7/4) loam, light yellowish brown (2.5Y 6/4) moist; moderate fine subangular blocky structure; hard, friable; common fine concretions of calcium carbonate; calcium carbonate equivalent is about 60 percent; violently effervescent; moderately alkaline; gradual smooth boundary.

C—16 to 60 inches; yellow (2.5Y 7/6) marl that has silty clay texture, olive yellow (2.5Y 6/6) moist and light brownish gray (2.5Y 6/2) moist; massive; hard, very firm; few very fine roots; common medium masses of calcium carbonate; about 12 percent fossil shells less than 2 inches across; calcium carbonate equivalent is about 70 percent; violently effervescent; moderately alkaline.

Solumn thickness ranges from 14 to about 30 inches. The texture of the soil is loam, clay loam, or their gravelly counterparts. Fragments of limestone and fossil shells range from a few to 35 percent by volume in some horizons. The limestone fragments are typically less than 5 inches across and the fossil shells are less than 2 inches across. The calcium carbonate equivalent ranges from 40 to 80 percent throughout the pedon.

The A horizon has hue of 10YR or 2.5Y, value of 5 to 8, and chroma of 2 to 4.

The B horizon has hue of 10YR or 2.5Y, value of 5 to 8, and chroma of 2 to 4. Some pedons have few to common yellow, brown, or gray mottles inherited from the parent material. Films, threads, and masses of calcium carbonate are few or common.

The C horizon has colors in shades of yellow, brown, or gray. Typically, there are mottles, streaks, and thin discontinuous strata of these same colors. It is marl that has textures of clay loam or silty clay. Some pedons are interbedded with strata of calcium carbonate and marl. Massive beds of fossil shells are below a depth of 60 inches in some pedons.

Caradan Series

The Caradan series consists of very deep, well drained, very gently sloping soils on stream terraces or stream divides on uplands. They formed in clayey calcareous sediments. Slopes are 1 to 3 percent.

Typical pedon of Caradan silty clay, 1 to 3 percent slopes; from the intersection of U.S. Highway 84 and U.S. Highway 281 in Evant, 8.4 miles west on U.S. Highway 84, 2.4 miles north on county road, 1.8 miles west on private ranch road, and 2,000 feet north in rangeland.

A—0 to 4 inches; very dark grayish brown (10YR 3/2) silty clay, very dark brown (10YR 2/2) moist; moderate very fine subangular blocky structure; very hard, firm; many fine and medium roots; few fine siliceous pebbles; neutral; clear wavy boundary.

Bt—4 to 13 inches; dark brown (7.5YR 4/2) clay, dark brown (7.5YR 3/2) moist; moderate medium prismatic structure parting to moderate medium angular blocky; very hard, firm; common fine and medium roots; common pressure faces; few small slickensides; few fine siliceous pebbles; neutral; gradual wavy boundary.

Btss—13 to 19 inches; dark brown (7.5YR 4/2) clay, dark brown (7.5YR 3/2) moist; moderate medium prismatic structure parting to moderate medium angular blocky; very hard, firm; common fine and medium roots; common pressure faces; common small slickensides; few fine siliceous pebbles; neutral; clear wavy boundary.

Btkss—19 to 26 inches; dark brown (7.5YR 4/4) silty clay, dark brown (7.5YR 3/4) moist; weak medium prismatic structure parting to moderate medium subangular blocky; very hard, firm; few fine and medium roots; common pressure faces; common medium continuous slickensides; about 10 percent white (10YR 8/2) vertically oriented soft carbonate segregations; few fine siliceous pebbles; slightly alkaline; clear smooth boundary.

2Bk1—26 to 63 inches; reddish yellow (7.5YR 7/6) silt loam; yellowish red (5YR 5/8) moist; moderate fine subangular blocky structure; hard, friable; few fine and medium roots; few fine siliceous pebbles; about 30 percent white (10YR 8/2) vertically oriented, soft carbonate segregations; moderately alkaline; gradual smooth boundary.

2Bk2—63 to 80 inches; yellowish red (5YR 4/6) silty clay loam, yellowish red (5YR 4/6) moist; few fine faint strong brown masses of oxidized iron; moderate fine subangular blocky structure; hard, friable; few fine roots; about 10 to 15 percent white (10YR 8/1) vertically oriented, soft carbonate segregations; some segregations have weakly indurated centers; few fine siliceous pebbles; moderately alkaline.

Solumn thickness ranges from 60 to more than 80 inches. Chert fragments of gravel and cobble size range from few to about 15 percent of the soil surface. Cracks more than 0.25 inch wide extend to depths of 20 to 30 inches at some season during most years. The soil is slightly acid to slightly alkaline and noncalcareous in the upper part, and slightly alkaline or moderately alkaline and calcareous in the lower Bt horizon. Masses, films, and threads of calcium carbonate occur at depths below 12 inches but commonly within 28 inches. The COLE is 0.07 to 0.13 or more in some horizon or horizons 20 or more inches thick.

The A horizon has hue of 5YR to 10YR, value of 2.5 to 4, and chroma of 2 or 3. It is clay loam, silty clay, or clay.

The Bt horizons have hue of 5YR or 7.5YR, value of 3 to 5, and chroma of 2 to 6. Vertically oriented concretions, films, and threads of calcium carbonate range from 3 to 15 percent by volume in the lower part of the Bt. The average clay content ranges from 50 to 60 percent.

The 2Bk horizons have hue of 5YR or 7.5YR, value of 4 to 7, and chroma of 4 or 6. Vertically oriented concretions, films, and threads of calcium carbonate range from 15 to 40 percent by volume. It is loam, silt loam, clay loam, or silty clay loam.

Cho Series

The Cho series consists of very shallow and shallow, well drained, very gently sloping soils on uplands. They formed in calcareous, loamy, gravelly material. Slopes are 1 to 3 percent.

Typical pedon of Cho gravelly clay loam, 1 to 3 percent slopes; from the intersection of Texas Highway 36 and U.S. Highway 281 in Hamilton, 10.7 miles north on U.S. Highway 281 to intersection with gravel county road, 2.0 miles west on gravel county road, and 20 feet south in pit in rangeland.

A—0 to 14 inches; dark grayish brown (10YR 4/2) gravelly clay loam, very dark grayish brown (10YR 3/2) moist; weak medium subangular blocky structure; hard, friable; many very fine and fine roots; common fine pores; 15 percent by volume indurated caliche fragments from 0.5 inch to 3 inches across; violently effervescent; moderately alkaline; abrupt wavy boundary.

Bkm—14 to 19 inches; pinkish white (7.5YR 8/2) indurated caliche, in plates 3 to 8 inches across and 1 to 2 inches thick; laminar in upper part; few seams of dark brown loamy material between plates and in solution channels; moderately alkaline; clear wavy boundary.

Bk—19 to 62 inches; pink (7.5YR 8/4) gravelly loam; massive; hard, friable; about 60 to 70 percent by volume of calcium carbonate; violently effervescent; moderately alkaline.

Solumn thickness ranges from 7 to 20 inches and corresponds to the depth to the petrocalcic horizon.

The A horizon has hue of 7.5YR or 10YR, value of 3 to 5, and chroma of 2 or 3. It is gravelly clay loam.

The Bkm horizon is indurated caliche with a laminar cap 0.5 inch to 1 inch thick.

The Bk horizon has hue of 5YR to 10YR, value of 7 or 8, and chroma of 2 to 4. The fine earth fraction is loam or clay loam.

Cisco Series

The Cisco series consists of very deep, well drained, gently sloping soils on uplands. They formed in sandy and loamy material. Slopes are 1 to 5 percent.

Typical pedon of Cisco fine sandy loam, 1 to 5 percent slopes; from the intersection of Texas Highway 6 and U.S. Highway 281 in Hico, 0.8 mile south on U.S. Highway 281, 4.7 miles south on Farm Road 1602, 0.6 mile west on private road, and 900 feet north of farm house in old cropland field.

Ap—0 to 6 inches; brown (7.5YR 5/4) fine sandy loam, dark brown (7.5YR 4/4) moist; weak fine granular structure; slightly hard, friable; many very fine and fine roots; few wormcasts; neutral; abrupt smooth boundary.

A—6 to 12 inches; brown (7.5YR 5/4) fine sandy loam, dark brown (7.5YR 4/4) moist; weak fine granular structure; slightly hard, friable; many very fine and fine roots; few wormcasts; neutral; abrupt smooth boundary.

Bt1—12 to 18 inches; reddish brown (5YR 4/4) sandy clay loam, dark reddish brown (5YR 3/4) moist; moderate medium subangular blocky structure; hard, firm; common

fine roots; common thin discontinuous clay films on faces of peds; few wormcasts; neutral; gradual smooth boundary.

Bt2—18 to 37 inches; yellowish red (5YR 5/6) sandy clay loam, yellowish red (5YR 4/6) moist; moderate medium subangular blocky structure; hard, firm; common fine roots; few thin discontinuous clay films on faces of peds; few wormcasts; neutral; gradual smooth boundary.

BC—37 to 51 inches; yellowish red (5YR 5/6) sandy clay loam, yellowish red (5YR 4/6) moist; moderate medium subangular blocky structure; few fine faint brown masses of oxidized iron; hard, firm; neutral; clear wavy boundary.

BCk—51 to 80 inches; light gray (10YR 7/2) fine sandy loam, light brownish gray (10YR 6/2) moist; few fine distinct strong brown (7.5YR 5/6), and yellowish red (5YR 5/8) masses of oxidized iron; massive; slightly hard, friable; few fine concretions of calcium carbonate; slightly effervescent; moderately alkaline.

Solumn thickness ranges from 60 to more than 80 inches. The clay content decreases with depth. The depth to secondary carbonates is within 60 inches of the surface.

The A horizon has hue of 5YR to 10YR, value of 4 or 5, and chroma of 3 or 4. It is fine sandy loam. Reaction is slightly acid or neutral.

The Bt horizon has hue of 2.5YR or 5YR, value of 4 or 5, and chroma of 4 to 8. The clay content of the upper 20 inches of the Bt horizon ranges from 20 to 35 percent. It is sandy clay loam or clay loam. Reaction is neutral or slightly alkaline.

The BC horizon, where present, has hue of 5YR or 7.5YR, value of 4 to 6, and chroma of 4 to 8. It is fine sandy loam or sandy clay loam. Reaction is slightly alkaline or moderately alkaline.

The C horizon is fine sandy loam or limy earth interbedded with weakly cemented sand. Reaction is slightly alkaline or moderately alkaline.

The Cisco soils described in Hamilton County are a taxadjunct to the Cisco series because they are slightly more moist than typical for the series. They are in an ustic soil moisture regime bordering on udic, rather than a typic ustic soil moisture regime. This difference does not significantly change use and management of the soils.

Cranfill Series

The Cranfill series consists of very deep, well drained, gently sloping to moderately steep soils on uplands. They formed in loamy, calcareous colluvial sediments containing many limestone fragments. Slopes are 3 to 20 percent.

Typical pedon of Cranfill gravelly clay loam, 3 to 8 percent slopes; from the intersection of Texas Highway 36 and U.S. Highway 281 in Hamilton, 3.1 miles south on U.S. Highway 281 to intersection with gravel county road, 0.7 mile east on county road, and 20 feet south in rangeland.

A—0 to 10 inches; pale brown (10YR 6/3) gravelly clay loam, brown (10YR 5/3) moist; weak fine subangular blocky and weak fine granular structure; hard, friable; many very fine and fine roots; common films, threads, and concretions of calcium carbonate; 20 percent by volume of limestone fragments from 0.25 inch to 3 inches across; calcium carbonate equivalent is about 60 percent; violently effervescent; moderately alkaline; clear smooth boundary.

Bk1—10 to 17 inches; light yellowish brown (10YR 6/4) gravelly clay loam, yellowish brown (10YR 5/4) moist; weak fine subangular blocky and weak fine granular structure; hard, friable; many very fine, fine, and medium roots; many films, threads, and concretions of calcium carbonate; 30 percent by volume of limestone fragments from 0.25 inch to 3 inches across; calcium carbonate equivalent is about 70 percent; violently effervescent; moderately alkaline; gradual wavy boundary.

Bk2—17 to 45 inches; very pale brown (10YR 7/4) gravelly clay loam, light yellowish brown (10YR 6/4) moist; weak fine subangular blocky and weak fine granular structure; hard, friable; few very fine, fine, and coarse roots; many films, threads, and concretions of calcium carbonate; 20 percent by volume of limestone fragments from 0.25 inch to 3 inches across; calcium carbonate equivalent is about 75 percent; violently effervescent; moderately alkaline; gradual wavy boundary.

BCk—45 to 80 inches; light yellowish brown (10YR 6/4) gravelly clay loam, yellowish brown (10YR 5/4) moist; massive; hard, friable; few coarse roots; many masses, threads, and concretions of calcium carbonate; 20 percent by volume of limestone fragments from 0.25 inch to 2 inches across; many pale brown (10YR 6/3) shale fragments; calcium carbonate equivalent is about 85 percent; violently effervescent; moderately alkaline.

Solum thickness ranges from 40 to 60 inches. The 10- to 40-inch control section ranges from 60 to 90 percent calcium carbonate equivalent. The control section has 22 to 35 percent silicate clay.

The A horizon has hue of 7.5YR to 2.5Y, value of 5 or 6, and chroma of 2 or 3. Coarse fragments range from 15 to 30 percent and are mainly limestone fragments from 0.25 inch to 3 inches across. It is gravelly clay loam.

The Bk horizon has hue of 7.5YR to 2.5Y, value of 5 to 7, and chroma of 3 or 4. It is gravelly loam, gravelly silty clay loam, or gravelly clay loam. Coarse fragments of limestone range from 20 to 35 percent by volume.

The BCk horizon has similar colors to the Bk horizon. It is gravelly clay loam or gravelly silty clay loam. Coarse fragments of limestone range from 15 to 30 percent by volume.

Denton Series

The Denton series consists of deep, well drained, very gently sloping soils on uplands. They formed in clayey materials over limestone bedrock. Slopes are 1 to 3 percent.

Typical pedon of Denton silty clay, 1 to 3 percent slopes; from the intersection of Texas Highway 36 and Texas Highway 22 in Hamilton, 12.8 miles east on Texas Highway 22 to intersection with private road, 1.2 miles north on private road, and 150 feet west in cropland field.

Ap—0 to 5 inches; dark grayish brown (10YR 4/2) silty clay, very dark grayish brown (10YR 3/2) moist; moderate very fine and fine granular structure; hard, firm; few fine roots; few fine concretions of calcium carbonate; slightly effervescent; moderately alkaline; clear smooth boundary.

A—5 to 13 inches; dark grayish brown (10YR 4/2) silty clay, very dark grayish brown (10YR 3/2) moist; few medium faint yellowish brown (10YR 5/4) masses of oxidized iron; moderate fine and medium subangular blocky structure; very hard, firm; few fine roots; few small pressure faces; few fine concretions of calcium carbonate; calcium carbonate equivalent is about 35 percent; few wormcasts; strongly effervescent; moderately alkaline; gradual smooth boundary.

Bw—13 to 24 inches; reddish brown (5YR 5/4) silty clay, reddish brown (5YR 4/4) moist; moderate medium subangular blocky structure; very hard, firm; few fine roots; few medium stains of very dark grayish brown; few small pressure faces; calcium carbonate equivalent is about 45 percent; strongly effervescent; moderately alkaline; clear smooth boundary.

2Bk1—24 to 29 inches; brown (7.5YR 5/4) silty clay loam, dark brown (7.5YR 4/4) moist; few medium faint strong brown (7.5YR 5/6) masses of oxidized iron; moderate medium subangular blocky structure; hard, firm; common masses of calcium

carbonate; calcium carbonate equivalent is about 55 percent; violently effervescent; moderately alkaline; clear smooth boundary.

2Bk2—29 to 38 inches; light brown (7.5YR 6/4) silty clay loam, brown (7.5YR 5/4) moist; moderate fine and medium subangular blocky structure; hard, firm; common masses of calcium carbonate; calcium carbonate equivalent is about 60 percent; violently effervescent; moderately alkaline; clear smooth boundary.

2CBk—38 to 54 inches; brownish yellow (10YR 6/6) marl that has gravelly silty clay loam texture; massive; about 20 percent very pale brown (10YR 7/2) and white (10YR 8/1) coarse masses and thin discontinuous strata of calcium carbonate; 15 percent by volume limestone fragments 1 inch to 8 inches across; calcium carbonate equivalent is about 65 percent; violently effervescent; moderately alkaline; abrupt wavy boundary.

2R—54 to 60 inches; indurated limestone bedrock interbedded with marl.

Solum thickness ranges from 22 to 40 inches and the depth to limestone bedrock ranges from 40 to 60 inches. The average silicate clay content of the control section ranges from 25 to 35 percent. Films, threads, or masses of calcium carbonate are within a depth of 15 to 28 inches of the surface. The calcium carbonate equivalent is 40 to 65 percent. The COLE in the upper 50 inches or to bedrock ranges from 0.02 to 0.06. However, the soil lacks a layer 20 inches or more thick with COLE of 0.07 or more.

The A horizon has hue of 7.5YR to 2.5Y, value of 3 or 4, and chroma of 2 or 3. It is silty clay. The total clay content ranges from 35 to 55 percent with 0 to 5 percent as clay size carbonates.

Some pedons lack a Bw horizon. Where present, it has hue of 5YR to 10YR, value of 3 to 5, and chroma of 4 or 6. It is silty clay loam or silty clay.

The 2Bk horizon has hue of 7.5YR or 10YR, value of 5 to 7, and chroma of 2 to 6. It is loam, silt loam, or silty clay loam. Fragments of limestone from pebble to cobble size range from none to about 15 percent by volume.

The 2CBk horizon is absent in some pedons. Where present, it has colors mainly in shades of yellow or brown. It is marl with textures mainly of silt loam or silty clay loam. Limestone pebbles and cobbles range from about 5 to 35 percent by volume. Limestone fragments typically occur in a discontinuous lag line in the 2Bk or 2CBk horizons. Large masses and discontinuous strata of calcium carbonate range from about 5 to 35 percent by volume.

The 2R layer is indurated limestone bedrock that is interbedded with marly soil materials or chalky limestone at vertical intervals of 4 to 20 inches. There are cracks or fractures spaced about 6 to 30 inches apart. Fractures are tight, less than 0.25 inch to about 1.5 inches wide.

Desan Series

The Desan series consists of very deep, somewhat excessively drained, very gently sloping soils on ancient stream terraces. They formed in sandy and loamy alluvium. Slopes are 1 to 3 percent.

Typical pedon of Desan fine sand, 1 to 3 percent slopes; from the intersection of Texas Highway 36 and U.S. Highway 281 in Hamilton, 5.1 miles north on U.S. Highway 281 to intersection with paved road, 0.8 mile east and north on paved road to intersection with county road, 1.1 miles east on county road, and 100 feet south in bermudagrass pasture.

Ap—0 to 5 inches; pale brown (10YR 6/3) fine sand, brown (10YR 4/3) moist; single grained; loose, very friable; common fine and medium roots; neutral; abrupt smooth boundary.

A—5 to 20 inches; light yellowish brown (10YR 6/4) fine sand, yellowish brown (10YR 5/4) moist; single grained; loose, very friable; few fine roots; neutral; clear wavy boundary.
E—20 to 55 inches; reddish yellow (7.5YR 6/6) fine sand, strong brown (7.5YR 5/6) moist; single grained; loose, very friable; few fine roots; neutral; clear wavy boundary.
Bt1—55 to 69 inches; yellowish red (5YR 5/6) sandy clay loam, yellowish red (5YR 4/6) moist; moderate medium subangular blocky structure; hard, firm; few fine roots; few fine pores; few thin discontinuous clay films on faces of peds; slightly acid; clear wavy boundary.
Bt2—69 to 80 inches; reddish yellow (5YR 6/6) fine sandy loam, yellowish red (5YR 5/6) moist; moderate medium subangular blocky structure; hard, firm; few fine roots; few fine pores; few thin discontinuous clay films on faces of peds; slightly acid.

Solum thickness ranges from 65 to more than 120 inches. The combined thickness of the A and E horizons is 40 to 80 inches. It is loamy fine sand or fine sand. Reaction ranges from strongly acid to neutral.

The A horizon has hue of 7.5YR or 10YR, value of 5 to 7, and chroma of 3 to 6.

The E horizon has hue of 7.5YR or 10YR, value of 6 to 8, and chroma of 3 to 6.

The Bt horizon has hue of 2.5YR to 7.5YR, value of 4 to 6, and chroma of 6 or 8. It is fine sandy loam or sandy clay loam with a clay content of 18 to 35 percent.

The 2C horizon, where present, has hue of 2.5YR to 10YR, value of 5 to 7, and chroma of 4 to 8. It is loamy sand, loamy fine sand, sandy loam, or sandy clay loam.

Doss Series

The Doss series consists of shallow, well drained, undulating soils on uplands. They formed in weakly cemented limestone interbedded with calcareous marl. Slopes are 1 to 8 percent.

Typical pedon of Doss clay loam, from an area of Real-Doss complex, 1 to 8 percent slopes; from the intersection of Texas Highway 36 and Farm Road 932 in Hamilton, 1.5 miles south on Farm Road 932 to Farm Road 1241, 12.6 miles south on Farm Road 1241 to private ranch road, 1.2 miles south on private ranch road, and 150 feet southeast in rangeland.

A—0 to 8 inches; dark brown (10YR 4/3) clay loam, dark brown (10YR 3/3) moist; weak fine subangular blocky structure; hard, friable; many very fine and fine roots; common concretions of calcium carbonate; 10 percent of surface covered with gravel and cobbles; calcium carbonate equivalent is about 40 percent; violently effervescent; moderately alkaline; clear smooth boundary.
Bk—8 to 17 inches; pale brown (10YR 6/3) clay loam, brown (10YR 5/3) moist; weak medium subangular blocky structure; hard, friable; 5 percent limestone fragments about 0.5 inch thick and 2 inches across; 20 percent masses and concretions of calcium carbonate; calcium carbonate equivalent is about 60 percent; violently effervescent; moderately alkaline; abrupt smooth boundary.
Cr—17 to 60 inches; weakly consolidated platy limestone interbedded with yellowish brown (10YR 5/6) clay loam, yellowish brown (10YR 5/4) moist; few very fine roots in fractures; limestone has hardness of less than 3 on Mohs scale; violently effervescent; moderately alkaline.

Solumn thickness ranges from 11 to 20 inches. It is clay loam, silty clay loam, or silty clay. The total clay content ranges from 27 to 40 percent in the solum, and silicate clay ranges from 25 to 35 percent. Limestone fragments of gravel and cobble size range from a few to 15 percent by volume. The calcium carbonate equivalent ranges from 40 to 60 percent. Reaction is moderately alkaline.

The A horizon has hue of 7.5YR or 10YR, value of 3 or 4, and chroma of 2 or 3.

The Bk horizon has hue of 7.5YR or 10YR, value of 5 or 6, and chroma of 2 to 4. This horizon is absent in some pedons.

The Cr horizon is weakly cemented limestone interbedded with loamy, calcareous marls. The loamy marls are dark brown, light gray, yellowish brown, light yellowish brown, or yellow. The limestone has a hardness of less than 3 on Mohs scale.

Eckrant Series

The Eckrant series consists of very shallow and shallow, well drained, gently sloping soils on uplands. They formed in interbedded limestone and marl. Slopes are 1 to 5 percent (fig 10).

Typical pedon of Eckrant very cobbly clay, in an area of Eckrant-Rock outcrop complex, 1 to 5 percent slopes; from the intersection of Texas Highway 36 and Texas Highway 22 in Hamilton, 12.7 miles east on Texas Highway 22 to private road, 0.6 mile north to ranch road, 1.8 miles north on ranch road, and 50 feet east in rangeland.

Figure 10.—Profile of Eckrant very cobbly clay. The soil is shallow to indurated limestone bedrock.

A1—0 to 3 inches; very dark gray (10YR 3/1) very cobbly clay, black (10YR 2/1) moist; moderate medium angular blocky structure parting to moderate fine angular blocky; very hard, firm; many very fine and fine roots; about 40 percent limestone cobbles, 10 to 15 percent stones; neutral; clear wavy boundary.
A2—3 to 9 inches; very dark gray (10YR 3/1) very cobbly clay; black (10YR 2/1) moist; moderate medium angular blocky structure parting to moderate fine angular blocky; very hard, firm; common very fine and fine roots; 50 percent limestone cobbles, 15 percent gravel, and 10 percent stones; neutral; abrupt wavy boundary.
R—9 to 15 inches; coarsely fractured indurated limestone bedrock.

Solum thickness and depth to limestone bedrock ranges from 6 to 15 inches. The clay content ranges from 40 to 55 percent. Coarse fragments of pebbles, cobbles, and stones make up 35 to 70 percent of the pedon and increase with depth. The soil is neutral to moderately alkaline.

The A horizon has hue of 7.5YR or 10YR, value of 3, and chroma of 1 to 3. Secondary calcium carbonate coats some of the limestone along fractures.

The R layer is coarsely fractured indurated limestone bedrock. In some pedons, the upper 0.5 inch to 1 inch of the bedrock is softer than that below. Some pedons have soft lime materials interbedded with limestone.

Evant Series

The Evant series consists of shallow, well drained, gently sloping soils on uplands. They formed in clayey marine sediments. Slopes are 1 to 3 percent.

Typical pedon of Evant gravelly silty clay, 1 to 3 percent slopes; from the intersection of U.S. Highway 84 and U.S. Highway 281 in Evant, 3.0 miles west on U.S. Highway 84 to intersection with Farm Road 2414, 3.5 miles north on Farm Road 2414 to intersection with county road, 3.6 miles west on county road, 1.1 miles west on ranch road, and 300 feet southwest in rangeland.

A—0 to 5 inches; dark brown (7.5YR 4/2) gravelly silty clay, dark brown (7.5YR 3/2) moist; moderate medium subangular blocky structure; extremely hard, firm; many very fine and fine roots; about 20 percent by volume chert pebbles and cobbles up to 5 inches across; neutral; clear smooth boundary.
Bt—5 to 14 inches; reddish brown (5YR 4/3) clay, dark reddish brown (5YR 3/3) moist; moderate medium subangular blocky structure; extremely hard, firm; few pressure faces; few small slickensides; many filled cracks with soil from horizon above; neutral; abrupt wavy boundary.
Bkm—14 to 18 inches; pinkish white (7.5YR 8/2) strongly cemented material plugged with carbonates; upper 0.5 inch is a laminar cap; roots are matted on top of the laminar cap; violently effervescent; moderately alkaline; abrupt wavy boundary.
Cr—18 to 50 inches; interbedded weakly cemented layers of chalky limestone and white (10YR 8/2) silt loam stratified with dark brown (7.5YR 4/4) loam; hardness of less than 3 on Mohs scale.

Solum thickness and depth to petrocalcic horizon range from 14 to 20 inches. Pebbles and cobbles of chert and limestone range from none to 35 percent by volume.

The A horizon has hue of 5YR to 10YR, value of 3 or 4, and chroma of 2 or 3. It is gravelly silty clay. Reaction is slightly acid or neutral.

The Bt horizon has hue of 2.5YR to 7.5YR, value of 3 to 5, and chroma of 2 to 4. It is clay or gravelly clay. The clay content ranges from 60 to 80 percent. Reaction ranges from moderately acid to neutral.

The Bkm horizon has colors in shades of white or pink with thin horizontal seams of yellow or brown. It is plugged with carbonates and is weakly to strongly cemented. This horizon has an indurated laminar cap 0.25 inch to 1 inch thick. The cap is thinnest in

landscape positions with the most slopes and is absent in some pedons. Roots enter this horizon only along fractures and in some of the softer horizontal seams.

The Cr horizon is weakly or strongly cemented chalky limestone. It is massive or platy. Some pedons are strongly cemented and platy in the upper part and weakly cemented and massive below. It can be chipped or dug with a spade when moist.

Frio Series

The Frio series consists of very deep, well drained, nearly level soils on flood plains. They formed in loamy and clayey calcareous alluvium. Slopes are 0 to 1 percent.

Typical pedon of Frio silty clay, occasionally flooded; from the intersection of Texas Highway 36 and Texas Highway 22 in Hamilton, 12 miles east on Texas Highway 36, 0.6 mile north on gravel county road, 0.7 mile north along field road, and 0.1 mile west along fence line in coastal bermudagrass pasture.

Ap—0 to 7 inches; very dark grayish brown (10YR 3/2) silty clay, very dark brown (10YR 2/2) moist; moderate fine and medium subangular blocky structure; very hard, very firm; many very fine and fine roots; many very fine and fine pores; strongly effervescent; moderately alkaline; abrupt smooth boundary.

A—7 to 37 inches; very dark grayish brown (10YR 3/2) silty clay, very dark brown (10YR 2/2) moist; moderate fine and medium subangular blocky structure; very hard, very firm; many fine roots; many fine pores; strongly effervescent; moderately alkaline; gradual wavy boundary.

Bk1—37 to 54 inches; grayish brown (10YR 5/2) silty clay, dark grayish brown (10YR 4/2) moist; moderate fine and medium subangular blocky structure; very hard, very firm; common very fine and fine roots; few vertical streaks of surface material; common fine iron-manganese concretions; common films, threads, and masses of calcium carbonate; violently effervescent; moderately alkaline; gradual wavy boundary.

Bk2—54 to 70 inches; grayish brown (10YR 5/2) silty clay, dark grayish brown (10YR 4/2) moist; moderate fine and medium subangular blocky structure; very hard, very firm; few fine roots; common films and threads, and few masses of calcium carbonate; violently effervescent; moderately alkaline.

Depth to sand, gravel, or limestone ranges from 6 to about 30 feet. The clay content ranges from 30 to 50 percent. Texture of the solum is clay loam, silty clay loam, or silty clay. The calcium carbonate equivalent ranges from 15 to 40 percent. The COLE ranges from about 0.04 to 0.09 in the upper 50 inches, but lacks a layer 20 inches or more thick with COLE of 0.07 or more. Some pedons contain limestone and chert pebbles or cobbles that make up less than 15 percent by volume. The mollic epipedon is greater than 20 inches thick.

The A horizon has hue of 7.5YR or 10YR, value of 3 or 4, and chroma of 2 or 3. Some pedons have light colored discontinuous loamy strata less than 3 inches thick.

The Bk horizon has hue of 7.5YR or 10YR, value of 4 or 5, and chroma of 2 to 4.

Krum Series

The Krum series consists of very deep, well drained, very gently and gently sloping soils on terraces or valley fill. They formed in clayey sediments. Slopes are 1 to 5 percent.

Typical pedon of Krum silty clay, 1 to 5 percent slopes; from the intersection of Texas Highway 36 and Texas Highway 22 in Hamilton, 4.2 miles east on Texas Highway 36, 0.1 mile north on private road, and 0.1 mile west in rangeland.

A1—0 to 8 inches; very dark grayish brown (10YR 3/2) silty clay, very dark brown (10YR 2/2) moist; moderate very fine and fine angular blocky structure; very hard, firm; many very fine and fine roots and pores; 10 percent gravel less than 1 millimeter across; common wormcasts; strongly effervescent; moderately alkaline; clear wavy boundary.

A2—8 to 36 inches; very dark grayish brown (10YR 3/2) silty clay, very dark brown (10YR 2/2) moist; moderate very fine and fine angular blocky structure; very hard, very firm; many very fine and fine roots; many very fine and fine pores; few fine concretions of calcium carbonate; strongly effervescent; moderately alkaline; gradual wavy boundary.

Bw—36 to 48 inches; grayish brown (10YR 5/2) silty clay, dark grayish brown (10YR 4/2) moist; moderate fine and medium angular blocky structure; very hard, very firm; few very fine and fine roots; many very fine pores; cracks extend to bottom of layer filled with soil material from above layer; 3 percent fine concretions of calcium carbonate; few limestone fragments less than 1 inch across; violently effervescent; moderately alkaline; gradual wavy boundary.

Bk—48 to 62 inches; pale brown (10YR 6/3) silty clay, brown (10YR 4/3) moist; moderate medium subangular blocky structure; common fine and medium distinct light olive brown (2.5Y 5/4) masses of oxidized iron; very hard, very firm; few very fine roots; 5 percent very fine concretions of calcium carbonate; few vertical streaks of surface material; violently effervescent; moderately alkaline.

Solum thickness ranges from 40 to 70 inches. The soil, when dry, has cracks 0.25 inch to 1.2 inches wide that extend from the surface to depths of about 24 to 48 inches. It is silty clay or clay with a clay content of 40 to 60 percent. Reaction is slightly alkaline or moderately alkaline.

The A horizon has hue of 7.5YR or 10YR, value of 3 to 5, and chroma of 2 or 3.

The B horizon has hue of 5YR to 10YR, value of 5 or 6, and chroma of 2 to 4. The B horizon of some pedons contains up to 5 percent by volume of concretions and masses of calcium carbonate.

Lamkin Series

The Lamkin series consists of very deep, well drained, nearly level soils on flood plains. They formed in loamy, calcareous alluvium. Slopes are 0 to 1 percent.

Typical pedon of Lamkin clay loam, occasionally flooded; from the intersection of U.S. Highway 281 and Texas Highway 6 in Hico, 0.1 mile east on Texas Highway 6, 0.4 mile south on Elm Street, and 0.15 mile east along Bosque River in Hico City Park.

A—0 to 10 inches; dark grayish brown (10YR 4/2) clay loam, very dark grayish brown (10YR 3/2) moist; weak fine granular structure; hard, firm; few fine roots; few fine pores; few fine fragments of limestone; strongly effervescent; moderately alkaline; gradual smooth boundary.

C1—10 to 34 inches; pale brown (10YR 6/3) very fine sandy loam, brown (10YR 5/3) moist; massive; hard, friable; few thin strata of clayey material; violently effervescent; moderately alkaline; gradual smooth boundary.

C2—34 to 80 inches; dark brown (10YR 4/3) silty clay loam, dark brown (10YR 3/3) moist; massive; hard, friable; few thin strata of very fine sandy loam and clay loam materials; common films and threads of calcium carbonate; violently effervescent; moderately alkaline.

Silicate clay content in the 10- to 40-inch control section is 18 to 30 percent, with textures of loam, silt loam, clay loam, or silty clay loam. The soil is calcareous and moderately alkaline with the calcium carbonate equivalent in the 10- to 40-inch control section ranging from 10 to 30 percent.

The A horizon has hue of 10YR, value of 3 to 5, and chroma of 2 or 3. It is clay loam.

The C horizon has hue of 10YR, value of 3 to 7, and chroma of 2 to 6. It is silt loam, silty clay loam, clay loam, or very fine sandy loam with thin strata of loamy very fine sand, fine sandy loam, or silty clay.

Lampasas Series

The Lampasas series consists of soils that are shallow to fragmental limestone. They are well drained, very gently sloping soils on uplands. They formed in fragmental limestone or claystone. Slopes are 1 to 3 percent.

Typical pedon of Lampasas gravelly clay, 1 to 3 percent slopes; from the intersection of Farm Road 218 and Farm Road 1702 in Indian Gap, 0.9 mile north on Farm Road 1702 to private ranch road, 1.2 miles east on private ranch road, and 25 feet north in wooded rangeland.

A1—0 to 3 inches; dark grayish brown (10YR 4/2) gravelly clay, very dark grayish brown (10YR 3/2) moist; moderate coarse subangular blocky structure parting to moderate fine and medium subangular blocky; hard, firm; many fine, common medium, and few coarse roots; common pressure faces; 15 percent limestone fragments up to 10 inches across; neutral; clear smooth boundary.

A2—3 to 11 inches; dark grayish brown (10YR 4/2) very gravelly clay, very dark grayish brown (10YR 3/2) moist; moderate coarse subangular blocky structure parting to moderate fine and medium subangular blocky; hard, firm; many fine and common medium roots; 40 to 50 percent limestone fragments up to 10 inches across; neutral; abrupt wavy boundary.

C—11 to 60 inches; fragmental white limestone; fractured at about 1- to 4-inch intervals with thin coatings of secondary carbonates along some fractures; limestone has a hardness of greater than 3 on Mohs scale.

Solumn thickness ranges from 9 to 16 inches. Texture of the soil is clay loam or clay or their gravelly and very gravelly counterparts. Limestone fragments range up to 10 inches across, but are typically less than 3 inches. Reaction is neutral or slightly alkaline.

The A horizon has hue of 5YR to 10YR, value of 2 to 4, and chroma of 2 or 3.

The C horizon can be several feet thick. It can usually be cut with conventional earth-moving equipment.

Maloterre Series

The Maloterre series consists of very shallow, somewhat excessively drained, gently sloping to strongly sloping soils on uplands. They formed in residuum weathered from limestone. Slopes are dominantly 2 to 4 percent, but range from 2 to 12 percent.

Typical pedon of Maloterre gravelly clay loam in an area of Brackett-Maloterre complex, 2 to 12 percent slopes; from the intersection of Texas Highway 36 and U.S. Highway 281 in Hamilton, 0.4 mile west on Texas Highway 36, 1.2 miles west on Farm Road 218, 2.2 miles south on Farm Road 2005, 1.8 miles south on gravel road, and 50 feet west in rangeland.

A—0 to 5 inches; brown (10YR 5/3) gravelly clay loam, dark brown (10YR 4/3) moist; weak fine subangular blocky and weak fine granular structure; slightly hard, friable; many very fine and fine roots; many very fine and fine pores; about 25 percent by volume indurated fossil shells from 1/8-inch to 2 inches across; few limestone fragments and 10 percent fossil shell fragments, 2 to 4 inches across on the soil surface; violently effervescent; moderately alkaline; abrupt smooth boundary.
R—5 to 7 inches; indurated limestone bedrock containing many imbedded fossil shells; massive and unfractured; hardness of greater than 3 on Mohs scale.

Solum thickness ranges from 3 to 10 inches, and corresponds to the depth of indurated limestone. Fragments of limestone and fossil shell in the soil range from 5 to 30 percent by volume.

The A horizon has hue of 10YR or 2.5Y, value of 4 to 7, and chroma of 2 to 4. Where A horizons with moist color values and chromas of less than 3.5, they are less than 4 inches thick. It is gravelly clay loam.

The R layer ranges from white indurated limestone bedrock to conglomerate limestone with many imbedded fossil shells.

Minwells Series

The Minwells series consists of very deep, well drained, very gently sloping soils on river terraces. They formed in ancient river terrace sediments. Slopes are 1 to 3 percent.

Typical pedon of Minwells fine sandy loam, 1 to 3 percent slopes; from the intersection of U.S. Highway 281 and Farm Road 2905 in Hamilton, 6.9 miles east on Farm Road 2905 to intersection with county road, 2.9 miles north on county road, 0.5 mile west and south along fence, and 150 feet west in pastureland.

Ap—0 to 6 inches; dark brown (10YR 4/3) fine sandy loam, dark brown (10YR 3/3) moist; weak fine granular structure; loose, friable; many very fine and fine roots; many very fine pores; few siliceous pebbles up to 1/8-inch across; neutral; abrupt smooth boundary.
A—6 to 9 inches; dark brown (10YR 4/3) fine sandy loam, dark brown (10YR 3/3) moist; weak fine subangular blocky structure; slightly hard, friable; many very fine and fine roots; many very fine pores; few siliceous pebbles up to 1/8-inch across; neutral; clear smooth boundary.
Bt1—9 to 20 inches; reddish brown (2.5YR 5/4) clay, reddish brown (2.5YR 4/4) moist; moderate fine subangular blocky structure; hard, firm; common very fine and fine roots; many very fine pores; many thin continuous dark reddish brown (2.5YR 3/4) clay films on faces of peds; about 5 percent siliceous pebbles up to 0.25 inch across; neutral; clear smooth boundary.
Bt2—20 to 46 inches; red (2.5YR 5/6) sandy clay, red (2.5YR 4/6) moist; moderate fine subangular blocky structure; hard, firm; few very fine roots; common very fine pores; many thin discontinuous reddish brown (2.5YR 4/4) clay films on faces of peds; about 10 percent siliceous pebbles up to 0.25 inch across; neutral; clear smooth boundary.
BCk—46 to 63 inches; reddish yellow (5YR 5/6) gravelly sandy clay loam, yellowish red (5YR 5/6) moist; weak fine subangular blocky structure; hard, friable; estimated 20 percent siliceous pebbles up to 1 inch across; about 10 percent by volume masses and concretions of calcium carbonate; strongly effervescent; moderately alkaline; gradual wavy boundary.
2Ck—63 to 80 inches; red (2.5YR 5/8) very gravelly sand, red (2.5YR 4/8) moist; massive; hard, friable; estimated 50 percent siliceous pebbles and limestone fragments less than 1 inch across; strongly effervescent; moderately alkaline.

Solum thickness ranges from 60 to about 80 inches. Depth to beds of gravel range from 4 feet to about 7 feet.

The A horizon has hue of 7.5YR or 10YR, value of 4 or 5, and chroma of 3 or 4. Siliceous pebbles range from none to 10 percent by volume. Reaction is neutral or slightly alkaline.

The Bt horizon has hue of 2.5YR or 5YR, value of 4 or 5, and chroma of 4 to 8. It is sandy clay loam, sandy clay, or clay. The clay content of the upper 20 inches ranges from 35 to 45 percent. Reaction ranges from moderately acid to neutral.

The BCk horizon has hue of 2.5YR to 7.5YR, value of 4 to 6, and chroma of 4 to 8. It is sandy clay loam, clay loam, or their gravelly counterparts. Siliceous pebbles and limestone fragments range from none to 15 percent by volume in the upper part of the horizon, and from 3 to 50 percent by volume in the lower part. Reaction ranges from neutral to moderately alkaline.

The 2C horizon has colors in shades of red, yellow, or brown. It is a very gravelly sand or gravelly sandy loam. Reaction ranges from neutral to moderately alkaline.

Nuff Series

The Nuff series consists of very deep, well drained, gently sloping to moderately sloping soils on uplands. They formed in interbedded limestone, marl, and shale. Slopes are 2 to 6 percent.

Typical pedon of Nuff silty clay loam, 2 to 6 percent slopes, very stony; from the intersection of Texas Highway 36 and Farm Road 218 in Hamilton, 4.9 miles southwest on Farm Road 218 to the intersection with Farm Road 2486, 1.4 miles northwest on Farm Road 2486 to intersection with county road, 2.0 miles northeast on county road to intersection with private ranch road, and 0.2 mile east on private ranch road in roadside pit in rangeland.

A1—0 to 10 inches; grayish brown (10YR 5/2) very stony silty clay loam, very dark grayish brown (10YR 3/2) moist; moderate very fine and fine subangular blocky structure; very hard, firm; common fine to medium roots; many fine concretions of calcium carbonate; calcium carbonate equivalent is about 45 percent; limestone fragments from 3 to 30 inches across and 0.5 inch to 2 inches thick cover about 3 percent of the surface; there are about 35 percent by volume pebbles, cobbles, and stones; strongly effervescent; moderately alkaline; gradual smooth boundary.

A2—10 to 18 inches; grayish brown (10YR 5/2) silty clay loam, dark grayish brown (10YR 4/2) moist; moderate fine and medium subangular blocky structure; very hard, firm; few fine and medium roots; few indurated pieces of calcium carbonate; common fine concretions of calcium carbonate; calcium carbonate equivalent is about 45 percent; strongly effervescent; moderately alkaline; clear smooth boundary.

Bk—18 to 25 inches; brown (10YR 5/3) silty clay loam, dark brown (10YR 4/3) moist; moderate fine and medium subangular blocky structure; very hard, firm; common fine concretions of calcium carbonate; calcium carbonate equivalent is about 60 percent; strongly effervescent; moderately alkaline; gradual smooth boundary.

Ck—25 to 80 inches; light gray (10YR 7/2) and white (10YR 8/2) interbedded compact layers of shale that has texture of silty clay loam; massive; few fine roots; calcium carbonate equivalent is about 60 percent; strongly effervescent; moderately alkaline.

Solum thickness ranges from 20 to 40 inches. Limestone pebbles and fragments as much as 48 inches across and 0.5 inch to 4 inches thick cover 0 to 3 percent of the surface. Most of the fragments are 6 to 24 inches across and 0.5 inch to 6 inches thick. Some fragments are tilted at an angle of 30 to 50 degrees. Concretions of calcium carbonate are typically throughout the soil, and films, threads, or masses of calcium carbonate are within a depth of 15 to 24 inches. Reaction is moderately alkaline throughout the soil.

The A horizon has hue of 10YR or 2.5Y, value of 3 to 5, and chroma of 1 or 2. It is silty clay loam, stony or very stony silty clay loam. Pebbles, cobbles, and stone-sized

limestone fragments range from 2 to 40 percent by volume, stones and cobbles typically make up 3 to 25 percent.

The Bk horizon has hue of 10YR or 2.5Y, value of 4 to 7, and chroma of 2 to 6. Yellow or brown masses of oxidized iron range from none to few. It is silt loam, silty clay loam, or their stony counterparts. Limestone fragments make up 5 to 35 percent by volume of some layers in this horizon. The stony layers are thin and discontinuous. Some pedons do not have stone layers.

The C horizon has colors in shades of yellow, brown, gray, or white. It is interbedded marl and shale that has textures of silt loam, silty clay loam, or silty clay. Some pedons have limestone layers 2 to 4 inches thick at vertical intervals of 2 to 6 feet.

Oglesby Series

The Oglesby series consists of shallow, well drained, very gently sloping soils on uplands. They formed in clayey residuum of weathered limestone sediments over limestone bedrock. Slopes are 1 to 3 percent.

Typical pedon of Oglesby gravelly silty clay, 1 to 3 percent slopes; from the intersection of Texas Highway 36 and Texas Highway 22 in Hamilton, 16.0 miles east on Texas Highway 36 to Farm Road 1602, 2.0 miles east on Farm Road 1602 to intersection with county road, 2.2 miles east and north on county road, and 200 feet east in pastureland.

A1—0 to 8 inches; very dark grayish brown (10YR 3/2) gravelly silty clay, very dark brown (10YR 2/2) moist; weak medium subangular blocky and granular structure; hard, firm; many very fine and fine, and common medium roots; common fine pores; about 20 percent limestone pebbles; slightly alkaline; gradual smooth boundary.

A2—8 to 17 inches; very dark grayish brown (10YR 3/2) gravelly silty clay, very dark brown (10YR 2/2) moist; moderate medium angular and subangular blocky structure; hard, firm; common fine and few medium roots; common pressure faces; few slickensides; about 15 percent by volume limestone fragments 2 to 6 inches across; slightly alkaline; abrupt smooth boundary.

R—17 to 35 inches; indurated limestone bedrock with a hardness by Mohs scale of 3 or more; upper part has coarse fractures filled with soil material; the lower bedrock has tight fractures and it cannot be excavated with a backhoe.

Solumn thickness ranges from 10 to 20 inches. The average clay content is 40 to 50 percent. Limestone fragments less than 3 inches to about 10 inches across range from none to few on the surface, and up to about 25 percent by volume of the solum. Some pedons have a few chert fragments of similar size. The reaction is neutral or slightly alkaline.

The A horizon has hue of 7.5YR or 10YR, value of 3 or 4, and chroma of 1 or 2. It is gravelly silty clay.

The R layer is indurated limestone bedrock.

Pedernales Series

The Pedernales series consists of very deep, well drained, very gently sloping and gently sloping soils on uplands. They formed in loamy and clayey calcareous sediments. Slopes are 1 to 5 percent.

Typical pedon of Pedernales fine sandy loam, 1 to 3 percent slopes; from the intersection of U.S. Highway 281 and Texas Highway 6 in Hico, 1.3 miles south on Texas Highway 281, 0.6 mile southwest on Farm Road 1744, and 160 feet east in cropland field.

Ap—0 to 9 inches; yellowish red (5YR 4/6) fine sandy loam, reddish brown (5YR 4/4) moist; weak fine subangular blocky structure; hard, friable; many very fine and fine roots; neutral; abrupt smooth boundary.

Bt1—9 to 24 inches; red (2.5YR 4/6) sandy clay, dark red (2.5YR 3/6) moist; moderate medium and coarse angular blocky structure; very hard, very firm; few very fine and fine roots; few very fine and fine pores; common discontinuous clay films on faces of peds; neutral; clear smooth boundary.

Bt2—24 to 29 inches; yellowish red (5YR 4/6) sandy clay, reddish brown (5YR 4/4) moist; moderate medium and coarse angular blocky structure; very hard, very firm; few very fine roots; few very fine pores; common discontinuous clay films on faces of peds; slightly alkaline; clear wavy boundary.

Btk—29 to 35 inches; yellowish red (5YR 5/6) sandy clay loam, yellowish red (5YR 4/6) moist; weak medium blocky structure; hard, friable; few films and threads and fine concretions of calcium carbonate; slightly effervescent; moderately alkaline; clear smooth boundary.

BCtk—35 to 80 inches; very pale brown (10YR 8/3) clay loam, very pale brown (10YR 7/3) moist; weak medium subangular blocky structure; hard, firm; common films and threads and soft concretions of calcium carbonate; strongly effervescent; moderately alkaline.

Solumn thickness ranges from 60 to 80 inches. Secondary carbonates are at depths of more than 28 inches. The average clay content of the control section is 35 to 55 percent.

The A horizon has hue of 5YR to 10YR, value of 4 to 6, and chroma of 3 to 6. Reaction is slightly acid to slightly alkaline.

The Bt and Btk horizons have hue of 2.5YR or 5YR, value of 4 or 5, and chroma of 4 to 8. It is clay loam, sandy clay loam, or sandy clay. The clay content ranges from 35 to 50 percent. Reaction is slightly acid to slightly alkaline.

The BCtk horizon has hue of 5YR to 10YR, value of 6 to 8, and chroma of 3 or 4. It is sandy clay loam, clay loam, or sandy clay. It contains from 5 to 25 percent by volume of calcium carbonate in the form of films, threads, and soft powdery masses.

The Pedernales soils described in Hamilton County are a taxadjunct to the Pedernales series because they are slightly more moist than typical for the series. They are in an ustic soil moisture regime bordering on udic, rather than a typic ustic soil moisture regime. This difference does not significantly change use and management of the soils.

Pidcoke Series

The Pidcoke series consists of shallow, well drained, very gently sloping soils on uplands. They formed in loamy residuum weathered from fossiliferous limestone. Slopes are 1 to 3 percent.

Typical pedon of Pidcoke gravelly clay loam, 1 to 3 percent slopes; from the intersection of Texas Highway 36 and Farm Road 218 in Hamilton, 1.2 miles west on Farm Road 218, 2.2 miles south on Farm Road 2005, 0.3 mile south on gravel road, 0.1 mile east on private road, and 210 feet south in improved pasture.

A—0 to 11 inches; dark grayish brown (10YR 4/2) gravelly clay loam, very dark grayish brown (10YR 3/2) moist; moderate fine subangular blocky and weak fine granular structure; hard, friable; many very fine and fine roots; many very fine and fine pores; 15 percent fine concretions of calcium carbonate; 15 percent limestone fragments less than 3 inches across; few fossil shells less than 1 inch across; calcium carbonate equivalent is about 50 percent; common wormcasts; strongly effervescent; moderately alkaline; gradual wavy boundary.

Bk—11 to 18 inches; dark brown (10YR 4/3) gravelly clay loam, very dark brown (10YR 3/3) moist; moderate fine subangular blocky structure; hard, friable; many very fine and fine, and few medium roots; 10 percent indurated fossil shells, 20 percent fine concretions of calcium carbonate; 15 percent limestone fragments 0.75 inch to 3 inches across; calcium carbonate equivalent is about 60 percent; violently effervescent; moderately alkaline; abrupt wavy boundary.
R—18 to 24 inches; indurated fossiliferous limestone bedrock; massive and unfractured; hardness of about 3 or more on Mohs scale.

Solumn thickness ranges from 10 to 20 inches. It is clay loam, silty clay loam, or their gravelly counterparts. Silicate clay ranges from 20 to 35 percent. The calcium carbonate equivalent ranges from 40 to 60 percent. Fossil shells, mainly of texigryphaea (oyster), from 1/8-inch to 3 inches across range from a few to 15 percent by volume in the control section. The reaction is moderately alkaline and calcareous throughout.

The A horizon has hue of 7.5YR or 10YR, value of 3 or 4, and chroma of 2 or 3. Fossil shells range from few to about 25 percent by volume.

The B horizon has hue of 7.5YR or 10YR, value of 3 to 5, and chroma of 2 to 4. Fossil shells range from 15 to 35 percent by volume.

The R layer is indurated limestone bedrock. The limestone consists of cemented beds of oyster shells. They range from 2 to 20 feet thick and have thin marl or shale seams at vertical intervals of about 1 to 3 feet.

Real Series

The Real series consists of shallow, well drained, very gently sloping to steep soils on uplands. They formed in weakly cemented limestone interbedded with loamy, calcareous marls. Slopes are 1 to 30 percent (fig. 11).

Typical pedon of Real gravelly clay loam, 1 to 3 percent slopes; from the intersection of Texas Highway 36 and Farm Road 932 in Hamilton, 12.3 miles south on Farm Road 932, and 100 feet west in rangeland.

A—0 to 5 inches; brown (10YR 4/3) gravelly clay loam, dark brown (10YR 3/3) moist; moderate fine subangular blocky and moderate fine granular structure; hard, friable; many very fine and fine roots; few fine pores; about 30 percent limestone fragments from 0.25 inch to 2 inches across; calcium carbonate equivalent is about 50 percent; violently effervescent; moderately alkaline; clear wavy boundary.
Ak—5 to 12 inches; brown (10YR 4/3) extremely gravelly clay loam, dark brown (10YR 3/3) moist; moderate fine subangular blocky structure; hard, friable; many very fine and fine roots; about 65 percent limestone fragments from 0.25 inch to 3 inches across; calcium carbonate equivalent is about 65 percent; violently effervescent; moderately alkaline; abrupt wavy boundary.
Bkm—12 to 14 inches; white (10YR 8/2) strongly cemented caliche; indurated and laminar cap; clear wavy boundary.
Crk—14 to 60 inches; white (10YR 8/2) weakly cemented limestone; contains thin seams in shades of brown or yellow with a loam texture; many masses of calcium carbonate; violently effervescent; moderately alkaline.

Thickness of the solum and depth to a petrocalcic horizon above weakly cemented limestone ranges from 9 to 20 inches. Coarse fragments in the sola average from 35 to 80 percent and consists of limestone fragments from 0.25 inch to 24 inches across. The calcium carbonate equivalent ranges from 40 to 70 percent. Silicate clay content ranges from 22 to 35 percent.

The A horizon has hue of 7.5YR or 10YR, value of 3 to 5, and chroma of 2 or 3.

The Bkm horizon is weakly to strongly cemented and is indurated in the upper part. Color is white or pink.

Figure 11.—Profile of Real gravelly clay loam, 1 to 3 percent slopes.

The Crk layer is weakly cemented limestone interbedded with marl that has a loam texture. The limestone has a hardness of less than 3 on Mohs scale.

The Real soils described in Hamilton County are a taxadjunct to the Real series because they have a thin petrocalcic horizon (Bkm) above the paralithic contact (Crk). This difference does not significantly change use and management of the soils.

Riesel Series

The Riesel series consists of very deep, well drained, gently sloping soils on high stream terraces. They formed in gravelly clayey and loamy alluvium. Slopes are 1 to 5 percent.

Typical pedon of Riesel gravelly fine sandy loam, 1 to 5 percent slopes; from the intersection of U.S. Highway 281 and Farm Road 2905 in Hamilton, 2.3 miles north on Farm Road 2905, 1.0 mile east on county gravel road, 2.3 miles north on county gravel road, 0.2 mile east on private gravel road, and 40 feet south in rangeland.

A—0 to 3 inches; dark grayish brown (10YR 4/2) gravelly fine sandy loam, very dark grayish brown (10YR 3/2) moist; weak fine granular structure; soft, very friable; common very fine and fine roots; about 25 percent by volume of siliceous and limestone pebbles that are mainly less than 1 inch across; neutral; clear smooth boundary.

E—3 to 9 inches; brown (7.5YR 5/4) very gravelly fine sandy loam, dark brown (7.5YR 4/4) moist; weak fine granular structure; soft, very friable; common fine and medium roots; about 50 percent by volume of siliceous and limestone pebbles that are mainly less than 1 inch across; neutral; abrupt smooth boundary.

Bt1—9 to 32 inches; red (2.5YR 4/6) very gravelly clay, dark red (2.5YR 3/6) moist; weak fine angular blocky structure; extremely hard, very firm; common fine to coarse roots; few coarse root stains; thin discontinuous clay films on faces of peds and on pebbles;

about 45 percent by volume of siliceous and limestone pebbles that are mainly less than 2 inches across; few chert cobbles; neutral; gradual wavy boundary.

Bt2—32 to 43 inches; red (2.5YR 5/6) gravelly clay, red (2.5YR 4/6) moist; weak fine angular blocky structure; extremely hard, very firm; common very fine and fine roots; thin discontinuous clay films on faces of peds and on pebbles; about 30 percent by volume of siliceous and limestone pebbles that are mainly less than 2 inches across; few chert cobbles; neutral; clear wavy boundary.

Bt3—43 to 52 inches; red (2.5YR 5/6) clay, red (2./5YR 4/6) moist; weak medium subangular blocky structure; very hard, very firm; few very fine roots; thin discontinuous clay films on faces of peds; few siliceous and limestone pebbles; few chert cobbles; clay matrix with sand coatings on ped faces; neutral; clear wavy boundary.

Bt4—52 to 59 inches; red (2.5YR 5/6) gravelly clay loam, red (2.5YR 4/6) moist; weak medium subangular blocky structure; hard, firm; about 15 percent by volume of siliceous and limestone pebbles mainly less than 2 inches across; slightly alkaline; clear wavy boundary.

2C—59 to 70 inches; strong brown (7.5YR 5/6) gravelly loamy sand, strong brown (7.5YR 4/6) moist; massive; pebbles comprise about 30 percent of the layer; slightly alkaline.

Solum thickness ranges from 40 to 70 inches.

The A horizon has hue of 7.5YR or 10YR, value of 3 to 5, and chroma of 2 or 3. It is gravelly or very gravelly fine sandy loam. Coarse fragments of siliceous and limestone pebbles range from 10 to 30 percent. Reaction is slightly acid or neutral.

The E horizon has colors of value 1 to 3 units greater than the A horizon. It is very gravelly fine sandy loam. Coarse fragments of siliceous and limestone pebbles range from 35 to 60 percent. Reaction is slightly acid or neutral.

The Bt horizon has hue of 2.5YR, value of 3 to 5, and chroma of 2 to 8. Some pedons have reddish yellow, strong brown, or yellowish red masses of oxidized iron in the lower part of the horizon. It is gravelly, very gravelly, or extremely gravelly clay or clay loam with a clay content ranging from 35 to 50 percent. Coarse fragments of siliceous and limestone pebbles range from 25 to 65 percent by volume in the upper part of the Bt horizon and from 10 to 70 percent in the lower part. Reaction ranges from slightly acid to slightly alkaline.

The 2C horizon has hue of 7.5YR, value of 5, and chroma of 4 or 6. It is gravelly or very gravelly loamy sand. Reaction ranges from neutral to moderately alkaline.

Rumley Series

The Rumley series consists of very deep, well drained, very gently sloping soils on stream terraces. They formed in calcareous alluvial sediments. Slopes are 1 to 3 percent (fig. 12).

Typical pedon of Rumley clay loam, 1 to 3 percent slopes; from the intersection of U.S. Highway 281 and Texas Highway 36, 0.5 mile west on Texas Highway 36, 12.0 miles west on Farm Road 218, and 300 feet north in cropland.

Ap—0 to 7 inches; dark grayish brown (10YR 4/2) clay loam, very dark grayish brown (10YR 3/2) moist; weak very fine subangular blocky and granular structure; hard, firm; common fine roots; common fine pores; few very fine concretions of calcium carbonate; calcium carbonate equivalent is about 35 percent; strongly effervescent; moderately alkaline; abrupt smooth boundary.

A—7 to 16 inches; dark grayish brown (10YR 4/2) clay loam, very dark grayish brown (10YR 3/2) moist; moderate fine subangular blocky structure; hard, firm; common fine roots; few very fine concretions of calcium carbonate; calcium carbonate

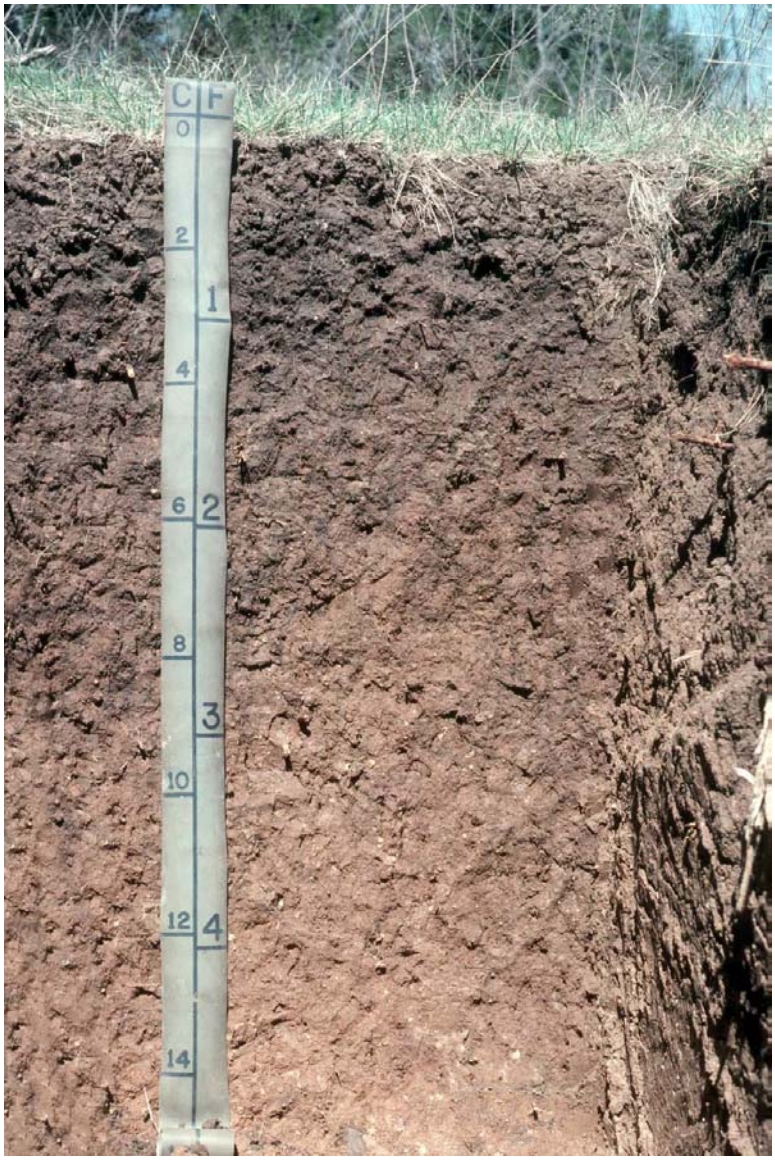

Figure 12.—Profile of Rumley clay loam, 1 to 3 percent slopes.

equivalent is about 40 percent; strongly effervescent; moderately alkaline; gradual smooth boundary.

Bk1—16 to 28 inches; brown (7.5YR 5/4) silty clay, dark brown (7.5YR 4/4) moist; moderate medium subangular blocky structure; hard, firm; few fine roots; few masses, and pitted concretions of calcium carbonate; calcium carbonate equivalent is about 45 percent; violently effervescent; moderately alkaline; gradual smooth boundary.

Bk2—28 to 35 inches; yellowish brown (10YR 5/4) silty clay, dark yellowish brown (10YR 4/4) moist; moderate medium subangular blocky structure; hard, firm; few fine roots; common masses, films and threads of calcium carbonate, common to many medium pitted concretions of calcium carbonate; calcium carbonate equivalent is about 50 percent; violently effervescent; moderately alkaline; gradual smooth boundary.

Bk3—35 to 70 inches; yellow (10YR 7/6) clay loam, brownish yellow (10YR 6/6) moist; weak fine subangular blocky structure; hard, friable; many films, threads, and masses of calcium carbonate, few medium pitted concretions of calcium carbonate; calcium carbonate equivalent is about 60 percent; violently effervescent; moderately alkaline.

Solum thickness is greater than 60 inches. It is clay loam, silty clay loam, or silty clay throughout the solum. The weighted average calcium carbonate equivalent in the 10- to 40-inch control section ranges from 40 to 60 percent. Depth to a distinct and contrasting calcic horizon ranges from 28 to 42 inches. Reaction is slightly alkaline or moderately alkaline throughout the solum.

The A horizon has hue of 7.5YR or 10YR, value of 3 to 5, and chroma of 2 or 3.

The Bk horizons have hue of 7.5YR or 10YR, value of 5 to 7, and chroma of 3 to 6. The upper part of the Bk horizon has pitted concretions of calcium carbonate ranging from 15 to 30 percent by volume. Masses of films and threads of calcium carbonate range from few to common. The calcium carbonate equivalent ranges from 40 to 60 percent. The lower part of the Bk horizon has concretions or masses of films and threads of calcium carbonate ranging from common to many that make up 10 to 35 percent by volume.

San Saba Series

The San Saba series consists of moderately deep, moderately well drained, nearly level to very gently sloping soils on uplands. They formed in clayey sediments over hard limestone. Slopes are 0 to 3 percent.

Typical pedon of San Saba clay, 0 to 3 percent slopes; from the intersection of Texas Highway 36 and Farm Road 932 in Hamilton, 5.0 miles south and east on Farm Road 932 to intersection with gravel county road, 1.3 miles south on gravel county road, 0.5 mile west on private (cemetery) road, and 0.2 mile north on private field road in cropland field.

Ap—0 to 6 inches; very dark gray (10YR 3/1) clay, black (10YR 2/1) moist; moderate fine subangular blocky structure; extremely hard, very firm; common fine and medium roots; many very fine and fine pores; common cracks 1 inch wide; slightly effervescent; moderately alkaline; abrupt smooth boundary.

Bss1—6 to 29 inches; very dark gray (10YR 3/1) clay, black (10YR 2/1) moist; moderate medium angular blocky structure; extremely hard, very firm; common fine and medium roots; common pressure faces; common fine slickensides; cracks filled with soil material from horizon above to a depth of 20 inches; slightly effervescent; moderately alkaline; clear wavy boundary.

Bss2—29 to 36 inches; dark grayish brown (10YR 4/2) clay, very dark grayish brown (10YR 3/2) moist; few prominent slickenslides and wedge-shaped peds, these part to moderate fine and medium angular blocky structure; extremely hard, very firm; few fine roots; 10 percent concretions of calcium carbonate; few films and threads of calcium carbonate; few fine limestone fragments; bottom 1 inch has spots of light yellowish brown (10YR 6/4) and yellowish brown (10YR 5/6) silty clay with increasing amounts of limestone fragments; common pressure faces; strongly effervescent; moderately alkaline; abrupt wavy boundary.

R—36 to 40 inches; gray indurated limestone bedrock, fractured.

Thickness of the soil to limestone, or limestone interbedded with clay or chalk, ranges from 24 to 40 inches. When dry, these soils have cracks from 1 to 3 inches wide that extend from the surface to depths of 20 inches or more. Undisturbed areas have gilgai relief with knolls 3 to 6 inches higher than the depressions, and the distance between the knolls ranges from 45 to 60 feet. It is clay. The soil is slightly alkaline or moderately alkaline.

The A horizon has hue of 10YR, value of 3 or 4, and chroma of 1.

The Bss horizon has hue of 10YR, value of 3 or 4, and chroma of 1 or 2.
The R layer is indurated, fractured limestone bedrock.

Seawillow Series

The Seawillow series consists of very deep, well drained, gently sloping and moderately sloping soils on terraces. They formed in loamy ancient alluvial sediments. Slopes are 3 to 8 percent.

Typical pedon of Seawillow clay loam, 3 to 8 percent slopes; from the intersection of U.S. Highway 281 and Texas Highway 36 in Hamilton, 6.9 miles south on U.S. Highway 281, and 45 feet east in rangeland.

A—0 to 6 inches; dark brown (10YR 4/3) clay loam, dark brown (10YR 3/3) moist; weak fine granular structure; slightly hard, very friable; many very fine and fine roots; few fine concretions of calcium carbonate; violently effervescent; moderately alkaline; clear wavy boundary.

Bk1—6 to 14 inches; brown (10YR 5/3) clay loam, dark brown (10YR 4/3) moist; weak fine granular structure; slightly hard, very friable; common very fine and fine roots; 20 percent films, threads, and concretions of calcium carbonate; few limestone fragments less than 1 inch across; calcium carbonate equivalent is about 45 percent; violently effervescent; moderately alkaline; gradual wavy boundary.

Bk2—14 to 44 inches; light brown (7.5YR 6/4) clay loam, brown (7.5YR 5/4) moist; weak fine granular structure; slightly hard, friable; common very fine and fine roots; 20 percent by volume concretions, films and threads, and masses of calcium carbonate; about 5 percent by volume limestone fragments; calcium carbonate equivalent is about 50 percent; violently effervescent; moderately alkaline; clear wavy boundary.

BCk—44 to 62 inches; light brown (7.5YR 6/4) clay loam, brown (7.5YR 5/4) moist; weak fine granular structure and massive; slightly hard, friable; few very fine roots; 30 percent calcium carbonate as films and threads; violently effervescent; moderately alkaline.

Solumn thickness ranges from 60 to 80 inches. Texture of the solum is clay loam or silty clay loam. The silicate clay content ranges from 18 to 35 percent. The calcium carbonate equivalent ranges from 40 to 70 percent. Gravel layers are common below a depth of 60 inches.

The A horizon has hue of 7.5YR or 10YR, value of 4 or 5, and chroma of 2 to 4.

The Bk horizon has hue of 7.5YR or 10YR, value of 5 to 8, and chroma of 3 to 6. Calcium carbonate content increases with depth.

The BCk horizon has hue of 7.5YR or 10YR, value of 6, and chroma of 4 or 6.

The C horizon, when present, has stratified layers of gravel. Thick layers of gravel are common at greater depths.

Slidell Series

The Slidell series consists of very deep, moderately well drained, very gently sloping soils on uplands. They formed in calcareous, clayey sediments. Slopes are 1 to 3 percent (fig. 13).

Typical pedon of Slidell silty clay, 1 to 3 percent slopes; from the intersection of Farm Road 1602 and Farm Road 219 west of Fairy, 3.0 miles south on Farm Road 1602 to intersection with county road, 0.1 mile east on county road, and 300 feet south in cropland field.

Ap—0 to 8 inches; very dark gray (10YR 3/1) silty clay, black (10YR 2/1) moist; moderate medium subangular blocky and granular structure; extremely hard, very firm; many fine roots; common fine concretions of calcium carbonate; slightly effervescent; moderately alkaline; abrupt smooth boundary.

A—8 to 24 inches; very dark gray (10YR 3/1) silty clay, black (10YR 2/1) moist; moderate medium angular blocky structure; extremely hard, very firm; common fine roots; common fine concretions of calcium carbonate; slightly effervescent; moderately alkaline; gradual wavy boundary.

Bkss1—24 to 33 inches; dark gray (10YR 4/1) silty clay, very dark gray (10YR 3/1) moist; moderate medium angular blocky structure; extremely hard, very firm; few fine roots; common coarse slickensides; few vertical streaks of very dark gray (10YR 3/1) material from above horizon; common fine concretions of calcium carbonate; few fine black concretions; strongly effervescent; moderately alkaline; gradual wavy boundary.

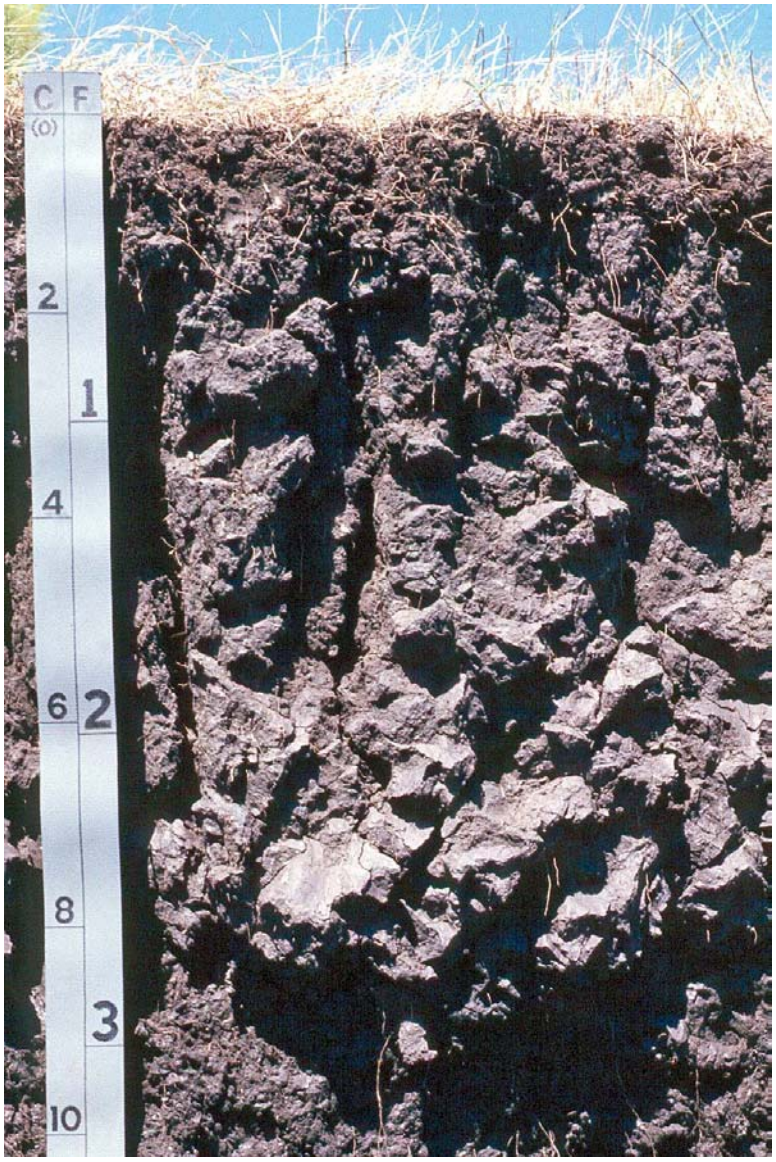

Figure 13.—Profile of Slidell silty clay, 1 to 3 percent slopes. The shiny, grooved slickensides are a result of soil movement.

Bkss2—33 to 45 inches; grayish brown (10YR 5/2) silty clay, dark grayish brown (10YR 4/2) moist; moderate coarse angular blocky structure; extremely hard, very firm; common coarse slickensides; few vertical streaks of very dark gray (10YR 3/1) material from above horizons; common fine concretions and few masses of calcium carbonate; few fine black concretions; violently effervescent; moderately alkaline; diffuse wavy boundary.
Bkss3—45 to 65 inches; grayish brown (10YR 5/2) silty clay, dark grayish brown (10YR 4/2) moist; few fine distinct brownish yellow (10YR 6/6) masses of oxidized iron; moderate coarse angular blocky structure; extremely hard, very firm; common coarse slickensides; few vertical streaks of black (10YR 2/1) material from above horizons; few fine concretions of calcium carbonate; violently effervescent; moderately alkaline; diffuse wavy boundary.
Bkss4—65 to 80 inches; grayish brown (10YR 5/2) silty clay, dark grayish brown (10YR 4/2) moist; common fine distinct light olive brown (2.5Y 5/6) masses of oxidized iron; moderate coarse angular blocky structure; extremely hard, very firm; common coarse slickensides; many fine and medium concretions of calcium carbonate; violently effervescent; moderately alkaline.

Solum thickness ranges from 60 to more than 80 inches. Texture of the soil is clay or silty clay throughout.

The A and Bkss1 horizons have hue of 10YR, value of 3 or 4, and chroma of 1. It is silty clay.

The Bkss horizons have hue of 10YR or 2.5Y, value of 4 to 6, and chroma of 2. In some pedons there are yellow and brown masses of oxidized iron. Some pedons have fractured limestone interbedded with marl below 70 inches.

Tarpley Series

The Tarpley series consists of shallow, well drained, very gently sloping soils on uplands. They formed in clayey residuum over limestone. Slopes are 1 to 3 percent.

Typical pedon of Tarpley clay loam, 1 to 3 percent slopes; from the intersection of Farm Road 1702 and Farm Road 218 in Indian Gap, 1.8 miles south and west on county road to private ranch road, and 0.2 mile south and 0.8 mile east in rangeland.

A—0 to 7 inches; dark reddish gray (5YR 4/2) clay loam, dark reddish brown (5YR 3/2) moist; moderate fine and medium subangular blocky structure; hard, firm; common very fine and fine roots; few fine pores; neutral; clear smooth boundary.
Bt—7 to 18 inches; reddish brown (2.5YR 4/4) clay, dark reddish brown (2.5YR 3/4) moist; moderate fine and medium angular blocky structure; very hard, very firm; common fine roots; few very fine pores; few thin discontinuous clay films on faces of peds; few chert and limestone fragments; neutral; abrupt smooth boundary.
R—18 to 24 inches; indurated, fractured limestone bedrock.

Solum thickness to limestone ranges from 13 to 20 inches. Cobbles and stones of limestone and chert range from a few to about 30 percent on the surface and in the soil. Soil reaction ranges from slightly acid to slightly alkaline.

The A horizon has hue of 5YR to 10YR, value of 2 to 4, and chroma of 2 or 3. It is clay loam.

The Bt horizon has hue of 2.5YR to 7.5YR, value of 3 or 4, and chroma of 2 to 4. It is clay with the clay content ranging from 60 to 80 percent.

The R layer is indurated limestone bedrock.

Topsey Series

The Topsey series consists of very deep, well drained, gently sloping to moderately sloping soils on uplands. They formed in calcareous shale and marl. Slopes are 1 to 8 percent.

Typical pedon of Topsey clay loam, 1 to 5 percent slopes; from the intersection of Texas Highway 36 and Farm Road 932 in Hamilton, 1.5 miles south on Farm Road 932 to intersection with Farm Road 1241, 3.2 miles south on Farm Road 1241 to intersection with gravel road, 1.4 miles east on gravel road, 0.1 mile south on field road, and 60 feet east in cropland field.

Ap—0 to 6 inches; dark grayish brown (10YR 4/2) clay loam, very dark grayish brown (10YR 3/2) moist; moderate fine subangular blocky structure and weak fine granular; slightly hard, friable; many fine and medium roots; many very fine and fine pores; strongly effervescent; moderately alkaline; clear smooth boundary.

A—6 to 12 inches; dark brown (10YR 4/3) clay loam, dark brown (10YR 3/3) moist; moderate fine subangular blocky structure and weak fine granular; slightly hard, friable; many very fine and fine roots; many very fine and fine pores; calcium carbonate equivalent is about 30 percent; strongly effervescent; moderately alkaline; clear smooth boundary.

Bw—12 to 18 inches; light olive brown (2.5Y 5/4) clay loam, olive brown (2.5Y 4/4) moist; moderate fine and medium subangular blocky structure; slightly hard, friable; common fine and few medium roots; common fine pores; 15 percent very fine concretions, and masses of calcium carbonate; calcium carbonate equivalent is about 45 percent; violently effervescent; moderately alkaline; gradual wavy boundary.

Bk—18 to 32 inches; light olive brown (2.5Y 5/4) clay loam, olive brown (2.5Y 4/4) moist; weak fine subangular blocky structure and weak fine granular; slightly hard, friable; 20 percent fine concretions and masses of calcium carbonate; calcium carbonate equivalent is about 60 percent; violently effervescent; moderately alkaline; gradual wavy boundary.

2C1—32 to 39 inches; pale yellow (2.5Y 7/4) marl and shale with a texture of silty clay loam, light yellowish brown (2.5Y 6/4) moist; massive; hard, firm; 20 percent fine concretions and masses of calcium carbonate; common light brownish gray (10YR 6/2) coarse shale fragments; calcium carbonate equivalent is about 60 percent; violently effervescent; moderately alkaline; gradual wavy boundary.

2C2—39 to 62 inches; pale yellow (2.5Y 7/4) marl and shale that has texture of silty clay loam, light yellowish brown (2.5Y 6/4) moist; massive; hard, firm; few light brownish gray (10YR 6/2) coarse shale fragments; 20 percent masses of calcium carbonate; calcium carbonate equivalent is about 65 percent; violently effervescent; moderately alkaline.

Solum thickness ranges from 20 to 40 inches. The texture of the soil is loam, silt loam, or clay loam. Total carbonates in the control section range from 40 to 80 percent. Coarse fragments, consisting of shell fragments, range from none to 15 percent.

The A horizon has hue of 10YR or 2.5Y, value of 4, and chroma of 2 or 3.

The B horizons has hue of 7.5YR to 2.5Y, value of 5 to 7, and chroma of 3 to 6.

The 2C horizon has hue of 10YR or 2.5Y, value of 6 or 7, and chroma of 2 to 8. Some pedons have few to common masses of oxidized iron in these same colors.

Venus series

The Venus series consists of very deep, well drained, nearly level to very gently sloping soils on stream terraces and flood plains. They formed in loamy alluvial sediments. Slopes are 0 to 3 percent.

Typical pedon of Venus loam, rarely flooded; from the intersection of Texas Highway 36 and Farm Road 932 in Hamilton, 1.5 miles south on Farm Road 932 to junction with Farm Road 1241, 9.2 miles south on FM 1241 to junction with county road, 0.4 mile south on gravel county road, and 20 feet north of road in cropland field (fig. 14).

Ap—0 to 7 inches; dark grayish brown (10YR 4/2) loam, very dark grayish brown (10YR 3/2) moist; moderate fine subangular blocky structure parting to moderate very fine granular; slightly hard, friable; common very fine and fine roots; common concretions of calcium carbonate; common snail shells; strongly effervescent; moderately alkaline; abrupt smooth boundary.

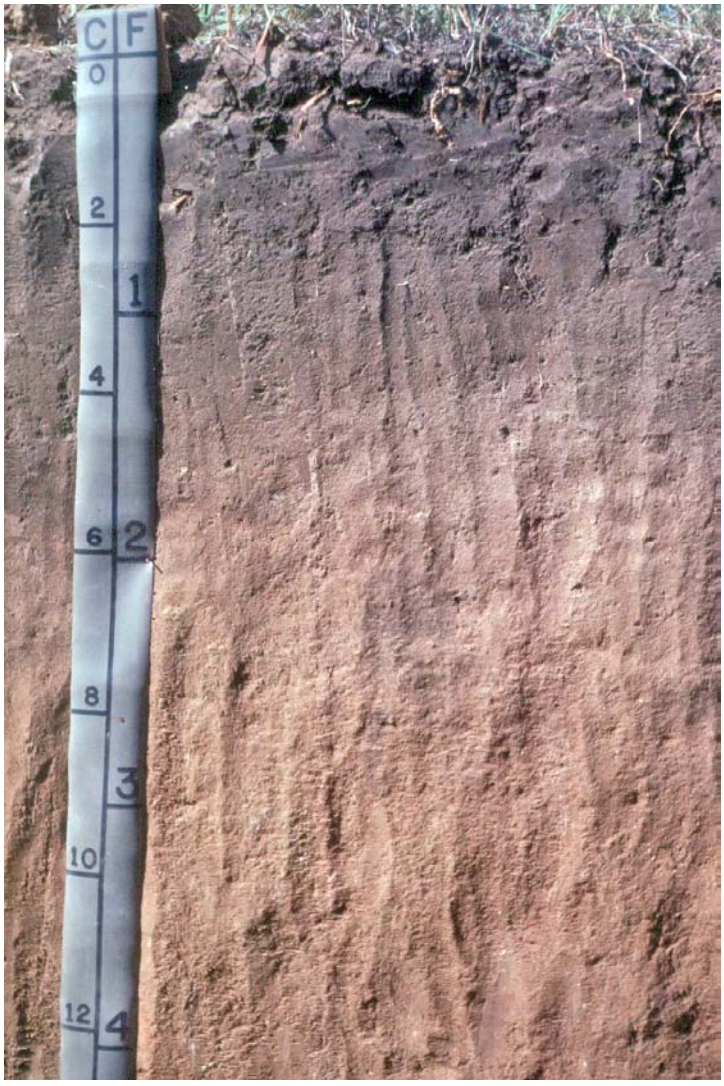

Figure 14.—Profile of Venus loam, rarely flooded.

A—7 to 15 inches; dark grayish brown (10YR 4/2) loam, very dark grayish brown (10YR 3/2) moist; weak medium subangular blocky structure; slightly hard, friable; common very fine and fine roots; common concretions of calcium carbonate; few films and threads of calcium carbonate; strongly effervescent; moderately alkaline; clear smooth boundary.

Bk1—15 to 24 inches; grayish brown (10YR 5/2) loam, dark grayish brown (10YR 4/2) moist; moderate fine subangular blocky structure; slightly hard, friable; common very fine and fine roots; common concretions of calcium carbonate; few films and threads of calcium carbonate; violently effervescent; moderately alkaline; clear smooth boundary.

Bk2—24 to 35 inches; pale brown (10YR 6/3) loam, brown (10YR 5/3) moist; weak medium subangular blocky structure; hard, friable; common very fine and fine roots; common fine concretions of calcium carbonate; few snail shells; violently effervescent; moderately alkaline; clear smooth boundary.

Bk3—35 to 80 inches; light yellowish brown (10YR 6/4) loam, yellowish brown (10YR 5/4) moist; weak medium subangular blocky structure; hard, friable; few very fine and fine roots; few fine films, threads, and concretions of calcium carbonate; violently effervescent; moderately alkaline.

Solumn thickness ranges from 60 to 80 inches. Organic matter decreases regularly with depth. The mollic epipedon is 10 to 20 inches thick.

The A horizon has hue of 7.5YR or 10YR, value of 3 to 5, and chroma of 2 or 3.

The Bk horizons have hue of 7.5YR or 10YR, value of 5 to 7, and chroma of 2 to 4. It is loam, sandy clay loam, or clay loam. Concretions, films, threads, and masses of calcium carbonate range from 5 to about 20 percent by volume.

Wise Series

The Wise series consists of very deep, well drained, gently sloping soils on uplands. They formed in interbedded calcareous loamy marls and sands. Slopes are 3 to 5 percent.

Typical pedon of Wise clay loam, 3 to 5 percent slopes; from the intersection of U.S. Highway 281 and Texas Highway 36 in Hamilton, 11.7 miles south on U.S. Highway 281, 2.6 miles east by northeast on gravel county road, 1.2 mile south on gravel county road, and 0.7 mile west and north on pasture road in rangeland.

A—0 to 5 inches; grayish brown (10YR 5/2) clay loam, dark grayish brown (10YR 4/2) moist; weak fine subangular blocky and weak fine granular structure; hard, friable; many very fine and fine roots; many very fine and fine pores; few limestone gravel less than 0.75 inch across; strongly effervescent; moderately alkaline; clear smooth boundary.

Bw—5 to 11 inches; light brownish gray (10YR 6/2) clay loam, dark grayish brown (10YR 4/2) moist; weak fine subangular blocky structure; hard, friable; many very fine and fine roots; many very fine and fine pores; few films and threads of calcium carbonate; strongly effervescent; moderately alkaline; gradual wavy boundary.

Bk—11 to 26 inches; pale brown (10YR 6/3) clay loam, grayish brown (10YR 6/2) moist; weak fine subangular blocky structure; slightly hard, friable; common very fine and fine roots; common very fine and fine pores; common films, threads, masses, and concretions of calcium carbonate; violently effervescent; moderately alkaline; clear wavy boundary.

C—26 to 62 inches; stratified layers of light gray (2.5Y 7/2) silt loam and pale brown (10YR 6/3) sandy loam; common fine distinct brownish yellow (10YR 6/6) masses of oxidized iron in shale; single grained; loose; few concretions and masses of calcium carbonate; few sandstone fragments in lower part; strongly effervescent; moderately alkaline.

Solumn thickness ranges from 20 to 40 inches. It is loam, clay loam, or silty clay loam throughout the solum. Reaction is slightly alkaline or moderately alkaline.

The A horizon has hue of 10YR or 2.5Y, value of 4 or 5, and chroma of 2 or 3.

The B horizon has hue of 7.5YR or 10YR, value of 5 to 7, and chroma of 2 to 6. Some pedons have sand strata in shades of yellow or gray. There can be few fine prominent dark yellowish brown or faint light olive brown masses of oxidized iron.

The C horizon is interbedded loamy or clayey marl often with pockets of carbonates. It has hue of 10YR to 5Y, value of 6 to 8, and chroma of 2 to 4. Some pedons have masses of oxidized iron in these colors or in shades of yellow or brown.

Formation of the Soils

In this section, the factors of soil formation are related to the formation of soils in Hamilton County. Also, the processes of horizon differentiation and the surface geology 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 at any given point depend on the physical and mineralogical composition of the parent material; the climate under which the soil material has accumulated and has existed since accumulation; the plant and animal life on and in the soil; the relief, or lay of the land; and the length of time the forces of soil formation have acted on the soil material.

All five factors are important in the genesis of each soil; some have had more influence than others on a given soil.

Parent Material

Parent material is the unconsolidated mass in which a soil forms. It affects the chemical and mineral composition of the soil. The parent material in Hamilton County consists of unconsolidated sediments of the Cretaceous and Quaternary periods. The parent material on stream terraces consists of unconsolidated alluvial sediments of clay, silt, sand, and gravel. The parent material on the flood plains consists of recent alluvium, mainly clays. The geology of the parent material is described in the section, "Surface Geology."

Climate

Hamilton County has a warm-temperate, subhumid climate and hot summers. This climate contributes to the formation of soils in several ways. Expansion that occurs at high temperatures and contraction that occurs at low temperatures fractures parent rock and hastens weathering. Patterns of rainfall distribution cause the soils to be alternately wet and dry.

A clay soil, such as Slidell silty clay, cracks when dry, then the cracks fill with water during rains. After it becomes wet, the clayey soil swells and the cracks close. This alternate shrinking and swelling causes the soil to churn and affects the downward movement and accumulation of clay in the subsoil.

Other soils, such as Pedernales fine sandy loam, have clayey lower layers. Water moving through the soil carries clay particles downward from the surface layer and deposits them as the water movement slows. As the clay accumulates, the water moves even slower and deposition of clay accelerates. Thus, the process tends to speed up, and eventually, the lower layers become clayey.

Wind also affects the formation of soils in the county. For example, the sandy Desan soils formed in windblown sediments.

Plant and Animal Life

Plants, animals, man, insects, bacteria, worms, and fungi are important in the formation of soils. Gains in organic matter and nitrogen in the soil, gains or losses of

plant nutrients, and changes in structure and porosity are among the changes caused by living organisms.

In the limestone derived soils, tall prairie grasses had more influence on soil development than other plants. These tall grasses provided residue that protected the surface and added organic matter to dark-colored soils, such as Denton, Purves, and Slidell. The grass roots reached deep into the soil and fed on minerals at lower depths. Lime, minerals, and organic matter were distributed throughout the soil profile as these plants died and decomposed. The decomposed plant roots left channels that increased the intake of water and the aeration of the soil. Earthworms and other soil organisms fed on the decomposed roots. The borings of earthworms also helped channel the water and air through the soil.

The vegetation, dominantly oak savannah, has affected soils formed in stratified sands, clays, and sandstones. The soils that formed under hardwood vegetation are medium to low in organic matter and have tight, light-colored surface layers. Some of these soils are Bastsil and Minwells.

Activities that have influenced soil formation include vegetation grazed by cattle, and the land plowed and planted to crops.

Relief

Relief, or topography, affects soil formation through its influence on drainage, plant cover, and soil temperature. The topography of Hamilton County ranges from nearly level to steep.

Nearly level or gently sloping Krum soils are deeper and have more distinct horizons than do the gently sloping and hilly Brackett soils. This difference occurs because the Krum soils in lower positions receive additional water, have less runoff, and are subject to less erosion than the Brackett soils.

On the steeper slopes, geological erosion occurs almost as fast as the soil material is formed. For example, Brackett soils have been forming as long as the less sloping Bolar soils, but they are much shallower in their soil horizon development.

Time

Generally a long time is required for formation of soils that have distinct horizons. The length of time that parent materials have been in place, therefore, is commonly reflected in the development of the soil profile.

The soils in Hamilton County range from young soils that have little development to older soils with well developed soil horizons. The soil horizons of Bosque soils still show the evidence of stratification, and there has been little change from the original stream deposited alluvium. Krum soils are an example of older soils that have well developed soil horizons. The parent material of the Krum soils has been in place for a long time. There has been a downward movement and accumulation of clay particles, an accumulation of a thin, darkened upper surface layer, and the development of a thick, leached lower surface layer.

Processes of Horizon Differentiation

Soils are derived from the decomposition of the mineral particles they contain and from the plant and animal remains added to them. Silicate clays, mineral particles, humus, living organisms, and water have a major influence in determining the character of the soil. Soil layers, or horizons, are formed by additions, removals, transfers, and transformations within the soil profile *(17)*. These processes include additions or losses of organic, mineral, and gaseous materials to the soil, transfers of material from one point to another within the soil, and physical and chemical transformation of mineral and organic materials within the soil. In most soils, more than one of these processes have been active in the development of horizons, and many processes occur simultaneously.

Soil profiles are made up of a series of horizons that extend from the surface to the parent material. The parent material has been influenced little by the processes of soil formation. The horizons that make up a soil profile differ in one or more properties, such as color, texture, structure, consistence, porosity, and reaction.

There are five major (master) soil horizons. These are the A, E, B, C, and R horizons. These five are not all found in every soil profile.

The A horizon is the surface layer. It is the horizon that has the maximum accumulation of organic matter. Organic matter has accumulated, partially decomposed, and been incorporated into the soil. The accumulation of organic matter in soils is greatest in and above the surface layer. Many of the more stable products of organic matter decomposition remain as finely divided materials that result in darker colors, increased water-holding and cation-exchange capacities, and granulation of the soil.

The content of organic matter in the soils in Hamilton County ranges from low to medium. Many of the soils in the county have accumulated sufficient organic matter to form a dark surface layer, or A horizon.

The E horizon is a subsurface layer. It is directly below the A horizon. It is characterized by the leaching of dissolved or suspended materials. Clay particles, organic matter, and oxides of free iron have been leached from the E horizon, leaving a concentration of light-colored sand and silt particles or other resistant materials. Desan and Riesel soils have well developed E horizons.

The B horizon is the subsoil. It is directly below the A or E horizons. It is the horizon that has the maximum accumulation of dissolved or suspended materials, such as clay and iron. It may also be an altered horizon that has a distinctly different structure than that of the A horizon but shows little evidence of clay translocation or accumulation.

A B horizon that has a significant amount of clay accumulation is called a Bt horizon. Clay accumulates in horizons largely because of translocation from upper to lower horizons. As water moves downward, it can carry small amounts of clay in suspension. This clay accumulates at depths penetrated by water. It accumulates in fine pores in the soil and as clay films on surfaces of peds. Over long periods of time, at least a few thousand years, such processes can result in distinct horizons. Minwells, Pedernales, and Riesel soils are examples of soils that have strongly developed Bt horizons.

A B horizon that has distinct structure or color development with little or no evidence of clay accumulation is called a Bw horizon. Plant roots and other organisms contribute to the rearrangement of soil materials into secondary aggregates. Organic residues and secretions of organisms serve as cementing agents that help stabilize structural aggregates. Soils that have appreciable amounts of clay develop structural aggregates because of drying and wetting and because of shrinking and swelling. Bosque, Denton, and Krum soils have Bw horizons.

Some soils in Hamilton County have a high content of clay that has smectite as the dominant clay mineral. These soils shrink and develop wide, deep cracks when dry and swell and become very plastic and cohesive when wet. Because of overburden pressure, soil movement, and stress caused by wetting and drying, a platy and wedge-like structure can form in the Bss horizon. Individual structural aggregates have distinct cleavage planes and polished faces known as slickensides. When the soil is dry, soil material from the surface often falls into the wide, deep cracks or is washed into the cracks by rain. When the soil is wet, lateral pressure caused by the swelling can result in surface heaving, which eventually leads to the formation of gilgai microrelief that consists of microknolls and microdepressions. This gilgai microrelief is locally referred to as "hogwallow land." Evant, San Saba, and Slidell soils have Bss horizons that have slickensides. Slidell soils have gilgai microrelief.

The C horizon is relatively unchanged by soil-forming processes, although in some places it is modified by weathering. It is generally below the B horizon. Brackett, Cisco, and Topsey soils have C horizons. Some soils have an A horizon over C horizons. These soils commonly occur on flood plains, such as the Lamkin soils.

Another important process in soil formation is the loss of components from the soil. Water can leach many soluble components, such as calcium carbonate, to the lower horizons in the profile. A horizon that has a significant accumulation of calcium carbonate is designated by the addition of the symbol "k." Brackett, Pidcoke, Rumley, and Venus soils are examples of soils that have accumulations of calcium carbonate in the lower horizons.

Once the accumulations of calcium carbonate become solidified, they become a petrocalcic horizon. Petrocalcic horizons are designated by the symbol "km." Cho and Real soils have petrocalcic horizons.

The R horizon is indurated bedrock. In Hamilton County the main type of bedrock is limestone. Real and Tarpley soils are examples of soils with an R layer.

Surface Geology

Dr. David L. Amsbury, Geologist, National Aeronautic and Space Administration, prepared this section.

Rocks under Hamilton County soils are sedimentary in origin. The rock-forming sediments were originally deposited by water as particles of sand, clay, fossil shell fragments, or lime mud. Most sediments in this area were deposited in ancient Cretaceous seas that periodically covered Central Texas. Younger sediments subsequently were laid down by Quaternary streams that eroded the older Cretaceous deposits.

Sedimentary rocks are deposited in layers or strata. Individual strata are grouped into rock units that are thick enough to map at a desired scale. The basic rock unit is the "formation." Named or unnamed "members" may be recognized within a formation. The name that accompanies a formation or member is derived from a typical outcrop, or from the rock type at the place where the formation was first named. The Walnut Clay Formation, for example, is mostly shale and clay near the community of Walnut Springs in nearby Bosque County where it was first named. However, the Walnut Clay is dominantly limestone in southern Hamilton County.

Rocks representing the Cretaceous Period of the Mesozoic Era overlie buried Paleozoic rocks in Hamilton County. Cretaceous deposits in the county formed during a span of several million years, centered at about 95 million years ago. Sediments deposited during the Tertiary Period have not been found in Hamilton County. The youngest strata in the county are Quaternary Period alluvial sediments on stream terraces and flood plains of Pleistocene and Holocene age. These sediments are located adjacent to or within the Leon River, North Bosque River, Lampasas River, and Cowhouse Creek flood plains.

The present landscape of Hamilton County formed during the Pleistocene Epoch. Broad valleys, graded to a level above Pleistocene terraces, are characteristic of Hamilton County. This widespread landscape is the Lampasas Cut Plain *(8)*. The Lampasas Cut Plain was formed when Central Texas drainage was at a higher elevation. This was during a time of valley widening that contrasts with more recent valley entrenchment *(11)*. The significance to soil genesis is that most soils in Hamilton County represent development during the last 500,000 years. During this time, rainfall, temperature, and vegetation varied greatly. The soils, though reflecting bedrock and parent material, are composite soils that record the effects of changing climate. Thick caliche horizons indicate a past climate much warmer and drier with probably more seasonal rainfall than present. Conversely, scattered areas of shallow, red clayey soils on limestone imply a climate warmer and wetter than at present.

Bedrock provides the parent material for soil development. Most soils in Hamilton County were formed by weathering of calcareous clay, clayey limestone, limestone, sand beds, and old stream deposits derived from these rocks. Bedrock type determines a formation's relative resistance to erosion and thus a soil's topographic position. Bedrock type also affects the chemical composition and physical texture of the soil. Relatively

pure limestones on steep slopes usually produce shallow, stony, clayey soils. Clayey bedrock and ancestral stream deposits on gentle slopes generally develop deep, clayey soils.

There is a general correspondence among the major soil types shown on the Hamilton County general soil map and the bedrock geology shown on the Brownwood and Waco Geologic Atlas of Texas sheets *(4)*. Similar patterns are shown on the smaller scale Geological Map of Texas and on the Land Resource Map *(11,13)*.

Holocene Epoch

Holocene alluvial flood plain deposits are the youngest mappable geologic units in the county. These deposits form relatively narrow low terraces inset into higher and wider Pleistocene deposits and terraces. Most Holocene stream deposits are reworked material from older Pleistocene alluvium and material eroded and transported from valley sides and hilltops within the county. Leon River alluvium contains gravel and sand transported from upstream exposures. The present-day Leon River carries mostly clay and silt in contrast to much coarser material found under stream terraces of Pleistocene age. Water transport and deposition of sediment is evidenced in vertical streambanks and excavations as relict stream bottom sand bars and gravel lenses, crossbedding, a general upward decrease in gravel content and grain size, and a mixture of materials derived from older geologic units upstream. Holocene alluvial deposits have been accumulating sporadically during the last 12,000 years or since the end of the last ice age.

Bosque and Frio soils of the Bosque-Frio-Venus general soil map unit are mapped in Holocene alluvium.

Pleistocene Epoch

Pleistocene terraces above Holocene flood plains are along the Leon, North Bosque, and Lampasas Rivers, and their tributaries and along Cowhouse Creek. These terraces formed over gravelly, sandy silt and clay similar to Holocene deposits. Pleistocene deposits along the Leon River contain coarse, red gravel carried from far upstream. Gully erosion and man-made cuts reveal Pleistocene alluvial deposits that are thicker than those laid down by younger streams.

Pleistocene flood plains and stream channel meanders were formed when rainfall and stream discharge were several times greater that at present. Pleistocene flood plains were much wider than Holocene flood plains and (where preserved) Pleistocene stream meanders are much larger than Holocene meanders (*13*). Examples of large Pleistocene stream meanders cut by the Leon River in bedrock are downstream from the U.S. Highway 281 crossing north of the city of Hamilton, and at the extreme eastern edge of the county north of Texas Highway 36.

Venus soils formed on Pleistocene terraces throughout the county. The Minwells-Bastsil general soil map unit is mapped on Pleistocene terraces on the Leon River.

Cretaceous Period

Most Lower Cretaceous deposits in Hamilton County formed near the shore of a shallow sea that extended from the ancestral Gulf of Mexico through the East Texas Basin and westward across Hamilton County *(1)*. The original flat-lying layers of sediment were compacted and tilted 15 to 20 feet per mile eastward. This eastward dip of the rock layers is greater than the gradient of streams that cover the area. Consequently, the streams must erode the valleys more deeply in the western part of the county to expose the oldest rocks. The youngest Cretaceous rocks crop out only in the easternmost corner of the county.

The youngest Cretaceous rocks in the county, the Duck Creek Limestone member of the Georgetown Formation, overlie the Edwards Limestone. In descending order, the

Edwards, Comanche Peak, Walnut, and Paluxy Formations comprise the Fredericksburg Group *(1,6)*. The Paluxy Sand is underlain by the Glen Rose Formation. The terrestrial Travis Peak Formation separates marine deposits of Cretaceous age from underlying and completely buried Paleozoic strata.

Georgetown Formation (Duck Creek Limestone Member). Nodular limestone, marl, and calcareous shale of the Duck Creek Limestone form rolling uplands in the easternmost part of Hamilton County. Oyster shells and the internal molds of clams and snails are abundant in some beds.

The Duck Creek Limestone is parent material for the Denton-Bolar-Oglesby general soil map unit on summit positions of mesas in the eastern sector of the county.

Edwards Limestone. This deposit formed from the skeletons of thick-shelled, reef-building clams called rudistids *(14)*. Thinner beds of fine-grained limestone were deposited between mounds of shell debris. The thinner beds typically contain abundant nodules of chert. Beds of dolomite, a calcium-magnesium carbonate mineral, are in the Edwards Limestone. This dolomite in Central Texas is generally much less resistant to erosion than limestone. Dolomite strata thicker than a few feet crop out in extensive areas and are overlain by shallow, calcareous soils containing common chert fragments.

The Edwards Limestone is about 100 feet thick in the southern part of Hamilton County, but only about 40 feet thick in the northeastern sector of the county. This difference in thickness may account, in part, for the ridge between the Leon River and Lampasas River drainages being wider and longer than the ridge between the Leon and North Bosque River drainages. Thick, erosion-resistant Edwards Limestone forms the ridges of southwestern and northeastern Hamilton County. The ridges range in elevation from about 1,600 feet south of Indian Gap to about 1,500 feet south of Evant, and from about 1,300 feet at Fairy to 1,200 feet at the eastern corner of the county. A prominent Edwards Limestone exposure may be observed in a road cut along Texas Highway 22 east of Lanham.

Edwards Limestone underlies portions of the Brackett-Slidell-Pidcoke and the Eckrant-Evant general soil map units.

Comanche Peak Limestone. The Comanche Peak Limestone is white, nodular, fairly soft limestone interbedded with marl and calcareous clay. Thin, erosion-resistant beds of small fossilized oyster shells are prominent in some road cuts and road-metal quarries. Internal molds of clams and snails, several kinds of oyster shells, echinoids, and ammonites are extremely abundant in some beds *(14)*. The sediment was originally lime mud which came from marine algae and finely-ground shell debris. Clay from far to the north was deposited sporadically. Clams, snails, and other animals burrowed in these sediments partially mixing the clay and lime mud. Limestone nodules characteristic of the Comanche Peak are remnants of lumps of pure lime mud not completely mixed with clay.

The Comanche Peak Limestone is about 40 feet thick in the southern part of the county, where it crops out on steep slopes below ledges of Edwards Limestone. Slopes on Comanche Peak Limestone, where it underlies Edwards Limestone, are generally mantled by thick calcareous colluvium. The Comanche Peak Limestone is 100 to 120 feet thick in the northeastern and northern parts of the county. Its outcrop in this sector of the county forms low, rounded hills where the Edwards Limestone has been eroded away.

Soils in the Brackett-Slidell-Pidcoke general soil map unit are mapped on low hills in northeastern and eastern Hamilton County. Real-Cranfill-Brackett map unit soils have developed in other sectors of the county. Cranfill soils formed in Comanche Peak Limestone colluvium. Evant soils are also mapped over Comanche Peak Limestone.

Walnut Clay. Shale, oyster-shell beds, nodular limestone, and flaggy limestone underlie the gentle slopes of the Lampasas River and Cowhouse Creek drainage basins, and the middle to upper slopes of the Leon River and North Bosque River drainage basins *(4)*. The Walnut Clay in Hamilton County is 120 to 140 feet thick. Four members

are recognized. In descending order they are: the "upper marl member," Keys Valley Marl, Cedar Park Limestone, and Bee Cave Marl.

The "upper marl member" is composed of shale, nodular limestone, and indurated oyster-shell flagstones that weather to a brown surface color. This upper member forms long, gentle slopes. A prominent, erosion-resistant bed several feet thick containing the marine megafossil Gryphaea is at the top of the Keys Valley Marl. The oysters are 1 to 2 inches long, thick-shelled, reddish brown, and have beaks that curl into the body cavity *(14)*. This gryphaeid oyster bed extends from northern Travis County past Fort Worth and westward through Lampasas and Mills County *(9)*. This fossiliferous deposit can be observed on both small spurs along major drainages and on low hills on the divide between the Leon River and Cowhouse Creek. White, nodular limestone and chalk containing abundant molds of clams, snails, and other fossils are below the oyster bed. The remainder of the Keys Valley Marl is dark clay-shale containing indurated, brown flagstone beds. The Cedar Park Limestone member is characterized by white, nodular limestone similar to the Comanche Peak Limestone. The Bee Cave Marl member contains nodular limestone that is interbedded with hard, brown flagstone beds, oyster beds, and shale.

Weathered Walnut Clay is the parent material for several soils, depending on rock type, slope, and position on the valley sides. Soils in the Brackett-Slidell-Pidcoke, Nuff-Real-Cho, and Real-Doss general soil map units are mapped over the Walnut Clay Formation. Cho soils have developed over the gryphaeid oyster bed.

Paluxy Sand. The Paluxy Sand was deposited in shallow marine and beach depositional environments. Sand from northern and western sources spread over Glen Rose Formation strata dominated by limestone and fossiliferous clays. The sand texture varies from very fine-grained (almost silt) locally, to medium- or even coarse-grained sands associated with relatively thicker sand deposits. The Paluxy Sand also contains beds of white, hard sandy flagstone, greenish soft clay, and yellow to brown irregular sandy limestone that probably represent paleosols (with petrocalcic horizons) of Cretaceous age *(15)*. Thickness varies from 60 feet north of the Bosque River, to 50 feet near the city of Hamilton, to about 30 feet at Evant. The Paluxy Sand is an excellent aquifer providing water for livestock and domestic consumption.

The Paluxy Sand is parent material for soils in the Cisco-Pedernales general soil map unit. Generally, Pedernales soils are mapped where the sand is thick. Cisco soils are mapped where the formation is thin and flaggy.

Glen Rose Formation. Glen Rose Formation strata were deposited near the edge of a shallow sea. Depositional environments varied abruptly from marine, through lagoons and tidal flats, to subaerial coastal plains *(7)*. Consequently, the Glen Rose Formation is a complex geologic unit made up of alternating thin beds of several rock types. These types include very hard, strongly cemented beds of coquina and other carbonate particles, fossiliferous marl, moderately soft dolomite, greenish shale, oyster beds, and sandy and silty beds near the base. Some beds near the base of the formation contain nodules of celestite ($SrSO_4$) and strontianite ($SrCO_3$), which look like calcite ($CaCO_3$) but are much denser. The strontium minerals probably replaced original gypsum ($CaSO_4 \cdot 2H_2O$) nodules in the tidal-flat sediments. The thin, hard limestone beds of the Glen Rose Formation are similar to those of the lower part of the Walnut Clay. However, Glen Rose Formation beds are generally gray rather than brown, more resistant to weathering, and do not have the oyster fossils common to the Walnut Clay.

The Glen Rose Formation crops out on broad lower slopes of the North Bosque River and Leon River drainage basins. It also crops out along the lower slopes of Cowhouse Creek and the Lampasas River. The formation thickens southeastward from about 170 feet near Indian Gap to more than 300 feet at Jonesboro *(7)*.

Soils in the Real-Doss general soil map unit are mapped over the Glen Rose Formation throughout the county (fig. 15).

Travis Peak Formation. The Travis Peak Formation is mostly stream channel gravel and sand, silt, and clay that were unconformably deposited on Paleozoic flood plain and lagoon sediments. Paleosols with caliche horizons that developed in the sediments are also part of the formation. Alluvium in the Travis Peak Formation gradually filled in a rugged topography that included a southeastward-flowing valley in western Hamilton County *(5)*. However, the Travis Peak Formation crops out only locally in Hamilton County. These outcrops are exposed adjacent to Pleistocene terraces and the Holocene Leon River flood plain upstream from U.S. Highway 281 *(4)*.

The Travis Peak Formation in Hamilton County is an important, high-quality groundwater source. It is one of the most productive aquifers in Central Texas *(16)*.

Travis Peak Formation outcrops in Hamilton County are too small to delineate a separate general soils map unit. Soils that developed over the Travis Peak Formation are included in the Bastil-Minwells and Bosque-Frio-Venus general soil map units.

Figure 15.—Scenic views can be enjoyed from the tops of hills in Hamilton County. Edwards Limestone caps the mesa-like hills in the background. Soils on the steep side slopes of these hills formed from the Comanche Peak Limestone. The soils in the valleys are formed from Walnut Clay, Paluxy Sand, and the Glen Rose Formation.

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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 at http://soils.usda.gov).

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.

Alkali (sodic) soil. A soil having so high a degree of alkalinity (pH 8.5 or higher) or so high a percentage of exchangeable sodium (15 percent or more of the total exchangeable bases), or both, that plant growth is restricted.

Alluvial cone. A semiconical type of alluvial fan having very steep slopes. It is higher, narrower, and steeper than a fan and is composed of coarser and thicker layers of material deposited by a combination of alluvial episodes and (to a much lesser degree) landslides (debris flow). The coarsest materials tend to be concentrated at the apex of the cone.

Alluvial fan. A low, outspread mass of loose materials and/or rock material, commonly with gentle slopes. It is shaped like an open fan or a segment of a cone. The material was deposited by a stream at the place where it issues from a narrow mountain valley or upland valley or where a tributary stream is near or at its junction with the main stream. The fan is steepest near its apex, which points upstream, and slopes gently and convexly outward (downstream) with a gradual decrease in gradient.

Alluvium. Unconsolidated material, such as gravel, sand, silt, clay, and various mixtures of these, deposited on land by running water.

Alpha, alpha-dipyridyl. A compound that when dissolved in ammonium acetate is used to detect the presence of reduced iron (Fe II) in the soil. A positive reaction implies reducing conditions and the likely presence of redoximorphic features.

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.

Arroyo. The flat-floored channel of an ephemeral stream, commonly with very steep to vertical banks cut in unconsolidated material. It is usually dry but can be transformed into a temporary watercourse or short-lived torrent after heavy rain within the watershed.

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 hillslope. 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.

Badland. A landscape that is intricately dissected and characterized by a very fine drainage network with high drainage densities and short, steep slopes and narrow interfluves. Badlands develop on surfaces that have little or no vegetative cover overlying unconsolidated or poorly cemented materials (clays, silts, or sandstones) with, in some cases, soluble minerals, such as gypsum or halite.

Bajada. A broad, gently inclined alluvial piedmont slope extending from the base of a mountain range out into a basin and formed by the lateral coalescence of a series of alluvial fans. Typically, it has a broadly undulating transverse profile, parallel to the mountain front, resulting from the convexities of component fans. The term is generally restricted to constructional slopes of intermontane basins.

Basal area. The area of a cross section of a tree, generally referring to the section at breast height and measured outside the bark. It is a measure of stand density, commonly expressed in square feet.

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.

Bedding system. A drainage system made by plowing, grading, or otherwise shaping the surface of a flat field. It consists of a series of low ridges separated by shallow, parallel dead furrows.

Bedrock. The solid rock that underlies the soil and other unconsolidated material or that is exposed at the surface.

Bedrock-controlled topography. A landscape where the configuration and relief of the landforms are determined or strongly influenced by the underlying bedrock.

Bench terrace. A raised, level or nearly level strip of earth constructed on or nearly on a contour, supported by a barrier of rocks or similar material, and designed to make the soil suitable for tillage and to prevent accelerated erosion.

Bisequum. Two sequences of soil horizons, each of which consists of an illuvial horizon and the overlying eluvial horizons.

Blowout. A saucer-, cup-, or trough-shaped depression formed by wind erosion on a preexisting dune or other sand deposit, especially in an area of shifting sand or loose soil or where protective vegetation is disturbed or destroyed; the adjoining accumulation of sand derived from the depression, where recognizable, is commonly included. Blowouts are commonly small.

Bottom land. An informal term loosely applied to various portions of a flood plain.

Boulders. Rock fragments larger than 2 feet (60 cm) across.

Breaks. A landscape or tract of steep, rough or broken land dissected by ravines and gullies and marking a sudden change in topography.

Breast height. An average height of 4.5 feet above the ground surface; the point on a tree where diameter measurements are ordinarily taken.

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.

Butte. An isolated, generally flat-topped hill or mountain with relatively steep slopes and talus or precipitous cliffs and characterized by summit width that is less than the height of bounding escarpments; commonly topped by a caprock of resistant material and representing an erosion remnant carved from flat-lying rocks.

Cable yarding. A method of moving felled trees to a nearby central area for transport to a processing facility. Most cable yarding systems involve use of a drum, a pole, and wire cables in an arrangement similar to that of a rod and reel used for fishing. To reduce friction and soil disturbance, felled trees generally are reeled in while one end is lifted or the entire log is suspended.

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.)

Canyon. A long, deep, narrow valley with high, precipitous walls in an area of high local relief.

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.

Catena. A sequence, or "chain," of soils on a landscape that formed in similar kinds of parent material and under similar climatic conditions but that have different characteristics as a result of differences in relief and drainage.

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.

Catsteps. See Terracettes.

Cement rock. Clayey limestone used in the manufacture of cement.

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 cm) 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 millimeter across. 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 cm) across.

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 cm) across. 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 mm across. 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.

Coppice dune. See Shrub-coppice dune.

Coprogenous earth (sedimentary peat). A type of limnic layer composed predominantly of fecal material derived from aquatic animals.

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.

Crown. The upper part of a tree or shrub, including the living branches and their foliage.

Cuesta. An asymmetric ridge capped by resistant rock layers of slight or moderate dip (commonly less than 15 percent slopes); a type of homocline produced by differential erosion of interbedded resistant and weak rocks. A cuesta has a long, gentle slope on one side (dip slope) that roughly parallels the inclined beds; on the other side, it has a relatively short and steep or clifflike slope (scarp) that cuts through the tilted rocks.

Culmination of the mean annual increment (CMAI). The average annual increase per acre in the volume of a stand. Computed by dividing the total volume of the stand by its age. As the stand increases in age, the mean annual increment continues to increase until mortality begins to reduce the rate of increase. The point where the stand reaches its maximum annual rate of growth is called the culmination of the mean annual increment.

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.

Delta. A body of alluvium having a surface that is fan shaped and nearly flat; deposited at or near the mouth of a river or stream where it enters a body of relatively quiet water, generally a sea or lake.

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.

Desert pavement. A natural, residual concentration or layer of wind-polished, closely packed gravel, boulders, and other rock fragments mantling a desert surface. It forms where wind action and sheetwash have removed all smaller particles or where rock fragments have migrated upward through sediments to the surface. It typically protects the finer grained underlying material from further erosion.

Diatomaceous earth. A geologic deposit of fine, grayish siliceous material composed chiefly or entirely of the remains of diatoms.

Dip slope. A slope of the land surface, roughly determined by and approximately conforming to the dip of the underlying bedrock.

Diversion (or diversion terrace). A ridge of earth, generally a terrace, built to protect downslope areas by diverting runoff from its natural course.

Divided-slope farming. A form of field stripcropping in which crops are grown in a systematic arrangement of two strips, or bands, across the slope to reduce the hazard of water erosion. One strip is in a close-growing crop that provides protection from erosion, and the other strip is in a crop that provides less protection from erosion. This practice is used where slopes are not long enough to permit a full stripcropping pattern to be used.

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.

Duff. A generally firm organic layer on the surface of mineral soils. It consists of fallen plant material that is in the process of decomposition and includes everything from the litter on the surface to underlying pure humus.

Dune. A low mound, ridge, bank, or hill of loose, windblown granular material (generally sand), either barren and capable of movement from place to place or covered and stabilized with vegetation but retaining its characteristic shape.

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.

Ephemeral stream. A stream, or reach of a stream, that flows only in direct response to precipitation. It receives no long-continued supply from melting snow or other source, and its channel is above the water table at all times.

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 pavement. A surficial lag concentration or layer of gravel and other rock fragments that remains on the soil surface after sheet or rill erosion or wind has removed the finer soil particles and that tends to protect the underlying soil from further 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.

Extrusive rock. Igneous rock derived from deep-seated molten matter (magma) deposited and cooled on the earth's surface.

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.

Fan remnant. A general term for landforms that are the remaining parts of older fan landforms, such as alluvial fans, that have been either dissected or partially buried.

Fertility, soil. The quality that enables a soil to provide plant nutrients, in adequate amounts and in proper balance, for the growth of specified plants when light, moisture, temperature, tilth, and other growth factors are favorable.

Fibric soil material (peat). The least decomposed of all organic soil material. Peat contains a large amount of well preserved fiber that is readily identifiable according to botanical origin. Peat has the lowest bulk density and the highest water content at saturation of all organic soil material.

Field moisture capacity. The moisture content of a soil, expressed as a percentage of the ovendry weight, after the gravitational, or free, water has drained away; the field moisture content 2 or 3 days after a soaking rain; also called normal field capacity, normal moisture capacity, or capillary capacity.

Fill slope. A sloping surface consisting of excavated soil material from a road cut. It commonly occurs on the downhill side of the road.

Fine textured soil. Sandy clay, silty clay, or clay.

Firebreak. An area cleared of flammable material to stop or help control creeping or running fires. It also serves as a line from which to work and to facilitate the movement of firefighters and equipment. Designated roads also serve as firebreaks.

First bottom. An obsolete, informal term loosely applied to the lowest flood-plain steps that are subject to regular flooding.

Flaggy soil material. Material that has, by volume, 15 to 35 percent flagstones. Very flaggy soil material has 35 to 60 percent flagstones, and extremely flaggy soil material has more than 60 percent flagstones.

Flagstone. A thin fragment of sandstone, limestone, slate, shale, or (rarely) schist 6 to 15 inches (15 to 38 cm) long.

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.

Foothills. A region of steeply sloping hills that fringes a mountain range or high-plateau escarpment. The hills have relief of as much as 1,000 feet (300 meters).

Footslope. The concave surface at the base of a hillslope. 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.

Forest cover. All trees and other woody plants (underbrush) covering the ground in a forest.

Forest type. A stand of trees similar in composition and development because of given physical and biological factors by which it may be differentiated from other stands.

Fragipan. A loamy, brittle subsurface horizon low in porosity and content of organic matter and low or moderate in clay but high in silt or very fine sand. A fragipan appears cemented and restricts roots. When dry, it is hard or very hard and has a higher bulk density than the horizon or horizons above. When moist, it tends to rupture suddenly under pressure rather than to deform slowly.

Genesis, soil. The mode of origin of the soil. Refers especially to the processes or soil-forming factors responsible for the formation of the solum, or true soil, from the unconsolidated parent material.

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.

Graded stripcropping. Growing crops in strips that grade toward a protected waterway.

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 mm to 7.6 cm) across. 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 cm) across.

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.

Hemic soil material (mucky peat). Organic soil material intermediate in degree of decomposition between the less decomposed fibric material and the more decomposed sapric material.

High-residue crops. Such crops as small grain and corn used for grain. If properly managed, residue from these crops can be used to control erosion until the next crop in the rotation is established. These crops return large amounts of organic matter to the soil.

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.

Hillslope. 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:

O horizon.—An organic layer of fresh and decaying plant residue.

L horizon.—A layer of organic and mineral limnic materials, including coprogenous earth (sedimentary peat), diatomaceous earth, and marl.

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 occurs 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.

Igneous rock. Rock that was formed by cooling and solidification of magma and that has not been changed appreciably by weathering since its formation. Major varieties include plutonic and volcanic rock (e.g., andesite, basalt, and granite).

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.

Irrigation. Application of water to soils to assist in production of crops. Methods of irrigation are:

- Basin.—Water is applied rapidly to nearly level plains surrounded by levees or dikes.
- Border.—Water is applied at the upper end of a strip in which the lateral flow of water is controlled by small earth ridges called border dikes, or borders.
- Controlled flooding.—Water is released at intervals from closely spaced field ditches and distributed uniformly over the field.
- Corrugation.—Water is applied to small, closely spaced furrows or ditches in fields of close-growing crops or in orchards so that it flows in only one direction.
- Drip (or trickle).—Water is applied slowly and under low pressure to the surface of the soil or into the soil through such applicators as emitters, porous tubing, or perforated pipe.
- Furrow.—Water is applied in small ditches made by cultivation implements. Furrows are used for tree and row crops.
- Sprinkler.—Water is sprayed over the soil surface through pipes or nozzles from a pressure system.
- Subirrigation.—Water is applied in open ditches or tile lines until the water table is raised enough to wet the soil.
- Wild flooding.—Water, released at high points, is allowed to flow onto an area without controlled distribution.

Karst (topography). A kind of topography that formed in limestone, gypsum, or other soluble rocks by dissolution and that is characterized by closed depressions, sinkholes, caves, and underground drainage.

Knoll. A small, low, rounded hill rising above adjacent landforms.

K-sat. Saturated hydraulic conductivity. (See Permeability.)

Lacustrine deposit. Material deposited in lake water and exposed when the water level is lowered or the elevation of the land is raised.

Lake plain. A nearly level surface marking the floor of an extinct lake filled by well sorted, generally fine textured, stratified deposits, commonly containing varves.

Lake terrace. A narrow shelf, partly cut and partly built, produced along a lakeshore in front of a scarp line of low cliffs and later exposed when the water level falls.

Landslide. A general, encompassing term for most types of mass movement landforms and processes involving the downslope transport and outward deposition of soil and rock materials caused by gravitational forces; the movement may or may not involve saturated materials. The speed and distance of movement, as well as the amount of soil and rock material, vary greatly.

Large stones (in tables). Rock fragments 3 inches (7.6 cm) 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.

Loess. Material transported and deposited by wind and consisting dominantly of silt-sized 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.

Mass movement. A generic term for the dislodgment and downslope transport of soil and rock material as a unit under direct gravitational stress.

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.

Mesa. A broad, nearly flat topped and commonly isolated landmass bounded by steep slopes or precipitous cliffs and capped by layers of resistant, nearly horizontal rocky material. The summit width is characteristically greater than the height of the bounding escarpments.

Metamorphic rock. Rock of any origin altered in mineralogical composition, chemical composition, or structure by heat, pressure, and movement at depth in the earth's crust. Nearly all such rocks are crystalline.

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 mm (about 0.2 inch); medium, from 5 to 15 mm (about 0.2 to 0.6 inch); and coarse, more than 15 mm (about 0.6 inch).

Mountain. A generic term for an elevated area of the land surface, rising more than 1,000 feet (300 meters) above surrounding lowlands, commonly of restricted summit area (relative to a plateau) and generally having steep sides. A mountain can occur as a single, isolated mass or in a group forming a chain or range. Mountains are formed primarily by tectonic activity and/or volcanic action but can also be formed by differential erosion.

Muck. Dark, finely divided, well decomposed organic soil material. (See Sapric soil material.)

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.

Natric horizon. A special kind of argillic horizon that contains enough exchangeable sodium to have an adverse effect on the physical condition of the subsoil.

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

Paleoterrace. An erosional remnant of a terrace that retains the surface form and alluvial deposits of its origin but was not emplaced by, and commonly does not grade to, a present-day stream or drainage network.

Pan. A compact, dense layer in a soil that impedes the movement of water and the growth of roots. For example, hardpan, fragipan, claypan, plowpan, and traffic pan.

Parent material. The unconsolidated organic and mineral material in which soil forms.

Peat. Unconsolidated material, largely undecomposed organic matter that has accumulated under excess moisture. (See Fibric soil material.)

Ped. An individual natural soil aggregate, such as a granule, a prism, or a block.

Pedisediment. A layer of sediment, eroded from the shoulder and backslope of an erosional slope, that lies on and is being (or was) transported across a gently sloping erosional surface at the foot of a receding hill or mountain slope.

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.

Plateau (geomorphology). A comparatively flat area of great extent and elevation; specifically, an extensive land region that is considerably elevated (more than 100 meters) above the adjacent lower lying terrain, is commonly limited on at least one side by an abrupt descent, and has a flat or nearly level surface. A comparatively large part of a plateau surface is near summit level.

Playa. The generally dry and nearly level lake plain that occupies the lowest parts of closed depressions, such as those on intermontane basin floors. Temporary flooding occurs primarily in response to precipitation and runoff. Playa deposits are fine grained and may or may not have a high water table and saline conditions.

Plinthite. The sesquioxide-rich, humus-poor, highly weathered mixture of clay with quartz and other diluents. It commonly appears as red mottles, usually in platy, polygonal, or reticulate patterns. Plinthite changes irreversibly to an ironstone hardpan or to irregular aggregates on repeated wetting and drying, especially if it is exposed also to heat from the sun. In a moist soil, plinthite can be cut with a spade. It is a form of laterite.

Plowpan. A compacted layer formed in the soil directly below the plowed layer.

Ponding. Standing water on soils in closed depressions. Unless the soils are artificially drained, the water can be removed only by percolation or evapotranspiration.

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.

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

Red beds. Sedimentary strata that are mainly red and are made up largely of sandstone and shale.

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 mm 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.

Saline soil. A soil containing soluble salts in an amount that impairs growth of plants. A saline soil does not contain excess exchangeable sodium.

Sand. As a soil separate, individual rock or mineral fragments from 0.05 millimeter to 2.0 mm across. Most sand grains consist of quartz. As a soil textural class, a soil that is 85 percent or more sand and not more than 10 percent clay.

Sandstone. Sedimentary rock containing dominantly sand-sized particles.

Sapric soil material (muck). The most highly decomposed of all organic soil material. Muck has the least amount of plant fiber, the highest bulk density, and the lowest water content at saturation of all organic soil material.

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.

Scarification. The act of abrading, scratching, loosening, crushing, or modifying the surface to increase water absorption or to provide a more tillable soil.

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 hillslope. 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.

Silica-sesquioxide ratio. The ratio of the number of molecules of silica to the number of molecules of alumina and iron oxide. The more highly weathered soils or their clay fractions in warm-temperate, humid regions, and especially those in the tropics, generally have a low ratio.

Silt. As a soil separate, individual mineral particles that range across 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.

Sinkhole. A closed, circular or elliptical depression, commonly funnel shaped, characterized by subsurface drainage and formed either by dissolution of the surface of underlying bedrock (e.g., limestone, gypsum, or salt) or by collapse of underlying caves within bedrock. Complexes of sinkholes in carbonate-rock terrain are the main components of karst topography.

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 40 percent
Very steep	45+ percent

Classes for complex slopes are as follows:

Nearly level	0 to 3 percent
Gently undulating	1 to 5 percent
Undulating	1 to 8 percent
Rolling	5 to 10 percent
Strongly rolling	5 to 16 percent
Hilly	10 to 30 percent
Steep	20 to 45 percent
Very steep	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.

Sodic (alkali) soil. A soil having so high a degree of alkalinity (pH 8.5 or higher) or so high a percentage of exchangeable sodium (15 percent or more of the total exchangeable bases), or both, that plant growth is restricted.

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	13-30:1
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 mm in equivalent diameter and ranging between specified size limits. The names and sizes, in mm, 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.

Stone line. In a vertical cross section, a line formed by scattered fragments or a discrete layer of angular and subangular rock fragments (commonly a gravel- or cobble-sized lag concentration) that formerly was draped across a topographic surface and was later buried by additional sediments. A stone line generally caps material that was subject to weathering, soil formation, and erosion before burial. Many stone lines seem to be buried erosion pavements, originally formed by sheet and rill erosion across the land surface.

Stones. Rock fragments 10 to 24 inches (25 to 60 cm) across if rounded or 15 to 24 inches (38 to 60 cm) in length if flat.

Stony. Refers to a soil containing stones in numbers that interfere with or prevent tillage.

Strath terrace. A type of stream terrace; formed as an erosional surface cut on bedrock and thinly mantled with stream deposits (alluvium).

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 hillslope. It has a nearly level (planar or only slightly convex) surface.

Surface layer. The soil ordinarily moved in tillage, or its equivalent in uncultivated soil, ranging in depth from 4 to 10 inches (10 to 25 cm). 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.

Talus. Rock fragments of any size or shape (commonly coarse and angular) derived from and lying at the base of a cliff or very steep rock slope. The accumulated mass of such loose broken rock formed chiefly by falling, rolling, or sliding.

Taxadjuncts. Soils that cannot be classified in a series recognized in the classification system. Such soils are named for a series they strongly resemble and are designated as taxadjuncts to that series because they differ in ways too small to be of consequence in interpreting their use and behavior. Soils are recognized as taxadjuncts only when one or more of their characteristics are slightly outside the range defined for the family of the series for which the soils are named.

Terrace (conservation). An embankment, or ridge, constructed across sloping soils on the contour or at a slight angle to the contour. The terrace intercepts surface runoff so that water soaks into the soil or flows slowly to a prepared outlet. A terrace in a field generally is built so that the field can be farmed. A terrace intended mainly for drainage has a deep channel that is maintained in permanent sod.

Terrace (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 hillslope. Toeslopes in profile are commonly gentle and linear and are constructional surfaces forming the lower part of a hillslope continuum that grades to valley or closed-depression floors.

Topsoil. The upper part of the soil, which is the most favorable material for plant growth. It is ordinarily rich in organic matter and is used to topdress roadbanks, lawns, and land affected by mining.

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.

Tuff. A generic term for any consolidated or cemented deposit that is 50 percent or more volcanic ash.

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 hillslope 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.

Variegation. Refers to patterns of contrasting colors assumed to be inherited from the parent material rather than to be the result of poor drainage.

Water bars. Smooth, shallow ditches or depressional areas that are excavated at an angle across a sloping road. They are used to reduce the downward velocity of water and divert it off and away from the road surface. Water bars can easily be driven over if constructed properly.

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.

Windthrow. The uprooting and tipping over of trees by the wind.

Tables

Table 1.--Temperature and Precipitation

(Recorded for the period 1971-2000 at Hico, Texas)

Month	Temperature (Degrees F)					Precipitation (Inches)					
				2 years in 10 will have		Average number of growing degree days*		2 years in 10 will have		Average number of days w/.1 or more	Average total snow fall
	Average daily maximum	Average daily minimum	Average	Maximum temperature higher than	Minimum temperature less than		Average	less than	more than		
January	58.3	32.1	45.2	81	10	64	1.69	0.59	2.83	3	1.0
February	63.0	36.5	49.7	86	12	114	2.31	0.79	3.61	3	0.5
March	70.9	44.2	57.5	90	21	269	2.67	0.89	4.55	4	0.0
April	78.4	51.6	65.0	94	29	449	3.03	1.19	4.58	4	0.0
May	84.7	61.0	72.9	97	42	693	4.90	2.48	6.87	6	0.1
June	91.4	67.4	79.4	102	52	882	3.43	1.15	5.55	4	0.0
July	96.0	71.0	83.5	105	60	1,038	2.22	0.45	3.92	3	0.0
August	95.1	69.7	82.4	104	59	1,004	2.52	0.70	4.24	3	0.0
September	88.6	63.9	76.2	101	42	782	3.24	1.36	4.91	4	0.0
October	79.6	53.5	66.5	95	30	509	3.48	1.14	5.66	4	0.0
November	67.1	42.7	54.9	85	20	205	2.22	1.13	3.11	4	0.2
December	59.3	34.2	46.7	81	11	77	2.09	0.67	3.05	3	0.4
Yearly:	---	---	---	---	---	---	---	---	---	---	---
Average	77.7	52.3	65.0	---	---	---	---	---	---	---	---
Extreme	111	-7	---	107	6	---	---	---	---	---	---
Total	---	---	---	---	---	6,087	33.81	22.44	40.72	45	2.1

Average number of days per year with at least 1 inch of snow on the ground: 1

*A growing degree day is a unit of heat available for plant growth. It can be calculated by adding the maximum and minimum daily temperatures, dividing the sum by 2, and subtracting the temperature below which growth is minimal for the principal crops in the area. (Threshold: 50.0 degrees F.)

Table 2.--Freeze Dates in Spring and Fall

(Recorded for the period 1971-2000 at Hico, Texas)

Probability	Temperature		
	24°F or lower	28°F or lower	32°F or lower
Last freezing temperature in spring:			
1 year in 10 later than--	March 11	April 4	April 14
2 years in 10 later than--	March 4	March 27	April 7
5 years in 10 later than--	February 20	March 10	March 25
First freezing temperature in fall:			
1 year in 10 earlier than--	November 6	October 31	October 25
2 years in 10 earlier than--	November 13	November 6	October 30
5 years in 10 earlier than--	November 26	November 18	November 9

Table 3.--Growing Season

(Recorded for the period 1971-2000 at Hico, Texas)

Probability	Daily Minimum Temperature		
	Number of days less than 24°F	Number of days less than 28°F	Number of days less than 32°F
9 years in 10	250	223	205
8 years in 10	260	233	213
5 years in 10	278	254	229
2 years in 10	297	274	245
1 year in 10	306	285	253

Table 4.--Acreage and Proportionate Extent of the Soils

Map symbol	Soil name	Acres	Percent
BaB	Bastsil loamy fine sand, 1 to 3 percent slopes	3,088	0.6
BaC2	Bastsil fine sandy loam, 2 to 5 percent slopes, eroded	849	0.2
BgB	Bolar gravelly clay loam, 1 to 4 percent slopes	4,555	0.9
Bo	Bosque clay loam, rarely flooded	7,627	1.4
Bs	Bosque clay loam, occasionally flooded	15,640	2.9
BtC	Brackett gravelly clay loam, 1 to 5 percent slopes	3,860	0.7
BtE	Brackett gravelly clay loam, 8 to 30 percent slopes	11,210	2.1
BxD	Brackett-Maloterre complex, 2 to 12 percent slopes	20,040	3.7
ByC	Brackett-Pidcoke complex, 1 to 5 percent slopes	22,063	4.1
CdB	Caradan silty clay, 1 to 3 percent slopes	2,084	0.4
ChB	Cho gravelly clay loam, 1 to 3 percent slopes	11,132	2.1
CoC	Cisco fine sandy loam, 1 to 5 percent slopes	463	*
CoC2	Cisco fine sandy loam, 2 to 5 percent slopes, eroded	25,367	4.7
CrD	Cranfill gravelly clay loam, 3 to 8 percent slopes	12,707	2.4
CrE	Cranfill gravelly clay loam, 8 to 20 percent slopes	5,620	1.1
DnB	Denton silty clay, 1 to 3 percent slopes	6,531	1.2
DsB	Desan fine sand, 1 to 3 percent slopes	726	0.1
EcB	Eckrant very cobbly silty clay, 1 to 3 percent slopes	2,903	0.5
ErB	Eckrant-Rock outcrop complex, 1 to 5 percent slopes	24,055	4.5
EvB	Evant gravelly silty clay, 1 to 3 percent slopes	10,483	2.0
Fr	Frio silty clay, occasionally flooded	4,817	0.9
KrB	Krum silty clay, 1 to 5 percent slopes	27,544	5.2
La	Lamkin clay loam, occasionally flooded	432	*
LpB	Lampasas gravelly clay, 1 to 3 percent slopes	7,658	1.4
MnB	Minwells fine sandy loam, 1 to 3 percent slopes	2,795	0.5
NuB	Nuff silty clay loam, 1 to 3 percent slopes	13,046	2.4
NuC	Nuff silty clay loam, 2 to 6 percent slopes, very stony	57,867	10.8
OgB	Oglesby gravelly silty clay, 1 to 3 percent slopes	10,422	2.0
PdB	Pedernales fine sandy loam, 1 to 3 percent slopes	4,555	0.9
PdC2	Pedernales fine sandy loam, 3 to 5 percent slopes, eroded	3,891	0.7
PkB	Pidcoke gravelly clay loam, 1 to 3 percent slopes	22,526	4.2
ReB	Real gravelly clay loam, 1 to 3 percent slopes	13,834	2.6
ReC	Real clay loam, 1 to 5 percent slopes, very stony	926	0.2
ReD	Real-Doss complex, 1 to 8 percent slopes	65,911	12.3
ReF	Real-Rock outcrop complex, 8 to 30 percent slopes	17,323	3.2
RsC	Riesel gravelly fine sandy loam, 1 to 5 percent slopes	1,297	0.2
RuB	Rumley clay loam, 1 to 3 percent slopes	5,080	1.0
SaB	San Saba clay, 0 to 3 percent slopes	3,536	0.7
SeC	Seawillow clay loam, 3 to 8 percent slopes	1,760	0.3
SsB	Slidell silty clay, 1 to 3 percent slopes	34,368	6.4
TaB	Tarpley clay loam, 1 to 3 percent slopes	1,667	0.3
ToC	Topsey clay loam, 1 to 5 percent slopes	20,766	3.9
ToD	Topsey clay loam, 5 to 8 percent slopes	1,189	0.2
VnB	Venus loam, 1 to 3 percent slopes	7,241	1.4
Vs	Venus loam, rarely flooded	3,381	0.6
WsC	Wise clay loam, 3 to 5 percent slopes	10,206	1.9
	Water areas more than 40 acres in size	185	*
	Total	535,226	100.0

* Less than 0.1 percent.

Table 5.--Land Capability and Yields Per Acre of Crops and Pasture

(Yields are those that can be expected under a high level of management. Absence of a yield indicates that the soil is not suited to the crop or the crop generally is not grown on the soil.)

Map symbol and soil name	Land capability	Grain sorghum	Improved bermudagrass	Oats	Wheat
		Bu	AUM	AUM	Bu
BaB: Bastsil	3e	60.00	5.50	65.00	35.00
BaC2: Bastsil	3e	75.00	6.00	75.00	40.00
BgB: Bolar	4e	40.00	5.00	35.00	35.00
Bo: Bosque	1	70.00	8.00	65.00	45.00
Bs: Bosque	2w	65.00	7.00	60.00	45.00
BtC: Brackett	4e	---	2.00	30.00	15.00
BtE: Brackett	7s	---	---	---	---
BxD: Brackett Maloterre	7s 7s	---	---	---	---
ByC: Brackett Pidcoke	4e 4s	---	2.00	30.00	15.00
CdB: Caradan	3e	45.00	5.50	40.00	
ChB: Cho	4s	---	---	---	15.00
CoC: Cisco	3e	40.00	5.50	---	
CoC2: Cisco	3e	30.00	4.50	---	---
CrD: Cranfill	4e	25.00	3.00	30.00	15.00
CrE: Cranfill	6e	---	2.50	---	---
DnB: Denton	2e	75.00	7.00	65.00	40.00
DsB: Desan	3s	---	5.50	---	---
EcB: Eckrant	7s	---	---	---	---
ErB: Eckrant Rock Outcrop	7s 8s	---	---	---	---

Table 5.--Land Capability and Yields per Acre of Crops and Pasture--Continued

Map symbol and soil name	Land capability	Grain sorghum	Improved bermudagrass	Oats	Wheat
		Bu	AUM	AUM	Bu
EvB: Evant	4s	---	3.00	30.00	25.00
Fr: Frio	2w	55.00	7.00	60.00	---
KrB: Krum	3e	65.00	6.00	50.00	35.00
La: Lamkin	2w	70.00	7.00	60.00	---
LpB: Lampasas	6s	---	---	---	---
MnB: Minwells	2e	45.00	5.50	40.00	---
NuB: Nuff	2e	75.00	7.00	---	40.00
NuC: Nuff	6s	---	---	---	---
OgB: Oglesby	4s	---	3.00	35.00	30.00
PdB: Pedernales	2e	40.00	4.00	60.00	25.00
PdC2: Pedernales	3e	25.00	3.50	35.00	20.00
PkB: Pidcoke	4s	---	2.00	30.00	15.00
ReB: Real	6s	---	---	---	---
ReC: Real	6s	---	---	---	---
ReD: Real Doss	6s 4e	---	---	---	---
ReF: Real Rock Outcrop	7s 8s	---	---	---	---
RsC: Riesel	6s	---	3.50	---	---
RuB: Rumley	2e	40.00	7.00	75.00	40.00
SaB: San Saba	3e	75.00	6.00	55.00	40.00
SeC: Seawillow	4e	35.00	4.50	30.00	---
SsB: Slidell	2e	85.00	7.00	---	40.00

Table 5.--Land Capability and Yields per Acre of Crops and Pasture--Continued

Map symbol and soil name	Land capability	Grain sorghum	Improved bermudagrass	Oats	Wheat
		Bu	AUM	AUM	Bu
TaB: Tarpley	4e	25.00	2.50	30.00	---
ToC: Topsey	3e	---	5.00	40.00	25.00
ToD: Topsey	4e	---	4.00	35.00	20.00
VnB: Venus	2e	70.00	7.00	60.00	---
Vs: Venus	1	80.00	7.00	65.00	---
WsC: Wise	4e	---	4.00	---	---

Table 6.--Rangeland Productivity

(Only the soils that support rangeland vegetation suitable for grazing are rated.)

Map symbol and soil name	Ecological site	Total dry-weight production		
		Favorable year	Normal year	Unfavorable year
		Lb/acre	Lb/acre	Lb/acre
BaB:				
Bastsil	Loamy Sand PE 36-52	6,500	5,000	3,500
BaC2:				
Bastsil	Sandy Loam PE 36-52	6,500	5,000	3,500
BgB:				
Bolar	Clay Loam PE 40-54	6,500	5,000	3,000
Bo:				
Bosque	Loamy Bottomland PE 40-54	6,500	5,000	3,500
Bs:				
Bosque	Loamy Bottomland PE 40-54	6,500	5,000	3,500
BtC:				
Brackett	Adobe PE 40-54	4,000	3,200	1,800
BtE:				
Brackett	Steep Adobe PE 40-54	3,000	2,200	1,500
BxD:				
Brackett	Adobe PE 40-54	4,000	3,200	1,800
Maloterre	Very Shallow PE 40-54	1,500	1,200	750
ByC:				
Brackett	Adobe PE 40-54	4,000	3,200	1,800
Pidcoke	Shallow PE 40-54	4,000	3,000	1,800
CdB:				
Caradan	Deep Redland PE 40-54	6,000	5,000	3,000
ChB:				
Cho	Shallow PE 40-54	2,500	2,000	1,000
CoC:				
Cisco	Sandy Loam PE 40-54	5,000	4,000	3,000
CoC2:				
Cisco	Sandy Loam PE 40-54	5,000	4,000	3,000
CrD:				
Cranfill	Adobe PE 40-54	4,200	3,500	1,800
CrE:				
Cranfill	Steep Adobe PE 40-54	4,200	3,500	1,800
DnB:				
Denton	Clay Loam PE 40-54	6,500	5,000	3,000
DsB:				
Desan	Deep Sand PE 36-52	3,000	2,000	1,000
EcB:				
Eckrant	Low Stony Hill PE 40-54	3,000	2,500	1,500
ErB:				
Eckrant	Low Stony Hill PE 40-54	3,000	2,500	1,500
Rock Outcrop	---	---	---	---
EvB:				
Evant	Redland PE 40-54	5,000	3,500	2,500

Table 6.--Rangeland Productivity—Continued

Map symbol and soil name	Ecological site	Total dry-weight production		
		Favorable year	Normal year	Unfavorable year
		Lb/acre	Lb/acre	Lb/acre
Fr:				
Frio	Loamy Bottomland PE 40-54	5,500	4,000	3,000
KrB:				
Krum	Clay Loam PE 40-54	6,500	6,000	4,000
La:				
Lamkin	Loamy Bottomland PE 40-54	6,000	4,800	2,500
LpB:				
Lampasas	Shallow PE 40-54	3,500	2,500	1,800
MnB:				
Minwells	Sandy Loam PE 40-54	4,000	3,000	2,000
NuB:				
Nuff	Clay Loam PE 40-54	6,500	5,000	3,000
NuC:				
Nuff	Stony Clay Loam PE 40-54	5,500	4,500	2,500
OgB:				
Oglesby	Shallow PE 40-54	5,000	4,500	2,500
PdB:				
Pedernales	Tight Sandy Loam PE 36-52	3,500	3,000	1,500
PdC2:				
Pedernales	Tight Sandy Loam PE 36-52	3,500	3,000	1,500
PkB:				
Pidcoke	Shallow PE 40-54	4,000	3,000	1,800
ReB:				
Real	Adobe PE 40-54	3,500	2,500	1,500
ReC:				
Real	Adobe PE 40-54	3,500	2,500	1,500
ReD:				
Real	Adobe PE 40-54	3,500	2,500	1,500
Doss	Shallow PE 40-54	4,000	3,000	1,800
ReF:				
Real	Steep Adobe PE 40-54	3,500	2,500	1,500
Rock Outcrop	---	---	---	---
RsC:				
Riesel	Gravelly PE 44-64	4,500	3,500	2,000
RuB:				
Rumley	Clay Loam PE 40-54	6,500	5,500	3,000
SaB:				
San Saba	Blackland PE 40-54	6,000	5,000	3,500
SeC:				
Seawillow	Clay Loam PE 40-54	5,000	4,000	2,500
SsB:				
Slidell	Blackland PE 40-54	6,000	5,000	3,000
TaB:				
Tarpley	Redland PE 40-54	5,000	3,500	2,000

Table 6.--Rangeland Productivity—Continued

Map symbol and soil name	Ecological site	Total dry-weight production		
		Favorable year	Normal year	Unfavorable year
		Lb/acre	Lb/acre	Lb/acre
ToC:				
Topsey	Clay Loam PE 40-54	6,500	5,000	3,000
ToD:				
Topsey	Clay Loam PE 40-54	6,500	5,000	3,000
VnB:				
Venus	Clay Loam PE 40-54	6,500	5,000	3,000
Vs:				
Venus	Loamy Bottomland PE 40-54	5,500	4,500	3,000
WsC:				
Wise	Clay Loam PE 40-54	6,000	4,500	3,000

Table 7.--Recreational Development

(The information in this table indicates the dominant soil condition but does not eliminate the need for onsite investigation. See text for definitions of terms used in this table. Absence of an entry indicates that no rating is applicable.)

Map symbol and soil name	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf course fairways
BaB:					
Bastsil	Slight	Slight	Moderate: slope	Slight	Slight
BaC2:					
Bastsil	Slight	Slight	Moderate: slope	Slight	Slight
BgB:					
Bolar	Moderate: small stones	Moderate: small stones	Severe: small stones	Slight	Moderate: large stones small stones thin layer
Bo:					
Bosque	Severe: flooding	Slight	Slight	Slight	Slight
Bs:					
Bosque	Severe: flooding	Slight	Moderate: flooding	Slight	Moderate: flooding
BtC:					
Brackett	Moderate: small stones	Moderate: small stones	Severe: small stones	Slight	Moderate: small stones droughty
BtE:					
Brackett	Severe: slope	Severe: slope	Severe: slope small stones	Severe: slope	Severe: slope
BxD:					
Brackett	Moderate: small stones	Moderate: small stones	Severe: slope small stones	Slight	Moderate: small stones droughty
Maloterre	Severe: depth to rock	Severe: depth to rock	Severe: slope small stones depth to rock	Slight	Severe: depth to rock
ByC:					
Brackett	Moderate: small stones	Moderate: small stones	Severe: small stones	Slight	Moderate: small stones droughty
Pidcoke	Severe: depth to rock	Severe: depth to rock	Severe: depth to rock	Slight	Severe: depth to rock
CdB:					
Caradan	Moderate: percs slowly too clayey	Moderate: percs slowly too clayey	Moderate: slope small stones too clayey	Moderate: too clayey	Severe: too clayey
ChB:					
Cho	Severe: cemented pan	Severe: cemented pan	Severe: cemented pan small stones	Slight	Severe: cemented pan
CoC:					
Cisco	Slight	Slight	Moderate: slope	Slight	Slight
CoC2:					
Cisco	Slight	Slight	Moderate: slope	Slight	Slight
CrD:					
Cranfill	Moderate: small stones	Moderate: small stones	Severe: small stones	Slight	Moderate: small stones droughty

Table 7.--Recreational Development--Continued

Map symbol and soil name	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf course fairways
CrE:					
Cranfill	Moderate: slope, small stones	Moderate: slope, small stones	Severe: slope, small stones	Slight	Moderate: slope, small stones, droughty
DnB:					
Denton	Moderate: too clayey	Moderate: too clayey	Moderate: slope, too clayey	Moderate: too clayey	Severe: too clayey
DsB:					
Desan	Severe: too sandy	Severe: too sandy	Severe: too sandy	Severe: too sandy	Severe: droughty
EcB:					
Eckrant	Severe: depth to rock	Severe: depth to rock	Severe: large stones, small stones	Moderate: large stones	Severe: large stones, depth to rock
ErB:					
Eckrant	Severe: depth to rock	Severe: depth to rock	Severe: large stones, small stones	Moderate: large stones	Severe: large stones, depth to rock
Rock Outcrop	Severe: depth to rock	Severe: depth to rock	Severe: depth to rock	Slight	Severe: depth to rock
EvB:					
Evant	Severe: cemented pan	Severe: cemented pan	Severe: cemented pan, small stones	Moderate: too clayey	Severe: cemented pan, too clayey
Fr:					
Frio	Severe: flooding	Moderate: too clayey	Moderate: small stones, too clayey	Moderate: too clayey	Severe: too clayey
KrB:					
Krum	Moderate: too clayey	Moderate: too clayey	Moderate: slope, small stones	Moderate: too clayey	Severe: too clayey
La:					
Lamkin	Severe: flooding	Slight	Moderate: flooding	Slight	Moderate: flooding
LpB:					
Lampasas	Severe: small stones	Severe: small stones	Severe: small stones	Moderate: too clayey	Severe: small stones, too clayey, droughty
MnB:					
Minwells	Slight	Slight	Moderate: slope	Slight	Slight
NuB:					
Nuff	Slight	Slight	Moderate: slope	Slight	Slight
NuC:					
Nuff	Moderate: large stones	Moderate: large stones	Severe: slope, large stones	Moderate: large stones	Severe: large stones
OgB:					
Oglesby	Severe: depth to rock	Severe: depth to rock	Severe: small stones, depth to rock	Moderate: too clayey	Severe: too clayey, depth to rock
PdB:					
Pedernales	Slight	Slight	Moderate: slope	Slight	Slight
PdC2:					
Pedernales	Slight	Slight	Moderate: slope	Slight	Slight
PkB:					
Pidcoke	Severe: depth to rock	Severe: depth to rock	Severe: small stones, depth to rock	Slight	Severe: depth to rock

Table 7.--Recreational Development--Continued

Map symbol and soil name	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf course fairways
ReB:					
Real	Severe: depth to rock	Severe: depth to rock	Severe: small stones depth to rock	Slight	Severe: depth to rock
ReC:					
Real	Severe: small stones depth to rock	Severe: small stones depth to rock	Severe: large stones small stones	Severe: small stones	Severe: small stones depth to rock
ReD:					
Real	Severe: small stones depth to rock	Severe: small stones depth to rock	Severe: small stones depth to rock	Severe: small stones	Severe: small stones depth to rock
Doss	Severe: depth to rock	Severe: depth to rock	Severe: depth to rock	Slight	Severe: depth to rock
ReF:					
Real	Severe: slope depth to rock	Severe: slope depth to rock	Severe: slope small stones	Moderate: slope	Severe: slope depth to rock
Rock Outcrop	Severe: slope depth to rock	Severe: slope depth to rock	Severe: slope depth to rock	Moderate: slope	Severe: slope depth to rock
RsC:					
Riesel	Severe: small stones	Severe: small stones	Severe: small stones	Severe: small stones	Severe: small stones droughty
RuB:					
Rumley	Slight	Slight	Moderate: slope	Slight	Slight
SaB:					
San Saba	Moderate: percs slowly too clayey	Moderate: percs slowly too clayey	Moderate: slope small stones too clayey	Moderate: too clayey	Severe: too clayey
SeC:					
Seawillow	Slight	Slight	Severe: slope small stones	Slight	Moderate: large stones
SsB:					
Slidell	Moderate: percs slowly too clayey	Moderate: percs slowly too clayey	Moderate: percs slowly slope too clayey	Moderate: too clayey	Severe: too clayey
TaB:					
Tarpley	Severe: depth to rock	Severe: depth to rock	Severe: depth to rock	Slight	Severe: depth to rock
ToC:					
Topsey	Slight	Slight	Moderate: slope small stones	Slight	Slight
ToD:					
Topsey	Slight	Slight	Severe: slope	Slight	Slight
VnB:					
Venus	Slight	Slight	Moderate: slope	Slight	Slight
Vs:					
Venus	Severe: flooding	Slight	Slight	Slight	Slight
WsC:					
Wise	Slight	Slight	Moderate: slope	Slight	Moderate: droughty

Table 8.--Wildlife Habitat

(See text for definitions of terms used in this table. Absence of an entry indicates that no rating is applicable.)

Map symbol and soil name	Potential for habitat elements						Potential as habitat for--		
	Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Shrubs	Wetland plants	Shallow water areas	Openland wildlife	Wetland wildlife	Rangeland wildlife
BaB:									
Bastsil	Fair	Fair	Good	Good	Poor	Very poor	Fair	Very poor	Good
BaC2:									
Bastsil	Fair	Fair	Good	Good	Poor	Very poor	Fair	Very poor	Good
BgB:									
Bolar	Fair	Good	Fair	Fair	Poor	Very poor	Fair	Very poor	Fair
Bo:									
Bosque	Good	Good	Good	Good	Poor	Very poor	Good	Very poor	Good
Bs:									
Bosque	Good	Good	Good	Good	Poor	Very	Good	Very	Good
BtC:									
Brackett	Fair	Good	Fair	Fair	Poor	Very poor	Fair	Very poor	Fair
BtE:									
Brackett	Very poor	Very poor	Fair	Fair	Very poor	Very poor	Very poor	Very poor	Fair
BxD:									
Brackett	Poor	Poor	Fair	Fair	Poor	Very poor	Poor	Very poor	Fair
Maloterre	Very poor	Very poor	Poor	Very poor	Very poor	Very poor	Very poor	Very poor	Very poor
ByC:									
Brackett	Fair	Good	Fair	Fair	Poor	Very poor	Fair	Very poor	Fair
Pidcoke	Poor	Poor	Poor	Fair	Very poor	Very poor	Poor	Very poor	Poor
CdB:									
Caradan	Fair	Fair	Fair	Fair	Poor	Very poor	Fair	Very poor	Fair
ChB:									
Cho	Poor	Poor	Poor	Poor	Poor	Very poor	Poor	Very poor	Poor
CoC:									
Cisco	Good	Good	Good	Good	Poor	Very poor	Good	Very poor	Good
CoC2:									
Cisco	Fair	Good	Good	Good	Poor	Very poor	Good	Very poor	Good
CrD:									
Cranfill	Fair	Good	Fair	Fair	Very poor	Very poor	Fair	Very poor	Fair
CrE:									
Cranfill	Poor	Fair	Fair	Fair	Very poor	Very poor	Fair	Very poor	Fair
DnB:									
Denton	Good	Good	Fair	Fair	Very poor	Very poor	Good	Very poor	Fair
DsB:									
Desan	Fair	Good	Fair	Fair	Poor	Very poor	Fair	Very poor	Fair

Table 8.--Wildlife Habitat--Continued

Map symbol and soil name	Potential for habitat elements						Potential as habitat for--		
	Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Shrubs	Wetland plants	Shallow water areas	Open-land wildlife	Wetland wildlife	Rangeland wildlife
EcB:									
Eckrant	Very poor	Very poor	Fair	Fair	Very poor	Very poor	Poor	Very poor	Fair
ErB:									
Eckrant	Very poor	Very poor	Fair	Fair	Very poor	Very poor	Poor	Very poor	Fair
Rock Outcrop	---	---	---	---	---	---	---	---	---
EvB:									
Evant	Fair	Fair	Fair	Fair	Poor	Very poor	Fair	Very poor	Fair
Fr:									
Frio	Good	Good	Fair	Good	Poor	Very poor	Good	Very poor	Fair
KrB:									
Krum	Fair	Good	Fair	Fair	Poor	Very poor	Fair	Very poor	Fair
La:									
Lamkin	Good	Good	Fair	Good	Very poor	Very poor	Good	Very poor	Fair
LpB:									
Lampasas	Very poor	Very poor	Fair	Fair	Very poor	Very poor	Poor	Very poor	Fair
MnB:									
Minwells	Good	Good	Good	Good	Very poor	Very poor	Good	Very poor	Good
NuB:									
Nuff	Good	Good	Fair	Fair	Very poor	Very poor	Good	Very poor	Fair
NuC:									
Nuff	Poor	Fair	Fair	Fair	Poor	Very poor	Fair	Very poor	Fair
OgB:									
Oglesby	Fair	Fair	Fair	Fair	Poor	Poor	Fair	Poor	Fair
PdB:									
Pedernales	Good	Good	Good	Good	Poor	Very poor	Good	Very poor	Good
PdC2:									
Pedernales	Fair	Good	Good	Good	Poor	Very poor	Good	Very poor	Good
PkB:									
Pidcoke	Poor	Poor	Poor	Fair	Very poor	Very poor	Poor	Very poor	Poor
ReB:									
Real	Very poor	Poor	Poor	Fair	Poor	Very poor	Poor	Very poor	Poor
ReC:									
Real	Very poor	Poor	Poor	Fair	Poor	Very poor	Poor	Very poor	Poor
ReD:									
Real	Very poor	Poor	Poor	Fair	Poor	Very poor	Poor	Very poor	Poor
Doss	Fair	Good	Fair	Fair	Poor	Very poor	Fair	Very poor	Fair
ReF:									
Real	Very poor	Very poor	Poor	Fair	Very poor	Very poor	Very poor	Very poor	Poor
Rock Outcrop	---	---	---	---	---	---	---	---	---

Table 8.--Wildlife Habitat--Continued

Map symbol and soil name	Potential for habitat elements						Potential as habitat for--		
	Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Shrubs	Wetland plants	Shallow water areas	Open-land wildlife	Wetland wildlife	Rangeland wildlife
RsC:									
Riesel	Poor	Poor	Good	Good	Poor	Very poor	Fair	Very poor	Good
RuB:									
Rumley	Good	Good	Fair	Fair	Poor	Very poor	Good	Very poor	Fair
SaB:									
San Saba	Fair	Fair	Fair	Fair	Poor	Poor	Fair	Poor	Fair
SeC:									
Seawillow	Fair	Good	Fair	Good	Poor	Very poor	Fair	Very poor	Fair
SsB:									
Slidell	Good	Good	Fair	Fair	Poor	Very poor	Good	Very poor	Fair
TaB:									
Tarpley	Fair	Fair	Fair	Fair	Poor	Very poor	Fair	Very poor	Fair
ToC:									
Topsey	Fair	Good	Fair	Fair	Poor	Very poor	Fair	Very poor	Fair
ToD:									
Topsey	Fair	Good	Fair	Fair	Poor	Very poor	Fair	Very poor	Fair
VnB:									
Venus	Good	Good	Good	Fair	Poor	Very poor	Good	Very poor	Fair
Vs:									
Venus	Good	Good	Good	Fair	Poor	Very poor	Good	Very poor	Fair
WsC:									
Wise	Fair	Fair	Fair	Fair	Poor	Very poor	Fair	Very poor	Fair

Table 9.--Building Site Development

(The information in this table indicates the dominant soil condition but does not eliminate the need for onsite investigation. See text for definitions of terms used in this table. Absence of an entry indicates that no rating is applicable.)

Map symbol and soil name	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
BaB:						
Bastsil	Slight	Moderate: shrink-swell	Moderate: shrink-swell	Moderate: shrink-swell	Moderate: low strength shrink-swell	Slight
BaC2:						
Bastsil	Slight	Moderate: shrink-swell	Moderate: shrink-swell	Moderate: shrink-swell	Moderate: low strength shrink-swell	Slight
BgB:						
Bolar	Moderate: depth to rock	Moderate: shrink-swell	Moderate: shrink-swell depth to rock	Moderate: shrink-swell	Severe: low strength	Moderate: large stones small stones thin layer
Bo:						
Bosque	Moderate: too clayey	Severe: flooding	Severe: flooding	Severe: flooding	Severe: low strength	Slight
Bs:						
Bosque	Moderate: flooding too clayey	Severe: flooding	Severe: flooding	Severe: flooding	Severe: flooding low strength	Moderate: flooding
BtC:						
Brackett	Moderate: too clayey	Slight	Slight	Slight	Severe: low strength	Moderate: small stones droughty
BtE:						
Brackett	Severe: slope	Severe: slope	Severe: slope	Severe: slope	Severe: low strength slope	Severe: slope
BxD:						
Brackett	Moderate: too clayey	Slight	Slight	Moderate: slope	Severe: low strength	Moderate: small stones droughty
Maloterre	Severe: depth to rock	Severe: depth to rock	Severe: depth to rock	Severe: depth to rock	Severe: depth to rock	Severe: depth to rock
ByC:						
Brackett	Moderate: too clayey	Slight	Slight	Slight	Severe: low strength	Moderate: small stones droughty
Pidcoke	Severe: depth to rock	Severe: depth to rock	Severe: depth to rock	Severe: depth to rock	Severe: depth to rock	Severe: depth to rock

Table 9.--Building Site Development--Continued

Map symbol and soil name	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
CdB:						
Caradan	Moderate: too clayey	Severe: shrink-swell	Severe: shrink-swell	Severe: shrink-swell	Severe: low strength shrink-swell	Severe: too clayey
ChB:						
Cho	Severe: cemented pan	Moderate: cemented pan	Severe: cemented pan	Moderate: cemented pan	Moderate: cemented pan	Severe: cemented pan
CoC:						
Cisco	Severe: cutbanks cave	Moderate: shrink-swell	Moderate: shrink-swell	Moderate: shrink-swell	Moderate: low strength shrink-swell	Slight
CoC2:						
Cisco	Severe: cutbanks cave	Moderate: shrink-swell	Moderate: shrink-swell	Moderate: shrink-swell	Moderate: low strength shrink-swell	Slight
CrD:						
Cranfill	Slight	Moderate: shrink-swell	Moderate: shrink-swell	Moderate: shrink-swell slope	Moderate: low strength shrink-swell	Moderate: small stones droughty
CrE:						
Cranfill	Moderate: slope	Moderate: shrink-swell slope	Moderate: shrink-swell slope	Severe: slope	Moderate: low strength shrink-swell slope	Moderate: slope small stones droughty
DnB:						
Denton	Moderate: depth to rock	Moderate: shrink-swell	Moderate: shrink-swell depth to rock	Moderate: shrink-swell	Severe: low strength	Severe: too clayey
DsB:						
Desan	Severe: cutbanks cave	Slight	Slight	Slight	Slight	Severe: droughty
EcB:						
Eckrant	Severe: large stones depth to rock	Severe: large stones depth to rock	Severe: large stones depth to rock	Severe: large stones depth to rock	Severe: low strength depth to rock	Severe: large stones depth to rock
ErB:						
Eckrant	Severe: large stones depth to rock	Severe: large stones depth to rock	Severe: large stones depth to rock	Severe: large stones depth to rock	Severe: low strength depth to rock	Severe: large stones depth to rock
Rock Outcrop	Severe: depth to rock	Severe: depth to rock	Severe: depth to rock	Severe: depth to rock	Severe: depth to rock	Severe: depth to rock
EvB:						
Evant	Severe: cemented pan	Severe: shrink-swell	Severe: cemented pan shrink-swell	Severe: shrink-swell	Severe: low strength shrink-swell	Severe: cemented pan too clayey

Table 9.--Building Site Development--Continued

Map symbol and soil name	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
Fr:						
Frio	Moderate: flooding, too clayey	Severe: flooding	Severe: flooding	Severe: flooding	Severe: flooding, low strength	Severe: too clayey
KrB:						
Krum	Moderate: too clayey	Severe: shrink-swell	Severe: shrink-swell	Severe: shrink-swell	Severe: low strength, shrink-swell	Severe: too clayey
La:						
Lamkin	Moderate: flooding	Severe: flooding	Severe: flooding	Severe: flooding	Severe: flooding, low strength	Moderate: flooding
LpB:						
Lampasas	Slight	Slight	Slight	Slight	Slight	Severe: small stones, too clayey, droughty
MnB:						
Minwells	Severe: cutbanks cave	Moderate: shrink-swell	Moderate: shrink-swell	Moderate: shrink-swell	Severe: low strength	Slight
NuB:						
Nuff	Moderate: too clayey	Moderate: shrink-swell	Moderate: shrink-swell	Moderate: shrink-swell	Severe: low strength	Slight
NuC:						
Nuff	Moderate: too clayey	Moderate: shrink-swell	Moderate: shrink-swell	Moderate: shrink-swell, slope	Severe: low strength	Severe: large stones
OgB:						
Oglesby	Severe: depth to rock	Severe: shrink-swell, depth to rock	Severe: shrink-swell, depth to rock	Severe: shrink-swell, depth to rock	Severe: low strength, shrink-swell, depth to rock	Severe: too clayey, depth to rock
PdB:						
Pedernales	Moderate: too clayey	Moderate: shrink-swell	Moderate: shrink-swell	Moderate: shrink-swell	Severe: low strength	Slight
PdC2:						
Pedernales	Moderate: too clayey	Moderate: shrink-swell	Moderate: shrink-swell	Moderate: shrink-swell, slope	Severe: low strength	Slight
PkB:						
Pidcoke	Severe: depth to rock	Severe: depth to rock	Severe: depth to rock	Severe: depth to rock	Severe: depth to rock	Severe: depth to rock
ReB:						
Real	Severe: cemented pan, depth to rock	Moderate: cemented pan, depth to rock	Severe: cemented pan, depth to rock	Moderate: cemented pan, depth to rock	Moderate: cemented pan, depth to rock	Severe: depth to rock

Table 9.--Building Site Development--Continued

Map symbol and soil name	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
ReC:						
Real	Severe: cemented pan depth to rock	Moderate: cemented pan depth to rock	Severe: cemented pan depth to rock	Moderate: cemented pan depth to rock	Moderate: cemented pan depth to rock	Severe: small stones depth to rock
ReD:						
Real	Severe: cemented pan depth to rock	Moderate: cemented pan depth to rock	Severe: cemented pan depth to rock	Moderate: cemented pan slope depth to rock	Moderate: cemented pan depth to rock	Severe: small stones depth to rock
Doss	Severe: depth to rock	Moderate: shrink-swell depth to rock	Severe: depth to rock	Moderate: shrink-swell slope depth to rock	Severe: low strength	Severe: depth to rock
ReF:						
Real	Severe: cemented pan slope depth to rock	Severe: slope	Severe: cemented pan slope depth to rock	Severe: slope	Severe: slope	Severe: slope depth to rock
Rock Outcrop	Severe: slope depth to rock	Severe: slope depth to rock	Severe: slope depth to rock	Severe: slope depth to rock	Severe: slope depth to rock	Severe: slope depth to rock
RsC:						
Riesel	Severe: cutbanks cave	Moderate: shrink-swell	Moderate: shrink-swell	Moderate: shrink-swell	Moderate: shrink-swell	Severe: small stones droughty
RuB:						
Rumley	Moderate: too clayey	Severe: shrink-swell	Severe: shrink-swell	Severe: shrink-swell	Severe: low strength shrink-swell	Slight
SaB:						
San Saba	Severe: cutbanks cave depth to rock	Severe: shrink-swell	Severe: shrink-swell depth to rock	Severe: shrink-swell	Severe: low strength shrink-swell	Severe: too clayey
SeC:						
Seawillow	Slight	Moderate: shrink-swell	Moderate: shrink-swell	Moderate: shrink-swell slope	Severe: low strength	Moderate: large stones
SsB:						
Slidell	Severe: cutbanks cave	Severe: shrink-swell	Severe: shrink-swell	Severe: shrink-swell	Severe: low strength shrink-swell	Severe: too clayey

Table 9.--Building Site Development--Continued

Map symbol and soil name	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
TaB:						
Tarpley	Severe: depth to rock	Severe: shrink-swell depth to rock	Severe: shrink-swell depth to rock	Severe: shrink-swell depth to rock	Severe: low strength shrink-swell depth to rock	Severe: depth to rock
ToC:						
Topsey	Slight	Moderate: shrink-swell	Moderate: shrink-swell	Moderate: shrink-swell	Severe: low strength	Slight
ToD:						
Topsey	Slight	Moderate: shrink-swell	Moderate: shrink-swell	Moderate: shrink-swell slope	Severe: low strength	Slight
VnB:						
Venus	Slight	Slight	Slight	Slight	Moderate: low strength	Slight
Vs:						
Venus	Slight	Severe: flooding	Severe: flooding	Severe: flooding	Moderate: flooding low strength	Slight
WsC:						
Wise	Slight	Moderate: shrink-swell	Moderate: shrink-swell	Moderate: shrink-swell slope	Severe: low strength	Moderate: droughty

Table 10.--Sanitary Facilities

(The information in this table indicates the dominant soil condition but does not eliminate the need for onsite investigation. See text for definitions of terms used in this table. Absence of an entry indicates that no rating is applicable.)

Map symbol and soil name	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
BaB:					
Bastsil	Moderate: percs slowly	Moderate: seepage	Slight	Slight	Good
BaC2:					
Bastsil	Moderate: percs slowly	Moderate: seepage	Slight	Slight	Good
BgB:					
Bolar	Severe: percs slowly, depth to rock	Severe: depth to rock	Severe: depth to rock	Severe: depth to rock	Poor: area reclaim, hard to pack
Bo:					
Bosque	Moderate: flooding, percs slowly	Moderate: seepage	Moderate: flooding, too clayey	Moderate: flooding	Fair: thin layer, too clayey
Bs:					
Bosque	Severe: flooding	Severe: flooding	Severe: flooding	Severe: flooding	Fair: thin layer, too clayey
BtC:					
Brackett	Severe: percs slowly	Moderate: seepage, slope	Moderate: too clayey	Slight	Fair: small stones, too clayey
BtE:					
Brackett	Severe: percs slowly, slope	Severe: slope	Severe: slope	Severe: slope	Poor: slope
BxD:					
Brackett	Severe: percs slowly	Severe: slope	Moderate: too clayey	Slight	Fair: small stones, too clayey
Maloterre	Severe: depth to rock	Severe: slope, depth to rock	Severe: depth to rock	Severe: depth to rock	Poor: depth to rock
ByC:					
Brackett	Severe: percs slowly	Moderate: seepage, slope	Moderate: too clayey	Slight	Fair: small stones, too clayey
Pidcoke	Severe: depth to rock	Severe: depth to rock	Severe: depth to rock	Severe: depth to rock	Poor: small stones, depth to rock
CdB:					
Caradan	Severe: percs slowly	Moderate: slope	Severe: too clayey	Slight	Poor: hard to pack, too clayey
ChB:					
Cho	Severe: cemented pan	Severe: cemented pan	Moderate: cemented pan, too clayey	Severe: cemented pan	Poor: cemented pan, small stones
CoC:					
Cisco	Slight	Severe: seepage	Severe: seepage	Slight	Fair: too clayey
CoC2:					
Cisco	Slight	Severe: seepage	Severe: seepage	Slight	Fair: too clayey
CrD:					
Cranfill	Moderate: percs slowly	Moderate: seepage, slope	Moderate: too clayey	Slight	Poor: small stones
CrE:					
Cranfill	Moderate: percs slowly, slope	Severe: slope	Moderate: slope, too clayey	Moderate: slope	Poor: small stones

Table 10.--Sanitary Facilities--Continued

Map symbol and soil name	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
DnB:					
Denton	Moderate: percs slowly, depth to rock	Moderate: seepage, slope, depth to rock	Severe: depth to rock	Moderate: depth to rock	Poor: hard to pack
DsB:					
Desan	Severe: poor filter	Severe: seepage	Severe: too sandy	Severe: seepage	Poor: seepage, too sandy
EcB:					
Eckrant	Severe: large stones, depth to rock	Severe: large stones, depth to rock	Severe: too clayey, depth to rock	Severe: depth to rock	Poor: hard to pack, too clayey, depth to rock
ErB:					
Eckrant	Severe: large stones, depth to rock	Severe: large stones, depth to rock	Severe: too clayey, depth to rock	Severe: depth to rock	Poor: hard to pack, too clayey, depth to rock
Rock Outcrop	Severe: depth to rock	Severe: depth to rock	Severe: depth to rock	Severe: depth to rock	Poor: depth to rock
EvB:					
Evant	Severe: cemented pan, depth to rock	Severe: cemented pan, depth to rock	Severe: too clayey, depth to rock	Severe: cemented pan, depth to rock	Poor: hard to pack, too clayey, depth to rock
Fr:					
Frio	Severe: flooding, percs slowly	Severe: flooding	Severe: flooding, too clayey	Severe: flooding	Poor: hard to pack, too clayey
KrB:					
Krum	Severe: percs slowly	Moderate: slope	Severe: too clayey	Slight	Poor: hard to pack, too clayey
La:					
Lamkin	Severe: flooding	Severe: flooding	Severe: flooding	Severe: flooding	Fair: too clayey
LpB:					
Lampasas	Severe: percs slowly	Moderate: slope	Slight	Slight	Poor: seepage, small stones
MnB:					
Minwells	Severe: percs slowly	Severe: seepage	Severe: seepage	Slight	Poor: thin layer
NuB:					
Nuff	Severe: percs slowly	Moderate: seepage, slope	Severe: too clayey	Slight	Poor: hard to pack, too clayey
NuC:					
Nuff	Severe: percs slowly	Moderate: large stones, seepage, slope	Severe: too clayey	Slight	Poor: hard to pack, too clayey
OgB:					
Oglesby	Severe: depth to rock	Severe: depth to rock	Severe: too clayey, depth to rock	Severe: depth to rock	Poor: hard to pack, too clayey, depth to rock
PdB:					
Pedernales	Severe: percs slowly	Moderate: slope	Severe: too clayey	Slight	Poor: hard to pack, too clayey
PdC2:					
Pedernales	Severe: percs slowly	Moderate: slope	Severe: too clayey	Slight	Poor: hard to pack, too clayey

Table 10.--Sanitary Facilities--Continued

Map symbol and soil name	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
PkB:					
Pidcoke	Severe: depth to rock	Severe: depth to rock	Severe: depth to rock	Severe: depth to rock	Poor: small stones depth to rock
ReB:					
Real	Severe: cemented pan depth to rock	Severe: cemented pan depth to rock	Severe: depth to rock	Severe: cemented pan depth to rock	Poor: small stones depth to rock
ReC:					
Real	Severe: cemented pan depth to rock	Severe: cemented pan depth to rock	Severe: depth to rock	Severe: cemented pan depth to rock	Poor: small stones depth to rock
ReD:					
Real	Severe: cemented pan depth to rock	Severe: cemented pan depth to rock	Severe: depth to rock	Severe: cemented pan depth to rock	Poor: small stones depth to rock
Doss	Severe: depth to rock	Severe: depth to rock	Severe: depth to rock	Severe: depth to rock	Poor: depth to rock
ReF:					
Real	Severe: cemented pan slope depth to rock	Severe: cemented pan slope depth to rock	Severe: slope depth to rock	Severe: cemented pan slope depth to rock	Poor: slope small stones depth to rock
Rock Outcrop	Severe: slope depth to rock	Severe: slope depth to rock	Severe: slope depth to rock	Severe: slope depth to rock	Poor: slope depth to rock
RsC:					
Riesel	Severe: percs slowly	Severe: seepage	Severe: seepage too clayey	Slight	Poor: small stones too clayey
RuB:					
Rumley	Moderate: percs slowly	Moderate: seepage slope	Severe: too clayey	Slight	Poor: hard to pack too clayey
SaB:					
San Saba	Severe: percs slowly depth to rock	Severe: depth to rock	Severe: too clayey depth to rock	Severe: depth to rock	Poor: hard to pack too clayey depth to rock
SeC:					
Seawillow	Moderate: percs slowly	Moderate: seepage slope	Moderate: too clayey	Slight	Fair: small stones too clayey
SsB:					
Slidell	Severe: percs slowly	Moderate: slope	Severe: too clayey	Slight	Poor: hard to pack too clayey
TaB:					
Tarpley	Severe: depth to rock	Severe: depth to rock	Severe: too clayey depth to rock	Severe: depth to rock	Poor: hard to pack too clayey depth to rock
ToC:					
Topsey	Severe: percs slowly	Moderate: seepage slope	Severe: too clayey	Slight	Poor: too clayey
ToD:					
Topsey	Severe: percs slowly	Moderate: seepage slope	Severe: too clayey	Slight	Poor: too clayey
VnB:					
Venus	Moderate: percs slowly	Moderate: seepage slope	Moderate: too clayey	Slight	Fair: too clayey

Table 10.--Sanitary Facilities--Continued

Map symbol and soil name	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
Vs:					
Venus	Moderate: flooding	Moderate: seepage	Moderate: flooding too clayey	Moderate: flooding	Fair: too clayey
WsC:					
Wise	Slight	Severe: seepage	Severe: seepage	Severe: seepage	Fair: too clayey

Table 11.--Construction Materials

(The information in this table indicates the dominant soil condition but does not eliminate the need for onsite investigation. See text for definitions of terms used in this table. Absence of an entry indicates that no rating is applicable.)

Map symbol and soil name	Roadfill	Sand	Gravel	Topsoil
BaB:				
Bastsil	Fair: low strength, shrink-swell	Improbable: excess fines	Improbable: excess fines	Good
BaC2:				
Bastsil	Fair: low strength, shrink-swell	Improbable: excess fines	Improbable: excess fines	Good
BgB:				
Bolar	Poor: area reclaim, low strength	Improbable: excess fines	Improbable: excess fines	Poor: small stones
Bo:				
Bosque	Poor: low strength	Improbable: excess fines	Improbable: excess fines	Fair: too clayey
Bs:				
Bosque	Poor: low strength	Improbable: excess fines	Improbable: excess fines	Fair: too clayey
BtC:				
Brackett	Poor: thin layer	Improbable: excess fines	Improbable: excess fines	Poor: small stones
BtE:				
Brackett	Poor: thin layer	Improbable: excess fines	Improbable: excess fines	Poor: slope, small stones
BxD:				
Brackett	Poor: thin layer	Improbable: excess fines	Improbable: excess fines	Poor: small stones
Maloterre	Poor: depth to rock	Improbable: excess fines	Improbable: excess fines	Poor: small stones, depth to rock
ByC:				
Brackett	Poor: thin layer	Improbable: excess fines	Improbable: excess fines	Poor: small stones
Pidcoke	Poor: depth to rock	Improbable: excess fines	Improbable: excess fines	Poor: small stones, depth to rock
CdB:				
Caradan	Poor: low strength, shrink-swell	Improbable: excess fines	Improbable: excess fines	Poor: too clayey
ChB:				
Cho	Good	Improbable: excess fines	Improbable: excess fines	Poor: area reclaim, cemented pan, small stones
CoC:				
Cisco	Good	Improbable: excess fines	Improbable: excess fines	Fair: too clayey
CoC2:				
Cisco	Good	Improbable: excess fines	Improbable: excess fines	Fair: too clayey
CrD:				
Cranfill	Fair: low strength, shrink-swell, thin layer	Improbable: excess fines	Improbable: excess fines	Poor: area reclaim, small stones
CrE:				
Cranfill	Fair: low strength, shrink-swell, thin layer	Improbable: excess fines	Improbable: excess fines	Poor: area reclaim, small stones

Table 11.--Construction Materials--Continued

Map symbol and soil name	Roadfill	Sand	Gravel	Topsoil
DnB:				
Denton	Poor: low strength	Improbable: excess fines	Improbable: excess fines	Poor: area reclaim too clayey
DsB:				
Desan	Good	Probable	Improbable: too sandy	Poor: too sandy
EcB:				
Eckrant	Poor: large stones low strength depth to rock	Improbable: large stones excess fines	Improbable: large stones excess fines	Poor: large stones too clayey depth to rock
ErB:				
Eckrant	Poor: large stones low strength depth to rock	Improbable: large stones excess fines	Improbable: large stones excess fines	Poor: large stones too clayey depth to rock
Rock Outcrop	Poor: depth to rock	---	---	Poor: depth to rock
EvB:				
Evant	Poor: low strength shrink-swell depth to rock	Improbable: excess fines	Improbable: excess fines	Poor: cemented pan small stones too clayey
Fr:				
Frio	Poor: low strength	Improbable: excess fines	Improbable: excess fines	Poor: too clayey
KrB:				
Krum	Poor: low strength shrink-swell	Improbable: excess fines	Improbable: excess fines	Poor: too clayey
La:				
Lamkin	Poor: low strength	Improbable: excess fines	Improbable: excess fines	Fair: too clayey
LpB:				
Lampasas	Good	Improbable: small stones	Probable	Poor: area reclaim small stones
MnB:				
Minwells	Good	Probable	Probable	Poor: too clayey
NuB:				
Nuff	Poor: low strength	Improbable: excess fines	Improbable: excess fines	Fair: large stones thin layer too clayey
NuC:				
Nuff	Poor: low strength	Improbable: excess fines	Improbable: excess fines	Poor: large stones
OgB:				
Oglesby	Poor: low strength shrink-swell depth to rock	Improbable: excess fines	Improbable: excess fines	Poor: small stones too clayey depth to rock
PdB:				
Pedernales	Poor: low strength	Improbable: excess fines	Improbable: excess fines	Poor: too clayey
PdC2:				
Pedernales	Poor: low strength	Improbable: excess fines	Improbable: excess fines	Poor: too clayey
PkB:				
Pidcoke	Poor: depth to rock	Improbable: excess fines	Improbable: excess fines	Poor: small stones depth to rock

Table 11.--Construction Materials--Continued

Map symbol and soil name	Roadfill	Sand	Gravel	Topsoil
ReB:				
Real	Poor: depth to rock	Improbable: excess fines	Improbable: excess fines	Poor: cemented pan, small stones, depth to rock
ReC:				
Real	Poor: depth to rock	Improbable: excess fines	Improbable: excess fines	Poor: cemented pan, small stones, depth to rock
ReD:				
Real	Poor: depth to rock	Improbable: excess fines	Improbable: excess fines	Poor: cemented pan, small stones, depth to rock
Doss	Poor: low strength, depth to rock	Improbable: excess fines	Improbable: excess fines	Poor: small stones, depth to rock
ReF:				
Real	Poor: depth to rock	Improbable: excess fines	Improbable: excess fines	Poor: cemented pan, small stones, depth to rock
Rock Outcrop	Poor: depth to rock	Improbable: excess fines	Improbable: excess fines	Poor: slope, depth to rock
RsC:				
Riesel	Good	Probable	Probable	Poor: area reclaim, small stones, too clayey
RuB:				
Rumley	Poor: low strength	Improbable: excess fines	Improbable: excess fines	Poor: too clayey
SaB:				
San Saba	Poor: low strength, shrink-swell, depth to rock	Improbable: excess fines	Improbable: excess fines	Poor: too clayey
SeC:				
Seawillow	Poor: low strength	Improbable: excess fines	Improbable: excess fines	Poor: small stones
SsB:				
Slidell	Poor: low strength, shrink-swell	Improbable: excess fines	Improbable: excess fines	Poor: too clayey
TaB:				
Tarpley	Poor: low strength, shrink-swell, depth to rock	Improbable: excess fines	Improbable: excess fines	Poor: too clayey, depth to rock
ToC:				
Topsey	Poor: low strength	Improbable: excess fines	Improbable: excess fines	Poor: too clayey
ToD:				
Topsey	Poor: low strength	Improbable: excess fines	Improbable: excess fines	Poor: too clayey
VnB:				
Venus	Fair: low strength	Improbable: excess fines	Improbable: excess fines	Good
Vs:				
Venus	Fair: low strength	Improbable: excess fines	Improbable: excess fines	Good

Table 11.--Construction Materials--Continued

Map symbol and soil name	Roadfill	Sand	Gravel	Topsoil
WsC: Wise	Fair: low strength shrink-swell	Improbable: excess fines	Improbable: excess fines	Fair: too clayey

Table 12.--Water Management

(The information in this table indicates the dominant soil condition but does not eliminate the need for onsite investigation. See text for definitions of terms used in this table. Absence of an entry indicates that no rating is applicable.)

Map symbol and soil name	Limitations for--			Features affecting--			
	Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Drainage	Irrigation	Terraces and diversions	Grassed waterways
BaB:							
Bastsil	Moderate: seepage	Moderate: piping	Severe: no water	Limitation: deep to water	Limitation: fast intake soil blowing	Limitation: soil blowing	Favorable
BaC2:							
Bastsil	Moderate: seepage	Moderate: piping	Severe: no water	Limitation: deep to water	Limitation: slope soil blowing	Limitation: soil blowing	Favorable
BgB:							
Bolar	Moderate: seepage depth to rock	Moderate: hard to pack thin layer	Severe: no water	Limitation: deep to water	Limitation: percs slowly depth to rock	Limitation: percs slowly depth to rock	Limitation: percs slowly depth to rock
Bo:							
Bosque	Moderate: seepage	Severe: piping	Severe: no water	Limitation: deep to water	Favorable	Favorable	Favorable
Bs:							
Bosque	Moderate: seepage	Severe: piping	Severe: no water	Limitation: deep to water	Limitation: flooding	Favorable	Favorable
BtC:							
Brackett	Moderate: seepage slope	Moderate: piping	Severe: no water	Limitation: deep to water	Limitation: slope droughty	Favorable	Limitation: droughty
BtE:							
Brackett	Severe: slope	Moderate: piping	Severe: no water	Limitation: deep to water	Limitation: slope droughty	Limitation: slope	Limitation: slope droughty
BxD:							
Brackett	Moderate: seepage slope	Moderate: piping	Severe: no water	Limitation: deep to water	Limitation: slope droughty	Favorable	Limitation: droughty
Maloterre	Severe: depth to rock	Severe: thin layer	Severe: no water	Limitation: deep to water	Limitation: slope depth to rock	Limitation: depth to rock	Limitation: depth to rock
ByC:							
Brackett	Moderate: seepage slope	Moderate: piping	Severe: no water	Limitation: deep to water	Limitation: slope droughty	Favorable	Limitation: droughty
Pidcoke	Severe: depth to rock	Severe: thin layer	Severe: no water	Limitation: deep to water	Limitation: depth to rock	Limitation: depth to rock	Limitation: depth to rock

Table 12.--Water Management--Continued

Map symbol and soil name	Limitations for--			Features affecting--			
	Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Drainage	Irrigation	Terraces and diversions	Grassed waterways
CdB:							
Caradan	Slight	Moderate: hard to pack	Severe: no water	Limitation: deep to water	Limitation: percs slowly slow intake	Limitation: percs slowly	Limitation: percs slowly
ChB:							
Cho	Severe: cemented pan	Severe: thin layer	Severe: no water	Limitation: deep to water	Limitation: cemented pan droughty	Limitation: cemented pan	Limitation: cemented pan droughty
CoC:							
Cisco	Severe: seepage	Moderate: piping thin layer	Severe: no water	Limitation: deep to water	Limitation: slope soil blowing	Limitation: erodes easily soil blowing	Limitation: erodes easily
CoC2:							
Cisco	Severe: seepage	Moderate: piping thin layer	Severe: no water	Limitation: deep to water	Limitation: slope soil blowing	Limitation: erodes easily soil blowing	Limitation: erodes easily
CrD:							
Cranfill	Moderate: seepage slope	Moderate: piping	Severe: no water	Limitation: deep to water	Limitation: slope droughty	Favorable	Limitation: droughty
CrE:							
Cranfill	Severe: slope	Moderate: piping	Severe: no water	Limitation: deep to water	Limitation: slope droughty	Limitation: slope	Limitation: slope droughty
DnB:							
Denton	Moderate: seepage depth to rock	Moderate: hard to pack thin layer	Severe: no water	Limitation: deep to water	Limitation: percs slowly slow intake	Limitation: erodes easily	Limitation: erodes easily percs slowly
DsB:							
Desan	Severe: seepage	Severe: seepage piping	Severe: no water	Limitation: deep to water	Limitation: fast intake droughty	Limitation: too sandy soil blowing	Limitation: droughty
EcB:							
Eckrant	Severe: depth to rock	Severe: hard to pack large stones	Severe: no water	Limitation: deep to water	Limitation: large stones droughty	Limitation: large stones depth to rock	Limitation: large stones droughty
ErB:							
Eckrant	Severe: depth to rock	Severe: hard to pack large stones	Severe: no water	Limitation: deep to water	Limitation: large stones slope droughty	Limitation: large stones depth to rock	Limitation: large stones droughty
Rock Outcrop	Severe: depth to rock	Severe: depth to rock	Severe: no water	Limitation: deep to water	Limitation: slope depth to rock	Limitation: depth to rock	Limitation: depth to rock

Table 12.--Water Management--Continued

Map symbol and soil name	Limitations for--			Features affecting--			
	Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Drainage	Irrigation	Terraces and diversions	Grassed waterways
EvB:							
Evant	Severe: cemented pan	Severe: hard to pack	Severe: no water	Limitation: deep to water	Limitation: percs slowly slow intake droughty	Limitation: cemented pan percs slowly depth to rock	Limitation: cemented pan depth to rock droughty
Fr:							
Frio	Slight	Moderate: hard to pack	Severe: no water	Limitation: deep to water	Limitation: flooding slow intake	Favorable	Favorable
KrB:							
Krum	Slight	Severe: hard to pack	Severe: no water	Limitation: deep to water	Limitation: slope slow intake	Favorable	Favorable
La:							
Lamkin	Moderate: seepage	Moderate: piping	Severe: no water	Limitation: deep to water	Limitation: erodes easily flooding	Limitation: erodes easily	Limitation: erodes easily
LpB:							
Lampasas	Slight	Severe: seepage	Severe: no water	Limitation: deep to water	Limitation: slow intake droughty	Favorable	Limitation: droughty
MnB:							
Minwells	Severe: seepage	Moderate: piping thin layer	Severe: no water	Limitation: deep to water	Limitation: percs slowly soil blowing	Limitation: soil blowing	Limitation: percs slowly
NuB:							
Nuff	Moderate: seepage	Moderate: hard to pack	Severe: no water	Limitation: deep to water	Favorable	Favorable	Favorable
NuC:							
Nuff	Moderate: seepage	Moderate: hard to pack large stones	Severe: no water	Limitation: deep to water	Limitation: slope	Limitation: large stones	Limitation: large stones
OgB:							
Oglesby	Severe: depth to rock	Severe: hard to pack	Severe: no water	Limitation: deep to water	Limitation: percs slowly slow intake depth to rock	Limitation: percs slowly depth to rock	Limitation: percs slowly depth to rock
PdB:							
Pedernales	Slight	Moderate: hard to pack	Severe: no water	Limitation: deep to water	Limitation: soil blowing	Limitation: soil blowing	Favorable
PdC2:							
Pedernales	Slight	Moderate: hard to pack	Severe: no water	Limitation: deep to water	Limitation: slope soil blowing	Limitation: soil blowing	Favorable

Table 12.--Water Management--Continued

Map symbol and soil name	Limitations for--			Features affecting--			
	Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Drainage	Irrigation	Terraces and diversions	Grassed waterways
PkB:							
Pidcoke	Severe: depth to rock	Severe: thin layer	Severe: no water	Limitation: deep to water	Limitation: depth to rock	Limitation: depth to rock	Limitation: depth to rock
ReB:							
Real	Severe: cemented pan depth to rock	Severe: thin layer	Severe: no water	Limitation: deep to water	Limitation: depth to rock droughty	Limitation: cemented pan depth to rock	Limitation: depth to rock droughty
ReC:							
Real	Severe: cemented pan depth to rock	Severe: thin layer	Severe: no water	Limitation: deep to water	Limitation: slope depth to rock droughty	Limitation: large stones depth to rock	Limitation: large stones droughty
ReD:							
Real	Severe: cemented pan depth to rock	Severe: thin layer	Severe: no water	Limitation: deep to water	Limitation: slope depth to rock droughty	Limitation: cemented pan depth to rock	Limitation: depth to rock droughty
Doss	Severe: depth to rock	Severe: thin layer	Severe: no water	Limitation: deep to water	Limitation: slope depth to rock	Limitation: depth to rock	Limitation: depth to rock
ReF:							
Real	Severe: cemented pan slope depth to rock	Severe: thin layer	Severe: no water	Limitation: deep to water	Limitation: slope depth to rock droughty	Limitation: large stones slope depth to rock	Limitation: large stones slope droughty
Rock Outcrop	Severe: slope depth to rock	Severe: depth to rock	Severe: no water	Limitation: deep to water	Limitation: slope depth to rock	Limitation: slope depth to rock	Limitation: slope depth to rock
RsC:							
Riesel	Severe: seepage	Moderate: thin layer	Severe: no water	Limitation: deep to water	Limitation: percs slowly slope droughty	Limitation: percs slowly	Limitation: percs slowly droughty
RuB:							
Rumley	Moderate: seepage	Moderate: hard to pack	Severe: no water	Limitation: deep to water	Favorable	Limitation: erodes easily	Limitation: erodes easily
SaB:							
San Saba	Moderate: depth to rock	Severe: hard to pack	Severe: no water	Limitation: deep to water	Limitation: percs slowly slow intake	Limitation: percs slowly depth to rock	Limitation: percs slowly depth to rock
SeC:							
Seawillow	Moderate: seepage slope	Moderate: piping	Severe: no water	Limitation: deep to water	Limitation: slope	Favorable	Favorable

Table 12.--Water Management--Continued

Map symbol and soil name	Limitations for--			Features affecting--			
	Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Drainage	Irrigation	Terraces and diversions	Grassed waterways
SsB:							
Slidell	Slight	Moderate: hard to pack	Severe: no water	Limitation: deep to water	Limitation: percs slowly slow intake	Limitation: percs slowly	Limitation: percs slowly
TaB:							
Tarpley	Severe: depth to rock	Severe: hard to pack	Severe: no water	Limitation: deep to water	Limitation: percs slowly	Limitation: percs slowly depth to rock	Limitation: percs slowly depth to rock
ToC:							
Topsey	Moderate: seepage	Slight	Severe: no water	Limitation: deep to water	Limitation: rooting depth slope	Favorable	Limitation: rooting depth
ToD:							
Topsey	Moderate: seepage	Slight	Severe: no water	Limitation: deep to water	Limitation: rooting depth slope	Favorable	Limitation: rooting depth
VnB:							
Venus	Moderate: seepage	Severe: piping	Severe: no water	Limitation: deep to water	Favorable	Favorable	Favorable
Vs:							
Venus	Moderate: seepage	Severe: piping	Severe: no water	Limitation: deep to water	Favorable	Favorable	Favorable
WsC:							
Wise	Severe: seepage	Severe: piping	Severe: no water	Limitation: deep to water	Limitation: erodes easily slope droughty	Limitation: erodes easily	Limitation: erodes easily droughty

Table 13.--Engineering Index Properties

(Absence of an entry indicates that the data were not estimated.)

Map symbol and soil name	Depth	USDA texture	Classification		Fragments		Percentage passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO	>10 inches	3-10 inches	4	10	40	200		
	In				Pct	Pct					Pct	
BaB:												
Bastsil	0-17	Loamy fine sand	SC-SM, SM	A-2-4, A-4	0	0	95-100	95-100	75-95	20-50	0-20	NP-4
	17-80	Loam, clay loam, sandy clay loam	CL, SC	A-6, A-7-6	0	0	95-100	90-100	75-100	40-70	26-42	11-26
BaC2:												
Bastsil	0-5	Fine sandy loam	CL-ML, SM, ML, SC-SM	A-4	0	0	95-100	95-100	75-100	36-70	0-25	NP-7
	5-80	Loam, clay loam, sandy clay loam	CL, SC	A-6, A-7-6	0	0	95-100	90-100	75-100	40-70	26-42	11-26
BgB:												
Bolar	0-17	Gravelly clay loam	CL, CH, GC, SC	A-6, A-7	0-1	0-15	60-85	50-78	45-74	36-65	35-57	18-34
	17-36	Loam, clay loam, silty clay loam	CH, CL	A-6, A-7	0	0-5	85-100	78-100	70-99	55-93	34-59	16-38
	36-55	Bedrock			---	---	---	---	---	---	---	---
Bo:												
Bosque	0-14	Clay loam	CL, CL-ML	A-4, A-7-6, A-6	0	0	100	96-100	90-100	56-85	23-45	7-25
	14-52	Loam, clay loam, sandy clay loam	CL, CL-ML	A-4, A-6, A-7-6	0	0	100	95-100	80-90	50-85	23-45	7-25
	52-80	Loam, clay loam, clay	CL, CL-ML	A-4, A-6, A-7-6	0	0	98-100	95-100	85-100	65-94	23-49	7-29
Bs:												
Bosque	0-5	Clay loam	CL, CL-ML	A-4, A-7-6, A-6	0	0	100	96-100	90-100	56-85	23-45	7-25
	5-25	Loam, clay loam, sandy clay loam	CL, CL-ML	A-4, A-7-6, A-6	0	0	100	95-100	80-90	50-85	23-45	7-25
	25-80	Loam, clay loam, clay	CL, CL-ML	A-6, A-4, A-7-6	0	0	98-100	95-100	85-100	65-94	23-49	7-29
BtC:												
Brackett	0-6	Gravelly clay loam	CL, SC, GC	A-6	0-2	0-15	70-99	62-88	50-79	43-72	25-40	10-23
	6-16	Loam, clay loam	CL	A-6, A-7-6	0-2	0-3	90-100	85-100	65-94	60-87	25-43	10-26
	16-60	Loam, clay loam, silty clay	CL	A-6, A-7-6	0	0-3	90-100	85-100	68-98	67-97	25-43	10-26

Table 13.--Engineering Index Properties--Continued

Map symbol and soil name	Depth	USDA texture	Classification		Fragments		Percentage passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO	>10 inches	3-10 inches	4	10	40	200		
	In				Pct	Pct					Pct	
BtE:												
Brackett	0-11	Gravelly clay loam	CL, GC, SC	A-6	0-2	0-15	70-99	62-88	50-79	43-72	25-40	10-23
	11-31	Loam, clay loam	CL	A-6, A-7-6	0-2	0-3	90-100	85-100	65-94	60-87	25-43	10-26
	31-60	Loam, clay loam, silty clay	CL	A-6, A-7-6	0	0-3	90-100	85-100	68-98	67-97	25-43	10-26
BxD:												
Brackett	0-5	Gravelly clay loam	GC, CL, SC	A-6	0-2	0-15	70-99	62-88	50-79	43-72	25-40	10-23
	5-22	Loam, clay loam	CL	A-6, A-7-6	0-2	0-3	90-100	85-100	65-94	60-87	25-43	10-26
	22-60	Loam, clay loam, silty clay	CL	A-6, A-7-6	0	0-3	90-100	85-100	68-98	67-97	25-43	10-26
Maloterre	0-5	Gravelly clay loam	CL, GC, SC	A-6	0-2	0-10	60-95	50-95	45-90	36-80	30-40	11-20
	5-7	Bedrock			---	---	---	---	---	---	---	---
ByC:												
Brackett	0-4	Gravelly clay loam	CL, SC, GC	A-6	0-2	0-15	70-99	62-88	50-79	43-72	25-40	10-23
	4-26	Loam, clay loam	CL	A-6, A-7-6	0-2	0-3	90-100	85-100	65-94	60-87	25-43	10-26
	26-60	Loam, clay loam, silty clay	CL	A-6, A-7-6	0	0-3	90-100	85-100	68-98	67-97	25-43	10-26
Pidcoke	0-10	Gravelly clay loam	CL	A-6, A-7-6	0	0	90-100	80-100	75-100	65-94	32-49	13-26
	10-18	Gravelly clay loam, gravelly silty clay loam	CL, SC, GC	A-6, A-7-6	0	0-5	55-80	45-74	36-65	36-65	32-49	13-26
	18-25	Bedrock			---	---	---	---	---	---	---	---
CdB:												
Caradan	0-4	Silty clay	CH, CL	A-7-6	0	0-5	85-100	80-100	75-100	70-95	44-60	22-36
	4-26	Clay	CH	A-7-5, A-7-6	0	0-5	90-100	90-100	80-100	75-100	65-85	40-50
	26-63	Clay loam, clay, silt loam	CH, CL	A-7-6	0	0-5	90-100	90-100	80-100	75-100	41-60	20-36
	63-80	Silt loam, clay loam, silty clay loam	CL	A-6, A-4, A-7-6	0	0-5	90-100	90-100	80-100	65-95	28-45	9-22

Table 13.--Engineering Index Properties--Continued

Map symbol and soil name	Depth	USDA texture	Classification		Fragments		Percentage passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO	>10 inches	3-10 inches	4	10	40	200		
	In				Pct	Pct					Pct	
ChB:												
Cho	0-14	Gravelly clay loam	CL, GC, SC	A-6, A-7-6	0	0-5	60-85	55-80	50-80	40-70	30-50	11-26
	14-19	Petrocalcic			---	---	---	---	---	---	---	---
	19-62	Gravelly loam, gravelly clay loam, very gravelly loam	GC, GC-GM, SC-SM, SC	A-2, A-4, A-7-6, A-6	0	0-5	50-85	35-80	20-60	15-60	24-47	5-22
CoC:												
Cisco	0-12	Fine sandy loam	ML, SC-SM, CL-ML, SM	A-4	0	0	95-100	95-100	90-100	40-55	0-26	NP-7
	12-51	Sandy clay loam, clay loam	CL, SC	A-6	0	0	95-100	95-100	85-100	40-60	25-40	11-25
	51-80	Sandy clay loam, fine sandy loam, loamy fine sand	ML, SC, SM, SC-SM	A-2-4, A-4, A-6	0	0	95-100	95-100	80-95	25-54	17-35	NP-15
CoC2:												
Cisco	0-5	Fine sandy loam	ML, SC-SM, CL-ML, SM	A-4	0	0	95-100	95-100	90-100	40-55	0-26	NP-7
	5-51	Sandy clay loam, clay loam	CL, SC	A-6	0	0	95-100	95-100	85-100	40-60	25-40	11-25
	51-80	Sandy clay loam, fine sandy loam, loamy fine sand	SC, ML, SC-SM, SM	A-4, A-2-4, A-6	0	0	95-100	95-100	80-95	25-54	17-35	NP-15
CrD:												
Cranfill	0-10	Gravelly clay loam	CL, GC, SC	A-6, A-7	0	0-5	65-85	60-75	50-75	36-70	30-45	11-24
	10-17	Gravelly clay loam, gravelly loam, gravelly silty clay loam	CL, SC, GC	A-2-7, A-6, A-2-6, A-7	0	0-5	55-80	50-75	40-75	30-70	30-45	11-24
	17-80	Gravelly clay loam, gravelly silty clay loam	CL, GC, SC	A-6, A-7	0	0-5	65-85	60-75	50-75	36-70	35-48	18-28

Table 13.--Engineering Index Properties--Continued

Map symbol and soil name	Depth	USDA texture	Classification		Fragments		Percentage passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO	>10 inches	3-10 inches	4	10	40	200		
	In				Pct	Pct					Pct	
CrE:												
Cranfill	0-12	Gravelly clay loam	CL, GC, SC	A-6, A-7	0	0-5	65-85	60-75	50-75	36-70	30-45	11-24
	12-49	Gravelly clay loam, gravelly loam, gravelly silty clay loam	CL, SC, GC	A-2-7, A-6, A-2-6, A-7	0	0-5	55-80	50-75	40-75	30-70	30-45	11-24
	49-80	Gravelly clay loam, gravelly silty clay loam	GC, CL, SC	A-6, A-7	0	0-5	65-85	60-75	50-75	36-70	35-48	18-28
DnB:												
Denton	0-13	Silty clay	CH	A-7	0	0	97-100	94-100	90-100	85-98	50-70	29-45
	13-24	Silty clay, silty clay loam	CH, CL	A-7	0	0	97-100	94-100	90-100	80-98	45-63	25-40
	24-38	Silty clay loam, silt loam, loam	CH, CL	A-6, A-7	0	0-15	95-100	91-100	80-100	70-97	36-58	17-36
	38-54	Gravelly silty clay loam, cobbly silt loam, gravelly silt loam	CH, CL, SC, GC	A-2-6, A-2-7, A-6	0	1-25	44-73	32-61	26-55	25-54	36-58	17-36
	54-60	Bedrock			---	---	---	---	---	---	---	---
DsB:												
Desan	0-5	Fine sand	SC-SM, SM, SW-SM	A-2-4, A-3	0	0	98-100	95-100	80-100	8-30	16-25	NP-5
	5-55	Loamy fine sand, fine sand	SC-SM, SP-SM, SM	A-2-4, A-3	0	0	98-100	95-100	85-100	8-28	16-25	NP-5
	55-80	Sandy clay loam, fine sandy loam	SC	A-2, A-6, A-4	0	0	98-100	95-100	90-100	25-50	20-36	8-20
EcB:												
Eckrant	0-8	Very cobbly silty clay	CH, CL, SC, GC	A-7-6	0-30	10-50	70-95	50-95	45-95	45-94	41-60	24-40
	8-20	Bedrock			---	---	---	---	---	---	---	---

Table 13.--Engineering Index Properties--Continued

Map symbol and soil name	Depth	USDA texture	Classification		Fragments		Percentage passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO	>10 inches	3-10 inches	4	10	40	200		
	In				Pct	Pct					Pct	
ErB:												
Eckrant	0-3	Very cobbly clay	CH, CL, SC, GC	A-7-6	0-30	10-50	70-95	50-95	45-95	45-94	41-60	24-40
	3-9	Very cobbly clay, very stony clay, extremely stony clay	CL, GC, CH, SC	A-7-6	0-75	15-75	56-85	50-79	45-75	44-74	47-73	25-45
	9-15	Bedrock			---	---	---	---	---	---	---	---
Rock Outcrop	0-80	Bedrock			---	---	---	---	---	---	---	---
EvB:												
Evant	0-5	Gravelly silty clay	CH, CL	A-7-6	0	0-5	65-90	60-78	60-75	50-70	41-55	22-34
	5-14	Clay, gravelly clay	CH, GC, SC	A-7-5, A-7-6	0	0-2	50-95	45-90	45-85	40-75	70-90	41-55
	14-18	Petrocalcic			---	---	---	---	---	---	---	---
	18-50	Bedrock			---	---	---	---	---	---	---	---
Fr:												
Frio	0-37	Silty clay	CH, CL	A-6, A-7	0	0-2	90-100	85-100	85-100	69-100	36-59	17-34
	37-70	Silty clay, silty clay loam, clay loam	CH, CL	A-6, A-7	0	0-2	90-100	85-100	85-100	69-100	36-59	17-34
KrB:												
Krum	0-8	Silty clay	CH, CL	A-7-6	0	0	95-100	85-100	85-100	85-95	47-65	25-42
	8-48	Silty clay, clay	CH	A-7-6	0	0	95-100	85-100	80-100	65-95	51-74	28-50
	48-62	Silty clay loam, silty clay, clay	CH, CL	A-6, A-7-6	0	0	85-100	75-100	70-99	65-95	36-60	20-39
La:												
Lamkin	0-10	Clay loam	CL	A-6	0	0	100	99-100	90-100	70-95	30-40	15-24
	10-80	Silt loam, very fine sandy loam, silty clay loam	CL	A-6, A-7-6	0	0	100	99-100	85-100	60-90	25-45	11-27
LpB:												
Lampasas	0-3	Gravelly clay, gravelly clay loam	CH, CL, GC	A-7-6	0	0-2	45-70	45-60	40-60	40-60	41-70	24-42

Table 13.--Engineering Index Properties--Continued

Map symbol and soil name	Depth	USDA texture	Classification		Fragments		Percentage passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO	>10 inches	3-10 inches	4	10	40	200		
	In				Pct	Pct					Pct	
	3-11	Very gravelly clay, extremely gravelly clay, very gravelly clay loam	CL, CH, GC	A-2-7, A-7-6	0	0-15	25-60	20-55	15-51	15-51	41-72	24-44
	11-60	Fragmental material	GW	A-1	0	5-15	5-10	0-5	0-2	0-1	0-14	NP
MnB:												
Minwells	0-9	Fine sandy loam	CL, SC-SM, CL-ML, SC	A-4, A-2, A-6	0	0	96-100	90-100	80-98	30-60	0-30	NP-15
	9-20	Clay, clay loam, sandy clay	CL	A-6, A-7-6	0	0	95-100	90-100	85-98	50-80	32-50	15-32
	20-63	Clay loam, sandy clay, sandy clay loam, gravelly sandy clay loam	CL, SC	A-6, A-4, A-7-6	0	0	85-100	80-100	65-98	45-80	23-45	8-26
	63-80	Very gravelly sand, very gravelly sandy loam, gravelly sandy clay loam	GP-GM, GM, SC, SP-SM	A-1, A-2	0	0-5	15-75	10-60	5-50	5-30	0-44	NP-28
NuB:												
Nuff	0-9	Silty clay loam	CH, CL	A-7-6	0	0-5	95-100	90-100	90-100	80-95	42-55	23-33
	9-26	Silt loam, silty clay loam	CH, CL	A-6, A-7-6	0	0-3	95-100	95-100	85-100	70-95	35-55	15-29
	26-62	shale with silty clay texture	CH, CL	A-6, A-7-6	0	0-5	88-100	84-100	80-100	70-95	35-61	15-36
NuC:												
Nuff	0-10	Very stony silty clay loam	CH, CL	A-6, A-7-6	0-10	35-50	94-100	90-100	80-100	65-90	35-61	15-36
	10-18	Silt loam, silty clay loam	CH, CL	A-6, A-7-6	0	0-3	95-100	95-100	85-100	70-95	35-55	15-29
	18-25	Stony silt loam, stony	CH, CL	A-6, A-7-6	0-10	0-35	95-100	90-100	80-100	65-90	35-53	15-28

Table 13.--Engineering Index Properties--Continued

Map symbol and soil name	Depth	USDA texture	Classification		Fragments		Percentage passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO	>10 inches	3-10 inches	4	10	40	200		
	In				Pct	Pct					Pct	
		silty clay loam, very stony silty clay										
	25-80	shale with silty clay loam texture	CH, CL	A-6, A-7-6	0	0-5	88-100	84-100	80-100	70-95	35-61	15-36
OgB:												
Oglesby	0-17	Gravelly silty clay	CH, SC	A-7	0-2	0-5	75-85	60-80	50-75	36-70	55-75	30-45
	17-35	Bedrock			---	---	---	---	---	---	---	---
PdB:												
Pedernales	0-9	Fine sandy loam	CL-ML, ML, SM, SC-SM	A-4	0	0	95-100	90-100	70-85	35-55	0-25	NP-7
	9-29	Sandy clay, clay	CH, SC, CL	A-6, A-7	0	0	90-100	90-100	80-100	45-85	38-60	20-36
	29-80	Sandy clay loam, clay loam, sandy clay	CH, CL, SC	A-6, A-7	0	0-5	90-100	90-100	80-100	45-80	32-55	13-30
PdC2:												
Pedernales	0-5	Fine sandy loam	CL-ML, SM, ML, SC-SM	A-4	0	0	95-100	90-100	70-85	35-55	0-25	NP-7
	5-37	Sandy clay, clay	CH, SC, CL	A-6, A-7	0	0	90-100	90-100	80-100	45-85	38-60	20-36
	37-62	Sandy clay loam, clay loam, sandy clay	CL, CH, SC	A-6, A-7	0	0-5	90-100	90-100	80-100	45-80	32-55	13-30
PkB:												
Pidcoke	0-11	Gravelly clay loam	CL	A-6, A-7-6	0	0-1	65-85	60-80	60-75	50-70	32-49	13-26
	11-18	Gravelly clay loam, gravelly silty clay loam	GC, CL, SC	A-6, A-7-6	0	0-5	55-80	45-74	36-65	36-65	32-49	13-26
	18-24	Bedrock			---	---	---	---	---	---	---	---

Table 13.--Engineering Index Properties--Continued

Map symbol and soil name	Depth	USDA texture	Classification		Fragments		Percentage passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO	>10 inches	3-10 inches	4	10	40	200		
	In				Pct	Pct					Pct	
ReB:												
Real	0-5	Gravelly clay loam	GM, CL, ML, SM	A-4, A-6, A-7	0-3	1-5	65-90	50-77	45-65	36-60	30-55	8-25
	5-12	Extremely gravelly loam, extremely gravelly clay loam, very gravelly clay loam	GC, SM, GM, SC	A-2, A-7, A-4, A-6	0-3	0-15	25-75	20-50	20-45	20-40	30-55	8-25
	12-14	Cemented			---	---	---	---	---	---	---	---
	14-60	Bedrock			---	---	---	---	---	---	---	---
ReC:												
Real	0-8	Very stony clay loam	GC, SP-SC, GP-GC, SC	A-2-4, A-2-6	50-65	3-25	25-65	10-50	10-45	10-35	25-40	8-20
	8-16	Extremely gravelly loam, extremely gravelly clay loam, very gravelly clay loam loam	GC, SM, GM, SC	A-2, A-7, A-4, A-6	0-3	0-15	25-75	20-50	20-45	20-40	30-55	8-25
	16-18	Cemented			---	---	---	---	---	---	---	---
	18-60	Bedrock			---	---	---	---	---	---	---	---
ReD:												
Real	0-6	Very gravelly clay loam	GM, SC, GC, SM	A-2, A-7, A-4, A-6	0-3	0-15	35-85	30-50	20-45	20-40	30-55	8-25
	6-12	Extremely gravelly loam, extremely gravelly clay loam, very gravelly clay loam	GM, SC, GC, SM	A-4, A-2, A-6, A-7	0-3	0-15	25-75	20-50	20-45	20-40	30-55	8-25
	12-13	Cemented			---	---	---	---	---	---	---	---
	13-60	Bedrock			---	---	---	---	---	---	---	---
Doss	0-17	Clay loam	CL	A-6, A-7-6	0-1	0-15	80-100	80-100	75-95	60-90	28-49	13-29
	17-60	Bedrock			---	---	---	---	---	---	---	---

Table 13.--Engineering Index Properties--Continued

Map symbol and soil name	Depth	USDA texture	Classification		Fragments		Percentage passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO	>10 inches	3-10 inches	4	10	40	200		
	In				Pct	Pct					Pct	
ReF:												
Real	0-9	Very gravelly clay loam	GM, SC, GC, SM	A-2, A-7, A-4, A-6	0-3	0-15	35-85	30-50	20-45	20-40	30-55	8-25
	9-10	Cemented			---	---	---	---	---	---	---	---
	10-60	Bedrock			---	---	---	---	---	---	---	---
Rock Outcrop	0-80	Bedrock			---	---	---	---	---	---	---	---
RsC:												
Riesel	0-9	Very gravelly fine sandy loam, gravelly fine sandy loam, fine sandy loam	GP-GM, GM, SC, SM	A-1, A-2-6, A-2-4	0	0-5	25-88	15-85	12-70	5-30	16-33	3-17
	9-43	Very gravelly clay, very gravelly clay loam	GC, SC	A-2-7, A-7	0	0-5	25-70	25-50	18-50	15-45	41-60	23-40
	43-59	Clay, gravelly clay, very gravelly clay, gravelly clay loam	CH, CL, SC, GC	A-2-7, A-7	0	0-5	25-92	20-85	14-80	8-75	41-81	20-54
	59-70	Gravelly fine sand, very gravelly loamy sand, gravelly loamy sand	GP-GM	A-1	0	5-10	10-40	10-30	10-15	6-10	0-14	NP
RuB:												
Rumley	0-7	Clay loam	CH, CL	A-7	0	0	95-100	95-100	82-99	70-95	41-55	20-33
	7-16	Clay loam, silty clay loam, silty clay	CH, CL	A-6, A-7	0	0	95-100	95-100	70-98	70-95	38-60	20-35
	16-35	Gravelly clay loam, gravelly silty clay loam, gravelly silty clay, silty clay, silty clay loam	CL, CH, SC	A-6, A-7	0	0	75-100	55-100	40-98	40-95	30-55	11-32

Table 13.--Engineering Index Properties--Continued

Map symbol and soil name	Depth	USDA texture	Classification		Fragments		Percentage passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO	>10 inches	3-10 inches	4	10	40	200		
	In				Pct	Pct					Pct	
	35-70	Clay loam, silty clay loam	CH, CL	A-6, A-7	0	0	85-100	85-95	70-95	65-90	30-55	11-32
SaB:												
San Saba	0-6	Clay	CH	A-7-6	0	0	90-100	85-100	80-100	75-100	55-70	30-45
	6-36	Clay	CH	A-7-6	0	0	95-100	90-100	80-100	75-100	55-70	30-45
	36-40	Bedrock			---	---	---	---	---	---	---	---
SeC:												
Seawillow	0-6	Clay loam	CL	A-6, A-7-6	0	0-15	85-100	75-100	70-100	60-90	32-50	15-30
	6-44	Loam, clay loam, silty clay loam	CL	A-6, A-7-6	0	0-15	85-100	65-100	60-100	51-82	30-45	14-26
	44-62	Loam, clay loam, silty clay loam	CL	A-6, A-4, A-7-6	0	0-15	85-100	75-100	75-100	51-80	25-45	8-25
SsB:												
Slidell	0-8	Silty clay	CH	A-7-6	0	0	95-100	95-100	95-100	85-100	50-67	31-46
	8-45	Silty clay, clay	CH	A-7-6	0	0	95-100	95-100	95-100	85-100	50-67	31-46
	45-80	Silty clay, clay	CH, CL	A-6, A-7-6	0	0	95-100	93-100	85-100	70-98	34-51	18-30
TaB:												
Tarpley	0-7	Clay loam	CH, CL	A-7	0-1	0-3	90-100	90-100	80-95	70-90	41-60	20-38
	7-18	Clay	CH	A-7	0	0	90-100	90-100	90-100	65-98	51-80	30-55
	18-24	Bedrock			---	---	---	---	---	---	---	---
ToC:												
Topsey	0-6	Clay loam	CL	A-6, A-7-6	0	0	90-100	85-100	75-100	65-94	32-49	13-25
	6-12	Loam, clay loam, silty clay loam	CL	A-6, A-7-6	0	0	80-100	80-100	70-98	65-94	32-49	13-25
	12-18	Gravelly loam, gravelly clay loam, clay loam	CL, GC, SC	A-2-7, A-2-6, A-6, A-7-6	0	0	55-100	47-100	36-98	33-94	32-49	13-25
	18-32	Silt loam, loam, clay loam	CL	A-6, A-7-6	0	0	80-100	80-100	70-98	55-80	32-49	13-25
	32-62	Silty clay loam, clay loam, silty clay	CL	A-6, A-7-6	0	0	80-100	80-100	70-98	67-95	39-49	20-29

Table 13.--Engineering Index Properties--Continued

Map symbol and soil name	Depth	USDA texture	Classification		Fragments		Percentage passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO	>10 inches	3-10 inches	4	10	40	200		
	In				Pct	Pct					Pct	
ToD:												
Topsey	0-10	Clay loam	CL	A-6, A-7-6	0	0	90-100	85-100	75-100	65-94	32-49	13-25
	10-17	Loam, clay loam, silty clay loam	CL	A-6, A-7-6	0	0	80-100	80-100	70-98	65-94	32-49	13-25
	17-31	Silt loam, loam, clay loam	CL	A-6, A-7-6	0	0	80-100	80-100	70-98	55-80	32-49	13-25
	31-60	Silty clay loam, clay loam, silty clay	CL	A-6, A-7-6	0	0	80-100	80-100	70-98	67-95	39-49	20-29
VnB:												
Venus	0-6	Loam	CL, CL-ML	A-4, A-6	0	0	100	95-100	85-100	50-80	20-40	5-22
	6-38	Loam, clay loam, sandy clay loam	CL, CL-ML	A-4, A-6	0	0	95-100	95-100	85-100	50-80	20-40	5-24
	38-80	Fine sandy loam, loam, sandy clay loam	CL-ML, CL, SC, SC-SM	A-4, A-6	0	0	80-100	70-100	65-100	44-73	20-40	5-20
Vs:												
Venus	0-15	Loam	CL, CL-ML	A-4, A-6	0	0	100	95-100	85-100	50-80	20-40	5-22
	15-35	Loam, clay loam, sandy clay loam	CL, CL-ML	A-4, A-6	0	0	95-100	95-100	85-100	50-80	20-40	5-24
	35-80	Fine sandy loam, loam, sandy clay loam	CL, SC-SM, CL-ML, SC	A-4, A-6	0	0	80-100	70-100	65-100	40-80	20-40	5-20
WsC:												
Wise	0-5	Clay loam	CL, CL-ML	A-4, A-6	0	0	95-100	95-100	85-100	75-95	17-40	5-22
	5-26	Clay loam, loam, silty clay loam	CL, CL-ML	A-4, A-6	0	0	95-100	95-100	85-100	75-95	17-40	5-22
	26-62	Stratified very fine sandy loam and shale with silty clay loam texture	CL, CL-ML, SC-SM, SC	A-4, A-6	0	0	95-100	95-100	85-100	49-85	17-40	5-22

Table 14.--Physical Properties of the Soils

(Entries under "Erosion factors--T" apply to the entire profile. Entries under "Wind erodibility group" and "Wind erodibility index" apply only to the surface layer. Absence of an entry indicates that data were not estimated.)

Map symbol and soil name	Depth	Clay	Moist bulk density	Permeability (K-sat)	Available water capacity	Linear extensibility	Organic matter	Erosion factors			Wind erodibility group	Wind erodibility index
								Kw	Kf	T		
	In	Pct	g/cc	In/hr	In/in	Pct	Pct					
BaB:												
Bastsil	0-17	5-12	1.55-1.65	2-6	0.07-0.11	0.0-2.9	0.5-1.0	.20	.20	5	2	134
	17-80	18-35	1.50-1.65	0.6-2	0.12-0.16	3.0-5.9	0.5-1.0	.32	.32			
BaC2:												
Bastsil	0-5	7-20	1.50-1.65	2-6	0.11-0.15	0.0-2.9	0.5-2.0	.24	.24	5	3	86
	5-80	18-35	1.50-1.65	0.6-2	0.12-0.16	3.0-5.9	0.5-1.0	.32	.32			
BgB:												
Bolar	0-17	20-40	1.20-1.50	0.6-2	0.10-0.15	3.0-5.9	1.0-3.0	.20	.32	3	8	0
	17-36	20-40	1.20-1.50	0.6-2	0.11-0.18	3.0-5.9	0.5-2.0	.32	.32			
	36-55	---	---	0.06-2	---	---	0.5-1.0	---	---			
Bo:												
Bosque	0-14	27-35	1.20-1.40	0.6-2	0.15-0.20	0.0-2.9	1.0-4.0	.28	.28	5	4L	86
	14-52	20-35	1.20-1.40	0.6-2	0.15-0.20	0.0-2.9	0.5-1.0	.28	.28			
	52-80	20-45	1.20-1.40	0.6-2	0.11-0.18	0.0-2.9	0.5-1.0	.28	.28			
Bs:												
Bosque	0-5	27-35	1.20-1.40	0.6-2	0.15-0.20	0.0-2.9	1.0-4.0	.28	.28	5	4L	86
	5-25	20-35	1.20-1.40	0.6-2	0.15-0.20	0.0-2.9	0.5-1.0	.28	.28			
	25-80	20-45	1.20-1.40	0.6-2	0.11-0.18	0.0-2.9	0.5-1.0	.28	.28			
BtC:												
Brackett	0-6	10-35	1.30-1.50	0.6-2	0.08-0.12	0.0-2.9	1.0-3.0	.17	.32	2	8	0
	6-16	18-35	1.30-1.55	0.6-2	0.11-0.16	0.0-2.9	0.5-2.0	.32	.32			
	16-60	18-45	1.35-1.65	0.2-0.6	0.10-0.15	0.0-2.9	0.5-1.0	.32	.32			
BtE:												
Brackett	0-11	10-35	1.30-1.50	0.6-2	0.08-0.12	0.0-2.9	1.0-3.0	.17	.32	2	8	0
	11-31	18-35	1.30-1.55	0.6-2	0.11-0.16	0.0-2.9	0.5-2.0	.32	.32			
	31-60	18-45	1.35-1.65	0.2-0.6	0.10-0.15	0.0-2.9	0.5-1.0	.32	.32			
BxD:												
Brackett	0-5	10-35	1.30-1.50	0.6-2	0.08-0.12	0.0-2.9	1.0-3.0	.17	.32	2	8	0
	5-22	18-35	1.30-1.55	0.6-2	0.11-0.16	0.0-2.9	0.5-2.0	.32	.32			
	22-60	18-45	1.35-1.65	0.2-0.6	0.10-0.15	0.0-2.9	0.5-1.0	.32	.32			
Maloterre	0-5	30-45	1.30-1.50	0.2-0.6	0.13-0.16	0.0-2.9	0.5-1.0	.15	.32	1	8	0
	5-7	---	---	0.06-2	---	---	---	---	---			
ByC:												
Brackett	0-4	10-35	1.30-1.50	0.6-2	0.08-0.12	0.0-2.9	1.0-3.0	.17	.32	2	8	0
	4-26	18-35	1.30-1.55	0.6-2	0.11-0.16	0.0-2.9	0.5-2.0	.32	.32			
	26-60	18-45	1.35-1.65	0.2-0.6	0.10-0.15	0.0-2.9	0.5-1.0	.32	.32			
Pidcoke	0-10	20-35	1.30-1.50	0.2-0.6	0.13-0.17	3.0-5.9	1.0-3.0	.32	.32	1	4L	86
	10-18	20-35	1.30-1.50	0.2-0.6	0.11-0.15	3.0-5.9	0.5-1.0	.20	.32			
	18-25	---	---	0.06-0.6	---	---	---	---	---			

Table 14.--Physical Properties of the Soils--Continued

Map symbol and soil name	Depth	Clay	Moist bulk density	Permeability (K-sat)	Available water capacity	Linear extensibility	Organic matter	Erosion factors			Wind erodibility group	Wind erodibility index
								Kw	Kf	T		
	In	Pct	g/cc	In/hr	In/in	Pct	Pct					
CdB:												
Caradan	0-4	40-50	1.35-1.55	0.06-0.2	0.15-0.20	6.0-8.9	1.0-3.0	.32	.32	5	4	86
	4-26	50-60	1.35-1.50	0.0015-0.06	0.12-0.18	9.0-25.0	1.0-2.0	.32	.32			
	26-63	18-60	1.40-1.65	0.06-0.2	0.12-0.18	6.0-8.9	0.5-1.0	.32	.32			
	63-80	20-39	1.40-1.65	0.6-2	0.10-0.15	0.0-2.9	0.5-1.0	.43	.43			
ChB:												
Cho	0-14	20-35	1.30-1.50	0.6-2	0.07-0.12	0.0-2.9	1.0-2.0	.17	.32	2	8	0
	14-19	---	---	0.06-2	---	---	---	---	---			
	19-62	20-35	1.40-1.60	0.6-2	0.05-0.10	0.0-2.9	0.1-1.0	.15	.32			
CoC:												
Cisco	0-12	10-20	1.35-1.55	2-6	0.10-0.13	0.0-2.9	0.5-1.0	.37	.37	5	3	86
	12-51	20-35	1.40-1.65	0.6-2	0.12-0.18	3.0-5.9	0.1-0.5	.32	.32			
	51-80	15-30	1.50-1.65	2-6	0.10-0.15	0.0-2.9	0.1-0.5	.32	.32			
CoC2:												
Cisco	0-5	10-20	1.35-1.55	2-6	0.10-0.13	0.0-2.9	0.5-1.0	.37	.37	5	3	86
	5-51	20-35	1.40-1.65	0.6-2	0.12-0.18	3.0-5.9	0.1-0.5	.32	.32			
	51-80	15-30	1.50-1.65	2-6	0.10-0.15	0.0-2.9	0.1-0.5	.32	.32			
CrD:												
Cranfill	0-10	27-40	1.32-1.45	0.6-2	0.10-0.14	3.0-5.9	0.5-2.0	.17	.32	5	8	0
	10-17	20-40	1.32-1.50	0.6-2	0.08-0.14	3.0-5.9	0.1-0.5	.28	.32			
	17-80	27-40	1.35-1.60	0.6-2	0.08-0.14	3.0-5.9	0.1-0.5	.28	.32			
CrE:												
Cranfill	0-12	27-40	1.32-1.45	0.6-2	0.10-0.14	3.0-5.9	0.5-2.0	.17	.32	5	8	0
	12-49	20-40	1.32-1.50	0.6-2	0.08-0.14	3.0-5.9	0.1-0.5	.28	.32			
	49-80	27-40	1.35-1.60	0.6-2	0.08-0.14	3.0-5.9	0.1-0.5	.28	.32			
DnB:												
Denton	0-13	35-57	1.18-1.32	0.06-0.2	0.12-0.18	6.0-8.9	1.0-4.0	.32	.32	3	4	86
	13-24	35-55	1.28-1.50	0.06-0.2	0.12-0.18	6.0-8.9	1.0-2.0	.32	.32			
	24-38	12-37	1.40-1.65	0.6-2	0.11-0.14	3.0-5.9	0.1-1.0	.43	.43			
	38-54	12-35	1.40-1.65	0.6-2	0.08-0.12	3.0-5.9	0.1-1.0	.43	.28			
	54-60	---	---	0.06-2	---	---	---	---	---			
DsB:												
Desan	0-5	1-4	1.40-1.50	6-20	0.04-0.07	0.0-2.9	0.3-1.0	.17	.17	5	1	220
	5-55	2-12	1.30-1.60	6-20	0.05-0.08	0.0-2.9	0.3-1.0	.17	.17			
	55-80	12-25	1.35-1.65	0.6-2	0.12-0.16	0.0-2.9	0.1-0.5	.24	.17			
EcB:												
Eckrant	0-8	40-60	1.35-1.55	0.2-0.6	0.05-0.12	3.0-5.9	2.0-11	.15	.32	1	8	0
	8-20	---	---	0.06-2	---	---	---	---	---			
ErB:												
Eckrant	0-3	35-45	1.35-1.55	0.2-0.6	0.05-0.12	3.0-5.9	2.0-11	.15	.32	1	8	0
	3-9	40-60	1.35-1.60	0.2-0.6	0.05-0.12	3.0-5.9	2.0-11	.10	.32			
	9-15	---	---	0.06-2	---	---	---	---	---			
Rock Outcrop	0-80	---	---	---	---	---	---	---	---	--	---	---

Table 14.--Physical Properties of the Soils--Continued

Map symbol and soil name	Depth	Clay	Moist bulk density	Permeability (K-sat)	Available water capacity	Linear extensibility	Organic matter	Erosion factors			Wind erodibility group	Wind erodibility index
								Kw	Kf	T		
	In	Pct	g/cc	In/hr	In/in	Pct	Pct					
EvB:												
Evant	0-5	35-50	1.20-1.45	0.2-0.6	0.08-0.12	3.0-5.9	2.0-4.0	.24	.37	2	8	0
	5-14	60-80	1.25-1.45	0.06-0.2	0.07-0.12	6.0-8.9	1.0-3.0	.32	.32			
	14-18	---	---	0.06-0.6	---	---	---	---	---			
	18-50	---	---	0.06-2	---	---	---	---	---			
Fr:												
Frio	0-37	30-50	1.25-1.45	0.2-0.6	0.14-0.20	3.0-5.9	1.0-4.0	.32	.32	5	4	86
	37-70	30-50	1.25-1.45	0.2-0.6	0.14-0.20	3.0-5.9	1.0-3.0	.32	.32			
KrB:												
Krum	0-8	35-55	1.35-1.55	0.2-0.6	0.15-0.20	6.0-8.9	1.0-3.0	.32	.32	5	4	86
	8-48	40-60	1.25-1.50	0.2-0.6	0.12-0.18	6.0-8.9	0.5-2.0	.32	.32			
	48-62	35-60	1.30-1.55	0.2-0.6	0.07-0.18	6.0-8.9	0.1-1.0	.32	.32			
La:												
Lamkin	0-10	28-35	1.30-1.45	0.6-2	0.15-0.19	3.0-5.9	1.0-3.0	.37	.37	5	4L	86
	10-80	18-40	1.35-1.50	0.6-2	0.14-0.18	3.0-5.9	0.5-1.0	.37	.37			
LpB:												
Lampasas	0-3	35-45	1.35-1.55	0.2-0.6	0.07-0.12	3.0-5.9	2.0-5.0	.17	.32	2	8	0
	3-11	35-45	1.35-1.60	0.2-0.6	0.05-0.11	3.0-5.9	1.0-2.0	.05	.32			
	11-60	0-0	---	0.2-0.6	0.00-0.02	---	---	---	---			
MnB:												
Minwells	0-9	10-20	1.40-1.55	2-6	0.10-0.15	0.0-2.9	0.1-1.0	.24	.24	5	3	86
	9-20	35-45	1.35-1.60	0.06-0.2	0.11-0.16	3.0-5.9	0.1-1.0	.32	.32			
	20-63	20-35	1.35-1.60	0.2-0.6	0.10-0.16	3.0-5.9	0.1-1.0	.32	.32			
	63-80	3-25	1.35-1.60	2-6	0.01-0.09	0.0-2.9	0.1-1.0	.15	.24			
NuB:												
Nuff	0-9	27-40	1.30-1.55	0.2-0.6	0.18-0.22	3.0-5.9	2.0-4.0	.28	.28	5	4L	86
	9-26	20-40	1.35-1.55	0.6-2	0.15-0.18	3.0-5.9	0.5-1.0	.32	.32			
	26-62	25-45	1.45-1.69	0.2-0.6	0.15-0.18	3.0-5.9	0.5-1.0	.32	.37			
NuC:												
Nuff	0-10	25-45	1.35-1.55	0.2-0.6	0.12-0.16	3.0-5.9	2.0-4.0	.17	.37	5	8	0
	10-18	20-40	1.35-1.55	0.6-2	0.15-0.18	3.0-5.9	0.5-1.0	.32	.32			
	18-25	20-40	1.40-1.60	0.6-2	0.12-0.16	3.0-5.9	0.5-1.0	.20	.37			
	25-80	25-45	1.45-1.69	0.2-0.6	0.15-0.18	3.0-5.9	0.5-1.0	.32	.37			
OgB:												
Oglesby	0-17	40-50	1.25-1.45	0.06-0.2	0.10-0.15	6.0-8.9	1.0-3.0	.20	.32	1	8	0
	17-35	---	---	0.06-2	---	---	---	---	---			
PdB:												
Pedernales	0-9	5-20	1.40-1.50	0.6-2	0.12-0.15	0.0-2.9	0.5-1.0	.28	.28	5	3	86
	9-29	35-55	1.45-1.60	0.2-0.6	0.13-0.18	3.0-5.9	0.1-1.0	.32	.32			
	29-80	20-50	1.45-1.60	0.2-0.6	0.13-0.18	3.0-5.9	0.1-1.0	.28	.28			
PdC2:												
Pedernales	0-5	5-20	1.40-1.50	0.6-2	0.12-0.15	0.0-2.9	0.5-1.0	.28	.28	5	3	86
	5-37	35-55	1.45-1.60	0.2-0.6	0.13-0.18	3.0-5.9	0.1-1.0	.32	.32			
	37-62	20-50	1.45-1.60	0.2-0.6	0.13-0.18	3.0-5.9	0.1-1.0	.28	.28			

Table 14.--Physical Properties of the Soils--Continued

Map symbol and soil name	Depth	Clay	Moist bulk density	Permeability (K-sat)	Available water capacity	Linear extensibility	Organic matter	Erosion factors			Wind erodibility group	Wind erodibility index
								Kw	Kf	T		
	In	Pct	g/cc	In/hr	In/in	Pct	Pct					
PkB:												
Pidcoke	0-11	20-35	1.30-1.50	0.2-0.6	0.11-0.15	3.0-5.9	1.0-3.0	.20	.32	1	8	0
	11-18	20-35	1.30-1.50	0.2-0.6	0.11-0.15	3.0-5.9	0.5-1.0	.20	.32			
	18-24	---	---	0.06-0.6	---	---	---	---	---			
ReB:												
Real	0-5	22-40	1.25-1.55	0.6-2	0.05-0.10	0.0-2.9	2.0-10	.15	.28	2	8	0
	5-12	22-40	1.25-1.55	0.6-2	0.05-0.10	0.0-2.9	1.0-8.0	.10	.32			
	12-14	---	---	0.2-2	---	---	---	---	---			
	14-60	---	---	0.2-2	---	---	---	---	---			
ReC:												
Real	0-8	20-40	1.25-1.55	0.6-2	0.05-0.10	0.0-2.9	2.0-10	.10	.32	2	8	0
	8-16	20-40	1.25-1.55	0.6-2	0.05-0.10	0.0-2.9	0.1-8.0	.10	.32			
	16-18	---	---	0.2-2	---	---	---	---	---			
	18-60	---	---	0.2-2	---	---	---	---	---			
ReD:												
Real	0-6	22-40	1.25-1.55	0.6-2	0.05-0.10	0.0-2.9	2.0-10	.10	.32	2	8	0
	6-12	22-40	1.25-1.55	0.6-2	0.05-0.10	0.0-2.9	1.0-8.0	.10	.32			
	12-13	---	---	0.2-2	---	---	---	---	---			
	13-60	---	---	0.2-2	---	---	---	---	---			
Doss	0-17	27-40	1.25-1.45	0.2-0.6	0.12-0.16	3.0-5.9	1.0-3.0	.32	.37	2	4L	86
	17-60	---	---	0.06-2	---	---	---	---	---			
ReF:												
Real	0-9	20-40	1.25-1.55	0.6-2	0.06-0.12	0.0-2.9	2.0-10	.10	.32	2	8	0
	9-10	---	---	0.2-2	---	---	---	---	---			
	10-60	---	---	0.2-2	---	---	---	---	---			
Rock Outcrop	0-80	---	---	---	---	---	---	---	---	--	---	---
RsC:												
Riesel	0-9	5-15	1.40-1.60	2-6	0.04-0.10	0.0-2.9	0.5-2.0	.10	.28	4	8	0
	9-43	35-55	1.35-1.50	0.06-0.2	0.05-0.12	3.0-5.9	0.5-1.0	.17	.32			
	43-59	35-55	1.40-1.55	0.06-0.2	0.05-0.16	3.0-5.9	0.5-1.0	.17	.32			
	59-70	3-12	1.45-1.65	6-20	0.03-0.05	0.0-2.9	0.5-1.0	.10	.17			
RuB:												
Rumley	0-7	28-40	1.20-1.40	0.6-2	0.16-0.20	6.0-8.9	1.0-3.0	.37	.37	5	4L	86
	7-16	30-45	1.20-1.45	0.6-2	0.14-0.18	6.0-8.9	0.1-1.0	.37	.37			
	16-35	28-40	1.20-1.40	0.6-2	0.14-0.18	3.0-5.9	0.1-1.0	.37	.37			
	35-70	28-40	1.20-1.40	0.6-2	0.14-0.18	3.0-5.9	0.1-1.0	.37	.37			
SaB:												
San Saba	0-6	45-60	1.30-1.45	0.0015-0.06	0.12-0.16	6.0-8.9	1.0-4.0	.32	.32	2	4	86
	6-36	45-60	1.30-1.50	0.0015-0.06	0.12-0.16	6.0-8.9	0.5-2.0	.32	.32			
	36-40	---	---	0.06-2	---	---	---	---	---			

Table 14.--Physical Properties of the Soils--Continued

Map symbol and soil name	Depth	Clay	Moist bulk density	Permeability (K-sat)	Available water capacity	Linear extensibility	Organic matter	Erosion factors			Wind erodibility group	Wind erodibility index
								Kw	Kf	T		
	In	Pct	g/cc	In/hr	In/in	Pct	Pct					
SeC:												
Seawillow	0-6	22-40	1.40-1.55	0.6-2	0.12-0.20	3.0-5.9	0.3-1.0	.28	.32	5	4L	86
	6-44	22-40	1.35-1.55	0.6-2	0.12-0.16	3.0-5.9	0.1-1.0	.28	.32			
	44-62	22-40	1.35-1.60	0.6-2	0.12-0.14	0.0-2.9	0.1-1.0	.32	.32			
SsB:												
Slidell	0-8	40-60	1.25-1.55	0.0015-0.06	0.15-0.18	6.0-8.9	1.0-4.0	.32	.32	5	4	86
	8-45	40-60	1.25-1.55	0.0015-0.06	0.15-0.18	6.0-8.9	1.0-3.0	.32	.32			
	45-80	40-60	1.35-1.55	0.0015-0.06	0.13-0.18	6.0-8.9	0.1-1.0	.32	.32			
TaB:												
Tarpley	0-7	30-50	1.20-1.40	0.2-0.6	0.15-0.20	6.0-8.9	1.0-4.0	.32	.32	1	4	86
	7-18	60-80	1.15-1.35	0.06-0.2	0.07-0.14	9.0-25.0	1.0-2.0	.32	.32			
	18-24	---	---	0.2-2	---	---	---	---	---			
ToC:												
Topsey	0-6	20-35	1.32-1.50	0.6-2	0.12-0.17	3.0-5.9	2.0-8.0	.32	.32	5	4L	86
	6-12	20-35	1.32-1.50	0.6-2	0.12-0.17	3.0-5.9	1.0-3.0	.32	.32			
	12-18	20-35	1.32-1.50	0.6-2	0.10-0.16	3.0-5.9	1.0-3.0	.17	.32			
	18-32	20-35	1.50-1.65	0.6-2	0.12-0.17	3.0-5.9	1.0-2.0	.32	.32			
	32-62	35-50	1.50-1.73	0.2-0.6	0.09-0.16	3.0-5.9	0.5-1.0	.32	.32			
ToD:												
Topsey	0-10	20-35	1.32-1.50	0.6-2	0.12-0.17	3.0-5.9	2.0-8.0	.32	.32	5	4L	86
	10-17	20-35	1.32-1.50	0.6-2	0.12-0.17	3.0-5.9	1.0-3.0	.32	.32			
	17-31	20-35	1.50-1.65	0.6-2	0.12-0.17	3.0-5.9	1.0-2.0	.32	.32			
	31-60	35-50	1.50-1.73	0.2-0.6	0.09-0.16	3.0-5.9	0.5-1.0	.32	.32			
VnB:												
Venus	0-6	18-30	1.20-1.50	0.6-2	0.15-0.20	0.0-2.9	1.0-2.0	.28	.28	5	4L	86
	6-38	18-35	1.20-1.50	0.6-2	0.15-0.20	0.0-2.9	0.5-2.0	.28	.28			
	38-80	18-35	1.30-1.60	0.6-2	0.13-0.18	0.0-2.9	0.5-1.0	.28	.28			
Vs:												
Venus	0-15	18-30	1.20-1.50	0.6-2	0.15-0.20	0.0-2.9	1.0-3.0	.28	.28	5	4L	86
	15-35	18-35	1.20-1.50	0.6-2	0.15-0.20	0.0-2.9	1.0-2.0	.28	.28			
	35-80	18-35	1.30-1.60	0.6-2	0.13-0.18	0.0-2.9	0.5-2.0	.28	.28			
WsC:												
Wise	0-5	18-30	1.30-1.50	0.6-2	0.12-0.15	3.0-5.9	0.5-2.0	.37	.37	3	6	48
	5-26	20-30	1.35-1.60	0.6-2	0.09-0.12	3.0-5.9	0.5-1.0	.37	.37			
	26-62	10-30	1.35-1.65	0.6-6	0.08-0.12	3.0-5.9	0.1-0.5	.37	.37			

Table 15.--Chemical Properties of the Soils

(Absence of an entry indicates that data were not estimated.)

Map symbol and soil name	Depth	Cation exchange capacity	Soil reaction	Calcium carbonate	Gypsum	Salinity	Sodium adsorption ratio
	In	meq/100 g	pH	Pct	Pct	mmhos/cm	
BaB:							
Bastsil	0-17	2.0-7.0	5.1-7.3	0	0	0	0
	17-80	10-25	5.6-7.8	0-2	0	0	0
BaC2:							
Bastsil	0-5	5.0-10	5.1-7.3	0	0	0	0
	5-80	10-25	5.6-7.8	0-2	0	0	0
BgB:							
Bolar	0-17	10-25	7.9-8.4	40-60	0	0	0
	17-36	10-25	7.9-8.4	40-60	0	0	0
	36-55	---	---	---	---	---	---
Bo:							
Bosque	0-14	15-30	7.9-8.4	2-15	0	0	0
	14-52	10-25	7.4-8.4	5-20	0	0	0
	52-80	15-35	7.9-8.4	7-20	0	0	0
Bs:							
Bosque	0-5	15-30	7.9-8.4	2-15	0	0	0
	5-25	10-25	7.4-8.4	5-20	0	0	0
	25-80	15-35	7.9-8.4	7-20	0	0	0
BtC:							
Brackett	0-6	10-20	7.9-8.4	40-80	0	0.0-2.0	0
	6-16	10-20	7.9-8.4	40-80	0	0.0-2.0	0
	16-60	5.0-15	7.9-8.4	40-80	0-5	0.0-2.0	0
BtE:							
Brackett	0-11	10-20	7.9-8.4	40-80	0	0.0-2.0	0
	11-31	10-20	7.9-8.4	40-80	0	0.0-2.0	0
	31-60	5.0-15	7.9-8.4	40-80	0-5	0.0-2.0	0
BxD:							
Brackett	0-5	10-20	7.9-8.4	40-80	0	0.0-2.0	0
	5-22	10-20	7.9-8.4	40-80	0	0.0-2.0	0
	22-60	5.0-15	7.9-8.4	40-80	0-5	0.0-2.0	0
Maloterre	0-5	18-28	7.9-8.4	40-80	0	0	0
	5-7	---	---	---	---	---	---
ByC:							
Brackett	0-4	10-20	7.9-8.4	40-80	0	0.0-2.0	0
	4-26	10-20	7.9-8.4	40-80	0	0.0-2.0	0
	26-60	5.0-15	7.9-8.4	40-80	0-5	0.0-2.0	0
Pidcoke	0-10	20-40	7.9-8.4	40-60	0	0	0
	10-18	20-35	7.9-8.4	40-60	0	0	0
	18-25	---	---	---	---	---	---
CdB:							
Caradan	0-4	20-30	6.1-7.8	0	0	0.0-2.0	0
	4-26	30-55	6.1-7.8	10-30	0	0.0-2.0	0-2
	26-63	10-20	7.9-8.4	40-70	0	2.0-4.0	1-6
	63-80	10-20	7.9-8.4	40-70	0	2.0-4.0	5-10
ChB:							
Cho	0-14	10-20	7.9-8.4	40-65	0	0	0
	14-19	---	---	---	0	0	0
	19-62	10-20	7.9-8.4	40-85	0	0	0
CoC:							
Cisco	0-12	4.0-7.0	6.1-7.3	0	0	0	0
	12-51	12-22	6.1-7.8	0	0	0	0
	51-80	4.0-15	7.4-8.4	1-10	0	0	0
CoC2:							
Cisco	0-5	4.0-7.0	6.1-7.3	0	0	0	0
	5-51	12-22	6.1-7.8	0	0	0	0
	51-80	4.0-15	7.4-8.4	1-10	0	0	0

Table 15.--Chemical Properties of the Soils--Continued

Map symbol and soil name	Depth	Cation exchange capacity	Soil reaction	Calcium carbonate	Gypsum	Salinity	Sodium adsorption ratio
	In	meq/100 g	pH	Pct	Pct	mmhos/cm	
CrD:							
Cranfill	0-10	10-20	7.9-8.4	50-80	0	0.0-2.0	0
	10-17	10-20	7.9-8.4	50-85	0	0.0-2.0	0
	17-80	5.0-15	7.9-8.4	50-85	0	0.0-2.0	0
CrE:							
Cranfill	0-12	10-20	7.9-8.4	50-80	0	0.0-2.0	0
	12-49	10-20	7.9-8.4	50-85	0	0.0-2.0	0
	49-80	5.0-15	7.9-8.4	50-85	0	0.0-2.0	0
DnB:							
Denton	0-13	40-60	7.9-8.4	5-15	0	0	0
	13-24	40-60	7.9-8.4	10-30	0	0	0
	24-38	10-45	7.9-8.4	40-80	0	0	0
	38-54	10-25	7.9-8.4	50-80	0	0	0
	54-60	---	---	---	---	---	---
DsB:							
Desan	0-5	1.0-5.0	5.1-7.3	0	0	0.0-2.0	0
	5-55	1.0-5.0	5.1-7.3	0	0	0.0-2.0	0
	55-80	5.0-12	5.1-6.5	0	0	0.0-2.0	0
EcB:							
Eckrant	0-8	40-70	6.6-8.4	1-8	0	0.0-2.0	0
	8-20	---	---	---	---	---	---
ErB:							
Eckrant	0-3	40-70	6.6-8.4	1-8	0	0.0-2.0	0
	3-9	35-60	6.6-8.4	1-8	0	0.0-2.0	0
	9-15	---	---	---	---	---	---
Rock Outcrop	0-80	---	---	---	---	---	---
EvB:							
Evant	0-5	25-40	6.1-7.3	0-5	0	0	0
	5-14	35-55	5.6-7.8	1-15	0	0	0
	14-18	---	---	---	---	---	---
	18-50	---	---	---	---	---	---
Fr:							
Frio	0-37	35-60	7.9-8.4	15-40	0	0	0
	37-70	35-60	7.9-8.4	15-40	0	0	0
KrB:							
Krum	0-8	35-60	7.4-8.4	0-15	0	0.0-2.0	0
	8-48	30-50	7.9-8.4	10-30	0	0.0-2.0	0-1
	48-62	30-50	7.9-8.4	20-50	0	0.0-2.0	1-3
La:							
Lamkin	0-10	12-25	7.4-8.4	5-15	0	0	0
	10-80	10-25	7.9-8.4	10-25	0	0	0
LpB:							
Lampasas	0-3	15-30	6.6-7.8	2-10	0	0	0
	3-11	15-30	6.6-7.8	2-10	0	0	0
	11-60	---	7.9-8.4	0	0	0	0
MnB:							
Minwells	0-9	5.0-10	6.1-7.8	0	0	0	0
	9-20	15-25	5.6-7.8	0	0	0	0
	20-63	12-20	6.6-8.4	0-3	0	0	0
	63-80	1.0-10	6.6-8.4	0-11	0	0	0
NuB:							
Nuff	0-9	20-35	7.9-8.4	30-50	0	0	0
	9-26	20-35	7.9-8.4	40-80	0	0	0
	26-62	20-40	7.9-8.4	40-80	0	0	1-3
NuC:							
Nuff	0-10	20-35	7.9-8.4	30-50	0	0	0
	10-18	20-35	7.9-8.4	40-80	0	0	0-1
	18-25	15-35	7.9-8.4	40-80	0	0	1-3
	25-80	15-35	7.9-8.4	40-80	0	0	1-3

Table 15.--Chemical Properties of the Soils--Continued

Map symbol and soil name	Depth	Cation exchange capacity	Soil reaction	Calcium carbonate	Gypsum	Salinity	Sodium adsorption ratio
	In	meq/100 g	pH	Pct	Pct	mmhos/cm	
OgB:							
Oglesby	0-17	35-50	6.6-7.8	0-5	0	0	0
	17-35	---	---	---	---	---	---
PdB:							
Pedernales	0-9	5.0-15	6.1-7.8	0	0	0	0
	9-29	30-45	6.1-7.8	0	0	0	0-2
	29-80	10-25	7.9-8.4	5-35	0	0	0-2
PdC2:							
Pedernales	0-5	5.0-15	6.1-7.8	0	0	0	0
	5-37	30-45	6.1-7.8	0	0	0	0-2
	37-62	10-25	7.9-8.4	5-35	0	0	0-2
PkB:							
Pidcoke	0-11	20-35	7.9-8.4	40-60	0	0	0
	11-18	20-35	7.9-8.4	40-60	0	0	0
	18-24	---	---	---	---	---	---
ReB:							
Real	0-5	10-30	7.9-8.4	40-70	0	0	0
	5-12	10-30	7.9-8.4	40-70	0	0	0
	12-14	---	---	---	---	---	---
	14-60	---	---	---	---	---	---
ReC:							
Real	0-8	10-30	7.4-8.4	40-70	0	0.0-2.0	0
	8-16	10-30	7.4-8.4	40-70	0	0.0-2.0	0
	16-18	---	---	---	---	---	---
	18-60	---	---	---	---	---	---
ReD:							
Real	0-6	10-30	7.9-8.4	40-70	0	0	0
	6-12	10-30	7.9-8.4	40-70	0	0	0
	12-13	---	---	---	---	---	---
	13-60	---	---	---	---	---	---
Doss	0-17	20-35	7.9-8.4	40-70	0	0.0-2.0	0
	17-60	---	---	---	---	---	---
ReF:							
Real	0-9	10-30	7.4-8.4	40-70	0	0.0-2.0	0
	9-10	---	---	---	---	---	---
	10-60	---	---	---	---	---	---
Rock Outcrop	0-80	---	---	---	---	---	---
RsC:							
Riesel	0-9	4.0-10	6.1-7.3	0	0	0	0
	9-43	15-30	5.6-7.3	0	0	0	0
	43-59	15-30	5.6-7.3	0-4	0	0	0
	59-70	2.0-5.0	6.6-8.4	2-10	0	0	0
RuB:							
Rumley	0-7	20-35	7.9-8.4	30-50	0	0.0-2.0	0
	7-16	20-35	7.9-8.4	40-60	0	0.0-2.0	0
	16-35	10-30	7.9-8.4	40-60	0	0.0-2.0	0
	35-70	20-35	7.9-8.4	40-60	0	0.0-2.0	0
SaB:							
San Saba	0-6	35-55	7.4-8.4	5-20	0	0.0-2.0	0
	6-36	35-55	7.4-8.4	5-20	0	0.0-2.0	0
	36-40	---	---	---	---	---	---
SeC:							
Seawillow	0-6	10-25	7.9-8.4	30-50	0	0.0-2.0	0
	6-44	10-20	7.9-8.4	40-70	0	0.0-2.0	0
	44-62	10-20	7.9-8.4	40-70	0	0.0-2.0	0
SsB:							
Slidell	0-8	40-60	7.4-8.4	10-25	0	0.0-2.0	0
	8-45	40-60	7.4-8.4	10-25	0	0.0-2.0	0-2
	45-80	40-60	7.4-8.4	20-60	0	0.0-2.0	2-6

Table 15.--Chemical Properties of the Soils--Continued

Map symbol and soil name	Depth	Cation exchange capacity	Soil reaction	Calcium carbonate	Gypsum	Salinity	Sodium adsorption ratio
	In	meq/100 g	pH	Pct	Pct	mmhos/cm	
TaB:							
Tarpley	0-7	15-25	6.1-7.8	0-2	0	0.0-2.0	0
	7-18	15-35	6.1-7.8	0-2	0	0.0-2.0	0
	18-24	---	---	---	---	---	---
ToC:							
Topsey	0-6	15-35	7.9-8.4	30-50	0	0	0
	6-12	10-30	7.9-8.4	40-80	0	0	0
	12-18	10-30	7.9-8.4	40-80	0	0	0-1
	18-32	10-35	7.9-8.4	40-80	0	0	0-1
	32-62	10-35	7.9-8.4	40-80	0	0	1-3
ToD:							
Topsey	0-10	15-35	7.9-8.4	30-50	0	0	0
	10-17	10-30	7.9-8.4	40-80	0	0	0
	17-31	10-35	7.9-8.4	40-80	0	0	0-1
	31-60	10-35	7.9-8.4	40-80	0	0	1-3
VnB:							
Venus	0-6	10-20	7.9-8.4	15-40	0	0	0
	6-38	15-25	7.9-8.4	15-40	0	0	0
	38-80	10-20	7.9-8.4	15-40	0	0	0
Vs:							
Venus	0-15	10-20	7.9-8.4	5-10	0	0	0
	15-35	10-20	7.9-8.4	10-35	0	0	0
	35-80	10-20	7.9-8.4	15-35	0	0	0
WsC:							
Wise	0-5	10-15	7.4-8.4	5-30	0	0	0
	5-26	10-15	7.4-8.4	15-35	0	0	0
	26-62	10-15	7.4-8.4	15-35	0	0	0

Table 16.--Water Features

(See text for definitions of terms used in this table. Estimates of the frequency of ponding and flooding apply to the whole year rather than to individual months. Absence of an entry indicates that the feature is not a concern or that data were not estimated.)

Map symbol and soil name	Hydrologic group	Month	Ponding		Flooding	
			Frequency	Duration	Frequency	
BaB:						
Bastsil	B	Jan-Dec	None	---	None	
BaC2:						
Bastsil	B	Jan-Dec	None	---	None	
BgB:						
Bolar	C	Jan-Dec	None	---	None	
Bo:						
Bosque	B	January	None	Brief	Rare	
		February	None	Brief	Rare	
		March	None	Brief	Rare	
		April	None	Brief	Rare	
		May	None	Brief	Rare	
		June	None	Brief	Rare	
		July	None	Brief	Rare	
		August	None	Brief	Rare	
		September	None	Brief	Rare	
		October	None	Brief	Rare	
		November	None	Brief	Rare	
		December	None	Brief	Rare	
Bs:						
Bosque	B	January	None	Brief	Occasional	
		February	None	Brief	Occasional	
		March	None	Brief	Occasional	
		April	None	Brief	Occasional	
		May	None	Brief	Occasional	
		October	None	Brief	Occasional	
		November	None	Brief	Occasional	
		December	None	Brief	Occasional	
BtC:						
Brackett	C	Jan-Dec	None	---	None	
BtE:						
Brackett	C	Jan-Dec	None	---	None	
BxD:						
Brackett	C	Jan-Dec	None	---	None	
Maloterre	D	Jan-Dec	None	---	None	
ByC:						
Brackett	C	Jan-Dec	None	---	None	
Pidcoke	D	Jan-Dec	None	---	None	
CdB:						
Caradan	D	Jan-Dec	None	---	None	
ChB:						
Cho	C	Jan-Dec	None	---	None	
CoC:						
Cisco	B	Jan-Dec	None	---	None	
CoC2:						
Cisco	B	Jan-Dec	None	---	None	

Table 16.--Water Features--Continued

Map symbol and soil name	Hydrologic group	Month	Flooding		
			Frequency	Duration	Frequency
CrD:					
Cranfill	B	Jan-Dec	None	---	None
CrE:					
Cranfill	B	Jan-Dec	None	---	None
DnB:					
Denton	D	Jan-Dec	None	---	None
DsB:					
Desan	A	Jan-Dec	None	---	None
EcB:					
Eckrant	D	Jan-Dec	None	---	None
ErB:					
Eckrant	D	Jan-Dec	None	---	None
Rock Outcrop	D	Jan-Dec	None	---	None
EvB:					
Evant	D	Jan-Dec	None	---	None
Fr:					
Frio	B	January	None	Brief	Occasional
		February	None	Brief	Occasional
		March	None	Brief	Occasional
		April	None	Brief	Occasional
		May	None	Brief	Occasional
		October	None	Brief	Occasional
		November	None	Brief	Occasional
		December	None	Brief	Occasional
KrB:					
Krum	D	Jan-Dec	None	---	None
La:					
Lamkin	B	May	None	Brief	Occasional
		June	None	Brief	Occasional
		July	None	Brief	Occasional
		August	None	Brief	Occasional
		September	None	Brief	Occasional
		October	None	Brief	Occasional
LpB:					
Lampasas	D	Jan-Dec	None	---	None
MnB:					
Minwells	C	Jan-Dec	None	---	None
NuB:					
Nuff	C	Jan-Dec	None	---	None
NuC:					
Nuff	C	Jan-Dec	None	---	None
OgB:					
Oglesby	D	Jan-Dec	None	---	None
PdB:					
Pedernales	C	Jan-Dec	None	---	None
PdC2:					
Pedernales	C	Jan-Dec	None	---	None

Table 16.--Water Features--Continued

Map symbol and soil name	Hydrologic group	Month	Flooding		
			Frequency	Duration	Frequency
PkB:					
Pidcoke	D	Jan-Dec	None	---	None
ReB:					
Real	D	Jan-Dec	None	---	None
ReC:					
Real	D	Jan-Dec	None	---	None
ReD:					
Real	D	Jan-Dec	None	---	None
Doss	D	Jan-Dec	None	---	None
ReF:					
Real	D	Jan-Dec	None	---	None
Rock Outcrop	D	Jan-Dec	None	---	None
RsC:					
Riesel	C	Jan-Dec	None	---	None
RuB:					
Rumley	B	Jan-Dec	None	---	None
SaB:					
San Saba	D	Jan-Dec	None	---	None
SeC:					
Seawillow	B	Jan-Dec	None	---	None
SsB:					
Slidell	D	Jan-Dec	None	---	None
TaB:					
Tarpley	D	Jan-Dec	None	---	None
ToC:					
Topsey	C	Jan-Dec	None	---	None
ToD:					
Topsey	C	Jan-Dec	None	---	None
VnB:					
Venus	B	Jan-Dec	None	---	None
Vs:					
Venus	B	January	None	Brief	Rare
		February	None	Brief	Rare
		March	None	Brief	Rare
		April	None	Brief	Rare
		May	None	Brief	Rare
		June	None	Brief	Rare
		July	None	Brief	Rare
		August	None	Brief	Rare
		September	None	Brief	Rare
		October	None	Brief	Rare
		November	None	Brief	Rare
		December	None	Brief	Rare
WsC:					
Wise	C	Jan-Dec	None	---	None

Table 17.--Soil Features

(See text for definitions of terms used in this table. Absence of an entry indicates that the feature is not a concern or that data were not estimated.)

Map symbol and soil name	Restrictive layer				Risk of corrosion	
	Kind	Depth to top	Thickness	Hardness	Uncoated steel	Concrete
		In	In			
BaB:						
Bastsil	---	---	---	---	Moderate	Low
BaC2:						
Bastsil	---	---	---	---	Moderate	Low
BgB:						
Bolar	Bedrock (lithic)	20-40	---	Indurated	High	Low
Bo:						
Bosque	---	---	---	---	High	Low
Bs:						
Bosque	---	---	---	---	High	Low
BtC:						
Brackett	---	---	---	---	High	Low
BtE:						
Brackett	---	---	---	---	High	Low
BxD:						
Brackett	---	---	---	---	High	Low
Maloterre	Bedrock (lithic)	3-10	---	Indurated	High	Low
ByC:						
Brackett	---	---	---	---	High	Low
Pidcoke	Bedrock (lithic)	10-20	---	Indurated	Moderate	Low
CdB:						
Caradan	---	---	---	---	High	Low
ChB:						
Cho	Petrocalcic	7-20	0-3	Strongly cemented	High	Low
CoC:						
Cisco	---	---	---	---	Moderate	Low
CoC2:						
Cisco	---	---	---	---	Moderate	Low
CrD:						
Cranfill	---	---	---	---	High	Low
CrE:						
Cranfill	---	---	---	---	High	Low
DnB:						
Denton	Bedrock (lithic)	40-60	---	Indurated	High	Low
DsB:						
Desan	---	---	---	---	Moderate	Moderate
EcB:						
Eckrant	Bedrock (lithic)	8-20	---	Indurated	High	Low
ErB:						
Eckrant	Bedrock (lithic)	8-20	---	Indurated	High	Low
Rock Outcrop	Bedrock (lithic)	0-2	---	---	High	Low

Table 17.--Soil Features--Continued

Map symbol and soil name	Restrictive layer				Risk of corrosion	
	Kind	Depth to top	Thickness	Hardness	Uncoated steel	Concrete
		In	In			
EvB:						
Evant	Petrocalcic	14-20	0-3	Strongly cemented	High	Moderate
	Bedrock (paralithic)	20-40	---	Weakly cemented		
Fr:						
Frio	---	---	---	---	High	Low
KrB:						
Krum	---	---	---	---	High	Low
La:						
Lamkin	---	---	---	---	Moderate	Low
LpB:						
Lampasas	---	---	---	---	Low	Low
MnB:						
Minwells	---	---	---	---	High	Low
NuB:						
Nuff	---	---	---	---	Moderate	Low
NuC:						
Nuff	---	---	---	---	Moderate	Low
OgB:						
Oglesby	Bedrock (lithic)	10-20	---	Indurated	High	Low
PdB:						
Pedernales	---	---	---	---	High	Low
PdC2:						
Pedernales	---	---	---	---	High	Low
PkB:						
Pidcoke	Bedrock (lithic)	10-20	---	Indurated	Moderate	Low
ReB:						
Real	Petrocalcic	12-14	0-2	Strongly cemented	High	Low
	Bedrock (paralithic)	10-20	---	Weakly cemented	High	Low
ReC:						
Real	Petrocalcic	16-18	0-2	Strongly cemented	High	Low
	Bedrock (paralithic)	10-20	---	Weakly cemented	High	Low
ReD:						
Real	Petrocalcic	12-13	0-2	Strongly cemented	High	Low
	Bedrock (paralithic)	8-20	---	Weakly cemented	High	Low
Doss	Bedrock (paralithic)	11-20	---	Weakly cemented	High	Low
ReF:						
Real	Petrocalcic	9-10	0-2	Strongly cemented	High	Low
	Bedrock (paralithic)	8-20	---	Weakly cemented	High	Low
Rock Outcrop	Bedrock (lithic)	0-2	---	Indurated	High	Low
RsC:						
Riesel	---	---	---	---	High	Low

Table 17.--Soil Features--Continued

Map symbol and soil name	Restrictive layer				Risk of corrosion	
	Kind	Depth to top	Thickness	Hardness	Uncoated steel	Concrete
		In	In			
RuB:						
Rumley	---	---	---	---	High	Low
SaB:						
San Saba	Bedrock (lithic)	24-40	---	Indurated	High	Low
SeC:						
Seawillow	---	---	---	---	Moderate	Low
SsB:						
Slidell	---	---	---	---	Moderate	Low
TaB:						
Tarpley	Bedrock (lithic)	13-20	---	Indurated	High	Low
ToC:						
Topsey	---	---	---	---	Moderate	Low
ToD:						
Topsey	---	---	---	---	Moderate	Low
VnB:						
Venus	---	---	---	---	High	Low
Vs:						
Venus	---	---	---	---	High	Low
WsC:						
Wise	---	---	---	---	Moderate	Low

Table 18.--Physical Analyses of Selected Soils.

(Dash indicates the determination was not made. TR means trace.)

Soil Name and Number	Depth	Horizon	Coarse Fragments	Particle-size distribution								COLE[1]	Bulk Density 1/3-bar	Water Content 1/3-bar
				Sand						Silt (0.05-0.002mm)	Clay (<0.002 mm)			
				Very Coarse (2-1 mm)	Coarse (1-0.5mm)	Medium (0.5-0.25mm)	Fine (0.25-0.1mm)	Very Fine (0.1 - 0.05mm)	Total (2-0.05mm)					
	In		Pct	Pct	Pct	Pct	Pct	Pct	Pct	Pct	Pct	Cm/cm	g/cc	Pct(wt)
Bolar [3,4]	5-13	A2	44	5.2	4.9	3.6	4.3	5.8	23.8	29.8	46.4	—	—	—
(S86-TX-193-004)	18-21	Bk2	—	—	0.1	0.3	2.1	9.9	12.4	34.5	53.1	—	—	—
Caradan [2,5]	0-4	A	0	0.1	0.5	1.0	5.5	1.9	9.0	47.9	43.1	0.150	0.90	70.9
(S84-TX-193-001)	4-13	Bt	0	0.5	0.7	0.7	5.7	0.9	8.6	39.8	51.6	0.136	1.20	40.0
	13-19	Btss	0	0.7	0.7	0.7	5.3	1.4	8.8	35.3	55.9	0.127	1.21	40.4
	19-26	Btkss	0	0.6	0.8	0.9	3.9	1.4	7.6	45.0	47.4	0.081	1.30	33.9
	26-42	2Bk1 [6]	0	0.6	0.6	1.2	2.8	1.6	6.8	75.4	17.8	0.028	1.37	30.0
	42-63	2Bk1	1	1.0	1.6	2.0	3.8	1.0	9.4	67.4	23.2	—	—	—
	63-80	2Bk2	1	2.4	2.4	2.9	6.6	0.0	14.3	52.9	32.8	0.050	1.39	28.2
Cho, variant [2,7]	0-6	A	0	0.4	0.6	0.8	4.6	6.4	12.8	43.6	43.6	0.094	1.16	37.7
(S83-TX-193-001)	6-13	Bk1	0	0.8	1.4	1.4	4.4	5.5	13.5	41.7	44.8	0.106	1.08	46.1
	13-20	Bk2	33	3.7	3.3	2.5	4.6	4.9	19.0	40.2	40.8	0.067	1.22	31.5
	20-24	Bkm1	—	—	—	—	—	—	—	—	—	—	—	—
	24-30	Bkm2	14	9.7	6.9	6.1	5.0	2.0	29.7	57.2	13.1	0.000	1.44	23.5
	30-41	B'k1	6	3.2	4.9	6.6	4.9	2.6	22.2	60.5	17.3	0.002	1.43	25
	41-52	B'k2	3	0.3	0.8	2.5	3.7	2.1	9.4	66.4	24.2	0.010	1.28	26.7
	52-61	CBk	0	0.0	0.6	2.0	1.7	1.0	5.3	78.7	16.0	0.007	1.52	23.2
	61-71	Cr1	24	4.2	6.2	12.2	6.5	3.5	32.6	48.0	19.4	0.000	2.09	8.9
	71-74	Cr2	—	—	—	—	—	—	—	—	—	0.001	2.32	6.5
Eckrant [3,8]	0-3	A1	39	0.2	0.3	0.5	2.0	8.1	11.1	37.8	51.1	—	—	—
(S86-TX-193-003)	3-9	A2	62	1.0	0.8	0.8	1.8	6.8	11.2	30.4	58.4	—	—	—
Lampasas [3,9]	0-3	A1	25	0.2	—	0.5	5.9	14.8	21.4	42.7	35.9	—	—	—
(S86-TX-193-002)	3-6	A2	79	0.5	0.4	0.6	5.6	13.4	20.5	40.4	39.1	—	—	—
	6-11	A3	93	2.3	1.2	1.3	0.9	15.5	21.2	36.0	42.8	—	—	—
Lampasas, variant [2,10]	0-8	A	5	1.2	3.8	2.5	4.7	5.2	17.4	44.7	37.9	0.129	1.05	33.8
(S83-TX-193-002)	8-17	Ak	78	5.6	4.6	2.6	4.5	4.9	22.2	41.8	36.0	0.073	1.14	36.5
	17-29	Bk	77	10.7	9.0	5.5	4.4	2.6	34.2	45.6	22.2	—	—	—
	29-42	Rk	—	—	—	—	—	—	—	—	—	0.000	2.25	6.3
	42-55	Crk/Bm	—	—	—	—	—	—	—	—	—	0.013	1.27	32.9
	55-77	Crk	—	—	—	—	—	—	—	—	—	—	—	—
	77-78.5	Cr	—	—	—	—	—	—	—	—	—	0.008	2.01	11.7
Oglesby [3,11]	0-5	A1	—	—	0.1	0.5	3.2	6.5	10.3	38.7	51.0	—	—	—
(S86-TX-193-001)	5-10	A2	—	—	0.1	0.4	3.0	6.2	9.7	37.0	53.3	—	—	—
	10-15	Bw	2	0.2	—	0.4	2.7	6.4	9.7	35.7	54.6	—	—	—
	15-22	2R/Bk1	80	3.7	2.8	1.9	2.3	3.4	14.1	24.3	61.6	—	—	—
	22-22	2R/Bk2	37	3.3	2.2	2.6	4.4	3.9	16.4	41.0	42.6	—	—	—

[1] Coefficient of linear extensibility.

[2] Analysis by Soil Characterization Laboratory, Texas Agricultural Experiment Station, College Station, Texas.

[3] Analysis by National Soil Survey Laboratory, Natural Resources Conservation Service, Lincoln, Nebraska.

[4] This pedon is a taxadjunct to the series. Calcium carbonate equivalent is less than 40 percent in the upper part of the profile, and the solum is more than 40 inches. Location of this pedon: from the intersection of Texas Highway 22 and FM 1602, 1.9 miles east on Texas Highway 22, 0.8 mile north on ranch road, and 400 feet east in rangeland.

[5] Location of pedon sample is same as the pedon given as typical pedon for series in "Soil Series and Their Morphology."

[6] Horizon was subdivided for sampling purposes.

[7] This pedon is a taxadjunct to the series. Calcium carbonate equivalent is less than 40 percent in the upper part of the profile. Location of pedon sample: in Evant, from the intersection of U.S. Highway 84 and 281, 4.97 miles west on U.S. Highway 281, 1.86 miles south on county road, and about 1,200 feet northeast of road in rangeland.

[8] Location of pedon sample: from intersection of Texas Highway 22 and FM 1602, 1.9 miles east on Texas Highway 22, 1.4 miles north on ranch road, and 75 feet east in rangeland.

[9] Location of pedon sample: in Indian Gap, from the intersection of FM 218 and FM 1702, 0.9 mile north on FM 1702 to private ranch road, 1.8 miles east and north on ranch road, and 25 feet north in rangeland.

[10] This pedon is a taxadjunct to the series. It has a calcic horizon. Location of pedon sample: in Evant, from the intersection of U.S. Highway 84 and U.S. Highway 281, 4.97 miles west on U.S. Highway 84, 1.8 miles south on county road, and 750 feet northeast of road in rangeland.

[11] Location of pedon sample: in Indian Gap, from the intersection of FM 218 and FM 1702, 0.9 mile north on FM 1702 to private ranch road, and 150 feet north in rangeland.

Table 19.--Chemical Analyses of Selected Soils.

(Dash indicates the determination was not made. TR means trace.)

Soil name and sample number	Depth	Horizon	Extractable Bases				CEC NH_4OAc	Base Saturation (sum)	Reaction 1:1 Soil:Water	Organic Carbon	Electrical Conductivity	Exchangeable Sodium	Sodium Adsorption Ratio	Calcium Carbonate Equivalent
			Ca	Mg	Na	K								
	In		(meq / 100g)					Pct	pH	Pct	mmhos/cm	Pct		Pct
Bolar [2, 3]	5-13	A2	—	1.5	TR	0.6	34.2	—	7.4	1.55	0.21	TR	—	—
(S86-TX-193-004)	18-21	Bk2	—	2.4	—	1.2	47.6	—	8.0	2.03	0.43	—	TR	—
Caradan [1, 4]	0-4	A	57.0	2.5	0.0	0.8	24.4	100	6.8	3.01	0.8	0	0	—
(S84-TX-193-001)	4-13	Bt	44.0	2.0	0.1	0.3	24.4	100	7.1	1.54	0.6	0	0	—
	13-19	Btss	75.6	2.6	0.4	0.2	49.2	100	7.3	1.86	0.6	1	1	0
	19-26	Btkss	70.9	2.3	1.0	0.2	36.9	100	7.4	1.07	1.2	2	1	27.6
	26-42	2Bk1[5]	52.2	1.8	1.2	0.1	11.3	100	7.6	0.91	2.6	6	5	74.5
	42-63	2Bk1	52.3	3.1	2.0	0.1	15.4	100	7.8	0.29	2.2	8	7	67.1
	63-80	2Bk2	55.4	4.2	3.0	0.2	21.7	100	7.8	0.15	2.3	9	9	65.1
Cho, variant [1, 6]	0-6	A	67.3	1.6	0.1	1.5	40.1	100	7.6	3.13	1.1	0	0	4.9
(S83-TX-193-001)	6-13	Bk1	63.1	1.0	0.1	0.8	36.5	100	7.8	2.26	0.7	0	0	19.7
	13-20	Bk2	58.5	0.8	0.1	0.4	28.1	100	8	2.12	0.7	0	0	38.4
	20-24	Bkm1	—	—	—	—	—	—	—	—	—	—	—	91.6
	24-30	Bkm2	42.1	0.4	0.1	0.1	4.6	100	8.4	0.46	—	2	—	85.3
	30-41	B'k1	43.4	0.3	0.1	0.1	6.3	100	8.5	0.11	—	2	—	82.4
	41-52	B'k2	47.8	0.6	0.1	0.2	10.1	100	8.4	0.13	—	1	—	76.3
	52-61	CBk	39.3	0.6	0.1	0.1	6.1	100	8.5	0.05	—	2	—	81.1
	61-71	Cr1	35.9	0.6	0.1	0.1	4.8	100	8.4	0.60	—	2	—	84.0
	71-74	Cr2	—	—	—	—	—	—	—	—	—	—	—	88.4
Eckrant [2, 7]	0-3	A1	57	3.1	0.3	1.7	59.6	62.1	7.3	4.83	0.78	TR	TR	—
(S86-TX-193-003)	3-9	A2	79	2.4	0.4	1.1	62.2	82.9	7.7	3.20	0.67	1	TR	—
Lampasas [2, 8]	0-3	A1	36.6	2	0.2	0.9	39.9	39.7	7.5	2.92	0.64	1	TR	—
(S86-TX-193-002)	3-6	A2	50.5	1.9	0.2	0.8	42.4	53.4	7.6	3.08	0.61	TR	TR	—
	6-11	A3	—	1.6	0.2	0.7	38.2	—	7.8	3.01	0.62	1	TR	—
Lampasas, variant [1,9]	0-8	A	55.2	1.5	0.2	0.9	33.8	100	7.0	3.06	0.8	1	0	21.9
(S83-TX-193-002)	8-17	Ak	50.0	1.3	0.1	0.5	29.3	100	7.4	2.50	0.9	0	0	37.5
	17-29	Bk	28.7	0.6	0.1	0.2	11.4	100	7.6	1.31	0.7	1	0	73.2
	29-42	Rk	—	—	—	—	—	—	—	—	—	—	—	87.4
	42-55	Crk/Bm	—	—	—	—	—	—	—	—	—	—	—	82.5
	55-77	Crk	—	—	—	—	—	—	—	—	—	—	—	84.5
	77-80	Cr	—	—	—	—	—	—	—	—	—	—	—	82.8
Oglesby [2, 10]	0-5	A1	—	2.6	0.1	1.3	47.1	—	7.3	1.94	0.21	—	—	—
(S86-TX-193-001)	5-10	A2	41.9	2.1	0.2	0.9	47.4	90	7.8	1.46	0.17	—	—	—
	10-15	Bw	40.9	1.8	0.2	0.8	48.1	95	7.8	1.39	0.20	—	—	—
	15-22	2R/Bk1	—	1.9	0.2	0.9	45.9	—	8.0	1.30	0.24	—	—	—
	22-22	2R/Bk2	—	1.6	0.3	0.8	37.4	—	8.1	0.73	0.21	—	—	—

[1] Analysis by Soil Characterization Laboratory, Texas Agricultural Experiment Station, College Station, Texas.

[2] Analysis by National Soil Survey Laboratory, Natural Resources Conservation Service, Lincoln, Nebraska.

[3] This pedon is a taxadjunct to the series. Calcium carbonate equivalent is less than 40 percent in the upper part of the profile, and the solum is more than 40 inches. Location of this pedon: from the intersection of Texas Highway 22 and FM 1602, 1.9 miles east on Texas Highway 22, 0.8 mile north on ranch road, and 400 feet east in rangeland.

[4] Location of pedon sample is same as the pedon given as typical pedon for series in "Soil Series and Their Morphology."

[5] Horizon was subdivided for sampling purposes.

[6] This pedon is a taxadjunct to the series. Calcium carbonate equivalent is less than 40 percent in the upper part of the profile. Location of pedon sample: in Evant, from the intersection of U.S. Highway 84 and 281, 4.97 miles west on U.S. Highway 281, 1.86 miles south on county road, and about 1,200 feet northeast of road in rangeland.

[7] Location of pedon sample: from intersection of Texas Highway 22 and FM 1602, 1.9 miles east on Texas Highway 22, 1.4 miles north on ranch road, and 75 feet east in rangeland.

[8] Location of pedon sample: in Indian Gap, from the intersection of FM 218 and FM 1702, 0.9 mile north on FM 1702 to private ranch road, 1.8 miles east and north on ranch road, and 25 feet north in rangeland.

[9] This pedon is a taxadjunct to the series. It has a calcic horizon. Location of pedon sample: in Evant, from the intersection of U.S. Highway 84 and U.S. Highway 281, 4.97 miles west on U.S. Highway 84, 1.8 miles south on county road, and 750 feet northeast of road in rangeland.

[10] Location of pedon sample: in Indian Gap, from the intersection of FM 218 and FM 1702, 0.9 mile north on FM 1702 to private ranch road, and 150 feet north in rangeland.

Table 20.--Taxonomic Classification of the Soils

(An asterisk in the first column indicates a taxadjunct to the series. See text for a description of those characteristics that are outside the range of the series.)

Soil name	Family or higher taxonomic class
Bastsil	Fine-loamy, siliceous, thermic Udic Paleustalfs
Bolar	Fine-loamy, carbonatic, thermic Udic Calciustolls
Bosque	Fine-loamy, mixed, superactive, thermic Cumulic Haplustolls
Brackett	Fine-loamy, carbonatic, thermic Udic Haplustepts
Caradan	Fine, smectitic, thermic Udertic Argiustolls
Cho	Loamy, carbonatic, thermic, shallow Petrocalcic Calciustolls
*Cisco	Fine-loamy, siliceous, superactive, thermic Udic Haplustalfs
Cranfill	Fine-loamy, carbonatic, thermic Udic Haplustepts
Denton	Fine-silty, carbonatic, thermic Udic Calciustolls
Desan	Loamy, siliceous, thermic Grossarenic Paleustalfs
Doss	Loamy, carbonatic, thermic, shallow Typic Calciustolls
Eckrant	Clayey-skeletal, smectitic, thermic Lithic Haplustolls
Evant	Clayey, smectitic, thermic, shallow Petrocalcic Paleustolls
Frio	Fine, smectitic, thermic Cumulic Haplustolls
Krum	Fine, smectitic, thermic Udertic Haplustolls
Lamkin	Fine-silty, mixed, thermic Fluventic Haplustolls
Lampasas	Fragmental, mixed, thermic Udic Haplustolls
Maloterre	Loamy, carbonatic, thermic Lithic Ustorthents
Minwells	Fine, mixed, active, thermic Udic Paleustalfs
Nuff	Fine-silty, carbonatic, thermic Udic Calciustolls
Oglesby	Clayey, smectitic, thermic Lithic Haplustolls
*Pedernales	Fine, mixed, superactive, thermic Udic Paleustalfs
Pidcoke	Loamy, carbonatic, thermic Lithic Calciustolls
*Real	Loamy-skeletal, carbonatic, thermic, shallow Petrocalcic Calciustolls
Riesel	Clayey-skeletal, mixed, thermic Udic Paleustalfs
Rumley	Fine-loamy, carbonatic, thermic Udic Calciustolls
San Saba	Fine, smectitic, thermic Leptic Udic Haplusterts
Seawillow	Fine-loamy, carbonatic, thermic Udic Haplustepts
Slidell	Fine, smectitic, thermic Udic Haplusterts
Tarpley	Clayey, smectitic, thermic Lithic Argiustolls
Topsey	Fine-loamy, carbonatic, thermic Udic Calciustolls
Venus	Fine-loamy, mixed, superactive, thermic Udic Calciustolls
Wise	Fine-silty, siliceous, thermic Udic Haplustepts

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