United States
Department of
Agriculture

Natural
Resources
Conservation
Service

In cooperation with
Texas Agricultural
Experiment Station

Soil Survey of Karnes County, Texas

How to Use This Soil Survey

General Soil Map

The general soil map, which is the color map preceding the detailed soil maps, 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.

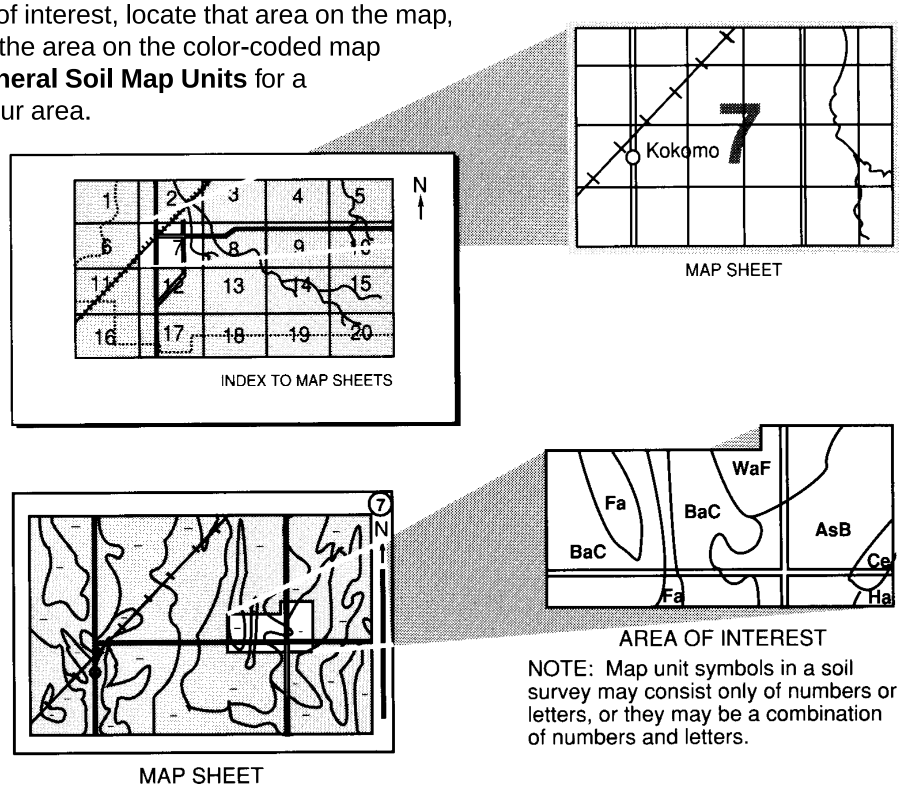
To find information about your area of interest, locate that area on the map, identify the name of the map unit in the area on the color-coded map legend, then refer to the section **General Soil Map Units** for a general description of the soils in your area.

Detailed Soil Maps

The detailed soil maps follow the general soil map. These 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**, which precedes the soil maps. Note the number of the map sheet and turn to that sheet.

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



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

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

Major fieldwork for this soil survey was completed in 1990. Soil names and descriptions were approved in 1991. 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 Karnes County Soil and Water Conservation District.

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

Cover: Scenic Skiles Falls is on the San Antonio River in Karnes County.

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

Contents

Issued 1999

Foreword

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

This soil survey is designed for many different users. Farmers, ranchers, 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 the Cooperative Extension Service.

John P. Burt
State Conservationist
Natural Resources Conservation Service

Soil Survey of Karnes County, Texas

By Ramiro Molina, Natural Resources Conservation Service

Fieldwork by Ramiro Molina, Jonathan K. Wiedenfeld, Nathan McCaleb, and John M. Galbraith, Natural Resources Conservation Service

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

KARNES COUNTY is in south Texas in the Northern Rio Grande Plain Major Land Resource Area (fig. 1). It is bound on the north by Wilson and Gonzales Counties, on the east by De Witt and Goliad Counties, on the south by Bee County, and on the west by Live Oak and Atascosa Counties. The survey area includes all of Karnes County.

The total area of Karnes County is 754 square miles or 482,701 acres, of which 653 acres is water. Elevation of the county ranges from 180 to 510 feet above sea level. Most of the area is nearly level to gently rolling.

One major stream and five important minor streams drain in an easterly or southeasterly direction. The San Antonio River drains the central part of the county. Cibolo Creek drains the north central part. Ecleto Creek drains the north and northeastern parts of the county. Medio and Hondo Creeks drain the southern part, and Escondido creek drains the western part of the county. Other smaller streams drain toward the Atascosa River, the Guadalupe River, and the San Antonio River.

The major land uses in Karnes County are rangeland and cropland. About 36 percent of the county is in rangeland, 34 percent in cropland, 25 percent in improved pasture, and the remaining 5 percent in urban and other land uses.

In 1990, the population of the county was estimated to be 12,945. Karnes City, the county seat, had an estimated population of 2,954. Kenedy, the largest community in the county, had a population of 3,777. Both cities are agribusiness and petroleum producing centers. Other communities in the county include Runge, Falls City, Hobson, Gillett, Helena, Panna Maria, Pawelekville, Cestohowa, and Choate.

The mineral value of the county is approximately 25 million dollars annually of oil, gas, and uranium production. The annual farm income is approximately 11 million dollars. Cattle, swine, and poultry are the main livestock enterprises. Sorghums, wheat, corn, and oats are the main cultivated crops.

This soil survey updates the “Reconnaissance Soil Survey of the Central Gulf Coast Area of Texas” published in 1910 (16). This survey provides additional information and has larger maps, which show the soils in greater detail.

General Nature of the County

This section gives general information about Karnes County. It describes the history, natural resources, economy, and climate of the county.

History

Robert H. Thonhoff, local historian, helped prepare this section.

The Coahuiltecan, Tonkawa, Apache, Comanche, and Karankawa tribes first inhabited Karnes County. During the period 1528 to 1534, Cabeza de Vaca and his companions, in search of seasonal food, may have been the first Europeans to travel through the Karnes County area. Governor Martin de Alarcon led an expedition into Texas in 1718 under the imperial banner of Spain. This is the first recorded history of Europeans in this territory.

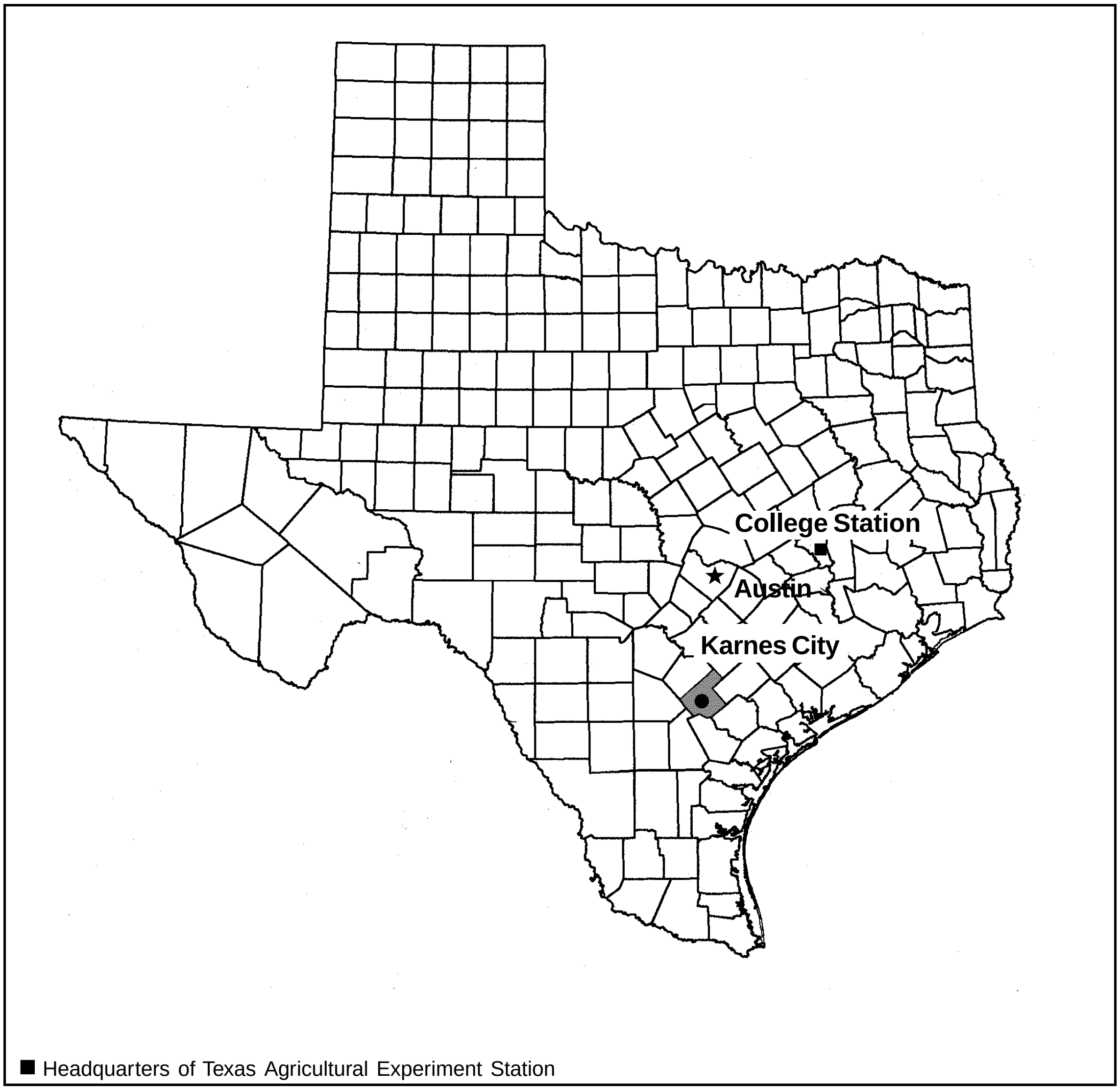


Figure 1.—Location of Karnes County in Texas.

From the mid-1750's to the time the Republic of Texas was established, the area was the site of many Spanish ranchos belonging to individuals and missions. During this time, ranching, as we know it today, started in this area.

The La Bahia Road, a route from Presidio La Bahia to San Antonio de Bexar, ran through the Karnes County territory. This road was a major supply route before and after the Texas Revolution.

The settlement of the Karnes County area was spurred by the war with Mexico from 1846 to 1848. By 1853, enough settlers were in the area to petition for the creation of Karnes County, which was done by an act of the Texas Legislature on February 4, 1854. The county was named after Henry Wax Karnes, a hero of the Texas Revolution. The town of Helena was designated as the county seat and became a major settlement between the Texas coast and San Antonio.

In 1854, Polish immigrants established the town of Panna Maria, known today as the first permanent Polish settlement in America. With the coming of the railroad and farming in the late 1800's and early 1900's, the towns of Bainville, Burnell, Cadillac, Choate, Couch, Coy City, Deweesville, Ecleto, El Oso, Flaccus, Falls City, Gillett, Green, Harmony, Hobson, Karnes City, Kenedy, Lenz, New Bremen, Nichols Switch, Overby, Pullin, Radford, and Zunkerville were established. Most of these towns are now ghost towns. An election in December 1893, changed the county seat from Helena to Karnes City.

Natural Resources

The most important natural resources in Karnes County are soil, water, wildlife, petroleum, natural gas, and uranium. Also present are large deposits of gravel, caliche, and sandstone, which are used for constructing roads and buildings.

Most of the soils in Karnes County are very deep to moderately deep. With proper management, they are capable of producing large amounts of forage and a wide variety of crops. The shallow soils are used primarily for rangeland.

Wildlife in the survey area provide both recreation and income for many landowners. White-tailed deer, javelina, quail, dove, and turkey are the major game species in the county. Farm stock ponds and the San Antonio River provide habitat for gamefish.

Economy

Agriculture, agribusiness, and oil, gas, and uranium production are the principal industries in Karnes County.

Cattle sales is the largest source of agricultural revenue in the county. Swine and some poultry are also produced. Other important agricultural products include grain sorghums, wheat, corn, and oats. Hunting leases are another important source of income.

Agribusiness operations in the county include grain storage, guar processing, fertilizer and agricultural chemical supply, livestock sales and shipping facilities, and farm machinery sales.

Other major industries in the county include uranium ore processing, oil field service, fiberglass fabrication, the knitting industry, machine work manufacturing, and retail trade.

Climate

The climate in Karnes County is subtropical with hot, humid summers and dry, mild winters. Prolonged cold spells or snowfalls are rare. Rains usually are heaviest late in spring and early in fall. Rain in the fall is often associated with a dissipating tropical storm.

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

In winter, the average temperature is 53 degrees F and the average daily minimum temperature is 40 degrees. The lowest temperature on record, which occurred on January 21, 1985, is 5 degrees. In summer, the average temperature is 84 degrees and the average daily maximum temperature is 95 degrees. The highest recorded temperature, which occurred on August 20, 1986, is 110 degrees.

Growing degree days are shown in table 1. They are equivalent to “heat units.” During the month, growing degree days accumulate by the amount that the average temperature each day exceeds a base temperature (50 degrees F). The normal monthly accumulation is used to schedule single or successive plantings of a crop between the last freeze in spring and the first freeze in fall.

The total annual precipitation is about 27 inches in Karnes County. Of this, 17 inches, or 63 percent, usually falls in April through September. The growing season for most crops falls within this period. The average growing season is 281 days. In 2 years out of 10, the rainfall in April through September is less than 12 inches. The heaviest 1-day rainfall during the period of record was 9.25 inches on September 9, 1967. Thunderstorms occur on about 37 days each year, and most occur in spring.

The average seasonal snowfall is less than 1 inch. The greatest snow depth at any one time during the period of record was 9 inches.

The average relative humidity in midafternoon is about 60 percent. Humidity is higher at night, and the average at dawn is about 80 percent. The sun shines 65 percent of the time possible in summer and 50 percent in winter. The prevailing wind is from the southeast. Average windspeed is highest, 11 miles per hour, in spring.

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.

General Soil Map Units

The general soil map at the back of this publication shows broad areas that have a distinctive pattern of soils, relief, and drainage. Each map unit on the general soil map is a unique natural landscape. Typically, it consists of one or more major soils 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.

1. Weesatche-Pernitas

Gently sloping to moderately sloping, very deep, slightly alkaline, well drained, loamy soils on uplands

This map unit consists of gently sloping to moderately sloping hills that are dissected by medium and small drainageways. The moderately permeable Weesatche and Pernitas soils are on side slopes and hilltops.

This map unit makes up about 24 percent of the county (fig. 2). It is about 40 percent Weesatche soils, 34 percent Pernitas soils, and 26 percent soils of minor extent.

Typically, the surface layer of the Weesatche soils is very dark gray, sandy clay loam about 8 inches thick. The subsoil, from a depth of 8 to 80 inches, is sandy clay loam. The upper part is very dark gray, the next part is dark brown to brown, and the lower part is pink.

Typically, the surface layer of the Pernitas soils is dark gray sandy clay loam about 7 inches thick. The subsoil is sandy clay loam. From a depth of 7 to 33 inches, it is dark grayish brown in the upper part and dark brown in the lower part. From a depth of 33 to 80 inches, it is light yellowish brown in the upper part and very pale brown in the lower part.

Of minor extent in this map unit are the Clareville, Colibro, Coy, Papalote, and Sarnosa soils. The Clareville and Papalote soils are in lower positions on the landscape than the Weesatche and Pernitas soils. The Coy soils are in similar to slightly lower positions, and the Colibro and Sarnosa soils are in similar to higher positions.

This map unit is used as improved pasture, rangeland, or cropland.

The Weesatche soils have few limitations for these uses and produce moderate to high yields of improved grasses, native plants, and crops. The Pernitas soils produce moderate yields of native plants. When these soils are used as pasture or cropland, yields are low. The Pernitas soils are limited by moderate available water capacity, low natural fertility, rate of runoff, and high lime content. Water erosion is a moderate to severe hazard. The major pasture grasses grown on these soils include bermudagrass, bluestems, and kleingrass. A wide variety of grasses, forbs, and shrubs are produced on rangeland under proper management. Thorny brush has invaded in some areas and reduced the quantity and quality of desirable plants. Common crops grown on the Weesatche soils are corn, grain sorghum, and wheat. The Pernitas soils generally are limited to grain sorghum. Water erosion is a hazard on steeper slopes.

These soils are moderately well suited to most urban and recreational uses. Permeability, clayey texture, seepage, slope, shrink-swell potential, and low strength are moderate limitations. They have a high potential for corrosion of uncoated steel.

2. Coy-Monteola

Nearly level to moderately sloping, very deep, moderately alkaline, well drained and moderately well drained, clayey soils on uplands

This map unit consists of nearly level to moderately sloping hills that are dissected by small drainageways. The Coy and Monteola soils are on hillsides from toe slopes to upper side slopes.

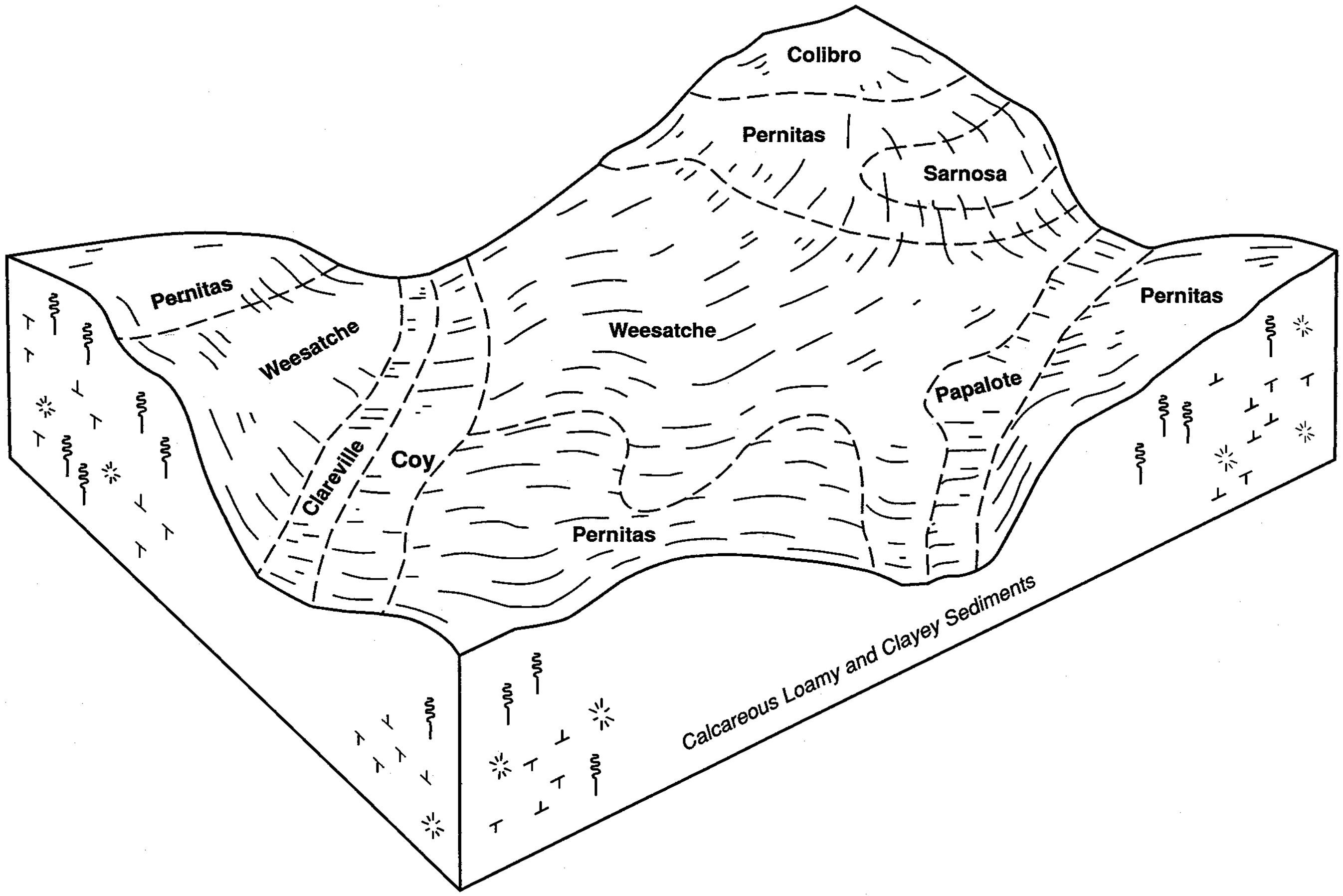


Figure 2.—Typical pattern of soils in the Weesatche-Pernitas general soil map unit.

This map unit makes up about 21 percent of the county (fig. 3). It is about 50 percent well drained, very slowly permeable Coy soils, 18 percent moderately well drained, very slowly permeable Monteola soils, and 32 percent soils of minor extent.

Typically, the surface layer of the Coy soils is very dark gray clay loam about 6 inches thick. The clay subsoil extends to a depth of 80 inches. In the upper part, it is very dark gray. In the next part, it is grayish brown, and in the lower part, it is very pale brown.

Typically, the surface layer of the Monteola soils is very dark gray clay about 12 inches thick. The clay subsoil extends to a depth of 50 inches. The upper part, from a depth of 12 to 26 inches, is very dark gray. The lower part, from a depth of 26 to 50 inches, is grayish brown and very pale brown. The underlying material, from a depth of 50 to 80 inches, is light gray clay.

Of minor extent in this map unit are the Clareville, Papalote, Pernitas, Schattel, and Weesatche soils. The Clareville and Papalote soils are in lower positions on the landscape than the Coy and Monteola soils. The Pernitas soils are in higher positions. The Schattel soils are on ridgetops. The Weesatche soils are in similar positions.

This map unit is used mainly as cropland or improved pasture.

These soils produce moderate to high yields of crops and forage grasses. Grain sorghum, corn, wheat, and cotton are the major crops. Improved varieties of bermudagrass, bluestems, and kleingrass are the major grasses grown. On steeper slopes, runoff is a limitation and water erosion is a hazard.

These soils produce moderate yields of forage when used as rangeland. Under proper management, a variety of grasses, forbs, and shrubs can be produced for livestock and wildlife.

These soils are poorly suited to most urban uses. Very slow permeability, clayey texture, high shrink-swell potential, low strength, and high potential for corrosion of uncoated steel are limitations.

These soils are moderately suited to recreational uses. Very slow permeability and clayey texture are the main limitations. Slope is a limitation for playgrounds on steeper slopes.

3. Eloso-Pavelek-Rosenbrock

Nearly level to gently sloping, deep to shallow, slightly or moderately alkaline, well drained, clayey soils on uplands

This map unit consists of nearly level to gently sloping upland areas that are dissected by small and medium drainageways. The Eloso soils are on side slopes and hilltops. The Pavelek soils are on hilltops and ridges, and the Rosenbrock soils are on toe slopes and in drainageways.

This map unit makes up about 17 percent of the county (fig. 4). It is about 31 percent moderately deep, very slowly permeable Eloso soils; 29 percent slowly permeable Pavelek soils that are shallow to a petrocalcic horizon; 19 percent deep, very slowly permeable Rosenbrock soils; and 21 percent soils of minor extent.

Typically, the surface layer of the Eloso soils is very dark gray clay about 12 inches thick. The subsoil, from a depth of 12 to 28 inches, is dark gray clay; from a depth of 28 to 37 inches, it is light gray, silty clay. The underlying material, from a depth of 37 to 80 inches, is white, weakly consolidated siltstone that has silt loam texture.

Typically, the surface layer of the Pavelek soils is very dark gray clay about 7 inches thick. The subsoil extends to a depth of about 46 inches. From a depth of 7 to 14 inches, it is very dark gray gravelly clay; from a depth of 14 to 20 inches, it is white strongly cemented caliche; and from a depth of 20 to 46 inches, it is very pale brown caliche. The underlying material, from a depth of 46 to 80 inches, is very pale brown, noncalcareous weakly consolidated siltstone that has silt loam texture.

Typically, the surface layer of the Rosenbrock soils is very dark gray clay about 8 inches thick. The subsoil is clay. From a depth of 8 to 31 inches, it is very dark gray and from a depth of 31 to 43 inches, it is grayish brown. The underlying material, from a depth of 43 to 80 inches, is very pale brown weakly consolidated tuffaceous siltstone that has loam and silt loam texture.

Of minor extent in this map unit are the Condido, Conquista, Coy, and Tordia soils, and pits and dumps. The Condido and Conquista soils and the pits and dumps are in positions on the landscape that are

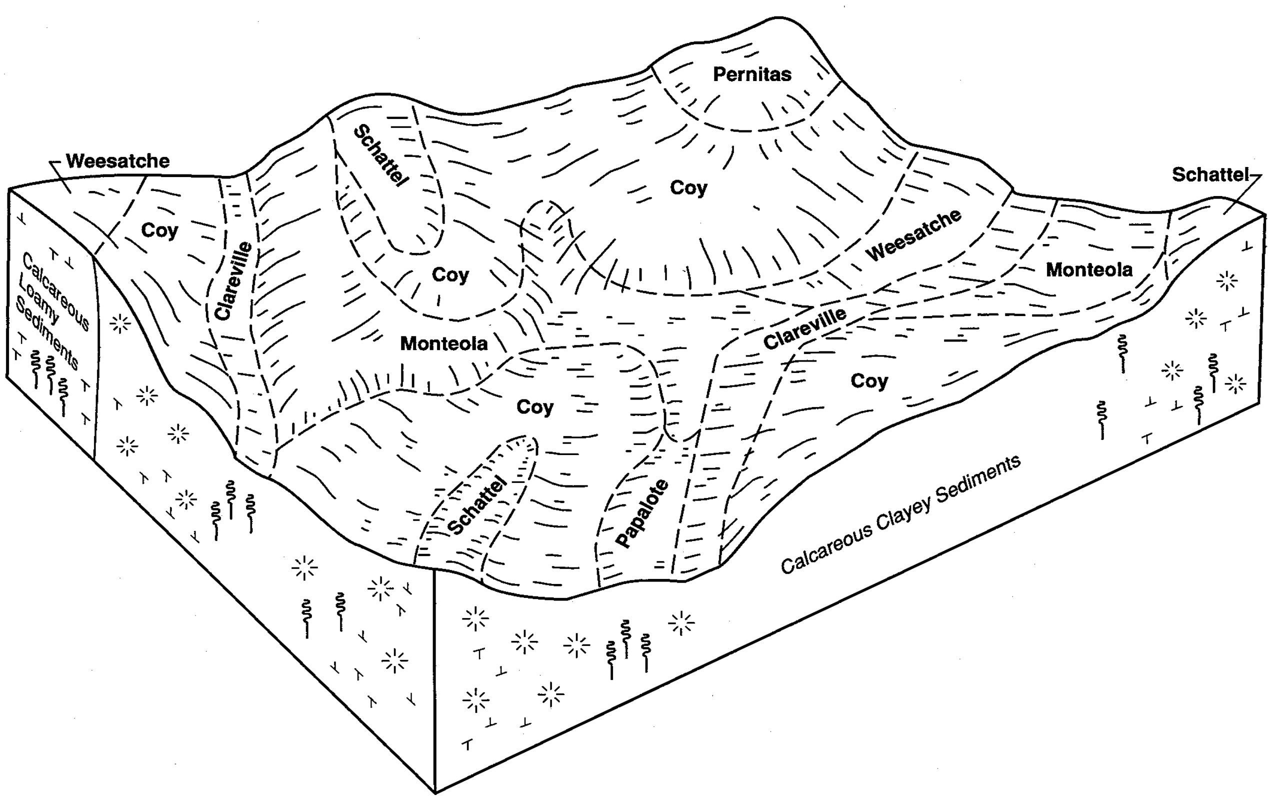


Figure 3.—Typical pattern of soils in the Coy-Monteola general soil map unit.

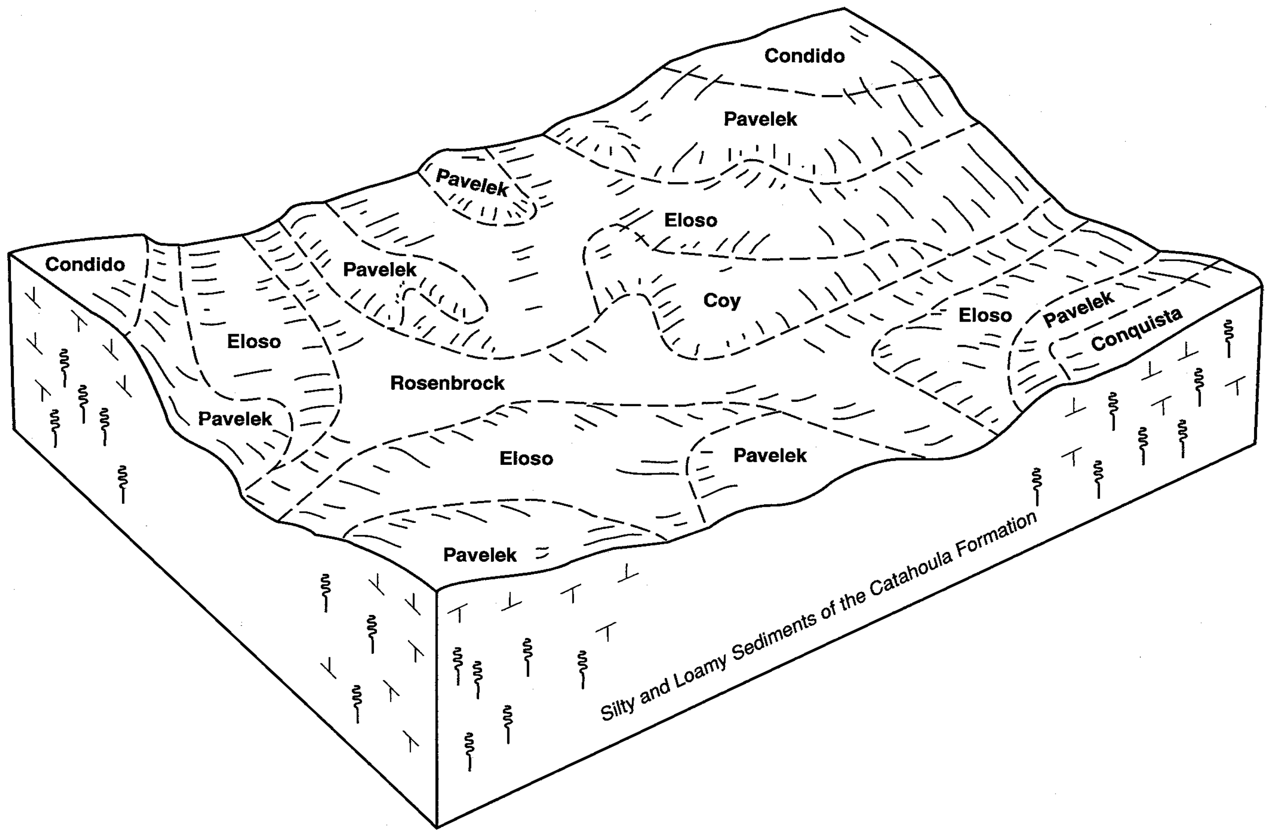


Figure 4.—Typical pattern of soils in the Eloso-Pavelek-Rosenbrock general soil map unit.

similar to slightly higher than the Eloso, Pavelek, and Rosenbrock soils. The Coy and Tordia soils are in similar positions.

This map unit is used as rangeland, wildlife habitat, and pasture. A few areas are used as cropland.

The Eloso and Rosenbrock soils produce moderate yields of forage when used as rangeland. The Rosenbrock soils are moderately limited by the thickness of the soil and clayey texture that restrict root growth. The Eloso soils are limited by the moderate available water capacity and droughtiness. With proper management, these soils produce a variety of grasses, forbs, and shrubs for livestock and wildlife. The Pavelek soils produce low yields of native forage because of the shallow rooting depth, very low available water capacity, droughtiness, and moderate to severe hazard of erosion.

When these soils are used as improved pasture, the Rosenbrock soils produce moderate yields. They are limited by the clayey texture. The Eloso and Pavelek soils produce low yields because of the rooting depth, available water capacity, droughtiness, and moderate to severe hazard of erosion. Improved varieties of bermudagrass, bluestems, and kleingrass are the major grasses grown on these soils.

When used as cropland, the Eloso and Rosenbrock soils produce moderate to high yields on less sloping areas and somewhat lower yields on steeper slopes. Wheat and corn are the major crops grown. The Rosenbrock soils have few limitations for use as cropland, although the clayey texture can restrict root development, and excessive runoff on some slopes reduces infiltration. The Eloso soils are limited by the clayey texture, moderate available water capacity, and medium to high rate of runoff. Water erosion is a moderate hazard. The Pavelek soils are poorly suited to cropland. They are limited by a shallow rooting depth, very low available water capacity, and medium rate of runoff. Water erosion is a moderate to severe hazard.

These soils are poorly suited to urban uses. All have major limitations that include slow permeability, clayey texture, high potential for corrosion of uncoated steel, and high shrink-swell potential. Other limitations include low strength, slope, seepage and depth to rock. Flooding is a hazard.

These soils are poorly suited to recreational uses because of slow and very slow permeability, clayey texture, limited soil depth, and in some areas, slope and the hazard of flooding.

4. Bryde-Gillett

Gently sloping, deep and moderately deep, slightly acid, well drained, loamy soils on uplands

This map unit consists of gently sloping uplands that are dissected by small drainageways. The deep and slowly permeable Bryde soils are on side slopes and toe slopes. The moderately deep and slowly permeable Gillett soils are on upper side slopes and ridgetops.

This map unit makes up about 14 percent of the county (fig. 5). It is about 32 percent Bryde soils, 30 percent Gillett soils, and 38 percent soils of minor extent.

Typically, the surface layer of the Bryde soils is grayish brown, fine sandy loam about 9 inches thick. The subsoil extends to a depth of about 47 inches. From a depth of 9 to 25 inches, it is dark gray clay; from a depth of 25 to 35 inches, it is dark gray sandy clay; from a depth of 35 to 41 inches, it is grayish brown clay loam; and from a depth of 41 to 47 inches, it is grayish brown sandy clay loam. The underlying material, from a depth of 47 to 80 inches, is light gray, weakly consolidated sandstone.

Typically, the surface layer of the Gillett soils is grayish brown, fine sandy loam about 7 inches thick. The subsoil extends to a depth of about 34 inches. From a depth of 7 to 13 inches, it is dark brown clay; from a depth of 13 to 19 inches, it is reddish brown clay; from a depth of 19 to 27 inches, it is brown clay; and from a depth of 27 to 34 inches, it is light yellowish brown, gravelly sandy clay loam. The underlying material, from a depth of 34 to 80 inches, is white weakly consolidated sandstone that has fine sandy loam texture.

Of minor extent in this map unit are the Coy, Ecleto, Fashing, Tordia, and Weigang soils. The Coy and Tordia soils are in positions on the landscape similar to slightly lower than the Bryde and Gillett soils. The Ecleto, Fashing, and Weigang soils are in higher positions.

This map unit is used mainly as rangeland and

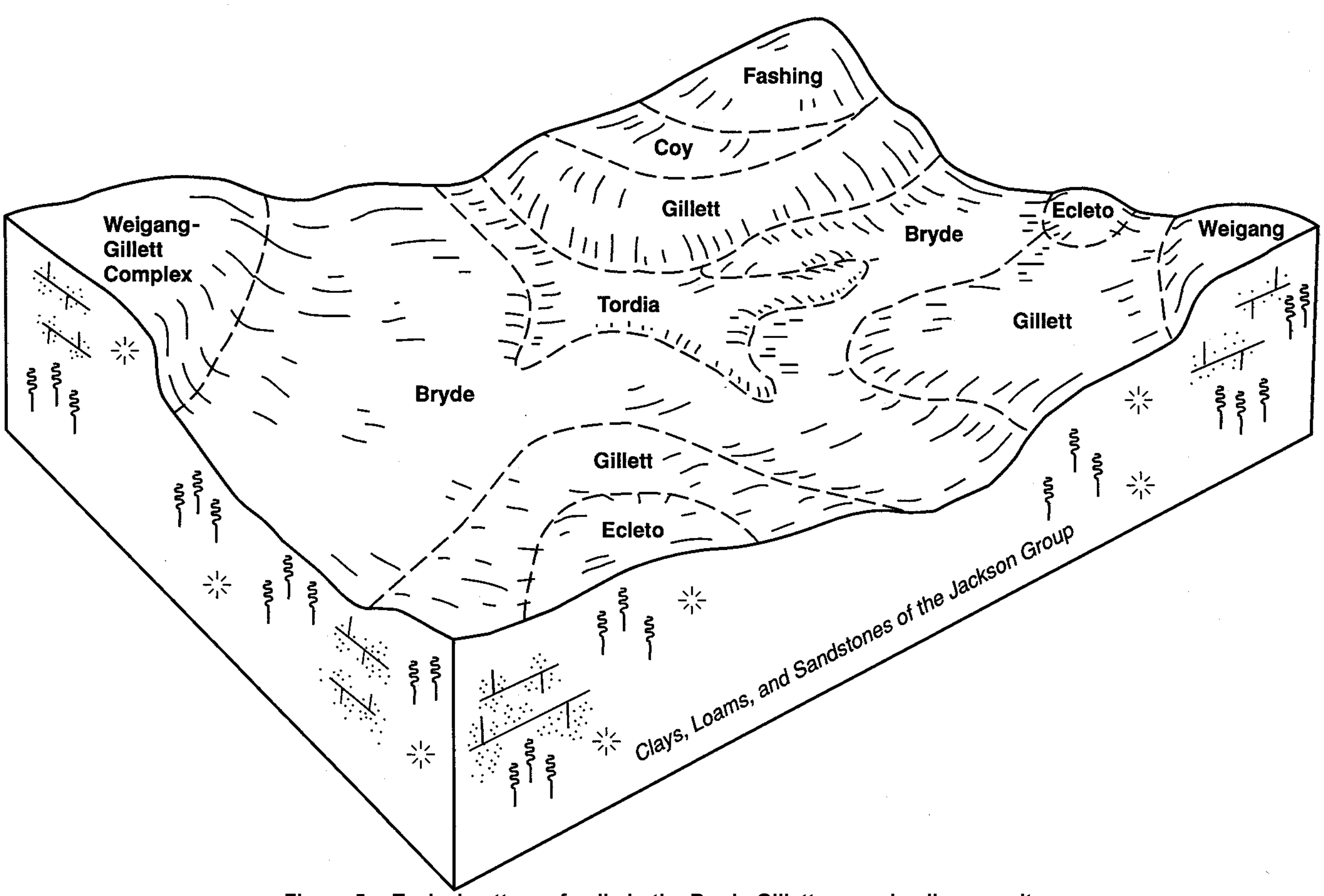


Figure 5.—Typical pattern of soils in the Bryde-Gillett general soil map unit.

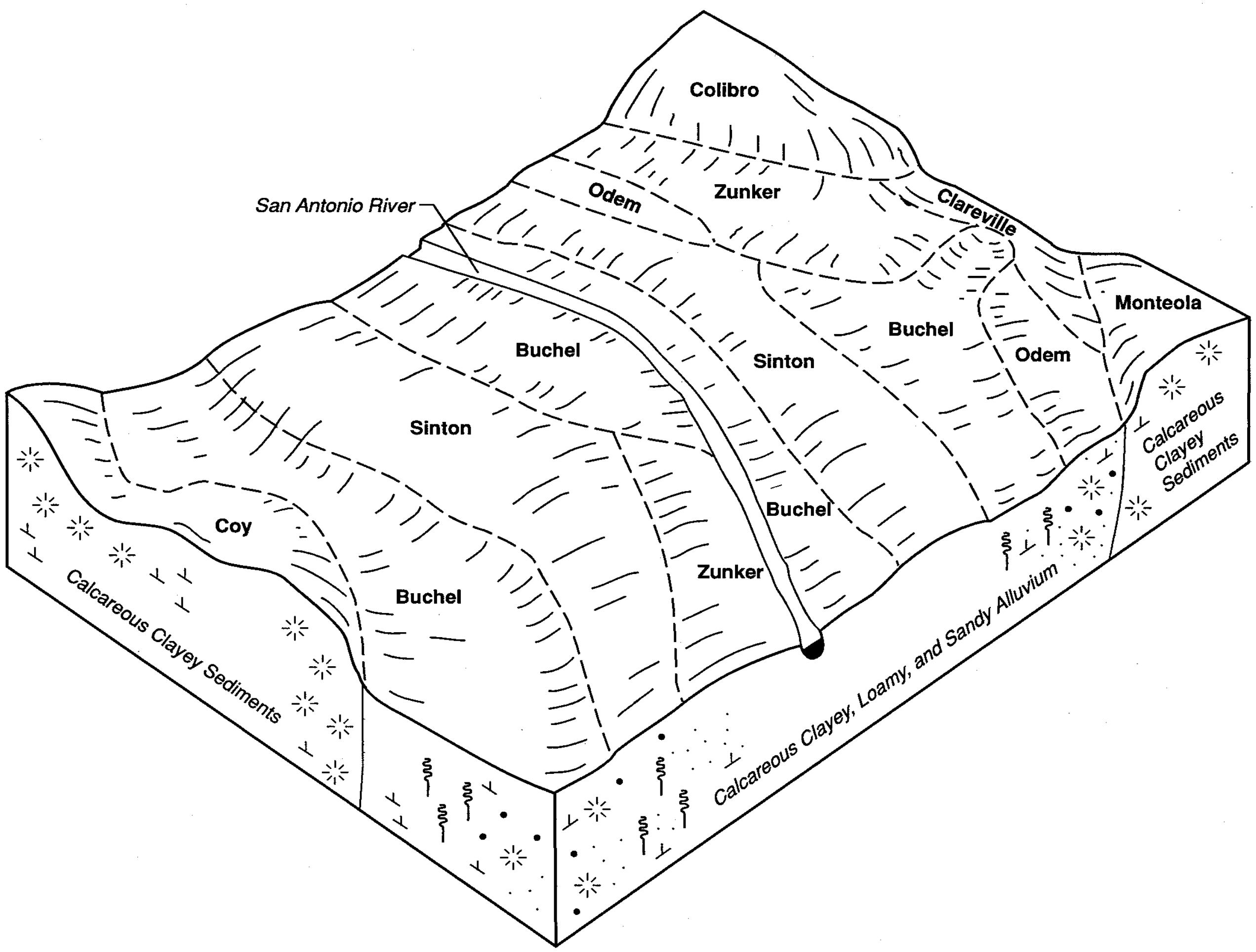


Figure 6.—Typical pattern of soils in the Buchel-Sinton general soil map unit.

wildlife habitat. A few areas are used as improved pasture.

When these soils are used as properly managed rangeland, they produce a variety of grasses, forbs, and shrubs, and moderate amounts of forage for livestock. They also provide good habitat for wildlife. If used as improved pasture, these soils produce low to moderate yields. Improved varieties of bermudagrass, bluestems, and kleingrass are the major grasses grown. The moderate available water capacity and low natural fertility are the main limitations.

These soils produce moderate yields when used as cropland. Corn, wheat, and grain sorghum are the major crops grown. The moderate available water capacity, medium rate of runoff, and low natural fertility are limitations. Water erosion is a moderate hazard. The clayey subsoil restricts root development.

These soils are poorly suited to urban uses. Clayey subsoil, slow permeability, high shrink-swell potential, low strength, and high potential for corrosion of uncoated steel are limitations. Slopes can be a limitation in steeper areas.

These soils are moderately well suited to recreational uses. Slope is a moderate limitation for playgrounds.

5. Buchel-Sinton

Nearly level, very deep, moderately alkaline, moderately well drained and well drained, clayey soils on flood plains

This map unit consists of nearly level flood plains of the San Antonio River and major drainageways. The moderately well drained and very slowly permeable Buchel soils are in positions on the landscape slightly lower than the well drained and moderately permeable Sinton soils.

This map unit makes up about 9 percent of the county (fig. 6). It is about 42 percent Buchel soils, 26 percent Sinton soils, and 32 percent soils of minor extent.

Typically, the surface layer of the Buchel soils is dark gray clay about 16 inches thick. The upper part of the subsoil, from a depth of 16 to 42 inches, is dark gray clay. The next part, from a depth of 42 to 60 inches, is grayish brown clay, and the lower part, from a depth of 60 to 80 inches, is pale brown clay.

Typically, the surface layer of the Sinton soils is dark grayish brown, sandy clay loam about 25 inches thick. The subsoil, from a depth of 25 to 80 inches, is pale brown, sandy clay loam.

Of minor extent in this map unit are the Clareville, Coy, Monteola, Odem, and Zunker soils. The Clareville, Colibro, Coy, and Monteola soils are in higher positions on the landscape than the Buchel and Sinton soils. The Odem and Zunker soils are in similar positions.

This map unit is used mainly as cropland and some improved pasture.

Under a high level of management, these soils produce moderate to high yields of crops and forages. Common crops grown are grain sorghum, wheat, corn, small grains, and cotton. Improved varieties of bermudagrass, bluestems, and kleingrass are the major grasses grown for pasture. Seasonal wetness and the clayey texture are limitations. Flooding is a hazard.

These soils produce high yields of native forage when used as rangeland. Under proper management, a variety of grasses, forbs, and shrubs can be produced for livestock and wildlife. Flooding can be a hazard.

These soils are poorly suited to urban and recreational uses. Seepage, shrink-swell potential, potential for corrosion of uncoated steel, clayey texture, and permeability are limitations. Low strength is a limitation for roads and streets. Flooding is a hazard.

6. Papalote-Nusil

Nearly level to gently sloping, very deep, slightly acid, moderately well drained, sandy soils on terraces and uplands

This map unit consists of nearly level to hummocky terraces of the San Antonio River and major tributaries. The slowly permeable Papalote soils are in positions on the landscape slightly higher than the Nusil soils, which have slow permeability in the subsoil and rapid permeability in the surface layer.

This map unit makes up about 8 percent of the county. It is about 65 percent Papalote soils, 21 percent Nusil soils, and 14 percent soils of minor extent.

Typically, the surface layer of the Papalote soils is loamy coarse sand that is about 19 inches thick; it is light brownish gray in the upper part and light gray in the lower part. From a depth of 19 to 33 inches, the subsoil is a mottled sandy clay that is grayish brown in the upper part and pale brown in the lower part. From a depth of 33 to 80 inches, it is a mottled sandy clay loam that is light gray in the upper part and strong brown in the lower part.

Typically, the surface layer of the Nusil soils is fine sand about 36 inches thick that is pale brown in the upper part and very pale brown in the lower part. The subsoil, from a depth of 36 to 80 inches, is a mottled sandy clay loam that is light brownish gray in the upper part, light gray in the next part, and very pale brown in the lower part.

Of minor extent in this map unit are the Bryde, Rhymes, and Weesatche soils. The Bryde and Weesatche soils are in slightly higher positions on the landscape than the Papalote and Nusil soils. The Rhymes soils are in similar positions.

This map unit is used mainly as rangeland and wildlife habitat. A few areas are use as improved pasture.

These soils produce moderate yields of forage when used as rangeland or pasture. Properly managed rangeland can produce a variety of grasses, forbs, and shrubs for livestock and wildlife. Improved varieties of bermudagrass are the major grasses grown for improved pastures. The moderate available water capacity, low natural fertility, and droughtiness are limitations.

Although not extensively used as cropland, grain sorghum, corn, cotton, peanuts, and watermelons have been grown on these soils, which produce low to moderate yields. The moderate available water capacity, droughtiness, low organic matter content, and low natural fertility are limitations. The hazard of water and wind erosion is moderate to severe. These soils are poorly suited to urban uses. Slow permeability, moderate shrink-swell potential and seepage are the main limitations. In addition, the Papalote soils have a high potential for corrosion of uncoated steel, are too clayey, and have low strength. Slope is a moderate limitation. The Nusil soils are too sandy, are poor filters, and have a moderate potential for corrosion of concrete.

The Papalote soils are well suited to recreational uses. Slope is a moderate limitation. The Nusil soils

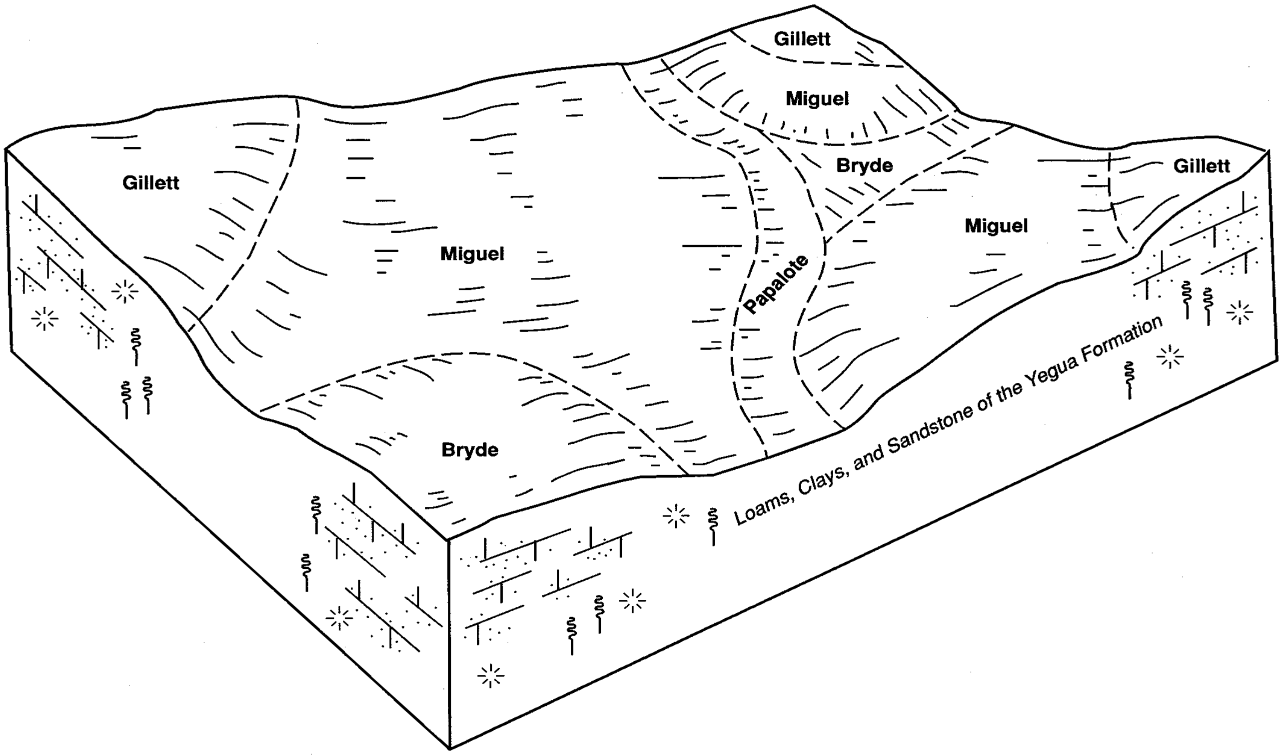


Figure 7.—Typical pattern of soils in the Miguel general soil map unit.

are poorly suited to recreational uses. The sandy surface texture is the main limitation.

7. Miguel

Gently sloping, very deep, slightly acid, well drained, loamy soils on uplands

This map unit consists of gently sloping uplands that are dissected by small and medium drainageways. The slowly permeable Miguel soils are on side slopes and hilltops.

This map unit makes up about 4 percent of the county (fig. 7). It is about 58 percent Miguel soils and 42 percent soils of minor extent.

Typically, the surface layer of the Miguel soils is yellowish brown, fine sandy loam about 8 inches thick. The subsoil extends to a depth of about 80 inches. From a depth of 8 to 16 inches, it is dark grayish brown clay; from a depth of 16 to 28 inches, it is yellowish red sandy clay; from a depth of 28 to 37 inches it is strong brown, sandy clay loam; from a depth of 37 to 48 inches, it is yellowish brown, sandy clay loam; and from a depth of 48 to 80 inches, it is brownish yellow, sandy clay loam.

Of minor extent in this map unit are the Bryde, Gillett, and Papalote soils. The Bryde soils are in positions on the landscape similar to those of the Miguel soils. The Gillett soils are in higher positions. The Papalote soils are in lower positions.

This map unit is used mainly as rangeland, wildlife habitat, and some improved pasture.

When used as rangeland, these soils produce moderate yields of forage and are good habitat for rangeland wildlife. With proper management, a variety of grasses, forbs, and shrubs can be produced for livestock and rangeland wildlife. Potential is only fair for openland wildlife habitat. These soils produce low to moderate yields on improved pasture. Improved varieties of bermudagrass and bluestems are the major grasses grown. The moderate available water capacity, medium rate of runoff, low natural fertility, and clayey texture are limitations.

When used as cropland, these soils produce low to moderate yields. Grain sorghum, corn, wheat, small grains, and peanuts are the major crops grown. The moderate available water capacity, medium rate of runoff, low natural fertility, droughtiness, and clayey texture are limitations. Water erosion is a hazard.

These soils are moderately suited to urban and recreational uses. Slow permeability, low strength, clayey subsoil, shrink-swell potential, and high potential for corrosion of uncoated steel are limitations. Slope can be a problem on steeper slopes.

8. Olmos-Pettus

Gently sloping to moderately sloping, shallow and very deep, moderately alkaline, well drained, loamy soils on uplands

This map unit consists of gently sloping to undulating uplands that are dissected by small drainageways. The moderately permeable Olmos soils are on ridgetops. They are shallow or very shallow over a cemented layer. The very deep, moderately permeable Pettus soils are on upper side slopes.

This map unit makes up about 3 percent of the county. It is about 30 percent Olmos soils, 21 percent Pettus soils, and 49 percent soils of minor extent.

Typically, the surface layer of the Olmos soils is very dark grayish brown, very gravelly loam about 11 inches thick. The subsoil, from a depth of 11 to 24 inches, is white, strongly cemented caliche. From a depth of 24 to 80 inches, it is white soft caliche.

Typically, the surface layer of the Pettus soils is dark gray loam about 10 inches thick. The subsoil, from a depth of 10 to 18 inches, is grayish brown, gravelly loam. From a depth of 18 to 28 inches it is light gray, very gravelly loam; and from a depth of 28 to 80 inches, it is white caliche that has a very gravelly loam texture.

Of minor extent in this map unit are the Parrita, Pernitas, and Weesatche soils. The Parrita soils are in positions on the landscape similar to those of the Olmos and Pettus soils. The Pernitas and Weesatche soils are in lower positions.

This map unit is used almost exclusively as rangeland and wildlife habitat. These soils produce low to moderate yields of native forage. With proper management, a variety of grasses, forbs, and shrubs can be produced for livestock and wildlife on the Pettus soils. Soil conditions on the Olmos soils are suitable for only a few species of wild herbaceous plants and shrubs. Both soils are limited by excess lime, low to very low available water capacity, droughtiness, and moderate hazard of water erosion. Thorny brush has invaded most areas of these soils.

These soils have very limited use as cropland or improved pasture. Low to very low available water capacity, excess lime, rate of runoff, droughtiness, gravelly texture, slope, and low natural fertility are major limitations, and erosion is a hazard.

These soils are poorly suited to most urban and recreational uses. Depth to cemented pan, permeability, stoniness, seepage, and potential for corrosion of uncoated steel are major limitations. Slope can be a limitation for small commercial buildings and playgrounds in steeper areas.

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, Monteola clay, 0 to 1 percent slopes, is a phase of the Monteola series.

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

A *complex* consists of two or more soils or miscellaneous areas in such an intricate pattern or in such small areas that they cannot be shown separately on the maps. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas. Elmendorf-Denhawken complex is an example.

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

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

BrB—Bryde fine sandy loam, 1 to 4 percent slopes

This deep, gently sloping, well drained soil is on convex side slopes on uplands. Areas are irregular in shape and range from 10 to 1,500 acres in size.

The typical sequence, depth, and composition of the layers of this soil are as follows—

Surface layer:
0 to 9 inches, grayish brown, slightly acid, fine sandy loam

Subsoil:
9 to 17 inches, dark gray, neutral clay
17 to 25 inches, dark gray, slightly alkaline clay
25 to 35 inches, dark gray, slightly alkaline sandy clay
35 to 41 inches, grayish brown, slightly alkaline clay loam
41 to 47 inches, grayish brown, slightly alkaline sandy clay loam

Underlying material:
47 to 80 inches, light gray, neutral, weakly consolidated sandstone that has fine sandy loam texture

Important soil properties—

Available water capacity: moderate
Permeability: slow
Drainage class: well drained
Runoff: medium
Root zone: deep, but high clay content can restrict root development and movement of air and water
Shrink-swell potential: very high in upper part of subsoil
Hazard of water erosion: moderate
Hazard of wind erosion: slight

Included with this soil in mapping are small areas of Bryde soil that has slopes of less than 1 percent, small areas where slopes are more than 4 percent, and a soil similar to Bryde soil that is less than a depth of 40 inches to weakly consolidated sandstone. Also included are small areas of Clareville, Denhawken, Ecleto, Elmendorf, Gillett, Miguel, and Tordia soils. The Clareville and Elmendorf soils have a dark surface layer. The Clareville soil is in positions on the landscape lower than the Bryde soil, and the Elmendorf soil is in positions similar to those of the Bryde soil. The Denhawken soil is calcareous throughout and is in similar positions on the landscape. The Ecleto soil is shallow and in higher positions on the landscape. The Gillett soil is mottled in the subsoil, moderately deep, and in similar or higher positions on the landscape. The Miguel soil has a mottled subsoil and is in similar positions. The Tordia soil is clayey throughout and is in lower positions. Included soils make up less than 10 percent of this map unit.

This Bryde soil is used mainly as rangeland and habitat for wildlife. A few areas are used as cropland or improved pasture.

Native plants yield a moderate amount of forage. The major limitation is the moderate available water capacity. Proper stocking rates, brush management, and controlled grazing can help improve or maintain plant production.

This soil has good potential for use as openland and rangeland wildlife habitat.

This soil is also used as cropland. The most common crops grown include corn, wheat, and grain sorghum. The dense, clayey subsoil restricts plant growth. Other limitations include a moderate available water capacity and medium runoff. The hazard of water erosion is moderate. On steeper slopes, contour farming, terraces, grassed waterways, or a combination of these practices can help control runoff and reduce erosion.

This soil is also used as improved pasture. Improved varieties of bermudagrass, bluestems, and kleingrass are the major grasses grown. The moderate available water capacity is the major limitation. The dense, clayey subsoil is difficult to work, especially when preparing a seedbed. Fertilizer applications, weed control, brush management, proper stocking rates, and controlled grazing can help conserve moisture and improve or maintain productivity.

This soil is poorly suited to urban uses. The slow permeability, clayey subsoil, very high shrink-swell potential, high potential for corrosion of uncoated steel, and low strength are the main limitations. Slope is a moderate limitation.

This soil is moderately well suited to recreational uses. Slope is a moderate limitation.

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

Bu—Buchel clay, occasionally flooded

This very deep, nearly level, moderately well drained soil is on plane to slightly concave stream flood plains. Slopes are less than 1 percent. Areas are irregular in shape and range from 10 to 175 acres in size.

The typical sequence, depth, and composition of the layers of the soil are as follows—

Surface layer:
0 to 16 inches, dark gray, moderately alkaline clay

Subsoil:
16 to 42 inches, dark gray, moderately alkaline clay
42 to 60 inches, grayish brown, moderately alkaline clay
60 to 80 inches, pale brown, moderately alkaline clay

Important soil properties—

Available water capacity: high
Permeability: very slow, except when soil is dry and cracks are open
Drainage class: moderately well drained
Runoff: low
Root zone: very deep; high clay content can restrict root development and the movement of air and water.
Shrink-swell potential: very high
Hazard of water erosion: slight
Hazard of wind erosion: slight
Hazard of flooding: occurs 2 or 3 years out of 10 for very brief periods after heavy rainfall, mainly during spring and fall

Included with this soil in mapping are small areas of Buchel soil that is frequently flooded, areas that have slopes of more than 1 percent, and areas that have a clay loam surface layer or a surface layer consisting of loamy or sandy outwash material. Also included are small areas of Clareville, Odem, Sinton, and Zunker soils. The Clareville soil is clayey, noncalcareous, and is in low terrace positions on the landscape. The Odem, Sinton, and Zunker soils are loamy and in slightly higher positions than the Buchel soil. Included soils make up less than 15 percent of this map unit.

This Buchel soil is used mainly as cropland (fig. 8) and improved pasture. A few areas are used as rangeland or habitat for wildlife.

The most common crops grown on this soil are grain sorghum, corn, wheat, and cotton. Seasonal wetness and the dense, clayey texture of the soil are limitations, and occasional flooding is a hazard. Surface water drains very slowly after flooding and heavy rains. In some areas, excess surface water can be removed by proper row direction. In other areas, a properly designed and installed diversion terrace or a field and lateral drainage ditch system is needed.

Improved pasture plants yield a high amount of forage. Improved varieties of bermudagrass, bluestem, and kleingrass are the major pasture grasses grown on this soil. The main limitations are wetness and the clayey texture of the soil, which make this soil difficult to work when preparing a seedbed. Occasional flooding is a hazard. Bermudagrass is frequently planted, because it is better adapted to prolonged periodical wetness that follows heavy rains and flooding. Fertilizer applications, weed control, brush management, proper stocking rates, and controlled grazing can help improve or maintain productivity.

Native plants yield a high amount of forage. Wetness is a limitation and occasional flooding is a hazard. Proper stocking rates, brush management, and controlled grazing can help improve or maintain soil productivity.

This soil has fair potential as openland wildlife habitat. Occasional flooding, wetness, and clayey texture of the soil limit the plant growth necessary for good habitat.

This soil is poorly suited to urban and recreational uses, mainly because of the hazard of flooding. Other limitations include very a high shrink-swell potential, very slow permeability, clayey texture of the soil, and low strength. Under certain conditions, trench sidewalls can become highly unstable in this soil. Trenches that have been excavated to a depth of more than 5 feet should be shored or the sidewall should be graded to an angle that ensures safe working conditions.

This Buchel soil is in capability subclass IIIw and in the Clayey Bottomland range site.

Bw—Buchel clay, frequently flooded

This very deep, nearly level, moderately well drained soil is on plane to slightly concave stream flood plains. Slopes are less than 1 percent. Areas are long and narrow and range from 10 to 100 acres in size.

The typical sequence, depth, and composition of the layers of the soil are as follows—

Surface layer:
0 to 14 inches, very dark gray, moderately alkaline clay

Subsoil:
14 to 54 inches, dark gray, moderately alkaline clay
54 to 80 inches, gray, moderately alkaline clay

Figure 8.—Spring wheat grows well on Buchel clay, occasionally flooded.

Important soil properties—

Available water capacity: high
Permeability: very slow, except when soil is dry and cracks are open
Drainage class: Moderately well drained
Runoff: low
Root zone: very deep; high clay content can restrict root development and the movement of air and water
Shrink-swell potential: very high
Hazard of wind erosion: slight
Hazard of water erosion: slight
Hazard of wind erosion: slight
Hazard of floodiing: can occur 5 to 7 years out of 10 for brief periods after heavy rainfall, mainly during spring and fall

Included with this soil in mapping are small areas of Buchel soil that is occasionally flooded, small areas that have a clay loam surface layer or a surface layer consisting of loamy or sandy outwash material, and areas that have slopes of more than 1 percent. Also included are small areas of Clareville, Odem, Sinton, and Zunker soils. The Clareville soil has a loamy surface layer and is in low terrace positions on the landscape. The Odem, Sinton, and Zunker soils are loamy and are in slightly higher positions than the Buchel soil. Included soils make up less than 15 percent of this map unit.

The Buchel soil is used mainly as rangeland and habitat for wildlife. A few areas are used as improved pasture or cropland.

Native plants yield a high amount of forage. Proper stocking rates, brush management, and controlled grazing can help improve or maintain soil productivity.

Potential for rangeland or openland wildlife habitat is poor. The hazard of frequent flooding and the clayey texture of the soil affect the plant growth necessary for good habitat.

Although this soil is not extensively used as pasture, improved varieties of bermudagrass, bluestem, and kleingrass can be grown. Frequent flooding is a hazard and wetness is a major limitation. The clayey texture makes this soil difficult to work when preparing a seedbed. In years of above normal rainfall, improved varieties of bermudagrass will produce more forage than other pasture grasses because they are better adapted to prolonged periods of wetness that follow heavy rains and flooding. Fertilizer applications, weed control, brush management, proper stocking rates and controlled grazing can help improve or maintain productivity.

This soil is not used extensively as cropland, mainly because of frequent flooding and wetness.

This soil is poorly suited to urban and recreational uses, mainly because of the hazard of flooding. Other limitations are the very high shrink-swell potential, high risk for corrosion of uncoated steel, very slow permeability, low strength, and clayey texture of the soil. Under certain conditions, trench sidewalls can become highly unstable in this soil. Trenches that have been excavated to a depth of more than 5 feet should be shored or the sidewall should be graded to an angle that ensures safe working conditions.

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

CaA—Clareville clay loam, 0 to 1 percent slopes

This very deep, nearly level, well drained soil is on plane to slightly concave ancient stream terraces. Areas are irregular in shape and range from 10 to 400 acres in size.

The typical sequence, depth, and composition of the layers of this soil are as follows—

Surface layer:
0 to 10 inches, black, neutral clay loam

Subsoil:
10 to 33 inches, black, neutral clay
33 to 43 inches, very dark gray, moderately alkaline clay
43 to 56 inches, grayish brown, moderately alkaline clay loam
56 to 64 inches, pale brown, moderately alkaline clay loam
64 to 80 inches, very pale brown, moderately alkaline sandy clay loam

Important soil properties—

Available water capacity: high
Permeability: moderately slow
Drainage class: well drained
Runoff: negligible
Root zone: very deep; high clay content can restrict root development and movement of air and water.
Shrink-swell potential: high in upper part of subsoil
Hazard of water erosion: slight
Hazard of wind erosion: slight

Included with this soil in mapping are small areas of Clareville soil that have slopes of more than 1 percent. Also included are small areas of Bryde, Buchel, Coy, Sinton, Tordia, and Weesatche soils. The Buchel and Sinton soils are calcareous throughout and are on flood plains. The Bryde soil has a fine sandy loam surface layer and is in higher positions on the landscape than the Clareville soil. The Coy and Tordia soils are clayey throughout and are in higher positions. The Weesatche soil has a sandier subsoil and is in higher positions on the landscape. Included soils make up less than 10 percent of this map unit.

This Clareville soil is used mainly as cropland. A few areas are used as improved pasture or rangeland.

The most common crops grown on this soil are grain sorghum, corn, and wheat. The main limitation is the clayey subsoil that can restrict root growth. Using high residue crops along with good residue management can help loosen the soil, maintain organic matter content, and improve tilth.

Although not extensively used as improved pasture, this soil produces moderate to high yields. Improved varieties of bermudagrass, bluestems, and kleingrass are the major pasture grasses grown on this soil. The dense, clayey subsoil makes preparing a seedbed difficult when establishing a pasture. Fertilizer applications, weed control, brush management, proper stocking rates, and controlled grazing can help improve or maintain productivity.

Native plants yield high amounts of forage. Proper stocking rates, brush management, and controlled grazing can improve or maintain productivity.

This soil has good potential for use as openland wildlife habitat and fair potential as rangeland wildlife habitat. The dense, clayey subsoil limits the growth of understory plants that can be grazed by game animals.

This soil is poorly suited to urban uses. The moderately slow permeability, clayey texture of the soil, high shrink-swell potential, high potential for corrosion of uncoated steel, and low strength are the main limitations.

This soil is well suited to recreational uses.

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

CbC—Colibro sandy clay loam, 3 to 5 percent slopes

This very deep, gently sloping, well drained soil is on convex side slopes and ridgetops on uplands. Areas are irregular in shape and range from 8 to 340 acres in size.

The typical sequence, depth, and composition of the layers of this soil are as follows—

Surface layer:
0 to 9 inches, dark grayish brown, moderately alkaline sandy clay loam

Subsoil:
9 to 17 inches, brown, moderately alkaline sandy clay loam
17 to 34 inches, light yellowish brown, moderately alkaline sandy clay loam
34 to 56 inches, very pale brown, moderately alkaline fine sandy loam

Underlying material:
56 to 80 inches, very pale brown, moderately alkaline loamy fine sand

Important soil properties—

Available water capacity: moderate
Permeability: moderately rapid
Drainage class: well drained
Runoff: low
Root zone: very deep
Shrink-swell potential: low
Hazard of water erosion: moderate
Hazard of wind erosion: slight

Included with this soil in mapping are small areas of Colibro soil that has slopes of less than 3 percent and small areas where slopes are more than 5 percent. Also included are small areas of Pernitas, Sarnosa, Schattel, and Shiner soils. The Pernitas soil has a dark surface layer and is in similar to slightly higher positions on the landscape than those of the Colibro soil. The Sarnosa soil has a fine sandy loam subsoil and is in similar positions. The Schattel soil is more clayey and is in similar to slightly higher positions. The Shiner soil is shallow and is in similar to slightly higher positions on the landscape. Included soils make up less than 20 percent of this map unit.

This Colibro soil is used mainly as improved pasture and rangeland. A few areas are used as cropland or habitat for wildlife.

Improved varieties of bermudagrass, bluestems, and kleingrass are the major pasture grasses grown on this soil. The moderate available water capacity, low natural fertility, and high lime content of the soil are limitations. Fertilizer applications, weed control, brush management, proper stocking rates, and controlled grazing can help conserve moisture and improve or maintain productivity.

Native plants yield a moderate amount of forage. The moderate available water capacity and low natural fertility are limitations. Proper stocking rates, brush management, and controlled grazing can help improve or maintain productivity.

This soil has fair potential for use as openland and rangeland wildlife habitat. The moderate available water capacity limits the plant growth necessary for good habitat.

This soil is moderately suited to use as cropland. The moderate available water capacity, high lime content of the soil, and low natural fertility are limitations. The hazard of water erosion is moderate. Fertilizer applications, minimum tillage, high-residue and cover crops, and crop residue management can help reduce soil temperature, conserve moisture, and improve or maintain soil tilth and productivity. Terraces, contour farming, grassed waterways, and diversion terraces, where needed, can help reduce erosion.

This soil is moderately well suited to urban uses. Excess lime in the soil and moderate potential for corrosion of uncoated steel are limitations. Seepage can be a problem for sewage lagoons, sanitary landfills and reservoirs.

This soil is moderately well suited to recreational uses. Slopes of more than 2 percent are a moderate limitation for playgrounds.

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

CbE—Colibro sandy clay loam, 5 to 12 percent slopes

This very deep, strongly sloping, well drained soil is on convex side slopes and ridgetops on uplands. Areas are irregular in shape and range from 8 to 50 acres in size.

The typical sequence, depth, and composition of the layers of this soil are as follows—

Surface layer:
0 to 8 inches, pale brown, moderately alkaline sandy clay loam

Subsoil:
8 to 18 inches, light yellowish brown, moderately alkaline sandy clay loam

18 to 45 inches, very pale brown, moderately alkaline sandy clay loam

Underlying material:
45 to 80 inches, very pale brown, moderately alkaline fine sandy loam

Important soil properties—

Available water capacity: moderate
Permeability: moderate
Drainage class: well drained
Runoff: low to medium
Root zone: very deep
Shrink-swell potential: low
Hazard of water erosion: severe
Hazard of wind erosion: slight

Included with this soil in mapping are small areas of Colibro soil that has slopes of less than 5 percent, small areas where slopes are more than 12 percent, and small areas where the Colibro soil has a fine sandy loam surface layer. Also included are small areas of Pernitas, Sarnosa, and Shiner soils. The Pernitas soil has a dark surface layer and is in positions on the landscape similar to those of the Colibro soil. The Sarnosa soil has a fine sandy loam texture and is in similar positions. The Shiner soil is shallow and in higher positions on the landscape. Included soils make up less than 15 percent of this map unit.

This Colibro soil is used mainly as rangeland and improved pasture. A few areas are used as habitat for wildlife.

Native plants yield moderate amounts of forage. The moderate available water capacity and low natural fertility are the major limitations. Proper stocking rates, brush management, and controlled grazing can help improve or maintain productivity.

This soil is also used as improved pasture. Improved varieties of bermudagrass, bluestems, and kleingrass are the major pasture grasses grown. The moderate available water capacity, low natural fertility and high lime content of the soil are limitations. The hazard of water erosion is severe. Fertilizer applications, weed control, brush management, proper stocking rates, and controlled grazing can help conserve moisture and improve or maintain productivity.

This soil has fair potential for use as openland and rangeland wildlife habitat. The moderate available water capacity and excess lime content of the soil limit the plant growth necessary for good habitat.

This soil has very limited use as cropland. Areas where slopes are more than 8 percent should not be cultivated. The moderate available water capacity, high lime content of the soil, and low natural fertility are limitations. Water erosion is a severe hazard.

This soil is poorly suited to urban uses. Slopes of more than 7 percent, the excess lime content of the soil, and moderate potential for corrosion of uncoated steel are limitations. Seepage can be a problem for landfills, sewage lagoons, and reservoirs. Trench sidewalls are unstable in this soil. Trenches that are excavated to a depth of more than 5 feet should be shored or the sidewall should be graded to an angle that ensures safe working conditions.

This soil is moderately suited to recreational uses. Slope is the main limitation.

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

CdA—Condido clay, 0 to 2 percent slopes

This soil is shallow to cemented caliche. This nearly level to very gently sloping soil is on ridgetops and upper side slopes on uplands. Areas are irregular in shape and range from 10 to 500 acres in size.

The typical sequence, depth, and composition of the layers of this soil are as follows—

Surface layer:
0 to 6 inches, black, neutral clay
6 to 15 inches, very dark gray, neutral clay
15 to 18 inches, very dark gray, moderately alkaline, gravelly clay

Subsoil:
18 to 24 inches, white, moderately alkaline, strongly cemented caliche
24 to 40 inches, very pale brown, moderately alkaline, weakly consolidated siltstone that has silt loam texture

Underlying material:
40 to 80 inches, very pale brown, moderately alkaline, weakly consolidated siltstone that has silt loam texture

Important soil properties—

Available water capacity: very low
Permeability: very slow
Drainage class: well drained
Runoff: low
Root zone: shallow, petrocalcic layer impedes root development
Shrink-swell potential: high in the surface layer; low in the subsoil
Hazard of water erosion: moderate

Hazard of wind erosion: moderate

Included with this soil in mapping are small areas of Condido soil that has slopes of more than 2 percent. Also included are small areas of Ecleto, Eloso, Fashing, and Pavelek soils. The Ecleto, Fashing, and Pavelek soils are shallow and are in positions on the landscape similar to those of the Condido soil. In addition, the Ecleto soil has a loamy surface layer. The Fashing and Pavelek soils are calcareous throughout. The Eloso soil is moderately deep and is in lower positions on the landscape. Included soils make up less than 10 percent of this map unit.

This Condido soil is used mainly as rangeland, habitat for wildlife, and improved pasture. A few small areas are used as cropland.

Native plants yield a low amount of forage. The shallow rooting depth and very low available water capacity are limitations. Proper stocking, brush management, and controlled grazing can help improve or maintain productivity.

This soil has fair potential for use as openland and rangeland wildlife habitat. The shallow rooting depth and very low available water capacity limit the plant growth necessary for good habitat.

Improved grasses yield low amounts of forage. The shallow rooting depth and very low available water capacity are limitations.

This soil has limited use as cropland. Limitations include shallow rooting depth and very low available water capacity. Water erosion is a moderate hazard.

This soil is poorly suited to urban uses. Depth to a cemented pan and high potential for corrosion of uncoated steel are limitations.

This soil is poorly suited to recreational uses. Depth to a cemented pan and the clayey texture of the soil are limitations.

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

CnC—Conquista clay, 1 to 3 percent slopes

This very deep, very gently sloping, well drained soil is in reclaimed mine areas. The surface is plane to slightly convex and contoured to represent the original landscape. Areas are irregular in shape and have straight soil boundaries. Areas range from 5 to 700 acres in size.

This soil was reconstructed from the overburden that was removed during uranium mining operations. The original surface layer was removed, stockpiled, and returned to its original position. The underlying layer consists of soil and geologic materials mixed during the mining process.

The typical sequence, depth, and composition of the layers of this soil are as follows—

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

Underlying material:
11 to 80 inches, pink, moderately alkaline, gravelly loam

Important soil properties—

Available water capacity: moderate
Permeability: very slow
Drainage class: well drained
Runoff: medium
Root zone: very deep
Shrink-swell potential: high in surface layer; low in underlying material
Hazard of water erosion: moderate
Hazard of wind erosion: moderate

Included with this soil in mapping are small areas of Conquista soil that has slopes of more than 3 percent. Also included are small areas of Condido, Ecleto, Eloso, Gillett, Monteola, and Pavelek soils. These soils are naturally developed adjacent to the mined area and have not been disturbed by mining activities. The Condido, Ecleto, Gillett, and Pavelek soils are in positions on the landscape similar to those of the Conquista soil. The Eloso and Monteola soils are in lower positions. Included soils make up less than 5 percent of this map unit.

This Conquista soil is used exclusively as improved pasture.

Improved varieties of bermudagrass, bluestems, and kleingrass are the major pasture grasses grown on this soil. The moderate available water capacity, medium runoff, and low natural fertility are limitations. Fertilizer applications, weed control, brush management, proper stocking rates, and controlled grazing can help conserve moisture and improve or maintain productivity.

This soil is not used as rangeland. Native grasses growing on these soils are limited because they would have to be seeded to use this soil as rangeland. The moderate available water capacity and low natural fertility are limitations.

This soil has fair potential for use as rangeland wildlife habitat. The moderate available water capacity, low natural fertility, and clayey texture of the soil are limitations that affect the growth of plants necessary for good habitat.

This soil is not used as cropland. The moderate available water capacity, medium runoff, and low natural fertility are limitations. Water erosion is a moderate hazard.

This soil is poorly suited to urban uses. Unstable fill, very slow permeability, and high potential for corrosion of uncoated steel are limitations.

This soil is moderately suited to recreational uses. Very slow permeability and the clayey texture of the soil are limitations.

This Conquista soil is in capability subclass IVe and is not assigned a range site.

CnG—Conquista clay, 20 to 40 percent slopes

This very deep, steeply sloping, well drained soil is on side slopes of reclaimed mine areas. The surface is linear to slightly convex. Areas are irregular in shape and some have straight soil boundaries. Areas range from 5 to 90 acres in size.

This soil has been reconstructed from the overburden that was removed during uranium mining operations. The original surface layer was removed, stockpiled, and returned in its original position. The underlying layer consists of soil and geologic materials mixed during the mining process. This soil is associated with partly filled mine pits that impound water. They are on side slopes of large reclaimed mounds.

The typical sequence, depth, and composition of the layers of this soil are as follows:

Surface layer:
0 to 12 inches, black, moderately alkaline clay

Underlying material:
12 to 80 inches, pinkish white, moderately alkaline, gravelly loam

Important soil properties—

Available water capacity: moderate
Permeability: very slow
Drainage class: well drained
Runoff: very high
Root zone: very deep
Shrink-swell potential: high in surface layer; low in underlying material
Hazard of water erosion: severe
Hazard of wind erosion: moderate

Included with this soil in mapping are small areas of Conquista soil that has slopes of less than 20 percent. Included soils make up less than 5 percent of this map unit.

The Conquista soil is used exclusively as improved pasture.

Improved varieties of bermudagrass, bluestems, and kleingrass are the major pasture grasses grown on this soil. The moderate available water capacity, very high rate of runoff, and low natural fertility are limitations. The hazard of water and wind erosion is severe. Fertilizer applications, weed control, brush management, proper stocking rates, and controlled grazing can help conserve moisture and improve or maintain productivity.

This soil is not used as rangeland. Native grasses growing on these soils is very limited or nonexistent and would have to be seeded to use this soil as rangeland. The moderate available water capacity and low natural fertility are limitations. The hazard of water erosion is severe.

This soil has fair potential for rangeland wildlife habitat. The moderate available water capacity, low natural fertility, and clayey texture of the soil are limitations that affect the growth of plants necessary for a good habitat.

This soil is not used as cropland. Steep slopes, low natural fertility, moderate available water capacity, and very high rate of runoff are limitations. The hazard of water erosion is severe.

This soil is poorly suited to urban uses. Unstable fill, very slow permeability, steep slopes, high potential for corrosion of uncoated steel, high shrink-swell potential, and small stones are limitations.

This soil is poorly suited to recreational uses. Steep slopes is a severe limitation.

This Conquista soil is in capability subclass VIIe and is not assigned a range site.

CoA—Coy clay loam, 0 to 1 percent slopes

This very deep, nearly level, well drained soil is on plane to slightly concave slopes on uplands. Areas are irregular in shape and range from 10 to 250 acres in size.

The typical sequence, depth, and composition of the layers of this soil are as follows—

Surface layer:
0 to 6 inches, very dark gray, moderately alkaline clay loam

Subsoil:
6 to 17 inches, very dark gray, moderately alkaline clay
17 to 26 inches, gray, moderately alkaline clay
26 to 50 inches, light brownish gray, moderately alkaline clay
50 to 80 inches, light gray, moderately alkaline clay

Important soil properties—

Available water capacity: high
Permeability: very slow, except when soil is dry and

cracked
Drainage class: well drained
Runoff: low
Root zone: very deep, but high clay content can restrict root development and movement of air and water
Shrink-swell potential: high
Hazard of water erosion: slight
Hazard of wind erosion: slight

Included with this soil in mapping are small areas of Coy soil that has slopes of more than 1 percent. Also included are small areas of Buchel, Clareville, Monteola, and Rosenbrock soils. The Buchel soil is clayey throughout and is on flood plains. The Clareville soil is noncalcareous and is on low terraces. The Monteola and Rosenbrock soils are clayey throughout and are in positions on the landscape similar to those of the Coy soil. Included soils make up less than 10 percent of this map unit.

This Coy soil is used mainly as cropland. A few areas are used as improved pasture or rangeland.

The most common crops grown on this soil are grain sorghum, corn, wheat, and cotton. The clayey texture of the soil can restrict root development and is the main limitation. Fertilizer applications, reduced tillage, high residue and cover crops, and crop residue management can help reduce soil temperature, conserve moisture, and maintain or improve soil tilth and productivity. Land smoothing and simple drainage practices are needed in some areas to promote better surface drainage.

Improved varieties of bermudagrass, bluestems, and kleingrass are the major pasture grasses. The clayey texture makes the soil difficult to work, especially when preparing a seedbed. Fertilizer applications, weed control, brush management, proper stocking rates, and controlled grazing can help conserve moisture and improve or maintain productivity.

Native plants yield moderate amounts of forage. Proper stocking rates, brush management, and controlled grazing can help improve or maintain productivity.

This soil has good potential for use as openland wildlife habitat and has fair potential for use as rangeland wildlife habitat. The clayey texture of the soil limits the plant growth necessary for good habitat for rangeland wildlife.

This soil is poorly suited to urban uses. The very slow permeability is a severe limitation for septic tank absorption fields; the clayey texture of the soil is a severe limitation for trench sanitary landfills; and the high shrink-swell potential is a severe limitation for dwellings with and without basements, small commercial buildings, and local roads and streets. Low strength and high potential for corrosion of uncoated steel are other limitations.

This soil is moderately suited to recreational uses. Very slow permeability is a moderate limitation.

This Coy soil is in capability subclass IIs and in the Rolling Blackland range site.

CoB—Coy clay loam, 1 to 3 percent slopes

This very deep, very gently sloping, well drained soil is on convex side slopes on uplands. Areas are irregular in shape and range from 10 to 300 acres in size.

The typical sequence, depth, and composition of the layers of this soil are as follows—

Surface layer:
0 to 6 inches, very dark gray, moderately alkaline clay loam

Subsoil:
6 to 25 inches, very dark gray, moderately alkaline clay
25 to 38 inches, dark grayish brown, moderately alkaline clay
38 to 47 inches, grayish brown, moderately alkaline clay
47 to 80 inches, very pale brown, moderately alkaline clay

Important soil properties—

Available water capacity: high
Permeability: very slow except when soil is dry and cracked
Drainage class: well drained
Runoff: medium
Root zone: very deep, but high clay content can restrict root development and movement of air and water
Shrink-swell potential: high
Hazard of water erosion: moderate
Hazard of water erosion: slight

Included with this soil in mapping are small areas of Coy soil that has slopes of less than 1 percent, small areas where slopes are more than 3 percent, and small areas where the Coy soil has a fine sandy loam surface layer. Also included are small areas of Clareville, Monteola, Pernitas, Schattel, and Weesatche soils. The Clareville soil is noncalcareous in the upper part and is on low terraces. The Monteola soil is clayey throughout and is in positions on the landscape similar to those of the Coy soil. The Pernitas and Weesatche soils are fine loamy and are in similar to slightly higher positions on the landscape. The Schattel soil is deep and is on ridgetops on uplands. Included soils make up less than 15 percent of this map unit.

This Coy soil is used mainly as cropland. A few areas are used as improved pasture or rangeland.

The most common crops grown on this soil are grain sorghum, corn, wheat, and cotton. The clayey texture of the soil, which can restrict root development, and medium runoff are moderate limitations. The hazard of water erosion is moderate. Fertilizer applications, reduced tillage, high residue and cover crops, and crop residue management can help reduce soil temperature, conserve moisture, and maintain or improve soil tilth and productivity. These practices also help control runoff and reduce water erosion.

Improved varieties of bermudagrass, bluestems, and kleingrass are the major pasture grasses grown on this soil. The clayey texture of the soil is difficult to work, especially when preparing a seedbed. Fertilizer applications, weed control, brush management, proper stocking rates and controlled grazing can help conserve moisture and improve or maintain productivity.

Native plants yield moderate amounts of forage. Proper stocking rates, brush management, and controlled grazing can help improve or maintain productivity.

This soil has good potential for use as openland wildlife habitat. It has fair potential for use as rangeland wildlife habitat. The surface texture of the soil limits the plant growth necessary for good rangeland wildlife habitat.

This soil is poorly suited to urban uses. The very slow permeability, clayey texture of the soil, high shrink-swell potential, low strength, and high potential for corrosion of uncoated steel are major limitations.

This soil is moderately suited to recreational uses. Very slow permeability and slopes of over 2 percent are moderate limitations.

This Coy soil is in capability subclass IIe and in the Rolling Blackland range site.

CoC—Coy clay loam, 3 to 5 percent slopes

This very deep, gently sloping, well drained soil is on convex side slopes on uplands. Areas are irregular in shape and range from 15 to 125 acres in size.

The typical sequence, depth, and composition of the layers of this soil are as follows—

Surface layer:
0 to 5 inches, very dark gray, moderately alkaline clay loam

Subsoil:
5 to 12 inches, very dark gray, moderately alkaline clay
12 to 22 inches, dark grayish brown, moderately alkaline clay
22 to 39 inches, grayish brown, moderately alkaline clay
39 to 54 inches, pale brown, moderately alkaline clay
54 to 80 inches, very pale brown, moderately alkaline clay

Important soil properties—

Available water capacity: high
Permeability: very slow except when soil is dry and cracks are open
Drainage class: well drained
Runoff: high
Root zone: very deep, but high clay content can restrict root development and the movement of air and water
Shrink-swell potential: high
Hazard of water erosion: moderate
Hazard of wind erosion: slight

Included with this soil in mapping are small areas of Coy soil that has slopes of less than 3 percent and small areas where slopes are more than 5 percent. Also included are small areas of Bryde, Eloso, Monteola, Pernitas, Schattel, and Weesatche soils. The Bryde soil has a fine sandy loam surface layer and is in positions on the landscape similar to those of the Coy soil. The Eloso and Monteola soils are clayey throughout and are in similar positions. The Pernitas and Weesatche soils are fine loamy and in similar to slightly higher positions on the landscape. The Schattel soil is deep and is on ridgetops on uplands. Included soils make up less than 15 percent of this map unit.

This Coy soil is used mainly as cropland. A few areas are used as improved pasture or rangeland.

The most common crops grown on this soil are grain sorghum, corn, wheat, and cotton. The high rate of runoff is a major limitation. The hazard of water erosion is moderate. The clayey subsoil can restrict root growth. Fertilizer applications, reduced tillage, high residue and cover crops, and crop residue management can help reduce soil temperature, conserve moisture, and improve or maintain soil tilth and productivity. Terraces, contour farming, grassed waterways, and diversion terraces, where needed, help control runoff and reduce the hazard of erosion.

Improved varieties of bermudagrass, bluestems, and kleingrass are the major pasture grasses grown on this soil. The high rate of runoff is a major limitation. The hazard of water erosion is moderate. The clayey subsoil is difficult to work when preparing a seedbed.

Fertilizer applications, weed control, brush management, proper stocking rates, and controlled grazing can help conserve moisture and improve or maintain productivity.

Native plants yield moderate amounts of forage. The high rate of runoff is a major limitation. The hazard of water erosion is moderate. Proper stocking rates, brush management, and a controlled grazing system can help improve or maintain productivity.

This soil has fair potential for use as openland and rangeland wildlife habitat. Texture of the soil and slope restrict the plant growth necessary for good habitat.

This soil is poorly suited to urban use. The very slow permeability, clayey texture of the soil, high shrink-swell potential, low strength, slope, and high potential for corrosion of uncoated steel are limitations.

This soil is moderately suited to recreational uses. Very slow permeability and slope are moderate limitations.

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

DeB—Devine very gravelly fine sandy loam, 1 to 4 percent slopes

This very deep, gently sloping, well drained soil is on convex side slopes on uplands. Areas are irregular in shape and range from 5 to 40 acres in size.

The typical sequence, depth, and composition of the layers of this soil are as follows—

Surface layer:
0 to 13 inches, dark reddish brown, slightly acid, very gravelly, fine sandy loam
13 to 22 inches, reddish brown, slightly acid, very gravelly, sandy loam

Subsoil:
22 to 60 inches, red, slightly acid, very gravelly clay
60 to 80 inches, red, slightly acid, gravelly sandy clay loam

Important soil properties—

Available water capacity: low
Permeability: moderately slow
Drainage class: well drained
Runoff: low
Root zone: very deep
Shrink-swell potential: low
Hazard of water erosion: slight
Hazard of wind erosion: slight

Included with this soil in mapping are small areas of Devine soil that has slopes of less than 1 percent, and small areas where slopes are more than 4 percent. Also included are small areas of Bryde, Gillett, Miguel, and Papalote soils. These soils are in positions on the landscape similar to those of the Devine soil. The Bryde soil has dark subsoil horizons; the Gillett soil is moderately deep; the Miguel soil is very deep; and the Papalote soil has gray mottles. In addition, none of these soils are gravelly. Included soils make up less than 10 percent of this map unit.

This Devine soil is used mainly as rangeland and habitat for wildlife.

Native plants yield low amounts of forage. The low available water capacity and low natural fertility are major limitations.

This soil has fair potential for use as rangeland wildlife habitat. The low available water capacity and low natural fertility limit the plant growth necessary for good habitat.

Improved grasses yield low amounts of forage. Improved varieties of bermudagrass, bluestems, and kleingrass are the major grasses grown on this soil. The low natural fertility and low available water capacity are limitations. Fertilizer applications, weed control, brush management, proper stocking rates, and controlled grazing can help conserve moisture and improve or maintain productivity.

This soil is not suited to use as cropland. The low available water capacity, low natural fertility, and gravelly texture of the soil are limitations.

This soil is poorly suited to urban uses. The moderately slow permeability, clayey subsoil, moderate potential for corrosion of uncoated steel, seepage, and small stones are limitations. The soil is also a poor filter for septic systems.

This soil is poorly suited to recreational uses. Small stones is a major limitation.

This Devine soil is in capability subclass VIs and in the Gravelly Ridge range site.

EcB—Ecleto sandy clay loam, 1 to 3 percent slopes

This shallow, very gently sloping, well drained soil is on ridgetops and upper side slopes on uplands. Areas are irregular in shape and range from 10 to 180 acres in size.

The typical sequence, depth, and composition of the layers of this soil are as follows—

Surface layer:
0 to 3 inches, dark grayish brown, neutral, sandy clay loam

Subsoil:
3 to 14 inches, very dark gray, neutral, sandy clay

14 to 18 inches, dark gray, moderately alkaline, gravelly sandy clay

Underlying material:
18 to 60 inches, white, moderately alkaline, noncalcareous, weakly cemented, coarsely fractured, sandstone

Important soil properties—

Available water capacity: very low
Permeability: slow
Drainage class: well drained
Runoff: medium
Root zone: shallow; sandstone layer impedes root development
Shrink-swell potential: high
Hazard of water erosion: moderate
Hazard of wind erosion: moderate

Included with this soil in mapping are small areas of Ecleto soil that has slopes of less than 1 percent, small areas where slopes are more than 3 percent, small areas where the Ecleto soil has a fine sandy loam surface layer, and small areas where sandstone fragments are on the surface. Also included are small areas of Condido, Fashing, Gillett, Pavelek, and Weigang soils. The Condido, Fashing, and Pavelek soils are clayey throughout and are in positions on the landscape similar to those of the Ecleto soil. The Gillett soil is moderately deep and is in lower positions on the landscape. The Weigang soil is fine-loamy and is in similar positions. Included soils make up less than 15 percent of this map unit.

The Ecleto soil is used mainly as rangeland, habitat for wildlife, and improved pasture. A few small areas are used as cropland.

Native plants yield low amounts of forage. This soil is shallow and has a sandstone layer that impedes root development. It also has very low available water capacity. Proper stocking rates, brush management, and controlled grazing can help improve or maintain productivity.

This soil has good potential for use as openland and rangeland wildlife habitat.

When this soil is used as improved pasture or cropland, yields are moderate to low. The shallow rooting depth, very low available water capacity and medium rate of runoff are limitations. The hazard of erosion is moderate.

This soil is poorly suited to urban uses. Depth to sandstone and high potential for corrosion of uncoated steel are severe limitations.

This soil is poorly suited to recreational uses. Depth to sandstone is a major limitation.

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

EcC—Ecleto sandy clay loam, 3 to 5 percent slopes

This shallow, gently sloping, well drained soil is on upper side slopes on uplands. Areas are irregular in shape and range from 8 to 45 acres in size.

The typical sequence, depth, and composition of the layers of this soil are as follows—

Surface layer:
0 to 6 inches, dark gray, neutral sandy clay loam

Subsoil:
6 to 10 inches, very dark grayish brown, slightly alkaline sandy clay
10 to 14 inches, very dark grayish brown, moderately alkaline clay loam

Underlying material:
14 to 80 inches, very pale brown, moderately alkaline, noncalcareous, weakly cemented, coarsely fractured sandstone

Important soil properties—

Available water capacity: very low
Permeability: slow
Drainage class: well drained
Runoff: medium
Root zone: shallow; sandstone layer impedes root development
Shrink-swell potential: high
Hazard of water erosion: severe
Hazard of wind erosion: moderate

Included with this soil in mapping are small areas of Ecleto soil that has slopes of less than 3 percent, small areas where the Ecleto soil has a fine sandy loam surface layer, and small areas where sandstone fragments are on the surface. Also included are small areas of Condido, Fashing, Gillett, Pavelek, and Weigang soils. The Condido, Fashing, and Pavelek soils are clayey throughout and are in positions on the landscape similar to those of the Ecleto soil. The Gillett soil is moderately deep and is in lower positions. The Weigang soil has a loamy subsoil and is in similar positions on the landscape. Included soils make up less than 15 percent of this map unit.

This Ecleto soil is used mainly as rangeland, habitat for wildlife, and improved pasture. A few small areas are used as cropland.

Native plants yield low amounts of forage. The shallow rooting depth and very low available water capacity are limitations. Proper stocking rates, brush management, and controlled grazing can help improve or maintain productivity.

This soil has good potential for use as openland and rangeland wildlife habitat.

This soil has limited use as improved pasture or cropland. The shallow rooting depth, very low available water capacity, and medium rate of runoff are limitations. The hazard of water erosion is severe.

This soil is poorly suited to urban uses. Depth to sandstone and the high potential for corrosion of uncoated steel are severe limitations.

This soil is poorly suited to recreational uses. Depth to sandstone is a severe limitation for camp and picnic areas and playgrounds.

This Ecleto soil is in capability subclass IVe and in the Shallow range site.

EdB—Elmendorf-Denhawken complex, 1 to 3 percent slopes

These very deep, very gently sloping, well drained soils are on uplands. Areas are irregular in shape and range from 10 to 300 acres in size.

The Elmendorf soil makes up about 60 percent of this map unit. The Denhawken soil makes up about 30 percent. Other soils make up about 10 percent. These soils are so intricately mixed that mapping them separately is not practical at the scale used.

In undisturbed areas, the microrelief is one of knolls and depressions that occur in a repeating pattern. The Elmendorf soil is in the depressions, which are 5 to 12 inches lower than the knolls. The Denhawken soil is on the knolls that are irregularly shaped or oblong.

The typical sequence, depth, and composition of the layers of the Elmendorf soil are as follows—

Surface layer:
0 to 7 inches, very dark gray, slightly alkaline sandy clay loam

Subsoil:
7 to 22 inches, black, moderately alkaline clay loam
22 to 34 inches, dark gray, moderately alkaline clay
34 to 48 inches, grayish brown, moderately alkaline clay
48 to 59 inches, light gray, moderately alkaline clay

Underlying material:
59 to 80 inches, pale yellow, moderately alkaline marine shale that has clay texture

The typical sequence, depth, and composition of the layers of the Denhawken soil are as follows—

Surface layer:
0 to 7 inches, dark gray, moderately alkaline sandy clay loam

Subsoil:
7 to 18 inches, gray, moderately alkaline clay
18 to 54 inches, light gray, moderately alkaline clay
54 to 80 inches, light gray, moderately alkaline clay

Important soil properties—

Available water capacity: Elmendorf—high, Denhawken—high
Permeability: very slow except when soils are dry and cracks are open
Drainage class: well drained
Runoff: medium
Root zone: very deep, but high clay content can restrict root development and movement of air and water
Shrink-swell potential: high in subsoil
Hazard of water erosion: slight
Hazard of wind erosion: slight

Included with these soils in mapping are small areas of these soils where slopes are less than 1 percent and small areas where slopes are more than 3 percent. Also included are small areas of Bryde, Coy, Gillett, and Tordia soils. The Bryde and Gillett soils are light in color, have a fine sandy loam surface layer, and are in positions on the landscape higher than the Elmendorf-Denhawken soils. The Coy soil is clayey and calcareous throughout. The Tordia soil is clayey and noncalcareous throughout. The Coy and Tordia soils are in positions on the landscape similar to those of the the Elmendorf-Denhawken soils. Included soils make up about 10 percent of this map unit.

These soils are used as cropland. A few areas are used as improved pasture or rangeland.

The most common crops grown are grain sorghum, corn, wheat, and cotton. A medium rate of runoff and droughtiness are limitations. The clayey texture of the soils restricts root development. Fertilizer applications, reduced tillage, high-residue and cover crops, and crop residue management can help reduce the soil temperature, conserve moisture, and improve or maintain soil tilth and productivity. These practices also help control runoff.

Improved varieties of bermudagrass, bluestems, and kleingrass are the major pasture grasses grown. A medium rate of runoff and droughtiness are limitations. The clayey texture makes the soils difficult to work, especially when preparing seedbeds. Fertilizer applications, weed control, brush management, proper stocking rates, and controlled grazing can help conserve moisture and improve or maintain productivity.

Native plants yield moderate amounts of forage. A medium rate of runoff and droughtiness are limitations. Proper stocking rates, brush management, and controlled grazing can help improve or maintain productivity.

The soils of this map unit have good potential for use as openland habitat and fair potential for use as rangeland wildlife habitat. Texture of the soils limits the plant growth necessary for good rangeland wildlife habitat.

These soils are poorly suited to urban uses. The high shrink-swell potential, high potential for corrosion of uncoated steel and low strength are severe limitations for building site development. The very slow permeability and clayey texture of the soils are severe limitations for sanitary facilities.

These soils are moderately well suited to recreational uses. The very slow permeability and slope are moderate limitations for camp and picnic areas and playgrounds.

The Elmendorf soil is in capability subclass IIe, and the Denhawken soil is in capability subclass IIIe. Both soils are in the Blackland range site.

EsB—Eloso clay, 1 to 3 percent slopes

This moderately deep, very gently sloping, well drained soil is on convex side slopes on uplands. Areas are irregular in shape and range from 15 to 3,000 acres in size.

The typical sequence, depth, and composition of the layers of this soil are as follows—

Surface layer:
O to 12 inches, very dark gray, slightly alkaline clay

Subsoil:
12 to 28 inches, dark gray, slightly alkaline clay
28 to 37 inches, light gray, slightly alkaline silty clay

Underlying material:
37 to 80 inches, white, slightly alkaline, noncalcareous, weakly consolidated siltstone that has silt loam texture

Important soil properties—

Available water capacity: moderate
Permeability: very slow
Drainage class: well drained
Runoff: medium
Root zone: moderately deep
Shrink-swell potential: high
Hazard of water erosion: moderate
Hazard of wind erosion: moderate

Included with this soil in mapping are small areas of Eloso soil that has of slopes of less than 1 percent and areas where slopes are more than 3 percent. Also included are small areas of the Condido, Coy, Monteola, Pavelek, Pettus, and Rosenbrock soils. The Condido and Pavelek soils are shallow and are in positions on the landscape higher than the Eloso soil. The Coy, Monteola, and Rosenbrock soils are deep and are in similar to lower positions on the landscape. The Pettus soils are loamy-skeletal and are on ridgetops. Included soils make up less than 20 percent of this map unit.

This Eloso soil is used mainly as cropland. A few areas are used as improved pasture, rangeland, or habitat for wildlife.

The most common crops grown are corn and wheat. Water erosion is a moderate hazard. A medium rate of runoff and moderate available water capacity are limitations. The clayey texture of the soil restricts root development. Fertilizer applications, reduced tillage, high residue and cover crops, and crop residue management can help reduce soil temperature, conserve moisture, and improve or maintain soil tilth and productivity. These practices also help control runoff and reduce the hazard of erosion.

Improved varieties of bermudagrass, bluestems, and kleingrass are the major pasture grasses grown on this soil. Forage yields are low. Water erosion is a moderate hazard. A medium rate of runoff, moderate available water capacity, and droughtiness are limitations. The clayey texture makes the soil difficult to work, especially when preparing a seedbed. Fertilizer applications, weed control, brush management, proper stocking rates, and controlled grazing can help conserve moisture and improve or maintain soil productivity.

Native plants yield moderate amounts of forage. The moderate available water capacity and droughtiness are limitations. Proper stocking rates, brush management, and controlled grazing can help improve or maintain productivity.

This soil has fair potential for use as openland and rangeland wildlife habitat. The clayey surface texture, moderate available water capacity, and soil thickness limit the growth of plants necessary for a good habitat.

This soil is poorly suited to urban uses. The very slow permeability is a severe limitation for septic tank absorption fields. The high shrink-swell potential, low strength, and high potential for corrosion of uncoated steel are severe limitations for building sites.

This soil is moderately suited to recreational uses. Very slow permeability, clayey texture of the soil, and slope are moderate limitations.

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

EsC—Eloso clay, 3 to 5 percent slopes

This moderately deep, gently sloping, well drained soil is on convex side slopes on uplands. Areas are irregular in shape and range from 10 to 120 acres in size.

The typical sequence, depth, and composition of the layers of this soil are as follows—

Surface layer:
O to 7 inches, very dark gray, slightly alkaline clay

Subsoil:
7 to 11 inches, very dark gray, moderately alkaline clay
11 to 26 inches, dark gray, moderately alkaline clay
26 to 34 inches,light brownish gray, moderately alkaline silty clay

Underlying material:
34 to 80 inches, white, slightly alkaline, noncalcareous, weakly consolidated siltstone that has silt loam texture

Important soil properties—

Available water capacity: moderate
Permeability: very slow
Drainage class: well drained
Runoff: high
Root zone: moderately deep
Shrink-swell potential: high
Hazard of water erosion: moderate
Hazard of wind erosion: moderate

Included with this soil in mapping are small areas of Eloso soil that has slopes of less than 3 percent and small areas where slopes are more than 5 percent. Also included are small areas of Condido, Coy, Monteola, Pavelek, Pettus, and Rosenbrock soils. The Condido and Pavelek soils are shallow and in positions on the landscape higher than the Eloso soil. The Coy, Monteola, and Rosenbrock soils are deep and in similar to lower positions on the landscape. The Pettus soils are loamy-skeletal and are on ridgetops. Included soils make up less than 20 percent of this map unit.

This Eloso soil is used mainly as cropland. A few areas are used as improved pasture, rangeland, or wildlife habitat.

The most common crops grown on this soil are corn and wheat. The hazard of water erosion is moderate. The high rate of runoff and moderate available water capacity are limitations. The clayey texture of the soil restricts root development. Fertilizer applications, reduced tillage, high residue and cover crops, and crop residue management can help reduce soil temperature, conserve moisture, and improve or maintain soil tilth and productivity. Terraces, contour farming, grassed waterways, and diversion terraces, where needed, can help control runoff and reduce the hazard of erosion.

Improved varieties of bermudagrass, bluestems, and kleingrass are the major pasture grasses grown on this soil. Forage yields are low. The moderate available water capacity, high rate of runoff, and droughtiness are limitations. The clayey texture makes the soil difficult to work, especially when preparing a seedbed. Fertilizer applications, weed control, brush management, proper stocking rates, and controlled grazing can help conserve moisture and improve or maintain soil productivity.

Native plants yield moderate amounts of forage. The moderate available water capacity, droughtiness, and high rate of runoff are limitations. Proper stocking rates, brush management, and controlled grazing can help improve or maintain productivity.

This soil has fair potential for use as openland and rangeland wildlife habitat. The clayey surface texture and moderate thickness of the soil and moderate available water capacity are limitations that affect the growth of plants necessary for a good habitat.

This soil is poorly suited to urban uses. The very slow permeability is a severe limitation for septic tank absorption fields. The high shrink-swell potential, low strength, and high potential for corrosion of uncoated steel are severe limitations for building site development.

This soil is moderately suited to recreational uses. The very slow permeability, clayey texture of the soil, and slope are limitations.

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

FaC—Fashing clay, 2 to 5 percent slopes

This shallow, gently sloping, well drained soil is on convex upper side slopes on uplands. Areas are irregular in shape and range from 8 to 50 acres in size.

The typical sequence, depth, and composition of the layers of this soil are as follows—

Surface layer:
0 to 12 inches, very dark gray, moderately alkaline clay

Subsoil:
12 to 18 inches, very dark gray and light gray, moderately alkaline clay

Underlying material:
18 to 80 inches, light brownish gray, moderately alkaline, weakly cemented siltstone

Important soil properties—

Available water capacity: low
Permeability: slow
Drainage class: well drained
Runoff: medium
Root zone: shallow
Shrink-swell potential: high
Hazard of water erosion: severe
Hazard of wind erosion: moderate

Included with this soil in mapping are small areas of Fashing soil that has slopes of less than 2 percent and small areas where slopes are more than 5 percent. Also included are small areas of Condido, Ecleto, Pavelek, and Weigang soils. The Condido and Ecleto soils are shallow and noncalcareous and are in positions on the landscape higher than the Fashing soil. The Pavelek soil has a cemented caliche layer and is in similar to higher positions. The Weigang soil is loamy and is in similar positions on the landscape. Included soils make up less than 10 percent of this map unit.

This Fashing soil is used mainly as rangeland and habitat for wildlife. A few areas are used as improved pasture or cropland.

Native plants yield low amounts of forage. The shallow rooting depth, low available water capacity and droughtiness are limitations. The hazard of water erosion is severe. Proper stocking rates, brush management, and controlled grazing can help improve or maintain productivity.

This soil has fair potential for use as openland and rangeland wildlife habitat. The shallow rooting depth, clayey surface layer, low available water capacity, and slopes of more than 3 percent limit the plant growth necessary for good habitat.

Improved varieties of bermudagrass, bluestems, and kleingrass are the major pasture grasses grown on this soil. Forage yields are low. The shallow rooting depth, low available water capacity, and droughtiness are limitations. The hazard of water erosion is severe. Fertilizer applications, weed control, brush control, proper stocking rates, and controlled grazing can help conserve moisture and improve or maintain productivity.

This soil is not extensively used as cropland. Crop yields are low. The shallow rooting depth, low available water capacity, and droughtiness are limitations. The hazard of water erosion is severe.

This soil is poorly suited to urban uses. The shallow depth to rock and clayey texture of the soil are severe limitations for sanitary facilities. Depth to rock, high shrink-swell potential, and high potential for corrosion of uncoated steel are severe limitations for building site development.

This soil is poorly suited to recreational uses. The shallow depth to bedrock is a severe limitation for camp and picnic areas and playgrounds. The clayey surface layer is a moderate limitation for paths and trails.

This Fashing soil is in capability subclass IVe and in the Shallow range site.

GtB—Gillett fine sandy loam, 1 to 4 percent slopes

This moderately deep, gently sloping, well drained soil is on convex side slopes on uplands. The areas are irregular in shape and range from 10 to 500 acres in size.

The typical sequence, depth, and composition of the layers of this soil are as follows—

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

Subsoil:
7 to 13 inches, dark brown, mottled, slightly acid clay
13 to 19 inches, reddish brown, mottled, slightly acid clay
19 to 27 inches, brown, moderately alkaline clay
27 to 34 inches, light yellowish brown, moderately alkaline, gravelly, sandy clay loam

Underlying material:
34 to 80 inches, white, slightly alkaline, weakly consolidated sandstone that has texture of fine sandy loam

Important soil properties—

Available water capacity: moderate
Permeability: slow
Drainage class: well drained
Runoff: medium
Root zone: moderately deep, but high clay content can restrict root development and movement of air and water
Shrink-swell potential: high in subsoil
Hazard of water erosion: moderate
Hazard of wind erosion: moderate

Included with this soil in mapping are small areas of

Gillett soil that has slopes of less than 1 percent and small areas where slopes are more than 4 percent. Also included are small areas of a soil similar to the Gillett soil except that it has a black unmottled subsoil. Other included soils are small areas of Bryde, Ecleto, Miguel, Papalote, and Weigang soils. The Bryde, Miguel, and Papalote soils are deep and are in positions on the landscape lower than the Gillett soil. The Ecleto and Weigang soils are shallow and are in slightly higher positions. Included soils make up less than 15 percent of this map unit.

This Gillett soil is used mainly as rangeland and habitat for wildlife. A few areas are used as improved pasture or cropland.

Native plants yield moderate amounts of forage. The moderate available water capacity, medium rate of runoff, and low natural fertility are limitations. Proper stocking rates, brush management, and controlled grazing can help improve or maintain productivity.

This soil has good potential for use as openland and rangeland wildlife habitat.

Improved varieties of bermudagrass, bluestems, and kleingrass are the major pasture grasses grown on this soil. Forage yields are low. The moderate available water capacity and low natural fertility are the major limitations. The dense, clayey subsoil makes this soil difficult to work, especially when preparing a seedbed. Fertilizer applications, weed control, brush management, proper stocking rates, and controlled grazing can help conserve moisture and improve or maintain productivity.

Crop yields are moderate on this soil. The hazard of water erosion is moderate. The moderate available water capacity, low natural fertility, and medium rate of runoff are limitations. The clayey subsoil restricts root development. Fertilizer applications, reduced tillage, high residue and cover crops, and crop residue management can help reduce soil temperature, conserve moisture, improve soil tilth and productivity, and reduce erosion and runoff.

This soil is poorly suited to urban uses. The slow permeability is a severe limitation for septic tank absorption fields. The high shrink-swell potential, low strength, high potential for corrosion of uncoated steel, and the clayey texture of the soil are limitations for building site development.

This soil is moderately well suited to recreational uses. Slope is a moderate limitation for playgrounds.

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

Gu—Gullied Land

This map unit consists of eroded soils on uplands or on breaks, ranging from high terraces to flood plains. Slopes range from 5 to 15 percent. Areas are irregular in shape and range from 5 to 45 acres in size.

Gullied land consists of areas that have been severely eroded by water. Eighty to ninety percent of the area consists of closely spaced, deep gullies. The areas have an intricate network of shallow and deep gullies that are V-shaped or U-shaped. They range from 1 to 25 feet deep and from 5 to 30 feet wide. The exposed soil material is light in color, sandy clay loam, clay loam, clay, or fine sandy loam that has a high content of lime. Erosion by water is a continuing process in most gullies.

Included in mapping are small areas of Gullied land where slopes are less than 5 percent. Also included are small areas of Bryde, Coy, Ecleto, Eloso, Gillett, Miguel, Monteola, Pavelek, Rosenbrock, and Tordia soils on the uplands and Buchel and Sinton soils on flood plains. Included soils make up less than 20 percent of this map unit.

The Gullied Land is used mainly as habitat for wildlife; it has limited potential.

These soils have little value for farming. Major reclamation is needed if used for farming or construction sites. Sediment eroding from these areas into local streams is a major concern. The present plant cover is not adequate to protect against further erosion. The hazard of water erosion is very severe.

The Gullied Land map unit is in capability subclass VIIe and is not assigned a range site.

Im—Imogene fine sandy loam, 0 to 1 percent slopes

This very deep, nearly level, moderately well drained soil is on plane to slightly concave uplands and old stream terraces. Areas are long and narrow, usually along drainageways, and range from 10 to 60 acres in size.

The typical sequence, depth, and composition of the layers of this soil are as follows—

Surface layer:
0 to 8 inches, gray, slightly acid, fine sandy loam

Subsoil:
8 to 17 inches, very dark gray, slightly alkaline sandy clay loam
17 to 28 inches, grayish brown, slightly alkaline sandy clay loam, few salt crystals
28 to 45 inches, light yellowish brown, moderately alkaline sandy clay loam, common salt crystals
45 to 80 inches, light gray, moderately alkaline sandy clay loam, common salt crystals

Important soil properties—

Available water capacity: low
Permeability: very slow
Drainage class: moderately well drained
Runoff: low
Root zone: very deep
Shrink-swell potential: moderate
Hazard of water erosion: moderate
Hazard of wind erosion: moderate

Included with this soil in mapping are small areas of Imogene soil that has slopes of more than 1 percent. Also included are small areas of Bryde, Gillett, Papalote, and Tordia soils. The Bryde soil has a clayey subsoil and is in positions on the landscape higher than the Imogene soil. The Gillett soil is moderately deep and is in higher positions. The Papalote soil has a clayey, mottled subsoil and is in similar to higher positions on the landscape. The Tordia soil is clayey throughout and is in higher positions. Included soils make up less than 10 percent of this map unit.

This Imogene soil is used mainly as improved pasture and rangeland. A few areas are used as habitat for wildlife.

Improved varieties of bermudagrass are the major pasture grasses grown on this soil. The low available water capacity and high salinity are limitations. Fertilizer applications, weed control, brush management, proper stocking rates, and controlled grazing can help conserve moisture and improve or maintain productivity.

Native plants yield moderate amounts of forage. The low available water capacity and high salinity are limitations. Proper stocking rates, brush management, and controlled grazing can help improve or maintain productivity.

This soil has poor potential for use as openland and rangeland wildlife habitat. The low available water capacity and high salinity limit the plant growth necessary for good habitat.

The low available water capacity, high salinity, and the moderate hazard of water erosion limit this soil for use as cropland. Cropping systems should be adapted to reduce sodium and salts and to improve or maintain soil tilth and productivity. The soil structure deteriorates quickly if salts are removed before the sodium; therefore, special considerations are necessary before using management to reduce sodium and salts. Fertilizer applications, reduced tillage, high residue and cover crops, and crop residue management can help reduce the soil temperature, conserve moisture and improve or maintain soil tilth and productivity.

This soil is poorly suited to urban and recreational uses. The very slow permeability and high salinity are severe limitations for sanitary facilities, camp and picnic areas, and playgrounds. The high potential for corrosion of uncoated steel, moderate shrink-swell potential, and low strength are limitations for building sites.

This Imogene soil is in capability subclass IVs and in the Tight Sandy Loam range site.

MgB—Miguel fine sandy loam, 1 to 3 percent slopes

This very deep, very gently sloping, well drained soil is on convex side slopes on uplands. Areas are irregular in shape and range from 8 to 1,200 acres in size.

The typical sequence, depth, and composition of the layers of this soil are as follows—

Surface layer:
0 to 8 inches, yellowish brown, slightly acid fine sandy loam

Subsoil:
8 to 16 inches, dark grayish brown, mottled, neutral clay
16 to 28 inches, yellowish red, mottled, slightly alkaline sandy clay
28 to 37 inches, strong brown, mottled, moderately alkaline sandy clay loam
37 to 48 inches, yellowish brown, mottled, moderately alkaline sandy clay loam
48 to 80 inches, brownish yellow, moderately alkaline sandy clay loam

Important soil properties:

Available water capacity: moderate
Permeability: slow
Drainage class: well drained
Runoff: medium
Root zone: very deep, but high clay content can restrict root development and movement of air and water
Shrink-swell potential: moderate in subsoil
Hazard of water erosion: moderate
Hazard of wind erosion: slight

Included with this soil in mapping are small areas of Miguel soil that has slopes of less than 1 percent, small areas where slopes are more than 3 percent, and small areas where the surface layer is sandy. Also included are small areas of Bryde, Gillett, Nusil, and Papalote soils. The Bryde soil has a subsoil that is dark in color and is in positions on the landscape similar to those of the Miguel soil. The Gillett soil is moderately deep and is in similar to higher positions. The Nusil soil has a sandy surface layer and is in lower positions on the landscape. The Papalote soil is deep, has gray mottles, and is in similar positions. Included soils make up less than 15 percent of this map unit.

This Miguel soil is used mainly as rangeland and habitat for wildlife. A few areas are used as improved pasture or cropland.

Native plants yield moderate amounts of forage. The moderate available water capacity and low natural fertility are limitations. Proper stocking rates, brush management, and controlled grazing can help conserve moisture and improve or maintain productivity.

This soil has good potential for use as rangeland wildlife habitat and has fair potential for use as openland wildlife habitat. The moderate available water capacity and the clayey subsoil limit the plant growth necessary for good openland wildlife habitat.

Improved varieties of bermudagrass, bluestems, and kleingrass are the major pasture grasses grown on this soil. The moderate available water capacity and low natural fertility are major limitations. The clayey subsoil makes this soil difficult to work, especially when preparing a seedbed. Fertilizer applications, weed control, brush management, proper stocking rates, and controlled grazing can help conserve moisture and improve or maintain productivity.

Grain sorghum, corn, and a few acres of peanuts are crops grown on this soil. The hazard of water erosion is moderate. The moderate available water capacity, low natural fertility, droughtiness, and medium rate of runoff are limitations. The clayey subsoil restricts root development. Fertilizer applications, reduced tillage, high-residue and cover crops, and crop residue management can help reduce soil temperature, conserve moisture, and improve or maintain soil tilth and productivity. Terraces, contour farming, grassed waterways, and diversion terraces, where needed, can help control runoff and water erosion.

This soil is moderately suited to urban uses. The slow permeability is a severe limitation for septic tank absorption fields. The clayey subsoil is a moderate limitation for sanitary facilities and shallow excavations. The high potential for corrosion of uncoated steel, low strength, and shrink-swell potential are limitations for building sites.

This soil is moderately well suited to recreational uses. Slope is a moderate limitation for playgrounds.

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

MgC—Miguel fine sandy loam, 3 to 5 percent slopes

This very deep, gently sloping, well drained soil is on convex side slopes on uplands. Areas are irregular in shape and range from 8 to 200 acres in size.

The typical sequence, depth, and composition of the layers of this soil are as follows—

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

Subsoil:
10 to 22 inches, dark brown, mottled, neutral sandy clay
22 to 31 inches, strong brown, mottled, neutral sandy clay
31 to 43 inches, brownish yellow, moderately alkaline sandy clay loam
43 to 60 inches, light gray, moderately alkaline sandy clay

Important soil properties—

Available water capacity: moderate
Permeability: slow
Drainage class: well drained
Runoff: medium
Root zone: deep, but high clay content can restrict root development and movement of air and water
Shrink-swell potential: moderate in subsoil
Hazard of water erosion: moderate
Hazard of wind erosion: slight

Included with this soil in mapping are small areas of Miguel soil that has slopes of less than 3 percent, small areas where slopes are more than 5 percent, and small areas where the surface layer is sandy. Also included are small areas of Bryde, Gillett, Nusil, and Papalote soils. The Bryde soil has a subsoil that is dark in color and is in positions on the landscape similar to those of the Miguel soil. The Gillett soil is moderately deep and is in similar to higher positions. The Nusil soil has a sandy surface layer and is in lower positions on the landscape. The Papalote soil is deep, has gray mottles, and is in similar to lower positions. Included soils make up less than 15 percent of this map unit.

This Miguel soil is used mainly as rangeland and habitat for wildlife. A few areas are used as improved pasture or cropland.

Native plants yield moderate amounts of forage. The moderate available water capacity, medium rate of runoff, and low natural fertility are limitations. Proper stocking rates, brush management, and controlled grazing can help conserve moisture and improve or maintain productivity.

This soil has good potential for use as rangeland wildlife habitat and has fair potential for use as openland wildlife habitat. The moderate available water capacity and the clayey subsoil limit the growth of plants necessary for a good openland wildlife habitat.

Improved varieties of bermudagrass, bluestems, and kleingrass are the major pasture grasses grown on this soil. Forage yields are low. The moderate available water capacity, medium rate of runoff, and low natural fertility are limitations. The clayey subsoil is difficult to work, especially when preparing a seedbed. Fertilizer applications, weed control, brush management, proper stocking rates, and controlled grazing can help conserve moisture and improve or maintain productivity.

This soil has limited use as cropland. Moderate available water capacity, medium rate of runoff, moderate hazard of water erosion, low natural fertility, clayey subsoil, and droughtiness are limitations. Fertilizer applications, reduced tillage, high-residue and cover crops, and crop residue management can help reduce soil temperature, conserve moisture, and improve or maintain soil tilth and productivity. Terraces, contour farming, grassed waterways, and diversion terraces, where needed, can help control runoff and reduce the hazard of water erosion.

This soil is moderately suited to urban uses. Slow permeability is a severe limitation for septic tank absorption fields. Slope and the clayey subsoil are moderate limitations for other sanitary facilities and shallow excavations. The shrink-swell potential, slope, low strength, and high potential for corrosion of uncoated steel are limitations for building sites.

This soil is moderately well suited to recreational uses. Slope is a moderate limitation for playgrounds.

This Miguel soil is in capability subclass IVe and in the Tight Sandy Loam range site.

MoA—Monteola clay, 0 to 1 percent slopes

This very deep, nearly level, moderately well drained soil is on plane to slightly concave areas on uplands. Areas are irregular in shape and range from 10 to 450 acres in size.

The typical sequence, depth, and composition of the layers of this soil are as follows—

Surface layer:
0 to 32 inches, very dark gray, moderately alkaline clay

Subsoil:
32 to 44 inches, dark grayish brown, moderately alkaline clay, few intersecting slickensides
44 to 54 inches, grayish brown, moderately alkaline clay, few intersecting slickensides
54 to 80 inches, very pale brown, moderately alkaline clay

Important soil properties—

Available water capacity: high
Permeability: very slow except when soil is dry and cracks are open
Drainage class: moderately well drained
Runoff: low
Root zone: very deep, but high clay content can restrict root development and movement of air and water
Shrink-swell potential: very high
Hazard of water erosion: slight
Hazard of wind erosion: slight

Included with this soil in mapping are small areas of Monteola soil that has slopes greater than 1 percent. Also included are small areas of Buchel, Clareville, Coy, and Rosenbrock soils. The Buchel soil is clayey and is on flood plains. The Clareville soil has argillic horizons and is on terraces. The Coy and Rosenbrock soils are clayey and are in positions on the landscape similar to or higher than those of the Monteola soil. Included soils make up less than 15 percent of this map unit.

This Monteola soil is used mainly as cropland. A few areas are used as improved pasture or rangeland.

The most common crops grown on this soil are grain sorghum, corn, wheat, and cotton. The clayey texture of the soil can restrict root development. Fertilizer applications, reduced tillage, high-residue and cover crops, and crop residue management can help reduce the soil temperature, conserve moisture, and improve or maintain soil tilth and productivity. Land smoothing and simple drainage practices are needed in some areas to promote better surface drainage.

Improved varieties of bermudagrass, bluestems, and kleingrass are the major pasture grasses grown on this soil. Droughtiness is a limitation. The clayey texture makes this soil difficult to work, especially when preparing a seedbed. Fertilizer applications, weed control, brush management, proper stocking rates, and controlled grazing can help conserve moisture and improve or maintain productivity.

Native plants yield moderate amounts of forage. Proper stocking rates, brush management, and controlled grazing can help improve or maintain productivity.

This soil has fair potential for use as openland and rangeland wildlife habitat. The clayey texture of the soil is a limitation that affects the growth of plants necessary for good wildlife habitat.

This soil is poorly suited to urban uses. The very slow permeability is a severe limitation for septic tank absorption fields and the clayey texture of the soil is a severe limitation for trench sanitary landfills. The very high shrink-swell potential, low strength, and high potential for corrosion of uncoated steel are severe limitations for building sites. Under certain conditions, trench sidewalls can become highly unstable in this soil. Trenches that have been excavated to more than a depth of 5 feet should be shored or the sidewall should be graded to an angle that ensures safe working conditions.

This soil is moderately suited to recreational uses. The very slow permeability is a moderate limitation for camp and picnic areas. The clayey texture of the soil is a moderate limitation for camp and picnic areas, playgrounds, and paths and trails.

This Monteola soil is in capability subclass IIs and in the Rolling Blackland range site.

MoB—Monteola clay, 1 to 3 percent slopes

This very deep, very gently sloping, moderately well drained soil is on convex side slopes on uplands. Areas are irregular in shape and range from 15 to 800 acres in size.

The typical sequence, depth, and composition of the layers of this soil are as follows—

Surface layer:
0 to 12 inches, very dark gray, moderately alkaline clay

Subsoil:
12 to 26, very dark gray, moderately alkaline clay
26 to 37 inches, grayish brown, moderately alkaline clay, few intersecting slickensides
37 to 50 inches, very pale brown, moderately alkaline clay, few intersecting slickensides
50 to 80 inches, light gray, moderately alkaline clay

Important soil properties—

Available water capacity: high
Permeability: very slow except when soil is dry and cracks are open
Drainage class: moderately well drained
Runoff: medium
Root zone: very deep, but high clay content can restrict root development and movement of air and water
Shrink-swell potential: very high
Hazard of water erosion: moderate
Hazard of wind erosion: slight

Included with this soil in mapping are small areas of Monteola soil that has slopes of less than 1 percent and small areas where slopes are more than 3 percent. Also included are small areas of Clareville, Coy, Eloso, Pernitas, Rosenbrock, and Schattel soils. The Clareville soil has argillic horizons and is on terraces. The Coy and Rosenbrock soils are deep, clayey, and are in positions on the landscape similar to those of the Monteola soil. The Eloso soil is moderately deep and is in similar positions. The Pernitas soil is loamy and is in similar positions. The Schattel soil has a surface layer that is light in color and is on ridgetops. Included soils make up less than 15 percent of this map unit.

This Monteola soil is used mainly as cropland. A few areas are used as improved pasture or rangeland.

The most common crops grown on this soil are grain sorghum, corn, wheat, and cotton. The clayey texture of this soil can restrict root development. The medium rate of runoff, moderate water erosion hazard, and droughtiness are other limitations. Fertilizer applications, reduced tillage, high-residue and cover crops, and crop residue management can help reduce the soil temperature, conserve moisture, and improve or maintain soil tilth and productivity. Terraces, contour farming, grassed waterways, and diversion terraces, where needed, can help control runoff and water erosion.

Improved varieties of bermudagrass, bluestems, and kleingrass are the major pasture grasses grown on this soil. The medium rate of runoff and droughtiness are limitations. The clayey texture makes this soil difficult to work, especially when preparing a seedbed. Fertilizer applications, weed control, brush management, proper stocking rates, and controlled grazing can help conserve moisture and improve or maintain productivity.

Native plants yield moderate amounts of forage. Proper stocking rates, brush management, and controlled grazing can help improve or maintain productivity.

This soil has fair potential for use as openland and rangeland wildlife habitat. The clayey texture of the soil limits the growth of plants necessary for a good wildlife habitat.

This soil is poorly suited to urban uses. The very slow permeability is a severe limitation for septic tank absorption fields and the clayey texture of the soil is a severe limitation for trench sanitary landfills. The very high shrink-swell potential, low strength, and high potential for corrosion of uncoated steel are limitations for building sites. Under certain conditions, trench sidewalls can become highly unstable in this soil. Trenches that have been excavated to a depth of more than 5 feet should be shored or the sidewall should be graded to an angle that ensures safe working conditions.

This soil is moderately suited to recreational uses. The very slow permeability is a moderate limitation for camp and picnic areas. The clayey texture of the soil is a moderate limitation for camp and picnic areas, playgrounds, and paths and trails.

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

MoC—Monteola clay, 3 to 5 percent slopes

This very deep, gently sloping, moderately well drained soil is on convex side slopes on uplands. Areas are irregular in shape and range from 15 to 400 acres in size.

The typical sequence, depth, and composition of the layers of this soil are as follows—

Surface layer:
0 to 13 inches, very dark gray, moderately alkaline clay

Subsoil:
13 to 22 inches, very dark gray, moderately alkaline clay, few intersecting slickensides
22 to 48 inches, very dark gray clay in upper part; very pale brown clay in lower part, moderately alkaline, few intersecting slickensides
48 to 80 inches, very pale brown, moderately alkaline clay

Important soil properties—

Available water capacity: high
Permeability: very slow except when soil is dry and cracks are open
Drainage class: moderately well drained
Runoff: high
Root zone: very deep, but high clay content can restrict root development and movement of air and water
Shrink-swell potential: very high
Hazard of water erosion: moderate
Hazard of wind erosion: slight

Included with this soil in mapping are small areas of Monteola soil that has slopes of less than 3 percent and small areas where slopes are more than 5 percent. Also included are small areas of Coy, Eloso, Pernitas, and Schattel soils. The Coy soil has argillic horizons and is in positions on the landscape similar to those of the Monteola soil. The Eloso soil is moderately deep and is in similar positions. The Pernitas soil is loamy and is in similar to slightly higher positions. The Schattel soil has a light color surface layer and is on ridgetops. Included soils make up less than 15 percent of this map unit.

This Monteola soil is used mainly as cropland. A few areas are used for improved pasture or rangeland.

The most common crops grown on this soil are grain sorghum, corn, wheat, and cotton. The high rate of runoff and the moderate hazard of water erosion limit the use of this soil for cropland. The clayey texture of the soil restricts root development. Fertilizer applications, reduced tillage, high-residue and cover crops, and crop residue management can help reduce the soil temperature, conserve moisture, and improve or maintain soil tilth and productivity. Grassed waterways, terraces, contour farming, and diversion terraces, where needed, can help control runoff and reduce the erosion hazard.

Improved varieties of bermudagrass, bluestems, and kleingrass are the major pasture grasses grown on this soil. The high rate of runoff is a limitation. The hazard of water erosion is moderate. The clayey texture makes this soil difficult to work, especially when preparing a seedbed. Fertilizer applications, weed control, brush management, proper stocking rates, and controlled grazing can help conserve moisture and improve or maintain productivity.

Native plants yield moderate amounts of forage. The high rate of runoff is a limitation. The hazard of water erosion is moderate. Proper stocking rates, brush management, and controlled grazing help improve or maintain productivity.

This soil has fair potential for use as openland and rangeland wildlife habitat. The clayey texture of the soil and slopes greater than 3 percent are limitations that affect the plant growth necessary for a good habitat.

This soil is poorly suited to urban uses. The very slow permeability and the clayey texture severely affect sanitary facilities, such as septic tank absorption fields and trench sanitary landfills. The very high shrink-swell potential, low strength, and high potential for corrosion of uncoated steel are limitations for building sites. Under certain conditions, trench sidewalls can become highly unstable in this soil. Trenches that have been excavated to a depth of more than 5 feet should be shored or the sidewall should be graded to an angle that ensures safe working conditions.

This soil is moderately suited to recreational uses. The clayey texture of the soil affects camp and picnic areas, playgrounds, and paths and trails, and the very slow permeability affects camp and picnic areas. Slope is a limitation for playgrounds.

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

MoD—Monteola clay, 5 to 8 percent slopes

This very deep, moderately sloping, moderately well drained soil is on convex side slopes on uplands. Areas are irregular in shape and range from 10 to 50 acres in size.

The typical sequence, depth, and composition of the layers of this soil are as follows—

Surface layer:
0 to 10 inches, very dark gray, moderately alkaline clay

Subsoil:
10 to 29 inches, very dark gray, moderately alkaline clay, few intersecting slickensides
29 to 43 inches, gray clay in the upper part, light yellowish brown clay in the lower part, moderately alkaline, few intersecting slickensides
43 to 80 inches, yellow, moderately alkaline clay

Important soil properties—

Available water capacity: high
Permeability: very slow except when soil is dry and cracks are open
Drainage class: moderately well drained
Runoff: very high
Root zone: very deep, but clay content can restrict root development and movement of air and water
Shrink-swell potential: very high
Hazard of water erosion: severe
Hazard of wind erosion: slight

Included with this soil in mapping are small areas of Monteola soil that has slopes of less than 5 percent and small areas where slopes are more than 8 percent. Also included are small areas of Coy, Eloso, Pernitas, and Schattel soils. The Coy soil has argillic horizons and is in lower positions on the landscape than the Monteola soil. The Eloso soil is moderately deep and is in lower positions. The Pernitas soil is loamy throughout and is in similar positions on the landscape. The Schattel soil has a light color surface layer and is on ridgetops. Included soils make up less than 15 percent of this map unit.

This Monteola soil is used mainly as improved pasture. A few areas are used as rangeland or habitat for wildlife.

Improved varieties of bermudagrass, bluestems, and kleingrass are the major pasture grasses grown on this soil. Forage yields are low. Limitations include very high runoff and high susceptibility to water erosion. The clayey texture makes this soil difficult to work, especially when preparing a seedbed. Fertilizer applications, weed control, brush management, proper stocking rates, and controlled grazing can help conserve moisture and improve or maintain productivity.

Native plants yield moderate amounts of forage. The hazard of water erosion is severe. Proper stocking rates, brush management, and controlled grazing can help improve or maintain productivity.

This soil has fair potential for use as openland and rangeland wildlife habitat. A clayey surface texture and slopes greater than 3 percent are limitations that affect the growth of plants necessary for a good habitat.

This soil is poorly suited to urban uses. Very slow permeability, clayey texture of the soil, very high shrink-swell potential, low strength, high potential for corrosion of uncoated steel, and moderate slope are limitations. Under certain conditions, trench sidewalls can become highly unstable in this soil. Trenches that have been excavated to a depth of more than 5 feet should be shored or the sidewall should be graded to an angle that ensures safe working conditions.

This soil is moderately suited to recreational uses. The very slow permeability and clayey texture of the soil are moderate limitations. Slope is a severe limitation for playgrounds.

This Monteola soil is in capability subclass VIe and in the Rolling Blackland range site.

NuC—Nusil fine sand, 1 to 5 percent slopes

This very deep, gently sloping, moderately well drained soil is on stream terraces and on uplands. The surface is plane to slightly convex and hummocky. Areas are irregular in shape and range from 10 to 300 acres in size.

The typical sequence, depth, and composition of the layers of this soil are as follows—

Surface layer:
0 to 30 inches, pale brown and light yellowish brown, slightly acid fine sand

Subsurface layer:
30 to 36 inches, very pale brown, slightly acid fine sand

Subsoil:
36 to 44 inches, light brownish gray, mottled, neutral sandy clay loam

44 to 54 inches, light gray, mottled, slightly alkaline sandy clay loam
54 to 80 inches, very pale brown, mottled, moderately alkaline sandy clay loam

Important soil properties—

Available water capacity: moderate
Permeability: slow in subsoil; rapid in surface and subsurface layers
Drainage class: moderately well drained
Runoff: very low
Root zone: very deep
Shrink-swell potential: moderate in subsoil
Hazard of water erosion : moderate
Hazard of wind erosion: severe

Included with this soil in mapping are small areas of Nusil soil that has a loamy fine sand surface layer. Also included are small areas of Miguel, Papalote, and Rhymes soils. The Papalote soil has a clayey subsoil and is in positions on the landscape similar to those of the Nusil soil. The Miguel soil has a fine sandy loam surface layer and is in higher positions. The Rhymes soil has a sandy surface layer more than 40 inches deep and is in similar positions. Included soils make up less than 15 percent of this map unit.

This Nusil soil is used mainly as rangeland and habitat for wildlife. A few areas are used as improved pasture or cropland.

Native plants yield moderate amounts of forage. The moderate available water capacity, low natural fertility, and droughtiness are limitations. Proper stocking rates, brush management, and controlled grazing can help conserve moisture and improve or maintain productivity.

This soil has fair potential for use as openland and rangeland wildlife habitat. The moderate available water capacity is a limitation that affects the plant growth necessary for a good habitat.

Improved varieties of bermudagrass, bluestems, and kleingrass are the major pasture grasses grown on this soil. The moderate available water capacity and low natural fertility are limitations. The hazard of water erosion is moderate. Fertilizer applications, weed control, brush management, proper stocking rates, and controlled grazing can help conserve moisture and improve productivity.

Although not extensively used as cropland, crops such as peanuts and watermelons have been grown. The moderate available water capacity, low natural fertility, and low organic matter content are limitations. The hazard of wind erosion is severe, and the hazard of water erosion is moderate. Fertilizer applications, reduced tillage, high residue and cover crops, and crop residue management can help reduce the soil temperature, conserve moisture, help reduce the hazard of erosion, and improve soil fertility, tilth, and productivity.

This soil is poorly suited to urban uses. Septic tank absorption fields are severely limited by the slow permeability of this soil, which is also a poor filter. The sandy texture is a severe limitation for trench sanitary landfills. Seepage is a severe limitation for sewage lagoon areas and area sanitary landfills. Under certain conditions, trench sidewalls can become highly unstable in this soil. Trenches that have been excavated to a depth of more than 5 feet should be shored or the sidewall should be graded to an angle that ensures safe working conditions.

This soil is poorly suited to recreational uses. The sandy surface texture is a severe limitation.

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

Od—Odem fine sandy loam, occasionally flooded

This very deep, nearly level, well drained soil is on bottom lands. The surface is plane to slightly convex. Areas are irregularly shaped bands that are parallel and adjacent to stream channels. They range from 10 to 150 acres in size. Slopes are less than 1 percent.

The typical sequence, depth, and composition of the layers of this soil are as follows—

Surface layer:
0 to 8 inches, very dark gray, neutral fine sandy loam
8 to 27 inches, dark grayish brown, slightly alkaline fine sandy loam
27 to 45 inches, grayish brown, moderately alkaline fine sandy loam that has a few thin bedding planes and thin strata of sandy clay loam

Subsoil:
45 to 80 inches, pale brown, moderately alkaline fine sandy loam

Important soil properties—

Available water capacity: moderate
Permeability: moderately rapid
Drainage class: well drained
Runoff: negligible
Root zone: very deep
Shrink-swell potential: low
Hazard of water erosion: slight
Hazard of wind erosion: slight
Flood hazard: can occur 2 or 3 years out of 10 for brief periods after heavy rainfall, generally in spring and fall.

Included with this soil in mapping are small areas of Odem soil that has slopes of more than 1 percent. Also included are small areas of Buchel, Sinton, and Zunker soils. The Buchel soil is clayey throughout and is in positions on the landscape lower than the Odem soil. The Sinton soil is calcareous throughout and is in lower to similar positions on the landscape. The Zunker soil is calcareous throughout, lighter in color, and is in similar positions. Included soils make up less than 10 percent of this map unit.

This Odem soil is used mainly as rangeland and habitat for wildlife. A few areas are used as improved pasture or cropland.

Native plants yield high amounts of forage. Proper stocking rates, brush management, and controlled grazing can help improve or maintain productivity.

This soil has good potential for use as openland and rangeland wildlife habitat.

Improved varieties of bermudagrass, bluestems, and kleingrass are the major pasture grasses grown on this soil. Occasional flooding is a hazard and the moderate available water capacity is a major limitation. Fertilizer applications, weed control, brush management, proper stocking rates, and controlled grazing can help conserve moisture and improve or maintain productivity. In above normal rainfall years, improved varieties of bermudagrass will produce more forage than other pasture grasses. Bermudagrass is frequently planted, because it is better adapted to prolonged periodical wetness that follows heavy rains and flooding.

Corn, grain sorghum, and wheat are the major crops grown on this soil. Occasional flooding is a hazard and the moderate available water capacity is a major limitation. Fertilizer applications, reduced tillage, high-residue and cover crops, and crop residue management can help reduce the soil temperature, conserve moisture, and improve or maintain soil tilth and productivity.

This soil is poorly suited to urban uses. Flooding is a severe hazard for sanitary facilities and building site development Seepage, moderately rapid permeability, and moderate potential for corrosion of uncoated steel are other limitations.

This soil is moderately suited to recreational uses. Flooding is a severe hazard for camp areas and a moderate hazard for playgrounds.

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

OmD—Olmos very gravelly loam, 1 to 8 percent slopes

This shallow, gently sloping to moderately sloping, well drained soil is on ridgetops and on upper side slopes on uplands. Areas are irregular in shape and range from 10 to 250 acres in size.

The typical sequence, depth, and composition of the layers of this soil are as follows—

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

Subsoil:
11 to 24 inches, white, moderately alkaline, strongly cemented, laminar capped caliche

Underlying material:
24 to 80 inches, white, moderately alkaline, soft caliche that has gravelly loam texture

Important soil properties—

Available water capacity: very low
Permeability: moderately permeable in surface layer; very slow in cemented layer
Drainage class: well drained
Runoff: medium
Root Zone: shallow, petrocalcic layer restricts root development and movement of air and water
Shrink-swell potential: low
Hazard of water erosion: moderate
Hazard of wind erosion: slight

Included with this soil in mapping are small areas of Olmos soil that has slopes of less than 1 percent, small areas where slopes are more than 8 percent, and small areas of a soil similar to Olmos soil that has less than 35 percent coarse fragments. Also included are small areas of Parrita, Pernitas, Pettus, Shiner, and Weesatche soils. The Parrita soil has a clayey subsoil and is in positions on the landscape lower than the Olmos soil. The Pernitas and Weesatche soils are deep and are in lower positions. The Pettus soil is moderately deep and is in similar positions. The Shiner soil is shallow over sandstone and is in similar positions. Included soils make up less than 15 percent of this map unit.

This Olmos soil is used as rangeland and habitat for wildlife. A few areas are used as improved pasture.

Native plants yield low amounts of forage. The shallow rooting depth, very low available water capacity and excess lime content are limitations. The hazard of water erosion is moderate. Proper stocking, brush management, and controlled grazing can help improve or maintain productivity.

This soil has limited use as wildlife habitat. The shallow rooting depth, very low available water capacity, excess lime content, and slope affect the plant growth necessary for good habitat.

This soil has very limited use for pasture or cropland, mainly because of the shallow rooting depth, very low available water capacity, medium rate of runoff, droughtiness, gravelly texture, excess lime content, slope, and moderate hazard of water erosion.

This soil is poorly suited to urban uses. Depth to a cemented pan is a severe limitation for sanitary facilities, shallow excavations, and dwellings with basements. Building sites are further limited by slope, stoniness, and high potential for corrosion of uncoated steel.

This soil is poorly suited to recreational uses. Depth to a cemented pan and small stones are severe limitations.

This Olmos soil is in capability subclass VIIs and in the Shallow Ridge range site.

PaB—Papalote loamy coarse sand, 0 to 3 percent slopes

This very deep, nearly level to very gently sloping, moderately well drained soil is on uplands. The surface is plane to slightly convex and hummocky. Areas are irregular in shape and range from 15 to 350 acres in size.

The typical sequence, depth, and composition of the layers of this soil are as follows—

Surface layer:
0 to 15 inches, light brownish gray, neutral loamy coarse sand

Subsurface layer:
15 to 19 inches, light gray, neutral loamy coarse sand

Subsoil:
19 to 26 inches, grayish brown, mottled, slightly alkaline sandy clay
26 to 33 inches, pale brown, mottled, moderately alkaline sandy clay
33 to 45 inches, light gray, mottled, moderately alkaline sandy clay loam
45 to 80 inches, strong brown, mottled, moderately alkaline sandy clay loam

Important soil properties—

Available water capacity: moderate
Permeability: slow
Drainage class: moderately well drained
Runoff: medium
Root zone: very deep, but high clay content can restrict root development and movement of air and water
Shrink-swell potential: low in surface; moderate in subsoil
Water erosion hazard: moderate
Wind erosion hazard: moderate

Included with this soil in mapping are small areas of Papalote soil that has slopes of more than 3 percent, small areas where the surface layer is fine sandy loam, and small areas where the soil has a fine loamy control section. Also included are small areas of Miguel, Nusil, Rhymes, and Tiocano soils. The Miguel soil has a fine sandy loam surface layer and is in positions on the landscape higher than the Papalote soil. The Nusil and Rhymes soils have a sandy surface layer more than 20 inches thick and are in positions similar to those of the Papalote soil. The Tiocano soil is clayey throughout and is in depressions. Included soils make up less than 15 percent of this map unit.

This Papalote soil is used mainly as rangeland and habitat for wildlife. A few areas are used as cropland or improved pasture.

Native plants yield moderate amounts of forage. The moderate available water capacity, low natural fertility, and droughtiness are limitations. Proper stocking rates, brush management, and controlled grazing can help conserve moisture and improve or maintain productivity.

This soil has good potential for use as openland and rangeland wildlife habitat.

Although not extensively used as cropland, peanuts and watermelons have been grown on this soil. The moderate available water capacity, low natural fertility, droughtiness, and low organic matter content are limitations. The hazard of water erosion is moderate. The clayey subsoil can restrict root development. Fertilizer applications, reduced tillage, high residue and cover crops, and crop residue management can help reduce the soil temperature, conserve moisture, control soil blowing, and help reduce runoff and water erosion.

Improved varieties of bermudagrass, bluestems, and kleingrass are the major pasture grasses grown on this soil. The moderate available water capacity, droughtiness, and low natural fertility are limitations. The clayey subsoil makes this soil difficult to work, especially when preparing a seedbed. Fertilizer applications, weed control, brush management, proper stocking rates, and controlled grazing can help conserve moisture and improve productivity.

This soil is poorly suited to urban uses. Slow permeability, seepage, and clayey subsoil are severe limitations for sanitary facilities. The high potential for corrosion of uncoated steel, the shrink-swell potential, clayey subsoil, and low strength are moderate to severe limitations for building site development.

This soil is well suited to recreational uses. The sandy surface texture is a moderate limitation.

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

PbB—Papalote fine sandy loam, 1 to 3 percent slopes

This very deep, very gently sloping, moderately well drained soil is on convex side slopes on uplands. Areas are irregular in shape and range from 8 to 300 acres in size.

The typical sequence, depth, and composition of the layers of this soil are as follows—

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

Subsoil:
8 to 18 inches, dark brown, mottled, neutral sandy clay
18 to 35 inches, brown, mottled, slightly alkaline sandy clay
35 to 45 inches, pale brown, mottled, moderately alkaline sandy clay loam
45 to 60 inches, very pale brown, mottled, moderately alkaline sandy clay loam

Important soil properties—

Available water capacity: moderate
Permeability: slow
Drainage class: moderately well drained
Runoff: medium
Root Zone: very deep, but high clay content can restrict root development and movement of air and water
Shrink-swell potential: moderate
Hazard of water erosion: moderate
Hazard of wind erosion: slight

Included with this soil in mapping are small areas of Papalote soil that has slopes of less than 1 percent, small areas where slopes are more than 3 percent, small areas where the surface layer is sandy, and small areas where the soil has a fine loamy control section. Also included are small areas of Bryde, Gillett, Miguel, and Weesatche soils. The Bryde soil has a subsoil that is dark in color and is in positions on the landscape similar to those of the Bryde soil. The Gillett soil is moderately deep and is in similar to higher positions. The Miguel soil does not have gray mottles and is in similar positions. The Weesatche soil has a dark surface layer, fine loamy control section, and is in similar positions. Included soils make up less than 15 percent of this map unit.

This Papalote soil is used mainly as rangeland and habitat for wildlife. A few areas are used as improved pasture or cropland.

Native plants yield moderate amounts of forage. The moderate available water capacity and low natural fertility are limitations. Proper stocking rates, brush management, and controlled grazing can help conserve moisture and improve or maintain productivity.

This soil has good potential for use as openland wildlife habitat and rangeland wildlife habitat.

Improved varieties of bermudagrass, bluestems, and kleingrass are the major pasture grasses grown on this soil. The moderate available water capacity, low natural fertility, and droughtiness are limitations. The clayey subsoil is difficult to work, especially when preparing a seedbed. Fertilizer applications, weed control, brush management, proper stocking rates, and controlled grazing can help conserve moisture and improve or maintain productivity.

The most common crops grown on this soil are grain sorghum, corn, and cotton. The moderate available water capacity, medium runoff, low natural fertility, and droughtiness are the major limitations. The hazard of water erosion is moderate. The clayey subsoil can restrict root development. Fertilizer applications, reduced tillage, high-residue and cover crops, and crop residue management can help reduce soil temperature, conserve moisture, and improve or maintain soil tilth and productivity. Terraces, contour farming, grassed waterways, and diversion terraces, where needed, can help control runoff and water erosion.

This soil is poorly suited to urban uses. The slow permeability, seepage, and the clayey subsoil are severe limitations for sanitary facilities. The shrink-swell potential, low strength, clayey subsoil, and high potential for corrosion of uncoated steel are moderate to severe limitations for building site development.

This soil is well suited to recreational uses. Slope is a moderate limitation for playgrounds.

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

PbC—Papalote fine sandy loam, 3 to 5 percent slopes

This very deep, gently sloping, moderately well drained soil is on convex side slopes on uplands. Areas are irregular in shape and range from 8 to 65 acres in size.

The typical sequence, depth, and composition of the layers of this soil are as follows—

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

Subsoil:
5 to 12 inches, dark brown, mottled, neutral sandy clay
12 to 30 inches, pale brown, mottled, slightly alkaline sandy clay
30 to 40 inches, yellowish brown, mottled, moderately alkaline sandy clay loam
40 to 60 inches, very pale brown, mottled, moderately alkaline sandy clay loam

Important soil properties—

Available water capacity: moderate
Permeability: slow
Drainage class: moderately well drained
Runoff: medium
Root zone: very deep, but high clay content can restrict root development and movement air and water
Shrink-swell potential: moderate
Hazard of water erosion: moderate
Hazard of wind erosion: slight

Included with this soil in mapping are small areas of Papalote soil that has slopes of less than 3 percent, small areas where slopes are more than 5 percent, small areas where the surface layer is sandy, and small areas that have a fine loamy control section. Also included are small areas of Bryde, Gillett, Miguel, and Weesatche soils. The Bryde soil has a subsoil that is dark in color and is in positions on the landscape similar to or lower than those of the the Papalote soil. The Gillett soil is moderately deep and is in similar to higher positions. The Miguel soil does not have gray mottles and is in similar positions. The Weesatche soil has a dark surface layer and is in similar positions on the landscape. Included soils make up less than 15 percent of this map unit.

This Papalote soil is used mainly as rangeland and habitat for wildlife. A few areas are used as improved pasture or cropland.

Native plants yield moderate amounts of forage. The moderate available water capacity, low natural fertility, droughtiness, and medium runoff are limitations. Proper stocking rates, brush management, and controlled grazing can help conserve moisture and improve or maintain productivity.

This soil has good potential for use as openland wildlife habitat and rangeland wildlife habitat.

Improved varieties of bermudagrass, bluestems, and kleingrass are the major pasture grasses grown on this soil. The moderate available water capacity, low natural fertility, and droughtiness are limitations. The hazard of water erosion is moderate. The clayey subsoil is difficult to work, especially when preparing a seedbed. Fertilizer applications, weed control, brush management, proper stocking rates, and controlled grazing can help conserve moisture and improve or maintain productivity.

Although not extensively used as cropland, grain sorghum has been grown on this soil. The moderate available water capacity, medium rate of runoff, low natural fertility, droughtiness, and moderate hazard of water erosion are limitations. The clayey subsoil can restrict root development. Fertilizer applications, reduced tillage, high-residue and cover crops, and crop residue management can help reduce soil temperature, conserve moisture, and improve or maintain soil tilth and productivity. Terraces, contour farming, grassed waterways, and diversion terraces, where needed, will help control runoff and reduce the hazard of erosion.

This soil is poorly suited to urban uses. The slow permeability, seepage, and the clayey subsoil are severe limitations for sanitary facilities. The shrink-swell potential, slope, low strength, clayey subsoil, and the potential for corrosion of uncoated steel are moderate to severe limitations for building site development.

This soil is well suited to recreational uses. Slope is a moderate limitation for playgrounds.

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

PcB—Parrita sandy clay loam, 1 to 3 percent slopes

This shallow, very gently sloping soil is on ridgetops and upper side slopes on uplands. Areas are irregular in shape and range from 10 to 100 acres in size.

The typical sequence, depth, and composition of the layers of this soil are as follows—

Surface layer:
0 to 4 inches, very dark grayish brown, slightly alkaline sandy clay loam

Subsoil:
4 to 10 inches, dark reddish brown, moderately alkaline sandy clay loam
10 to 19 inches, dark reddish gray, moderately alkaline clay

Underlying material:
19 to 24 inches, white strongly cemented caliche
24 to 80 inches, white, moderately alkaline soft caliche that has loam texture

Important soil properties—

Available water capacity: very low
Permeability: moderately slow
Drainage class: well drained

Runoff: very low
Root zone: shallow, petrocalcic layer impedes root development
Shrink-swell potential: low in surface layer; moderate in subsoil
Hazard of water erosion: severe
Hazard of wind erosion: moderate

Included with this soil in mapping are small areas of Parrita soil that has a fine sandy clay loam surface layer, soil that is calcareous throughout, soil that is less than 10 inches deep, and soil that has less than 35 percent clay in the subsoil. Also included are small areas of Olmos, Pernitas, Pettus, and Weesatche soils. The Olmos soil is loamy and calcareous throughout, and is in positions on the landscape higher than the Parrita soil. The Pernitas and Weesatche soils are deep and are in lower positions. The Pettus soil is moderately deep and is in similar to slightly higher positions.

This Parrita soil is used mainly as rangeland and habitat for wildlife. A few small areas are used as improved pasture or cropland.

Native plants yield moderate amounts of forage. The shallow rooting depth and very low available water capacity are limitations. Proper stocking, brush management, and controlled grazing can help improve or maintain productivity.

This soil has fair potential for use as openland and rangeland wildlife habitat. The shallow rooting depth and very low available water capacity limit the plant growth necessary for good wildlife habitat.

Although a few areas of this soil are used as improved pasture and cropland, the shallow rooting depth, very low available water capacity, and severe hazard of water erosion limit its use.

This soil is poorly suited to urban uses. The depth to a cemented pan is a severe limitation for sanitary facilities and a moderate to severe limitation for building site development. The high potential for corrosion of uncoated steel and moderate shrink-swell potential are other limitations.

This soil is poorly suited to recreational uses. The depth to a cemented pan is a severe limitation for camp and picnic areas and playgrounds.

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

PkB—Pavelek clay, 0 to 3 percent slopes

This nearly level to very gently sloping, well drained soil is shallow to cemented caliche. It is on convex upper side slopes and ridgetops on uplands. Areas are irregular in shape and range from 10 to 450 acres in size.

The typical sequence, depth, and composition of the layers of this soil are as follows—

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

Subsoil:
7 to 14 inches, very dark gray, moderately alkaline gravelly clay
14 to 20 inches, white, moderately alkaline strongly cemented caliche
20 to 46 inches, very pale brown, moderately alkaline, consolidated, calcareous caliche that has silt loam texture

Underlying material:
46 to 80 inches, very pale brown, moderately alkaline, noncalcareous, weakly consolidated siltstone that has silt loam texture

Important soil properties—

Available water capacity: very low
Permeability: slow
Drainage class: well drained
Runoff: medium
Root zone: shallow
Shrink-swell potential: high
Hazard of water erosion: moderate
Hazard of wind erosion: moderate

Included with this soil in mapping are small areas of Pavelek soil that has slopes of more than 3 percent, small areas that are eroded, and small areas where the soil is loamy throughout. Also included are small areas of Condido, Ecleto, Eloso, Fashing and Pettus soils. The Condido and Ecleto soils are noncalcareous throughout and are in positions on the landscape slightly lower than the Pavelek soil. The Eloso soil is moderately deep and is in lower positions. The Fashing soil is over shale and is in slightly lower positions. The Pettus soil is moderately deep, loamy-skeletal, and is in higher positions on the landscape.

This Pavelek soil is used mainly as rangeland and habitat for wildlife. A few areas are used as improved pasture or cropland.

Native plants yield low amounts of forage. The shallow rooting depth and very low available water capacity are major limitations. Proper stocking rates, brush management, and controlled grazing can help improve or maintain productivity.

This soil has fair potential for use as openland and rangeland wildlife habitat. The shallow rooting depth, clayey surface texture, and very low available water capacity limit the growth of plants necessary for a good habitat.

Improved varieties of bermudagrass, bluestems, and kleingrass are the major pasture grasses grown on this soil. Forage yields are low. The shallow rooting depth and very low available water capacity are limitations. Water erosion is a moderate hazard. Fertilizer applications, weed control, brush control, proper stocking rates, and controlled grazing can help conserve moisture and improve or maintain productivity.

This soil has limited use as cropland. The shallow rooting depth, very low available water capacity, medium rate of runoff, droughtiness, and moderate hazard of water erosion limit its use.

This soil is poorly suited to urban uses. The depth to a cemented pan is a severe limitation for sanitary facilities and a moderate to severe limitation for building site development. The high potential for corrosion of uncoated steel is also a limitation.

This soil is poorly suited to recreational uses. The depth to a cemented pan is a severe limitation for camp and picnic areas and playgrounds. The clayey surface layer is a moderate limitation for paths and trails.

This Pavelek soil is in capability subclass IIIe and in the Shallow Ridge range site.

PkC—Pavelek clay, 3 to 5 percent slopes, severely eroded

This gently sloping, well drained soil is shallow to cemented caliche. It is on convex upper side slopes on uplands. Areas are irregular in shape and range from 10 to 250 acres in size.

Areas of this soil are eroded by water to various degrees; some are slightly eroded and others are severely eroded. On average, about 75 percent of the original surface layer has been eroded away. The erosion is slowed by the cemented subsoil layer, although in a few areas the erosion is deeper than that layer and gullies are as much as 10 feet deep. The overall erosion pattern is U-shaped gullies that are only l foot or 2 feet deep, 6 to 10 feet wide and 10 to 30 feet apart. In most areas, the soil is bare, redeposited, or original soil layers that have been severely eroded. In cultivated areas, a significant amount of subsoil material is mixed into the plow layer.

The typical sequence, depth, and composition of the layers of this soil are as follows—

Surface layer:
0 to 4 inches, dark gray, moderately alkaline clay

Subsoil:
4 to 10 inches, dark gray, moderately alkaline gravelly clay
10 to 16 inches, light gray, moderately alkaline strongly cemented caliche
16 to 36 inches, very pale brown, moderately alkaline, consolidated, calcareous caliche that has silt loam texture

Underlying material:
36 to 80 inches, pale yellow, moderately alkaline, noncalcareous, weakly consolidated siltstone that has silt loam texture

Important soil properties—

Available water capacity: very low
Permeability: slow
Drainage class: well drained
Runoff: medium
Root zone: shallow
Shrink-swell potential: high
Hazard of water erosion: severe
Hazard of wind erosion: moderate

Included with this soil in mapping are small areas of Pavelek soil that has slopes of less than 3 percent, small areas where slopes are more than 5 percent, and small areas where the soil is loamy throughout. Also included are small areas of Condido, Ecleto, Eloso, Fashing, and Pettus soils. The Condido and Ecleto soils are noncalcareous throughout and are in positions on the landscape higher than the Pavelek soil. The Eloso soil is moderately deep and is in similar to lower positions. The Fashing soil is over shale and is in similar to higher positions. The Pettus soil is moderately deep, loamy-skeletal, and is in higher positions on the landscape.

This Pavelek soil is used mainly as rangeland and habitat for wildlife. A few areas are used as improved pasture or cropland.

Native plants yield low amounts of forage. The shallow rooting depth, very low available water capacity, and droughtiness are limitations. The hazard of water erosion is severe. Proper stocking rates, brush management, and controlled grazing can help improve or maintain productivity.

This soil has fair potential for openland and rangeland wildlife habitat. The shallow rooting depth and clayey surface texture, very low available water capacity, and slopes of more than 3 percent limit the growth of plants necessary for a good habitat.

This soil has very limited use as pasture or cropland. Yields are low. The shallow rooting depth, very low available water capacity, and medium rate of runoff are limitations. The hazard of water erosion is severe.

This soil is poorly suited to urban uses. The depth to a cemented pan is a severe limitation for sanitary facilities. The cemented pan, slope, and high potential for corrosion of uncoated steel are moderate to severe limitations.

This soil is poorly suited to recreational uses. The depth to a cemented pan is a severe limitation for camp and picnic areas and playgrounds. The clayey surface texture is a moderate limitation for paths and trails.

This Pavelek soil is in capability subclass VIe and in the Shallow Ridge range site.

PnC—Pernitas sandy clay loam, 2 to 5 percent slopes

This very deep, gently sloping, well drained soil is on convex side slopes and ridgetops on uplands. Areas are irregular in shape and range from 15 to 1,500 acres in size.

The typical sequence, depth, and composition of the layers of this soil are as follows—

Surface layer:
0 to 7 inches, dark gray, slightly alkaline sandy clay loam

Subsoil:
7 to 15 inches, dark grayish brown, slightly alkaline sandy clay loam
15 to 21 inches, brown, slightly alkaline sandy clay loam
21 to 33 inches, dark brown, moderately alkaline sandy clay loam
33 to 50 inches, light yellowish brown, moderately alkaline sandy clay loam
50 to 80 inches, very pale brown, moderately alkaline sandy clay loam

Important soil properties—

Available water capacity: moderate
Permeability: moderate
Drainage class: well drained
Runoff: low
Root zone: very deep
Shrink-swell potential: moderate
Hazard of water erosion: moderate
Hazard of wind erosion: slight

Included with this soil in mapping are small areas of Pernitas soil that has slopes of less than 2 percent and small areas where slopes are more than 5 percent. Also included are small areas of Colibro, Coy, Olmos, Pettus, Sarnosa, Schattel, and Weesatche soils. The Colibro soil is lighter in color and is in positions on the landscape similar to slightly higher than those of the Pernitas soil. The Coy soil is clayey throughout and is in similar to slightly lower positions. The Olmos soil is shallow and is in higher positions. The Pettus soil is loamy, moderately deep, and is in slightly higher positions. The Sarnosa soil is coarse loamy and is in similar positions. The Schattel soil is clayey, deep, and is in similar to slightly higher positions. The Weesatche soil is noncalcareous and is in similar to slightly lower positions on the landscape.

This Pernitas soil is used mainly as improved pasture (fig. 9) and rangeland. A few areas are used as cropland or habitat for wildlife.

Improved varieties of bermudagrass, bluestems, and kleingrass are the major pasture grasses grown on this soil. Forage yields are low. The moderate available water capacity, low natural fertility, and moderate hazard of water erosion limit production. Fertilizer applications, weed control, brush management, proper stocking rates, water management, and controlled grazing can help conserve moisture and improve or maintain productivity.

Native plants yield moderate amounts of forage. The moderate available water capacity and low natural fertility are limitations. Proper stocking rates, brush management, and controlled grazing can help improve or maintain productivity.

Grain sorghum and cotton are the major crops grown on this soil. The available water capacity, low natural fertility, and moderate hazard of water erosion limit its use as cropland. Fertilizer applications, reduced tillage, high-residue and cover crops, and crop residue management can help reduce the soil temperature, conserve moisture, and improve or maintain soil tilth and productivity. Grassed waterways, terraces, and contour farming, where needed, can help reduce the hazard of water erosion.

Although this soil can be used as openland and rangeland wildlife habitat, the surface texture, moderate available water capacity, and low natural fertility limit the growth of wild herbaceous plants necessary for good habitat. Its use is also limited by slopes that are more than 3 percent.

The soil is moderately suited to urban uses. The permeability, slope, seepage, and clayey texture are moderate limitations for sanitary facilities. The potential for shrinking and swelling and corrosion of uncoated steel are limitations for building site development. Severe low strength affects roadfill and local roads and streets.

This soil is moderately well suited to recreational uses. Slope is a moderate limitation.

Figure 9.—This stand of kleingrass will provide good quality hay for livestock during the winter. The soil is Pernitas sandy clay loam, 2 to 5 percent slopes.

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

PnD—Pernitas sandy clay loam, 5 to 8 percent slopes

This very deep, moderately sloping, well drained soil is on convex upper side slopes and ridgetops on uplands. Areas are irregular in shape and range from 8 to 80 acres in size.

The typical sequence, depth, and composition of the layers of this soil are as follows—

Surface layer:
0 to 7 inches, very dark grayish brown, moderately alkaline sandy clay loam

Subsoil:
7 to 26 inches, dark grayish brown, moderately alkaline sandy clay loam
26 to 42 inches, grayish brown, moderately alkaline sandy clay loam
42 to 80 inches, pale brown, moderately alkaline sandy clay loam

Important soil properties—

Available water capacity: moderate
Permeability: moderate
Drainage class: well drained
Runoff: medium
Root zone: very deep
Shrink-swell potential: moderate
Hazard of water erosion: severe

Hazard of wind erosion: slight

Included with this soil in mapping are small areas of Pernitas soil that has slopes of less than 5 percent, small areas where slopes are more than 8 percent, and small areas where the surface layer is fine sandy loam. Also included are small areas of Colibro, Sarnosa, Schattel, and Shiner soils. The Colibro soil is lighter in color and is in positions on the landscape similar to those of the Pernitas soil. The Sarnosa soil is coarse loamy and is in similar to slightly lower positions. The Schattel soil is clayey, deep, and is in similar positions. The Shiner soil is shallow and is in higher positions on the landscape. Included soils make up less than 15 percent of this map unit.

The Pernitas soil is used mainly as improved pasture and rangeland. A few areas are used as habitat for wildlife or cropland.

Improved varieties of bermudagrass, bluestems, and kleingrass are the major pasture grasses grown on this soil. Forage yields are low. The moderate available water capacity, medium rate of runoff, and low natural fertility are limitations. The hazard of water erosion is severe. Fertilizer applications, weed control, brush management, proper stocking rates, water management, and controlled grazing can help conserve moisture and improve or maintain productivity.

Native plants yield moderate amounts of forage. The moderate available water capacity, medium rate of runoff, and low natural fertility are limitations. The hazard of water erosion is severe. Proper stocking rates, brush management, and controlled grazing can help improve or maintain productivity.

This soil has fair potential as openland and rangeland wildlife habitat. The surface texture, moderate available water capacity, low natural fertility, and slopes of more than 3 percent limit the plant growth necessary for good habitat.

Although not extensively used as cropland, grain sorghum has been grown on this soil. The moderate available water capacity, low natural fertility, and medium rate of runoff are limitations. The hazard of water erosion is severe. Fertilizer applications, reduced tillage, high-residue and cover crops, and crop residue management can help reduce the soil temperature, conserve moisture, and improve or maintain soil tilth and productivity. Terraces, contour farming, grassed waterways, and diversion terraces, where needed, can help control runoff and reduce the hazard of erosion.

The soil is moderately suited to urban uses. Permeability, seepage, slope, and the clayey texture are moderate limitations for sanitary facilities. The slope and potential for shrinking and swelling and corrosion of uncoated steel are limitations for building site development. The severe low strength is a limitation for local roads and streets and roadfill.

This soil is moderately suited to recreational uses. Slope is a severe limitation for playgrounds.

This Pernitas soil is in capability subclass IVe and in the Gray Sandy Loam range site.

PtC—Pettus loam, 2 to 5 percent slopes

This very deep, gently sloping, well drained soil is on ridgetops and upper side slopes on uplands. Areas are irregular in shape and range from 10 to 100 acres in size.

The typical sequence, depth, and composition of the layers of this soil are as follows—

Surface layer:
0 to 10 inches, dark gray, moderately alkaline loam

Subsoil:
10 to 18 inches, grayish brown, moderately alkaline gravelly loam
18 to 28 inches, light gray, moderately alkaline very gravelly loam
28 to 80 inches, white, moderately alkaline, caliche that has very gravelly loam texture

Important soil properties—

Available water capacity: low
Permeability: moderate
Drainage class: well drained
Runoff: low
Root zone: very deep
Shrink-swell potential: low
Hazard of water erosion: moderate
Hazard of wind erosion: moderate

Included with this soil in mapping are small areas of Pettus soil that has slopes of less than 2 percent, small areas where slopes are more than 5 percent, and small areas where the surface layer is a lighter color. Also included are small areas of Olmos, Parrita, Pavelek, Pernitas, Sarnosa, Schattel, and Weesatche soils. The Olmos, Parrita, and Pavelek soils are shallow and are in positions on the landscape that are higher than the Pettus soil. The Pernitas, Sarnosa, and Weesatche soils are very deep and are in lower positions. The Schattel soil is clayey throughout and is on ridgetops. Included soils make up less than 15 percent of this map unit.

This Pettus soil is used mainly as rangeland and habitat for wildlife. A few areas are used as improved pasture or cropland.

Native plants yield a moderate amount of forage.

Figure 10.—Active erosion makes plant cover difficult to establish in this excavated area.

The low available water capacity and droughtiness are limitations. Proper stocking rates, brush management, and controlled grazing can help conserve moisture and improve or maintain productivity.

This soil has fair potential as openland and rangeland wildlife habitat. The low available water capacity, excess lime, and droughtiness limit the plant growth necessary for good habitat.

Yields are low if this soil is used as improved pasture or cropland. The low available water capacity, low natural fertility, droughtiness, and excess lime are limitations. The hazard of water erosion is moderate.

This soil is poorly suited to urban uses. Seepage, permeability, and stoniness are moderate to severe limitations for sanitary facilities. The potential for corrosion of uncoated steel is a moderate limitation for building site development.

This soil is moderately suited to recreational uses. Slope and small stones are moderate limitations.

This Pettus soil is in capability subclass IVe and in the Shallow Ridge range site.

Px—Pits and Dumps

This map unit consists of areas that have been excavated for uranium mining. They consist of mine pits that impound water and soil materials piled above ground level (fig. 10). These soil areas are prominent on the landscape.

The pits range from 5 to 35 acres in size and have nearly vertical side walls. They are 100 to 250 feet deep, 200 to 800 feet wide, and 600 to 3,200 feet long. They impound water that is 50 feet deep or more. Water erosion is very active on surface soil materials and on the side walls. The walls at ground level have deep gullies. The side walls are very unstable and are in a constant process of caving in.

The areas of piled soil material are 50 to 100 feet higher than the natural surface elevation. They consist of original topsoil that has been mixed with the parent material. They range from 10 to 450 acres in size. They have very steep side slopes and nearly level to gently sloping tops. The hazard of water erosion is very severe on the steep side slopes. Most areas are covered over with about 15 percent low quality native vegetation. Bare areas are common, usually occuring where sterile parent material is on the surface or active water erosion is taking place.

Areas of this map unit are used mainly as habitat for wildlife. The areas are severely limited for other uses because of the very steep slopes, severe hazard of water erosion, and very low natural fertility.

This Pits and Dumps map unit is not assigned a capability subclass or a range site.

Qu—Quarry, sandstone

This map unit consists of areas that have been excavated for sandstone to use for road materials. They consist of pits that impound water and have little or no vegetation growing in them. Areas are on uplands and are irregular in shape, but have straight boundaries and range from 10 to 120 acres in size.

The pits have almost vertical side walls. They are 5 to 15 feet deep, 300 to 2,400 feet wide, and 1,100 to 3,300 feet long. The exposed material in the quarries is hard sandstone that supports no plants.

Included in this map unit are small areas where the soil material was stockpiled on the surface. Also included are small areas of Ecleto, Gillett, and Weigang soils. These soils have complete profiles in some cases, but most have been disturbed to some degree during the mining process.

This map unit is occasionally used by transient wildlife that water here following rainy periods; however, since there is little or no vegetation, this use is very limited.

This Quarry map unit is not assigned a capability subclass or range site.

RhC—Rhymes fine sand, 1 to 5 percent slopes

This very deep, gently sloping, somewhat excessively drained soil is on stream terraces and on uplands. The surface is plane to slightly convex and hummocky. Areas are irregular in shape and range from 10 to 110 acres in size.

The typical sequence, depth, and composition of the layers of this soil are as follows—

Surface layer:
0 to 36 inches, pale brown and light yellowish brown, slightly acid fine sand

Subsurface layer:
36 to 56 inches, very pale brown, slightly acid loamy sand

Subsoil:
56 to 68 inches, very pale brown, mottled, slightly acid fine sandy loam
68 to 80 inches, very pale brown, mottled, neutral sandy clay loam

Important soil properties—

Available water capacity: low
Permeability: rapid in surface and subsurface layers; moderately slow in subsoil
Drainage class: somewhat excessively drained
Runoff: low
Root zone: very deep
Shrink-swell potential: low in surface layers; moderate in subsoil
Hazard of water erosion: moderate
Hazard of wind erosion: severe

Included with this soil in mapping are small areas of Rhymes soil that has a loamy fine sand surface layer. Also included are small areas of Miguel, Nusil, and Papalote soils. The Miguel soil has a fine sandy loam surface layer, a clayey subsoil, and is in positions on the landscape higher than the Rhymes soil. The Nusil soil has a sandy surface layer less than 40 inches deep and is in similar positions. The Papalote soil has a clayey subsoil and is in similar to lower positions on the landscape. Included soils make up less than 15 percent of this map unit.

This Rhymes soil is used mainly as rangeland and habitat for wildlife. A few areas are used as improved pasture or cropland.

Native plants yield moderate amounts of forage. The low available water capacity and low natural fertility are the major limitations. Proper stocking rates, brush management, and controlled grazing can help conserve moisture and improve or maintain productivity.

This soil has fair potential as openland and rangeland wildlife habitat. The surface texture, drainage, and low available water capacity limit the growth of most plants necessary for good habitat.

Improved varieties of bermudagrass, bluestems, and kleingrass are the major pasture grasses grown on this soil. Forage yields are moderate. The low available water capacity and low fertility are limitations and erosion is a hazard. Fertilizer applications, weed control, brush management, proper stocking rates, and controlled grazing can help conserve moisture and improve productivity.

Although not extensively used as cropland, peanuts and watermelons are grown on this soil. The low available water capacity, low fertility, and low organic matter content are limitations. Wind erosion is a severe hazard and water erosion is a moderate hazard.

This soil is poorly suited to urban uses. Permeability, seepage, and the sandy texture are severe limitations for sanitary facilities. This soil is also a poor filter. Under certain conditions, trench sidewalls can become highly unstable in this soil. Trenches that have been excavated to more than a depth of 5 feet should be shored or the sidewall should be graded to an angle that ensures safe working conditions.

This soil is poorly suited to recreational uses. The sandy texture is a severe limitation.

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

RoA—Rosenbrock clay, 0 to 1 percent slopes

This deep, nearly level, well drained soil is on plane to slightly convex surfaces on uplands. Areas are irregular in shape and range from 10 to 450 acres in size.

The typical sequence, depth, and composition of the layers of this soil are as follows—

Surface layer:
0 to 11 inches, very dark gray, slightly alkaline clay

Subsoil:
11 to 19 inches, very dark gray, slightly alkaline clay
19 to 40 inches, dark gray, moderately alkaline clay
40 to 45 inches, light brownish gray, moderately alkaline silty clay

Underlying material:
45 to 80 inches, very pale brown, moderately alkaline, weakly consolidated tuffaceous siltstone that has silt loam texture

Important soil properties—

Available water capacity: high
Permeability: very slow
Drainage class: well drained
Runoff: low
Root zone: deep
Shrink-swell potential: high
Hazard of water erosion: slight
Hazard of wind erosion: slight

Included with this soil in mapping are small areas of Rosenbrock soil that is rarely flooded or that has slopes of more than 1 percent. Also included are small areas of Buchel, Clareville, Coy, Eloso, and Monteola soils. The Buchel soil is on flood plains. The Clareville soil has an argillic horizon and is in positions on the landscape similar to slightly lower than those of the Rosenbrock soil. The Coy soil has an argillic horizon and is in similar to higher positions. The Eloso soil is moderately deep and is in higher positions. The Monteola soil has slickensides and is in higher positions on the landscape. Included soils make up less than 10 percent of this map unit.

This Rosenbrock soil is used mainly as rangeland and habitat for wildlife. A few areas are used as improved pasture or cropland.

Native plants yield moderate amounts of forage. Proper stocking rates, controlled grazing, and brush management can help improve or maintain soil productivity.

This soil has fair potential as openland and rangeland wildlife habitat. The clayey texture limits the plant growth necessary for good habitat.

Improved varieties of bermudagrass, bluestems, and kleingrass are the major pasture grasses grown on this soil and yields are moderate. The clayey texture makes this soil difficult to work, especially when preparing a seedbed. Fertilizer applications, weed control, brush management, proper stocking rates, and controlled grazing can help conserve moisture and improve or maintain productivity.

Wheat and corn are the major crops grown on this soil, followed by grain sorghum and cotton (fig. 11). Moderate to high yields are possible. Fertilizer applications, reduced tillage, high residue and cover crops, and crop residue management can help reduce the soil temperature, conserve moisture, and improve or maintain soil tilth and productivity.

This soil is poorly suited to urban uses. The very slow permeability and clayey texture are severe limitations for septic tank absorption fields and trench sanitary landfills. The Shrink-swell potential, low strength, and potential for corrosion of uncoated steel are severe limitations for building site development.

This soil is moderately suited to recreational uses. The very slow permeability and clayey texture are moderate limitations.

This Rosenbrock soil is in capability subclass IIc and in the Rolling Blackland range site.

RoB—Rosenbrock clay, 1 to 3 percent slopes

This deep, very gently sloping, well drained soil is on convex side slopes on uplands. Areas are irregular in shape and range from 15 to 200 acres in size.

The typical sequence, depth and composition of the layers of this soil are as follows—

Surface layer:
0 to 8 inches, very dark gray, slightly alkaline clay

Subsoil:
8 to 18 inches, very dark gray, slightly alkaline clay
18 to 31 inches, very dark gray, slightly alkaline clay

Figure 11.—Grain sorghum is a major crop grown in the county. The soil is Rosenbrock clay, 0 to 1 percent slopes.

31 to 43 inches, grayish brown, moderately alkaline clay

Underlying material:
43 to 80 inches, very pale brown, moderately alkaline, weakly consolidated tuffaceous siltstone that has loam and silt loam texture

Important soil properties—

Available water capacity: high
Permeability: very slow
Drainage class: well drained
Runoff: medium
Root zone: deep
Shrink-swell potential: high
Hazard of water erosion: moderate
Hazard of wind erosion: slight

Included with this soil in mapping are small areas of Rosenbrock soil that is rarely flooded or that has slopes of less than 1 percent. Also included are small areas of Clareville, Coy, Eloso, and Monteola soils. The Coy and Clareville soils have argillic horizons and are in positions on the landscape that are similar to slightly lower than those of the Rosenbrock soil. The Eloso soil is moderately deep and The Monteola soil has slickensides. Both soils are in similar to slightly higher positions on the landscape. Included soils make up less than 10 percent of this map unit.

The Rosenbrock soil is used mainly as rangeland

and improved pasture. A few areas are used as habitat for wildlife or cropland.

Native plants yield moderate amounts of forage. Proper stocking rates, controlled grazing, and brush management can help improve or maintain soil productivity.

Improved varieties of bermudagrass, bluestems, and kleingrass are the major pasture grasses grown on this soil. Forage yields are moderate. The rate of runoff is a limitation. The clayey texture makes this soil difficult to work, especially when preparing a seedbed. Fertilizer applications, weed control, brush management, proper stocking rates, and controlled grazing can help conserve moisture and improve or maintain soil productivity.

This soil has fair potential as openland and rangeland wildlife habitat. The clayey texture limits the plant growth necessary for good habitat.

Wheat and corn are the major crops grown on this soil and moderate to high yields are possible. The medium rate of runoff and a moderate hazard of water erosion limit the use of this soil as cropland. The clayey texture restricts root development. Fertilizer applications, reduced tillage, high residue and cover crops, and crop residue management can help reduce soil temperature, conserve moisture, improve or maintain soil tilth and productivity. Terraces, contour farming, grassed waterways, and diversion terraces, where needed, can help reduce runoff and erosion.

This soil is poorly suited to urban uses. The very slow permeability and clayey texture are severe limitations for septic tank absorption fields and trench sanitary landfills. The shrink-swell potential, low strength, and potential for corrosion of uncoated steel are severe limitations for building site development.

This soil is moderately suited to recreational uses. The very slow permeability, clayey texture, and slope are moderate limitations.

This Rosenbrock soil is in capability subclass IIe and in the Rolling Blackland range site.

Rr—Rosenbrock clay, rarely flooded

This deep, nearly level, well drained soil is on plane to slightly concave surfaces on flood plains. Slopes are less than 1 percent. Areas are irregularly shaped bands that are parallel and adjacent to stream channels. They range from 120 to 150 acres in size.

The typical sequence, depth, and composition of the layers of this soil are as follows—

Surface layer:
0 to 13 inches, very dark gray, slightly alkaline clay

Subsoil:
13 to 24 inches, very dark gray, slightly alkaline clay
24 to 45 inches, dark gray, moderately alkaline clay
45 to 55 inches, light brownish gray, moderately alkaline silty clay

Underlying material:
55 to 80 inches, very pale brown, moderately alkaline, weakly consolidated tuffaceous siltstone that has silt loam texture

Important soil properties—

Available water capacity: high
Permeability: very slow
Drainage class: well drained
Runoff: low
Root zone: deep
Shrink-swell potential: high
Hazard of water erosion: slight
Hazard of wind erosion: slight
Hazard of flooding: can occur 1 year out of 20 for brief periods after heavy rainfall, generally in spring and fall

Included with this soil in mapping are small areas of Rosenbrock soil where flooding does not occur and small areas where slopes are more than 1 percent. Also included are small areas of Clareville, Eloso, and Monteola soils. The Clareville soil has a loamy surface layer and is in positions on the landscape similar to slightly higher than those of the Rosenbrock soil. The Eloso soil is moderately deep and is in higher positions. The Monteola soil has slickensides and is in higher positions on the landscape. Included soils make up less than 5 percent of this map unit.

This Rosenbrock soil is used mainly as rangeland and habitat for wildlife. A few areas are used as improved pasture.

Native plants yield moderate amounts of forage. Proper stocking rates, controlled grazing, and brush management can help improve or maintain soil productivity.

This soil has fair potential as openland and rangeland wildlife habitat. The clayey texture and hazard of flooding limit the growth of grain and seed crop plants, and the clayey texture limits the growth of shrubs and wild herbaceous plants necessary for good habitat.

Improved varieties of bermudagrass, bluestems, and kleingrass are the major pasture grasses grown on this soil. Forage yields are moderate. The clayey texture makes this soil difficult to work, especially when preparing a seedbed. Fertilizer applications, weed control, brush management, proper stocking rates, and controlled grazing can help conserve moisture and improve or maintain productivity. In years of above normal rainfall, improved varieties of bermudagrass produce more forage than other pasture grasses. Bermudagrass is frequently planted, because it is better adapted to prolonged periodical wetness that follows heavy rains and flooding.

Wheat and corn are the major crops grown on this soil. Moderate to high yields are possible. The clayey texture can restrict root development. Fertilizer applications, reduced tillage, high residue and cover crops, and crop residue management can help reduce the soil temperature, conserve moisture, and improve or maintain soil tilth and productivity.

This soil is poorly suited to urban uses. The very slow permeability is a severe limitation for septic tank absorption fields and the clayey texture affects trench sanitary landfills. Dwellings and small commercial buildings are severely affected by the high shrink-swell potential and flooding. Local roads and streets are affected by the shrink-swell potential and low strength. The high potential for corrosion of uncoated steel is also a limitation affecting building sites.

This soil is poorly suited to recreational uses. Flooding is a severe hazard for camp areas. The very slow permeability and clayey texture are moderate limitations.

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

SeC—Sarnosa fine sandy loam, 2 to 5 percent slopes

This very deep, gently sloping, well drained soil is on convex side slopes on uplands. Areas are irregular in shape and range from 10 to 80 acres in size.

The typical sequence, depth, and composition of the layers of this soil are as follows—

Surface layer:
0 to 18 inches, dark grayish brown, moderately alkaline fine sandy loam

Subsoil:
18 to 30 inches, grayish brown, moderately alkaline fine sandy loam
30 to 45 inches, light brownish gray, moderately alkaline fine sandy loam
45 to 68 inches, light gray moderately alkaline fine sandy loam
68 to 80 inches, very pale brown, moderately alkaline fine sandy loam

Important soil properties—

Available water capacity: moderate
Permeability: moderate
Drainage class: well drained
Runoff: low
Root zone: very deep
Shrink-swell potential: low
Hazard of water erosion: moderate
Hazard of wind erosion: slight

Included with this soil in mapping are small areas of Sarnosa soil where slopes are less than 2 percent and areas where slopes are more than 5 percent. Also included are small areas of Colibro, Pernitas, and Weesatche soils. The Colibro soil has a surface layer that is lighter in color and is in positions on the landscape similar to those of the Sarnosa soil. The Pernitas and Weesatche soils have a more clayey subsoil and are in similar to lower positions. Included soils make up less than 15 percent of this map unit.

This soil is used equally as rangeland and habitat for wildlife. A few areas are used as improved pasture or cropland.

Native plants yield moderate amounts of forage. The available water capacity is a moderate limitation and the hazard of water erosion is moderate. Proper stocking rates, brush management, and controlled grazing can help improve or maintain productivity.

This soil is good habitat for openland and rangeland wildlife. A wide variety of adapted plants can be established and adequate stands for wildlife cover and food can be maintained.

Improved varieties of bermudagrass, bluestems, and kleingrass are the major pasture grasses grown on this soil. Forage yields are moderate to high. The available water capacity is a moderate limitation and the hazard of water erosion is moderate. Fertilizer applications, weed control, brush management, proper stocking rates, and controlled grazing can help conserve moisture and improve or maintain productivity.

A few areas of this soil are used as cropland that produces moderate yields of grain sorghum and corn. The available water capacity is a moderate limitation and the hazard of water erosion is moderate. Fertilizer applications, reduced tillage, high residue and cover crops, and crop residue management can help reduce soil temperature, conserve moisture, and improve or maintain soil tilth and productivity. Terraces, contour farming, grassed waterways, and diversion terraces, where needed, can help reduce the hazard of erosion.

This soil is moderately suited to urban uses. Seepage is a severe limitation for sewage lagoon areas and trench sanitary landfills. Permeability is a moderate limitation for septic tank absorption fields. The potential for corrosion of uncoated steel is a moderate limitation for building site development.

This soil is moderately well suited to recreational uses. Slope is a moderate limitation for playgrounds.

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

ShC—Schattel clay loam, 2 to 5 percent slopes

This very deep, gently sloping, well drained soil is on crests of ridges on uplands. The areas are irregular in shape and range from 10 to 100 acres in size.

The typical sequence, depth, and composition of the layers of this soil are as follows—

Surface layer:
0 to 5 inches, light brownish gray, moderately alkaline clay loam

Subsoil:
5 to 26 inches, very pale brown, moderately alkaline clay
26 to 37 inches, light gray, moderately alkaline clay
37 to 55 inches, white, mottled, moderately alkaline clay

Underlying material:
55 to 80 inches, white, moderately alkaline clay that has seams and pockets of salt and gypsum

Important soil properties—

Available water capacity: low
Permeability: slow
Drainage class: well drained
Runoff: medium
Root zone: deep
Shrink-swell potential: high
Hazard of water erosion: severe
Hazard of wind erosion: slight

Included with this soil in mapping are small areas of Schattel soil that has slopes of more than 5 percent. Also included are small areas of a soil similar to Schattel soil that has a sandy clay loam or fine sandy loam surface layer. Also included are Coy, Monteola, Pernitas, and Pettus soils. The Coy and Monteola soils are clayey, very deep, and are in positions on the landscape lower than the Schattel soil. The Pernitas and Pettus soils are loamy and are in similar to slightly lower positions. Included soils make up less than 15 percent of this map unit.

The Schattel soil is used mainly as improved pasture or range. A few areas are used as cropland.

This soil produces low yields of improved pasture grasses. The medium rate of runoff, low available water capacity, high salinity, droughtiness, and low natural fertility are limitations. The clayey texture of the soil restricts root development. Water erosion is a severe hazard. Fertilizer applications, weed control, brush management, proper stocking rates, and controlled grazing can help conserve moisture and improve or maintain productivity.

Native plants yield low to moderate amounts of forage. The low available water capacity, salinity, droughtiness, and low natural fertility are limitations. Proper stocking rates, brush management, and controlled grazing can help improve or maintain productivity.

This soil has very limited use as cropland. A medium rate of runoff, low available water capacity, high salinity, droughtiness, and low natural fertility are limitations. The clayey texture of the soil can restrict root development and water erosion is a severe hazard.

This soil is poorly suited to urban uses. Slow permeability is a severe limitation for septic tank absorption fields and the clayey texture affects trench sanitary landfills. The high shrink-swell potential is a severe limitation for dwellings and small commercial buildings. The high shrink-swell potential and low strength affect roads, streets, and roadfill. The high potential for corrosion of uncoated steel is also a major limitation.

This soil is moderately well suited to recreational uses. Slope is a moderate limitation.

This Schattel soil is in capability subclass IVe and in the Sloping Clay Loam range site.

SrD—Shiner fine sandy loam, 1 to 8 percent slopes

This shallow, gently sloping to moderately sloping, well drained soil is on ridgetops and on upper side slopes on uplands. Areas are irregular in shape and range from 8 to 220 acres in size.

The typical sequence, depth, and composition of the layers of this soil are as follows—

Surface layer:
0 to 9 inches, brown, moderately alkaline fine sandy loam

Subsoil:
9 to 14 inches, light yellowish brown, moderately alkaline fine sandy loam

Underlying material:
14 to 31 inches, very pale brown, moderately alkaline strongly cemented sandstone interbedded with fine sandy loam

31 to 80 inches, very pale brown, moderately alkaline fine sandy loam that has thin strata of weakly cemented sandstone

Important soil properties—

Available water capacity: low
Permeability: moderate
Drainage class: well drained
Runoff: very low on 1 to 3 percent slopes; low on 3 to 5 percent slopes; medium on 5 to 8 percent slopes
Root zone: shallow
Shrink-swell potential: low
Hazard of water erosion: moderate
Hazard of wind erosion: moderate

Included with this soil in mapping are small areas of a soil similar to Shiner soil that has a solum thicker than 20 inches. Also included are small areas of Colibro, Pernitas, and Sarnosa soils. The Colibro, Pernitas, and Sarnosa soils are very deep and are in lower positions on the landscape than those of the Shiner soil. Included soils make up less than 10 percent of this map unit.

This Shiner soil is used mainly as rangeland and habitat for wildlife. A few areas are used as improved pasture or cropland.

Native plants yield low amounts of forage. The shallow rooting depth, low available water capacity, and low organic matter content are limitations. The hazard of water erosion is moderate. Proper stocking rates, brush management, and controlled grazing can help improve range condition or maintain productivity.

This soil has fair potential as openland and rangeland wildlife habitat. The shallow rooting depth, low available water capacity, slope, and medium rate of runoff limit the plant growth necessary for good wildlife habitat.

This soil is not suited to use as improved pasture or cropland. The shallow rooting depth, low available water capacity, excess lime, low organic matter content, and medium rate of runoff are limitations. The hazard of water erosion is moderate.

This soil is poorly suited to urban and recreational uses. Depth to rock is a severe limitation for sanitary facilities, building sites, and recreational facilities. Slope and the potential for corrosion of uncoated steel are other limitations.

This Shiner soil is in capability subclass VIe and in the Chalky Ridge range site.

St—Sinton sandy clay loam, occasionally flooded

This very deep, nearly level, well drained soil is on flood plains. The surface is plane to slightly convex. Slopes are less than 1 percent. Areas are irregular in shape and range from about 10 to 100 acres in size.

The typical sequence, depth, and composition of the layers of this soil are as follows—

Surface layer:
0 to 8 inches, dark grayish brown, moderately alkaline sandy clay loam
8 to 25 inches, very dark grayish brown, moderately alkaline sandy clay loam

Subsoil:
25 to 43 inches, pale brown, moderately alkaline sandy clay loam that has thin strata of fine sandy loam
43 to 80 inches, pale brown, moderately alkaline sandy clay loam that has few thin strata of clay

Important soil properties—

Available water capacity: high
Permeability: moderate
Drainage: well drained
Runoff: negligible
Root zone: very deep
Shrink-swell potential: low
Water erosion hazard: slight
Wind erosion hazard: slight
Flood hazard: moderate; can occur 2 or 3 years out of 10 for brief periods after heavy rainfall, generally in spring and fall.

Included with this soil in mapping are small areas of Sinton soil that has slopes of more than 1 percent and small areas that are frequently flooded. Also included are small areas of Buchel, Odem, and Zunker soils. The Buchel soils are clayey throughout and in positions on the landscape lower than the Sinton soil. The Odem and Zunker soils are mainly fine sandy loam throughout, and are in similar positions. Included soils make up less than 15 percent of this map unit.

This Sinton soil is used mainly for cropland, rangeland, and wildlife habitat. A few areas are used for improved pasture.

Corn, wheat, grain sorghum, and cotton are common crops grown on this soil. Wetness is a moderate limitation, and occasional flooding is a hazard. Fertilizer applications, reduced tillage, and high residue and cover crops, and crop residue management can help reduce the soil temperature, conserve moisture, and improve or maintain soil productivity. In some areas, simple drainage practices, such as proper row direction, can carry off excess surface water. In other areas, a properly designed and installed diversion terrace or a field and lateral drainage ditch system is needed for water management.

Native plants yield high amounts of forage. Proper stocking rates, brush management, and controlled grazing can help maintain productivity.

This soil has good potential for openland and rangeland wildlife habitat.

Improved varieties of bermudagrass, bluestem, and kleingrass are the major pasture grasses grown on this soil. Forage yields are high. Wetness is a moderate limitation, and occasional flooding is a hazard. Fertilizer applications, weed control, brush management, proper stocking rates, and controlled grazing can help conserve moisture and improve or maintain productivity. In years of above normal rainfall, improved varieties of bermudagrass will produce more forage than other pasture grasses because they are better adapted to prolonged periods of wetness that follow heavy rains and flooding.

This soil is poorly suited to urban and recreational uses. Occasional flooding severely limits the use of this soil for sanitary facilities, building site development, camp areas, and playgrounds. Seepage is severe limitation for sanitary facilities. The potential for corrosion of uncoated steel is a moderate limitation.

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

Tc—Tiocano clay, 0 to 1 percent slopes

This very deep, nearly level, somewhat poorly drained soil is in depressions on uplands. The surface is plane to concave. Areas are round or oval in shape and range from about 8 to 30 acres in size.

The typical sequence, depth, and composition of the layers of this soil are as follows—

Surface layer:
0 to 8 inches, very dark gray, neutral clay
8 to 18 inches, very dark gray, slightly alkaline clay

Subsoil:
18 to 28 inches, dark gray, moderately alkaline clay
28 to 40 inches, gray, moderately alkaline clay
40 to 60 inches, light brownish gray, moderately alkaline clay
60 to 80 inches, light gray, moderately alkaline clay

Important soil properties—

Available water capacity: moderate
Permeability: very slow
Drainage class: somewhat poorly drained
Runoff: negligible, water ponds; soil saturated to surface or covered with water for a period of a few days to a week, mainly during spring and fall
Water table: ranges from 12 inches above surface to 24 inches below surface
Root zone: very deep; but high clay content can restrict root development and movement of air and water
Shrink-swell potential: very high
Hazard of water erosion: slight
Hazard of wind erosion: slight

Included with this soil in mapping are small areas of Clareville, Coy, and Weesatche soils. The Clareville and Weesatche soils are noncalcareous in the upper part and are in positions on the landscape higher than those of the Tiocano soil. The Coy soil is calcareous throughout and is in higher positions. Included soils make up less than 15 percent of this map unit.

The Tiocano soil is used almost exclusively as rangeland and habitat for wildlife. A few small areas are used as improved pasture and cropland because they are in areas of more suitable soils and it is not economically feasible to exclude them.

Native plants yield moderate amounts of forage. Wetness, ponding, and moderate available water capacity are limitations. Proper stocking rates, brush management, and controlled grazing can help improve or maintain productivity.

This soil has poor potential for openland or rangeland wildlife habitat. The clayey texture, moderate available water capacity, drainage, and soil moisture are limitations that restrict the growth of plants necessary for good habitat. Natural wet areas have unreliable water levels necessary for wetland plants, which limits the development of this soil for wetland wildlife habitat.

This soil is very limited for improved pasture, cropland, urban, or recreational uses. Ponding, the clayey texture, and very slow permeability are severe limitations for sanitary facilities. Ponding, very high shrink-swell potential, low strength, and high potential for corrosion of uncoated steel are limitations. Under certain conditions, trench sidewalls can become highly unstable in this soil. Trenches that have been excavated to a depth of more than 5 feet should be shored or the sidewall should be graded to an angle that ensures safe working conditions.

This Tiocano soil is in capability subclass IVw and in the Lakebed range site.

TrB—Tordia clay, 1 to 3 percent slopes

This deep, very gently sloping, well drained soil is on convex side slopes on uplands. Areas are irregular in shape and range from 10 to 350 acres in size.

The typical sequence, depth, and composition of the layers of this soil are as follows—

Surface layer:
0 to 8 inches, black, slightly alkaline clay
8 to 16 inches, black, moderately alkaline clay

Subsoil:
16 to 28 inches, black, moderately alkaline clay
28 to 37 inches, dark gray, moderately alkaline clay
37 to 43 inches, light gray to gray and pale yellow, moderately alkaline clay

Underlying material
43 to 80 inches, light gray, moderately alkaline, weakly consolidated shale that has clay texture

Important soil properties—

Available water capacity: high
Permeability: very slow, but water enters soil rapidly when it is dry and cracks are open
Drainage class: well drained
Runoff: medium
Root zone: deep, but high clay content can restrict root development and movement of air and water
Shrink-swell potential: high
Hazard of water erosion: moderate
Hazard of wind erosion: slight

Included with this soil in mapping are small areas of Tordia soil that has slopes of less than 1 percent and small areas where slopes are more than 3 percent. Also included are small areas of Bryde, Clareville, Coy, Fashing, and Rosenbrock soils. The Bryde soil has a fine sandy loam surface layer that is light in color and is in positions on the landscape similar to those of the Tordia soil. The Clareville soil has an argillic horizon and is in lower positions on the landscape. The Coy and Rosenbrock soils are calcareous throughout and are in similar positions. The Fashing soil is shallow and is in higher positions on the landscape. Included soils make up less than 10 percent of this map unit.

This Tordia soil is used mainly as cropland. A few areas are used as improved pasture or rangeland.

The most common crops are grain sorghum, corn, wheat, and some cotton. The rate of runoff is a moderate limitation, and water erosion is a moderate hazard. The clayey texture can restrict root development. Fertilizer applications, reduced tillage, high residue and cover crops, and crop residue management can help reduce soil temperature, conserve moisture, and help reduce the rate of runoff and the hazard of erosion.

Improved varieties of bermudagrass, bluestems, and kleingrass are the major pasture grasses grown on this soil. Forage yields are high. Fertilizer applications, weed control, brush management, proper stocking rates, and controlled grazing can help conserve moisture and improve or maintain productivity.

Native plants yield moderate amounts of forage. The rate of runoff and the restricted rooting depth are moderate limitations. Proper stocking rates, brush management, and controlled grazing can help improve or maintain productivity.

This soil has fair potential for use as openland wildlife habitat and poor potential for rangeland wildlife habitat. The high clay content restricts the plant growth necessary for good wildlife habitat.

This soil is poorly suited to urban uses. Very slow permeability is a severe limitation for septic tank absorption fields. The clayey texture affects trench sanitary landfills. The clayey texture, high shrink-swell potential, high potential for corrosion of uncoated steel, and low strength are limitations affecting building site development.

This soil is moderately well suited to recreational uses. The very slow permeability and clayey texture are moderate limitations. Slopes over 2 percent are a limitation for playgrounds.

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

TrC—Tordia clay, 3 to 5 percent slopes

This deep, gently sloping, well drained soil is on convex side slopes on uplands. Areas are irregular in shape and range from 8 to 45 acres in size.

The typical sequence, depth, and composition of the layers of this soil are as follows—

Surface layer:
0 to 6 inches, black, slightly alkaline clay

Subsoil:
6 to 20 inches, black, slightly alkaline clay
20 to 34 inches, black, moderately alkaline clay
34 to 40 inches, gray, moderately alkaline clay

Underlying material:
40 to 60 inches, very pale brown, moderately alkaline, weakly consolidated shale that has clay texture

Important soil properties—

Available water capacity: high
Permeability: very slow, but water enters soil rapidly when it is dry and cracks are open
Drainage class: well drained

Runoff: high
Root zone: deep, but high clay content can restrict the root development and movement of air and water
Shrink-swell potential: high
Hazard of water erosion: moderate
Hazard of wind erosion: slight

Included with this soil in mapping are small areas of Tordia soil that has slopes of less than 3 percent. Also included are small areas of Bryde, Coy, and Fashing soils. The Bryde soil has a fine sandy loam surface layer and is in positions on the landscape similar to or lower than the Tordia soil. The Coy soil is calcareous throughout and is in similar positions. The Fashing soil is shallow and is in higher positions on the landscape. Included soils make up less than 15 percent of this map unit.

The Tordia soil is used mainly as improved pasture and rangeland. A few areas are used as habitat for wildlife or cropland.

Improved varieties of bermudagrass, bluestems, and kleingrass are the major pasture grasses grown on this soil. Forage yields are high. The clayey texture makes the soil difficult to work, especially when preparing a seedbed. When grass is being established, the high rate of runoff is a moderate limitation, and water erosion is a moderate hazard. Fertilizer applications, weed control, brush management, proper stocking rates, and controlled grazing can help conserve moisture and improve or maintain productivity.

Native plants yield moderate amounts of forage. The clayey texture and high rate of runoff are limitations, and water erosion is a moderate hazard. Proper stocking rates, brush management, and controlled grazing can help improve or maintain productivity.

This soil has fair potential for use as openland wildlife habitat and poor potential for rangeland wildlife habitat. The clayey texture and slopes of more than 3 percent limit the plant growth necessary for good habitat.

The most common crops grown on this soil are grain sorghum, corn, and wheat. The high rate of runoff is a limitation, and water erosion is a moderate hazard. The clayey texture can restrict root development. Fertilizer applications, reduced tillage, high residue and cover crops, and crop residue management can help reduce soil temperature, conserve moisture, and improve or maintain soil tilth and productivity. Grassed waterways, terraces, contour farming, and diversion terraces, where needed, can help control runoff and reduce the hazard of erosion.

This soil is poorly suited to urban use. Very slow permeability is a severe limitation for septic tank absorption fields and the clayey texture is a severe limitation for trench sanitary landfills. High shrink-swell potential, low strength, high potential of corrosion on uncoated steel are severe limitations for building site development.

This soil is moderately well suited to recreational uses. The very slow permeability, slope, and clayey texture are moderate limitations.

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

Us—Ustarents

This map unit consists of eroded soils along escarpments between uplands and bottom lands. These soils have been shaped and smoothed by heavy machinery. Slopes range from 2 to 5 percent. Areas are long and narrow and range from 5 to 40 acres in size.

This map unit consists of formerly gullied areas that have been shaped, smoothed, and planted in grass to reduce erosion. The soil layers have been mixed to a depth of about 60 inches, but remnants of the soil layers are throughout. The soil material is mostly very pale brown or white sandy clay loam, clay loam, clay, or fine sandy loam. In some areas, it is mixed with a very dark grayish brown or dark gray soil material at various depths.

Important soil properties—

Available water capacity: low to moderate
Permeability: moderately slow to very slow
Drainage class: moderately to excessively drained
Runoff: medium
Root zone: shallow to very deep
Shrink-swell potential: low to moderate
Hazard of water erosion: moderate to severe
Hazard of wind erosion: slight

Included with this map unit are small areas of Ustarents soil that has slopes of less than 2 percent and small areas of Arents soil where slopes are more than 5 percent. Also included are small areas of Bryde, Coy, Gillett, Monteola, Pernitas, and Weesatche soils. These small areas are isolated remnants of soils that are not eroded. Included soils make up less than 5 percent of this map unit.

The Ustarents soil is used mainly as improved pasture and habitat for wildlife. A few areas are used as rangeland.

Improved varieties of bermudagrass, bluestems, and kleingrass are the major pasture grasses grown on this soil. The low to moderate available water capacity is a limitation and water erosion is a moderate to severe hazard. Fertilizer applications, weed control, brush management, and controlled grazing can helpconserve moisture and improve or maintain productivity.

This soil has good potential for use as openland and rangeland wildlife habitat. Slopes of more than 2 percent may be a limitation.

Native plants yield limited amounts of forage. The low to moderate available water capacity is a limitation, and water erosion is a moderate to severe hazard. Proper stocking rates, brush management, and controlled grazing can help improve or maintain productivity.

This soil is poorly suited to urban uses. The moderately slow to very slow permeability, seepage, slope, clayey subsoil, shrink-swell potential, high potential for corrosion of uncoated steel, and low strength are limitations.

This soil is moderately well suited to recreational uses. Slope is a limitation and water erosion is a hazard.

The capability subclass is IVe. These soils are not assigned to a range site.

WaC—Weesatche fine sandy loam, 2 to 5 percent slopes

This very deep, gently sloping, well drained soil is on convex slopes on uplands. Areas are irregular in shape and range from 10 to 800 acres in size.

The typical sequence, depth, and composition of the layers of this soil are as follows—

Surface layer:

0 to 5 inches, very dark grayish brown, slightly alkaline fine sandy loam

Subsoil:

5 to 17 inches, very dark gray, slightly alkaline sandy clay loam

17 to 29 inches, gray, slightly alkaline sandy clay loam

29 to 65 inches, reddish yellow, slightly alkaline sandy clay loam

65 to 80 inches, reddish yellow, moderately alkaline fine sandy loam

Important soil properties—

Available water capacity: high
Permeability: moderate
Drainage class: well drained
Runoff: low
Root zone: very deep
Shrink-swell potential: moderate
Hazard of water erosion: moderate
Hazard of wind erosion: slight

Included with this soil in mapping are small areas of Weesatche soil that has slopes of less than 2 percent, small areas where slopes are more than 5 percent, and small areas where the surface layer is sandy clay loam. Also included are small areas of Clareville, Papalote, Parrita, Pernitas, and Olmos soils. The Clareville soil has a clayey subsoil and is in positions on the landscape lower than the Weesatche soil. The Papalote soil has a surface layer that is light in color and is in similar positions. The Parrita and Olmos soils are shallow and are in higher positions on the landscape. The Pernitas soil is calcareous throughout and is in similar to slightly higher positions on the landscape. Included soils make up less than 15 percent of this map unit.

This Weesatche soil is used mainly as improved pasture and rangeland. A few areas are used as cropland or habitat for wildlife.

Improved varieties of bermudagrass, bluestems, and kleingrass are the major pasture grasses grown on this soil. Forage yields are moderate. Water erosion is a moderate hazard. Fertilizer applications, weed control, brush management, proper stocking rates, water management, and controlled grazing can help conserve moisture and improve or maintain productivity.

Native plants yield moderate amounts of forage. Proper stocking rates, brush management, and controlled grazing can help improve or maintain productivity.

Corn, grain sorghum, and wheat are common crops grown on this soil. Water erosion is a moderate hazard. Fertilizer applications, reduced tillage, high-residue and cover crops, and crop residue management can help reduce the soil temperature, conserve moisture, and improve or maintain tilth and productivity. Terraces, grassed waterways, and contour farming, where needed, can help reduce erosion.

This soil has good potential for use as openland wildlife habitat and fair potential for rangeland wildlife habitat. The clayey texture limits the plant growth necessary for good rangeland habitat.

This soil is moderately well suited to urban uses. The permeability, seepage, and slope are moderate limitations for septic tank absorption fields and sewage lagoon areas. The shrink-swell potential and low strength are moderate limitations for building site development. The high potential for corrosion of uncoated steel is also a limitation.

This soil is well suited to recreational uses. Slope is a moderate limitation for playgrounds.

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

Figure 12.—A good stand of corn growing on Weesatche sandy clay loam, 1 to 3 percent slopes.

WeB—Weesatche sandy clay loam, 1 to 3 percent slopes

This very deep, very gently sloping, well drained soil is on convex side slopes on uplands. Areas are irregular in shape and range from 10 to 750 acres in size.

The typical sequence, depth, and composition of the layers of this soil are as follows—

Surface layer:
0 to 8 inches, very dark gray, slightly alkaline sandy clay loam

Subsoil:
8 to 15 inches, very dark gray, slightly alkaline sandy clay loam
15 to 24 inches, dark brown, slightly alkaline sandy clay loam
24 to 51 inches, brown, moderately alkaline sandy clay loam
51 to 80 inches, pink, moderately alkaline sandy clay loam

Important soil properties—

Available water capacity: high
Permeability: moderate
Drainage class: well drained
Runoff: very low
Root zone: very deep
Shrink-swell potential: moderate
Hazard of water erosion: moderate
Hazard of wind erosion: slight

Included with this soil in mapping are small areas of Weesatche soil that has slopes of less than 1 percent, small areas where slopes are more than 3 percent, and small areas where the surface layer is fine sandy loam. Also included are small areas of Clareville, Papalote, Parrita, Pernitas, and Olmos soils. The Clareville soil has a clayey subsoil and is in positions on the landscape slightly lower than the Weesatche soil. The Papalote soil has a clayey subsoil, a lighter color surface layer, and is in similar positions. The Parrita and Olmos soils are shallow and are in slightly higher positions on the landscape. The Pernitas soil is calcareous throughout and is in similar positions. Included soils make up less than 15 percent of this map unit.

This Weesatche soil is used mainly as cropland (fig. 12) and improved pasture. A few areas are used as rangeland or habitat for wildlife.

Corn, grain sorghum, and wheat are common crops grown on this soil. Water erosion is a moderate hazard. Fertilizer applications, reduced tillage, high-residue and cover crops, and crop residue management can help reduce the soil temperature, conserve moisture, and improve or maintain tilth and productivity. Terraces, contour farming, grassed waterways, and diversion terraces, where needed, can help control water erosion.

Improved varieties of bermudagrass, bluestems, and kleingrass are the major pasture grasses grown on this soil. Forage yields are high. Fertilizer applications, weed control, brush management, proper stocking rates, water management, and controlled grazing can help conserve moisture and improve or maintain productivity.

Native plants yield moderate amounts of forage. Proper stocking rates, brush management, and controlled grazing can help improve or maintain productivity.

This soil has good potential for use as openland wildlife habitat and has fair potential for rangeland wildlife habitat. The surface texture limits the plant growth necessary for good rangeland habitat.

This soil is moderately well suited to urban uses. The permeability, seepage, and slope are moderate limitations for septic tank absorption fields and sewage lagoon areas. The shrink-swell potential and low strength are moderate limitations for building site development. The high potential for corrosion of uncoated steel is also a limitation.

This soil is well suited to recreational uses. Slope is a moderate limitation for playgrounds.

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

WeC—Weesatche sandy clay loam, 3 to 5 percent slopes

This very deep, gently sloping, well drained soil is on convex slopes on uplands. Areas are irregular in shape and range from 10 to 350 acres in size.

The typical sequence, depth, and composition of the layers of this soil are as follows—

Surface layer:
0 to 10 inches, very dark grayish brown, slightly alkaline sandy clay loam

Subsoil:
10 to 15 inches, dark brown, slightly alkaline sandy clay loam
15 to 30 inches, yellowish red, moderately alkaline sandy clay loam
30 to 45 inches, reddish yellow, moderately alkaline sandy clay loam
45 to 60 inches, reddish yellow, moderately alkaline fine sandy loam

Important soil properties—

Available water capacity: high
Permeability: moderate
Drainage class: well drained
Runoff: low
Root zone: very deep
Shrink-swell potential: moderate
Hazard of water erosion: moderate
Hazard of wind erosion: slight

Included with this soil in mapping are small areas of Weesatche soil that has slopes of less than 3 percent, small areas where slopes are more than 5 percent, and areas where the Weesatche soil has a fine sandy loam surface layer. Also included are small areas of Papalote, Parrita, Pernitas, and Olmos soils. The Papalote soil has a clayey subsoil, a surface layer that is lighter in color, and is in positions on the landscape similar to those of the Weesatche soil. The Parrita and Olmos soils are shallow and are in slightly higher positions. The Pernitas soil is calcareous throughout and is in similar to slightly higher positions on the landscape. Included soils make up less than 15 percent of this map unit.

This Weesatche soil is used mainly as improved pasture and rangeland. A few areas are used as cropland or habitat for wildlife.

Improved varieties of bermudagrass, bluestems, and kleingrass are the major pasture grasses grown on this soil. Forage yields are moderate. Water erosion is a moderate hazard. Fertilizer applications, weed control, brush management, proper stocking rates, water management, and controlled grazing can help conserve moisture and improve or maintain productivity.

Native plants yield moderate amounts of forage. Proper stocking rates, brush management, and controlled grazing can help improve or maintain productivity.

Corn, grain sorghum, and wheat are the common crops grown on this soil. Slope is a limitation and water erosion is a hazard. Fertilizer applications, reduced tillage, high-residue and cover crops, and crop residue management can help reduce the soil temperature, conserve moisture, and improve or maintain tilth and productivity. Terraces, contour farming, grassed waterways, and diversion terraces, where needed, can help reduce the erosion hazard.

This soil has good potential for use as openland wildlife habitat and has fair potential for rangeland wildlife habitat. The surface texture limits the plant growth necessary for good rangeland habitat.

This soil is moderately well suited to urban uses. The permeability, seepage, and slope are moderate limitations for septic tank absorption fields and sewage lagoon areas. The shrink-swell potential, slope, and low strength are moderate limitations for building site development. The high potential for corrosion of uncoated steel is also a limitation.

This soil is well suited to recreational uses. Slope is a moderate limitation.

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

WgC—Weigang fine sandy loam, 1 to 5 percent slopes

This shallow, gently sloping, well drained soil is on convex upper side slopes and ridgetops on uplands. Areas are irregular in shape and range from 8 to 200 acres in size.

The typical sequence, depth, and composition of the layers of this soil are as follows—

Surface layer:
0 to 5 inches, dark gray, neutral fine sandy loam

Subsoil:
5 to 18 inches, very dark gray, neutral clay loam

Underlying material:
18 to 80 inches, white, moderately alkaline sandstone that is moderately hard and brittle

Important soil properties—

Available water capacity: very low
Permeability: moderate except for underlying sandstone that is slowly or very slowly permeable
Drainage class: well drained
Runoff: 1 to 3 percent slopes, very low; 3 to 5 percent slopes, low
Root zone: shallow; sandstone layer impedes root development
Shrink-swell potential: moderate
Hazard of water erosion: severe
Hazard of wind erosion: moderate

Included with this soil in mapping are small areas of Weigang soil that has slopes of less than 1 percent, small areas where slopes are more than 5 percent, small areas where the surface layer is sandy clay loam, and small areas where sandstone fragments are on the surface. Also included are small areas of Ecleto, Fashing, Gillett, and Pavelek soils. The Ecleto soil has a clayey subsoil and is in positions on the landscape similar to those of the Weigang soil. The Fashing and Pavelek soils are calcareous, clayey throughout, and are in similar positions. The Gillett soil is moderately deep and is in lower positions on the landscape. Included soils make up less than 20 percent of this map unit.

The Weigang soil is used mainly as rangeland, habitat for wildlife, and improved pasture. A few small areas are used as cropland.

Native plants yield low amounts of forage. The shallow rooting depth and very low available water capacity are limitations. Proper stocking, brush management, and controlled grazing can help improve or maintain productivity.

This soil is also used as wildlife habitat. The shallow rooting depth and very low available water capacity limit the plant growth necessary for good habitat.

This soil has very limited use as improved pasture or cropland. The shallow rooting depth and very low available water capacity are limitations and water erosion is a severe hazard.

This soil is poorly suited to urban uses. Shallow depth to sandstone is a severe limitation for sanitary facilities. Slope and depth to rock are moderate to severe limitations for building site development. The shrink-swell potential and potential for corrosion of uncoated steel are moderate limitations.

This soil is poorly suited to recreational uses. The shallow depth to sandstone is a severe limitation for camp and picnic areas and playgrounds.

This Weigang soil in capability subclass IVe and in the Shallow range site.

WtF—Weigang-Gillett Complex, 3 to 25 percent slopes, very stony

These shallow and moderately deep, gently sloping to steep, well drained soils are on long ridges, hills, and escarpments on uplands. Areas are irregular in shape and range from 10 to 250 acres in size.

The Weigang soil makes up about 60 percent of this map unit and is in the steeper sloped areas. Rock fragments range from 15 to 55 percent in the surface layer. They are 3 to 30 inches in size and are dominantly in the Weigang soil. The Gillett soil makes up about 30 percent of this map unit and is on foot slopes and toe slopes where slope gradients are less. The soils of this map unit are so intricately mixed that mapping them separately is not practical at the scale used.

The typical sequence, depth, and composition of the layers of the Weigang soil are as follows—

Surface layer:
0 to 5 inches, dark grayish brown, neutral very stony fine sandy loam

Subsoil:
5 to 19 inches, very dark grayish brown, slightly alkaline very stony sandy clay loam

Underlying material:
19 to 80 inches, very pale brown, slightly alkaline weakly consolidated sandstone

The typical sequence, depth, and composition of the layers of the Gillett soil are as follows—

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

Subsoil:
5 to 19 inches, gray, slightly alkaline clay
19 to 36 inches, gray, slightly alkaline clay

Underlying material:
36 to 80 inches, light gray, slightly alkaline clay that has thin layers of weakly consolidated sandstone

Important soil properties—

Available water capacity: Weigang-very low; Gillett-moderate
Permeability: Weigang-moderate; Gillett-very slow
Drainage class: well drained
Runoff: Weigang-ranges from low on 3 to 5 percent slopes to high on slopes of more than 20 percent; Gillett-ranges from medium on 3 to 5 percent slopes to very high on slopes of more than 20 percent
Root zone: Weigang-shallow, stony sandstone layer can restrict root development; Gillett-moderately deep, but high clay content can restrict root development and movement of air and water
Shrink-swell potential: Weigang-moderate; Gillett-high
Hazard of water erosion: severe
Hazard of wind erosion: Weigang-slight; Gillett-moderate

Included with these Weigang and Gillett soils in mapping are small areas of Weigang or Gillett soils that have slopes of less than 3 percent, small areas where slopes are more than 25 percent, and areas where more than 60 percent rock fragments are in the surface layer. Also included are small areas of Bryde and Ecleto soils. The Bryde soil is deep and is in lower positions on the landscape than the Weigang and Gillet soils. The Ecleto soil is shallow, has a clayey subsoil, and is in similar or lower positions. Included soils make up less than 10 percent of this map unit.

The soils of this map unit are used exclusively as rangeland and habitat for wildlife (fig. 13).

Native plants yield low to moderate amounts of forage. Surface stoniness, shallow rooting depth, and very low to moderate available water capacity are limitations. Proper stocking rates, brush management, and controlled grazing can help improve or maintain productivity.

These soils have fair potential as rangeland wildlife habitat and openland wildlife habitat. Low available water capacity, surface stoniness, and low natural fertility limit the plant growth necessary for good habitat.

These soils have very limited use as improved pasture. The thickness of the soil, surface stoniness, low available water capacity, and high rate of runoff are limitations. The hazard of erosion is severe. The high cost of removing stones prohibits the use of these soils for improved pasture.

These soils are not used as cropland. Water erosion is a severe hazard. Surface stoniness, low available water capacity, high rate of runoff, low natural fertility, and slopes of more than 15 percent are major limitations.

These soils are very poorly suited to urban uses. Depth to bedrock and slope are severe limitations for sanitary facilities and building site development. The high shrink-swell potential, low strength, and high potential for corrosion of uncoated steel are other major limitations.

These soils are poorly suited to recreational uses. Depth to rock, surface stoniness, and slope are severe limitations.

The Weigang soil is in capability subclass VIIs; the Gillett soil is in capability subclass IIIe. The Weigang, very stony, soil is in the Sandstone Hills range site and the Gillett soil is in the Tight Sandy Loam site.

Zu—Zunker fine sandy loam, occasionally flooded

This very deep, nearly level, well drained, bottom land soil is on flood plains. The surface is plane to slightly convex. Slopes are less than 1 percent. Areas

Figure 13.—Livestock grazing and wildlife habitat are the best uses of the Weigang-Gillet Complex, 3 to 25 percent slopes.

are irregularly shaped bands that are parallel and adjacent to stream channels. They range from 8 to 120 acres in size.

The typical sequence, depth, and composition of the layers of this soil are as follows—

Surface layer:
0 to 18 inches, grayish brown, moderately alkaline fine sandy loam

Subsoil:
18 to 41 inches, pale brown, moderately alkaline fine sandy loam
41 to 60 inches, very pale brown, moderately alkaline loamy fine sand
60 to 80 inches, grayish brown, moderately alkaline fine sandy loam

Important soil properties—

Available water capacity: moderate
Permeability: moderately rapid
Drainage class: well drained
Runoff: negligible
Root zone: very deep
Shrink-swell potential: low
Hazard of water erosion: slight
Hazard of wind erosion: slight
Flood hazard: moderate;can occur 2 or 3 years out of 10 for brief periods after heavy rainfall, generally in spring and fall

Included with this soil in mapping are small areas of Zunker soil that has slopes of more than 1 percent and small areas that are noncalcareous throughout. Also included are small areas of Buchel, Odem, and Sinton soils. The Buchel soil is clayey throughout and is in positions on the landscape lower than the Zunker soil. The Sinton soil is fine loamy throughout and is in lower to similar positions. The Odem soil is noncalcareous throughout, has a darker surface layer, and is in similar positions on the landscape. Included soils make up less than 15 percent of this map unit.

The Zunker soil is used mainly as cropland and improved pasture. A few areas are used as rangeland or habitat for wildlife.

Wheat, grain sorghum, and corn are the common crops grown on this soil. Occasional flooding is a hazard, and the moderate available water capacity is a limitation. Fertilizer applications, reduced tillage, high-residue and cover crops, and crop residue management can help reduce the soil temperature, conserve moisture, and improve or maintain soil tilth and productivity.

Improved varieties of bermudagrass, bluestems, and kleingrass are the major pasture grasses grown on this soil. Occasional flooding is a hazard, and the moderate available water capacity is a limitation. Fertilizer applications, weed control, brush management, proper stocking rates, and controlled grazing can help conserve moisture and improve or maintain productivity. In years of above normal rainfall, improved varieties of bermudagrass produce more forage than other pasture grasses. Bermudagrass is frequently planted, because it is better adapted to prolonged periodical wetness that follows heavy rains and flooding.

Native plants yield high amounts of forage. Proper stocking rates, brush management, and controlled grazing can help improve or maintain productivity.

This soil has good potential for use as openland and rangeland wildlife habitat.

This soil is poorly suited to urban uses. The hazard of flooding is severe for sanitary facilities and building site development.

This soil is poorly suited to recreational uses. The hazard of flooding is severe for camp areas and moderate for playgrounds.

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

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.

About 373,568 acres in the survey area, or nearly 78 percent of the total area, meets the soil requirements for prime farmland.

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 in table 5. This list does not constitute a recommendation for a particular land use. On some soils included in the list, measures that overcome a hazard or limitation, such as flooding, wetness, and droughtiness, are needed. Onsite evaluation is needed to determine whether or not the hazard or limitation has been overcome by corrective measures. The extent of each listed map unit is shown in table 4. The location is shown on the detailed soil maps at the back of this publication. The soil qualities that affect use and management are described under the heading "Detailed Soil Map Units."

Use and Management of the Soils

This soil survey is an inventory and evaluation of the soils in the survey area. It can be used to adjust land uses to the limitations and potentials of natural resources and the environment. Also, it can help to prevent soil-related failures in land uses.

In preparing a soil survey, soil scientists, conservationists, engineers, and others collect extensive field data about the nature and behavioral characteristics of the soils. They collect data on erosion, droughtiness, flooding, and other factors that affect various soil uses and management. Field experience and collected data on soil properties and performance are used as a basis in predicting soil behavior.

Information in this section can be used to plan the use and management of soils for crops and pasture; as rangeland; as sites for buildings, sanitary facilities, highways and other transportation systems, and parks and other recreational facilities; and for wildlife habitat. It can be used to identify the potentials and limitations of each soil for specific land uses and to help prevent construction failures caused by unfavorable soil properties.

Planners and others using soil survey information can evaluate the effect of specific land uses on productivity and on the environment 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

Jerry L. Pearce, area resource conservationist, Natural Resources Conservation Service, helped prepare this section.

In Karnes County, about 286,216 acres of the land area is devoted to cropland and pasture.

General management needed for crops and pasture is suggested in this section. The estimated yields of the main crops and pasture plants are listed for each soil and the system of land capability classification used by the Natural Resources Conservation Service is explained.

Planners of management systems for individual fields or farms should consider the detailed information given in the description of each soil under the heading "Detailed Soil Map Units." Specific information can be obtained from the local office of the Natural Resources Conservation Service or the Cooperative Extension Service.

Crops

About 165,128 acres in the county is cropland, approximately 865 acres of which is irrigated. There is a slight trend toward converting cropland to pasture use.

The major crops are corn, grain sorghum, wheat, small grains, forage sorghum, cotton, and miscellaneous crops including vegetables and other specialty crops.

On all cropland, soil and water conservation are important concerns. Where slopes exceed one percent, erosion by water becomes a problem. Soils that are susceptible to water erosion include the Coy, Monteola, and Weesatche soils.

Water erosion of the soil surface results in reduced productivity. The loss of the surface layer is especially damaging to soils that have a clayey subsoil, such as the Papalote soils. Loss of topsoil is also damaging to soils that have a layer in or below the subsoil that restricts rooting depth, such as the Parrita and Pavelek soils, which have a layer of cemented caliche.

In many areas of sloping soils, tilling or preparing a good seedbed is difficult if the soils have a claypan or hardpan, which is often the result of the original topsoil being lost. Claypans and hardpans can be common in Papalote and Miguel soils.

Farming practices, such as crop residue use, conservation tillage, contour farming, using cover and green manure crops, terraces, diversions, waterways, and crop rotation help control the rate of runoff and reduce erosion by holding rainfall on the land so it can be absorbed by the soil. These practices also help conserve soil moisture and maintain tilth. With proper management, these practices generally result in higher sustained crop yields.

Crop residue maintained on the surface protects the soil against wind and water erosion. It also reduces soil crusting, thereby decreasing water runoff and water erosion. Where slopes are short and irregular, cropping systems providing substantial surface cover are often the most feasible means to control water erosion. Examples of soils with short, irregular slopes include the Coy, Monteola, and Pernitas soils. Additional benefits of using crop residue include reduced evaporation of soil moisture, improved tilth of the surface layer, and reduced compaction of subsurface layers by farm machinery. Soils that develop crusts and are susceptible to wind erosion include the Eloso and Weesatche soils.

Tillage should be sufficient to prepare a good seedbed and control weeds without damaging the structure of the soil. Heavy traffic on the soil, especially when it is wet, causes a compaction zone to form by altering soil structure and reducing porosity. The Coy, Monteola, and Tordia soils are susceptible to the formation of compaction zones. Compaction restricts root growth into and through the compacted layer. This limits the ability of the crop's root system to take up moisture and nutrients. Compaction increases the loss of moisture and nutrients through water runoff and water erosion. It also decreases yields. Crop residue management, crop rotation, conservation tillage, deep chiseling, and controlling traffic patterns are practices that help reduce soil compaction problems.

The proper use of fertilizer is important on all cultivated soils. Soil analyses and knowledge of the fertilizer application history of a field are needed to accurately estimate the kinds and amounts of nutrients needed to produce a specific crop yield.

Specific soils can have unique problems related to soil chemistry and fertility. Crops grown on the Pernitas and Eloso soils often exhibit chlorosis or yellowing of the leaves due to high levels of calcium carbonate (fig. 14). In severe cases, the affected plants will die. An annual soil analysis can detect a buildup or depletion of required amendments for the specific crop and needed adjustments can be made.

In addition, plant tissue analyses can be used to determine nutrient deficiencies in a growing crop. In some instances, use of better adapted crops and crop rotations can prove beneficial in dealing with imbalances in soil nutrient levels.

Pasture and Hayland

Pasture and hayland consists of perennial grasses used for forage. In Karnes County, pasture and hayland make up about 121,088 acres, most of which are non-irrigated.

Pasture and hayland management includes choosing plants adapted to the soil, fertilizing, rotating pastures for grazing, and using weed and brush control. Irrigation water management is important where pasture or hayland is irrigated.

Many grasses producing high forage yields are adapted for improved pasture. The most widely used grasses are kleingrass, common and improved bermudagrass, King Ranch and other improved bluestems, Bell rhodesgrass, johnsongrass, and Wilman lovegrass. The improved bermudagrasses are the most widely used and some pastures and hay fields are irrigated.

Application of commercial fertilizer or the interseeding of soil-improving legumes is essential for economical production of forage on pasture and hayland. Fertilizer should be applied on non-irrigated pasture when moisture is adequate. All fertilizer should be applied according to need as indicated by soil or plant analysis.

Rotational grazing of pastures is an important practice. Timely rotation allows for maximum returns from the improved grasses. Weeds and brush can be controlled by mowing, prescribed burning, or by treating with approved herbicides.

Yields per Acre

The average yields per acre that can be expected of the principal crops under a high level of management are shown in table 6. In any given year, yields may be higher or lower than those indicated in the table because of variations in rainfall and other climatic factors. The land capability classification of 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

Figure 14.—Chlorotic areas in this field of forage sorghum are caused by excess calcium carbonate in the soil, which interferes with the production of chlorophyll in the leaves. The soil is Coy clay loam, 1 to 3 percent slopes.

crop; effective use of crop residue, barnyard manure, and green manure crops; and harvesting that ensures the smallest possible loss.

For yields of irrigated crops, it is assumed that the irrigation system is adapted to the soils and to the crops grown, that good-quality irrigation water is uniformly applied as needed, and that tillage is kept to a minimum.

The estimated yields reflect the productive capacity of each soil for each of the principal crops. Yields are likely to increase as new production technology is developed. The productivity of a given soil compared with that of other soils, however, is not likely to change.

Crops other than those shown in table 6 are grown in the survey area, but estimated yields are not listed because the acreage of such crops is small. The local office of the Natural Resources Conservation Service or of the Cooperative Extension Service can provide information about the management and productivity of the soils for those crops.

Land Capability Classification

Land capability classification shows, in a general way, the suitability of soils for most kinds of field crops. 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 and for engineering purposes.

In the capability system, soils are generally grouped at three levels—capability class, subclass, and unit. Only class and subclass are used in this survey.

Capability classes, the broadest groups, are designated by numerals I through VIII. The numerals indicate progressively greater limitations and narrower choices for practical use. The classes are defined as follows:

Class I soils have few limitations that restrict their use. No soils in Karnes County are classified as Class I.

Class II soils have moderate limitations that reduce the choice of plants or that require moderate conservation practices.

Class III soils have severe limitations that reduce the choice of plants or that require special conservation practices, or both.

Class IV soils have very severe limitations that reduce the choice of plants or that require very careful management, or both.

Class V soils are not likely to erode but have other limitations, impractical to remove, that limit their use.

Class VI soils have severe limitations that make them generally unsuitable for cultivation.

Class VII soils have very severe limitations that make them unsuitable for cultivation.

Class VIII soils and miscellaneous areas have limitations that nearly preclude their use for commercial crop production.

Capability subclasses are soil groups within one class. They are designated by adding a small letter, *e, w, s,* or *c,* to the class numeral, for example, IIe. The letter *e* shows that the main hazard is the risk of erosion unless close-growing plant cover is maintained; *w* shows that water in or on the soil interferes with plant growth or cultivation (in some soils the wetness can be partly corrected by artificial drainage); *s* shows that the soil is limited mainly because it is shallow, droughty, or stony; and *c,* used in only some parts of the United States, shows that the chief limitation is climate that is very cold or very dry.

In class I there are no subclasses because the soils of this class have few limitations. Class V contains only the subclasses indicated by *w, s,* or *c* because the soils in class V are subject to little or no erosion. They have other limitations that restrict their use to pasture, rangeland, woodland, wildlife habitat, or recreation.

Capability units are soil groups within a subclass. The soils in a capability unit are enough alike to be suited to the same crops and pasture plants, to require similar management, and to have similar productivity. Capability units are generally designated by adding an Arabic numeral to the subclass symbol, for example, IIe-4 and IIIe-6.

The capability classification of each map unit is given in the section “Detailed Soil Map Units” and in the yields table.

Rangeland

Homer Sanchez, area range conservationist, Natural Resources Conservation Service, Temple, Texas, helped prepare this section.

Rangeland is the land on which the native vegetation is predominantly grasses, grasslike plants, forbs, or shrubs suitable for grazing or browsing. In areas that have similar climate and topography, the kind and amount of vegetation produced are closely related to the kind of soil. Effective management is based on the relationship of soils, vegetation, and water. Rangeland or native grassland receives no regular or frequent cultural treatment, such as fertilizer or tillage.

About 165,605 acres or 34.3 percent of Karnes County is classified as rangeland. The rangeland in Karnes County is located within the Northern Rio Grande Plains Major Land Resource Area of Texas. The soils are generally calcareous to neutral with clayey soils over clayey subsoils.

Few ranchers depend exclusively on rangeland to feed livestock. Although range vegetation often contributes significant amounts of forage during winter months, it is supplemented by protein concentrates and small-grain pasture. True native vegetation in most of the county is in small blocks of less than 100 acres, but some blocks are as large as several thousand acres. Forage productivity has been depleted in most of these areas because of improper grazing management and invasion of woody or weedy vegetation, or both, that reduce quality and quantity of suitable forage plants. Much of the acreage listed as rangeland is land that is abandoned cropland or pasture. Because these lands have not been managed properly, they generally produce less than half of their original potential. Most of the rangeland is in poor to fair condition. Some of the dominant grasses are Texas wintergrass, sideoats grama, windmillgrass species, threeawns, little bluestem, and some introduced species, such as KR bluestem, which have invaded or survived prior management.

Range Sites and Condition Classes

Soils vary in their capability to produce grasses and other plants suitable for grazing. Soils that produce about the same kinds and amounts of forage are grouped into a range site.

A range site is a distinctive kind of rangeland. It produces a characteristic natural plant community that differs from those on other range sites in kind, amount, and proportion of range plants. The natural plant community on the range site is also referred to as the climax plant community or climax vegetation because it represents the culmination of the effects of all the factors of the natural environment.

Climax vegetation is the stabilized plant community that reproduces itself and changes very little so long as the environment remains unchanged. It consists of the plants that grew there before the area was first settled. The most productive combination of native forage plants on a range site is generally the climax vegetation.

Range sites are subject to many influences that modify or even temporarily destroy vegetation. Examples are drought, overgrazing, wild fires, and short-term tillage. If the changes are not too severe, the plant community will recover and return to climax condition. However, severe deterioration may permanently alter the potential of the range site.

Grazing can change the quality and quantity of forage on a range site by changing the proportion of decreaser, increaser, and invader plants in the composition of the plant community.

Decreasers are plants in the climax vegetation that tend to decrease in relative amount under close grazing. They generally are the tallest and most productive perennial grasses and forbs and the most palatable to livestock.

Increasers are plants in the climax vegetation that increase in relative amount as the more desirable decreasers are reduced by close grazing. They are commonly shorter than decreasers and are generally less palatable to livestock.

Invaders are plants that are normally not included in the climax plant community because they cannot compete with the climax vegetation for moisture, nutrients, and light. They invade the site and grow along with increasers only after the climax vegetation has been reduced by continual heavy grazing. Most invader species have little grazing value.

Range management requires a knowledge of the kinds of soil and of the climax or potential natural plant community on a particular range site. The current range condition is assessed and compared to the climax plant community to determine the range condition. The more closely the existing community resembles the climax community, the better the range condition. Range condition is an ecological rating only and does not have a specific meaning relating to the existing plant community in a given use.

Four range condition classes are used to show the degree of departure from the potential or climax vegetation. A range site is in excellent condition if 76 to 100 percent of the present plant community is the same as the climax vegetation; in good condition if the percentage is 51 to 75; in fair condition if the percentage is 26 to 50; and in poor condition if the percentage is 25 or less.

Potential forage production depends on the range site. Current forage production depends on the range condition and the moisture available to plants during their growing season.

Good livestock and forage production on rangeland is achieved mainly by managing the time of grazing and limiting the amount of forage removed. Some of the food manufactured by the green parts of plants is used for growth and some is stored for use in regrowth and seed production.

Following years of prolonged overuse of range, seed sources of desirable vegetation are eliminated. Vegetation can be reestablished by applying one or a combination of the following practices: mechanical or chemical treatment, range seeding, fencing, water development, prescribed burning, or other treatments to revitalize stands of native plants. Thereafter, deferred grazing, proper grazing use, and planned grazing systems must be applied to maintain and improve the range. The physical practices should be followed by grazing management and follow-up brush control for maintenance. The combination of alternatives, or Resource Management Systems (RMS) is essential if rangeland productivity is to be maintained. Following are some of the more commonly used resource management practices.

Proper Grazing Use. The objective of this practice is to allow cattle to graze at an intensity that will maintain enough cover to protect the soil and maintain or improve the quantity of desirable vegetation.

Deferred Grazing. This is the deferment or restriction of grazing until the better forage plants have completed most of their seasonal growth or have made seed. This management practice helps keep the desirable plants healthy and vigorous and permits plants that have been depleted to recover. Deferred grazing helps to improve plant cover, conserve water, and reduce soil losses.

Fencing. This practice excludes livestock from areas needing protection from grazing and confines livestock to a specific area. Fencing also subdivides grazing land to permit use of a planned grazing system and protects new seedlings or plantings from grazing.

Prescribed Burning. Livestock operators and wildlife managers use this practice to periodically remove or reduce a dense cover of mature vegetation. When done properly and at the right time, prescribed burning stimulates new succulent growth, helps to restore climax plant species, and reduces infestations of noxious weed and brush. However, desirable plants can be severely damaged or killed if the soil surface is too dry, allowing the fire to reach the plant crowns and roots. Burning is not recommended more often than once every three years to avoid interfering with the regrowth cycle of perennial grasses. Prescribed burning is an effective management tool that can be substituted for chemical or mechanical treatment.

Planned Grazing Systems. The objective of this practice is to rotate the grazing of livestock through two or more pastures in a planned sequence for a specified period of time. A planned grazing system may be relatively simple in design when only two pastures are used, or may be more complex and management intensive when one or two herds and many pastures are used. To be successful, it must be tailored to conditions existing in each ranch unit and meet the needs of the plants and animals as well as the rancher.

Table 7 shows for each soil in the survey area that supports range vegetation, the range site and the potential annual production in favorable, average, and unfavorable years. Only soils that are used as rangeland or are suited to rangeland are listed.

A *range site* is listed for each soil map unit. The relationship between soils and vegetation was established during this survey; thus, range sites generally can be determined directly from the soil map. Soil properties that affect moisture supply and plant nutrients have the greatest influence on the productivity of range plants. Soil reaction, salt content, and a seasonal high water table are also important.

Potential annual production is the amount of vegetation that can be expected to grow annually on well managed rangeland that is supporting the potential natural plant community. It includes all vegetation, whether or not it is palatable to grazing animals. It includes the current year's growth of leaves, twigs, and fruits of woody plants. It does not include the increase in stem diameter of trees and shrubs. It is expressed in pounds per acre of air-dry vegetation for favorable, average, and unfavorable years. In a favorable year, the amount and distribution of precipitation and the temperatures make growing conditions substantially better than average. In an unfavorable year, growing conditions are well below average, generally because of low available soil moisture.

Yields are adjusted to a common percentage of air-dry moisture content. The relationship of green weight to air-dry weight varies according to such factors as exposure, amount of shade, recent rains, and unseasonable dry periods.

Following is a description of the 17 range sites in Karnes County: Blackland, Chalky Ridge, Clay Loam, Clayey Bottomland, Gravelly Ridge, Gray Sandy Loam, Lakebed, Loamy Bottomland, Loamy Sand, Rolling Blackland, Sandy, Sandy Loam, Shallow, Shallow Ridge, Shallow Sandy Loam, Sloping Clay Loam, and Tight Sandy Loam.

Blackland range site. The Elmendorf-Denhawken complex soils, map unit EdB, are in the Blackland range site. The climax vegetation is an open grassland prairie. A few large live oaks, elm, and hackberry trees are along drainageways and in motts. The composition by weight is 95 percent grasses, and 5 percent forbs.

This site has high natural fertility. In climax stage, little bluestem, indiangrass, and fourflower trichloris produce almost half of the forage. Other grasses, such as Arizona cottontop, sideoats grama, Texas wintergrass, Texas cupgrass, tall dropseed, pinhole bluestem, vine-mesquite, and plains bristlegrass, produce the rest. Many palatable forbs and legumes are native to the site.

Overgrazing by cattle eventually kills out the decreaser grasses, such as fourflower trichloris, indiangrass, sideoats grama, and little bluestem. These are replaced by increaser plants, such as silver bluestem, Texas wintergrass, tall dropseed, and other mid grasses. If overgrazing continues, buffalograss, Texas grama, tumblegrass, threeawns, annual weeds and annual grasses invade the site along with noxious brush species, such as mesquite, spiny hackberry, Retama, agarito, lotebush, and huisache.

Chalky ridge range site. The Shiner soil, map unit SrD, is in the Chalky Ridge range site. This site is a true prairie site. Large liveoak trees, occuring either singly or in small motts, offer some shade. The scattered trees, rolling topography and many native flowering forbs make this an attractive site. The composition by weight is 85 percent grasses, 10 percent forbs, and 5 percent woody plants.

The herbaceous plant community is dominated by little bluestem, which generally makes up a little more than half of the total grass composition. Indiangrass, big bluestem, Florida paspalum, and Canada and Virginia wildrye are also important and are often the dominant grasses. Sideoats grama, silver bluestem, and tall dropseed are mid grasses usually present in smaller amounts. Many forbs and legumes provide valuable grazing and an attractive landscape.

As retrogression occurs, the tall grass species decrease and are replaced by sideoats grama, Texas wintergrass, silver bluestem, buffalograss, threeawns, and less palatable forbs. With continued abuse, short grasses, such as red grama, hairy grama, Texas grama, tumblegrass, and threeawns, invade along with weeds, such as ragweed, broomweed, and curlycup gumweed. Woody invaders include pricklypear, baccharis, and mesquite.

Clay loam range site. The Clareville and Weesatche soils, map units CaA, WeB, and WeC, are in the Clay Loam range site. In pristine condition, the Clay Loam range site is open grassland with an occasional mesquite tree or woody shrub. The composition by weight is 90 percent grasses, 5 percent woody plants, and 5 percent forbs. Little bluestem and twoflower and fourflower trichloris are dominant, constituting about one-third of the total grass composition followed by pinhole bluestem, silver bluestem, plains bristlegrass, spike bristlegrass, and pink pappusgrass. Sideoats grama, Arizona cottontop, and short grasses make up lesser amounts. Woody plants include spiny hackberry, wolfberry, vine ephedra and condalia. The primary forbs, along with numerous other legumes, are Maximilian sunflower, Engelmanndaisy, orange zexmenia, and bundleflower.

As retrogression occurs because of overgrazing, tall grasses, such as bluestems, indiangrass, switchgrass, and Florida paspalum, decrease and are replaced by sideoats grama, silver bluestem, low panicums, Texas wintergrass, and tall dropseed. In a deteriorated condition, invader plants, such as threeawns, hairy grama, red lovegrass, Texas grama, buffalograss, tumblegrass, western ragweed, broomweed, prairie coneflower, and woody plants, such as mesquite, baccharis, yaupon, and hawthorn dominate the site, reducing the total production potential.

Clayey Bottomland range site. The Buchel soils, in map units Bu and Bw, are in the Clayey Bottomland range site. The climax plant community is a tall grass savannah. Oak, elm, hackberry, cottonwood, ash, black willow, some pecan, and other large trees make up about one-fourth of the canopy cover. The canopy is generally heavier along streams or drainageways. Cool-season grasses and sedges grow under the canopy, and warm-season grasses and forbs dominate the open areas. The composition by weight is 85 percent grasses, 10 percent woody plants, and 5 percent forbs.

Little bluestem, switchgrass, indiangrass, fourflowered trichloris, and giant sacaton comprise about one-third of the total grass composition, followed by Virginia wildrye, Canada wildrye, southwestern bristlegrass, and rustyseed paspalum. Vine-mesquite, buffalograss, long leaf uniola, knotroot bristlegrass, and other low panicums and paspalums are present in lesser amounts. The forbs are Engelmanndaisy, snoutbean, lespedeza, and western indigo.

This range site is preferred by livestock. The warm-season grasses and forbs are reduced when the site is grazed heavily and fire is suppressed, allowing the brush to form a dense canopy. Shade-tolerant grasses then dominate the understory and total usable forage is drastically reduced. Bushy bluestem, ragweed, sumpweed, spiny aster, and annual grasses and forbs dominate the site.

Gravelly Ridge range site. The Devine soil, map unit DeB, is in the Gravelly Ridge range site. The climax plant community is a semi-open grassland of mid grasses interspersed with low-growing browse plants. Guajillo and blackbrush are the dominant woody plants. Fire is probably a factor in keeping the brush from dominating completely. In climax condition, this site maintains at least a 25 percent brush canopy. The composition by weight is grasses 70 percent, forbs 5 percent, and woody plants 25 percent.

The dominant decreaser grasses, which make up about half of the total grass composition, are tanglehead, Arizona cottontop, pinhole bluestem, sideoats grama, and green sprangletop.

As retrogression occurs, blackbrush and guajillo dominate and threeawns, fall witchgrass, and Texas bristlegrass make up the understory.

Gray Sandy Loam range site. The Colibro, Pernitas, and Sarnosa soils, map units CbC, CbE, PnC, PnD, and SeC, are in the Gray Sandy Loam range site. The climax plant community is an open grassland with scattered mesquite and underbrush throughout the landscape. The understory is dominated by mid grasses such as trichloris and plains bristlegrass. The composition by weight is 90 percent grasses, 5 percent woody plans, and 5 percent forbs.

Twoflowered and fourflowered trichloris are the main decreaser grasses, making up about one-fifth of the total grass composition, followed by plains bristlegrass, Nash and hooded windmillgrass, and pink pappusgrass. Grasses, such as sideoats grama, green sprangletop, cottontop, buffalograss, sand dropseed, and other perennial increasers are present in lesser amounts.

As retrogression occurs, whitebrush, blackbrush, mesquite, spiny hackberry, and cactus can form a dense canopy. With continued overuse, the better mid grasses are replaced by invader plants, such as threeawns, croton, sneezeweed, ragweed, tumblegrass, broomweed, and grassbur. Huisache, an introduced species, comes in strongly with overuse.

Lakebed range site. The Tiocano soil, map unit Tc, is in the Lakebed range site. The climax plant community is an open grassland with varying degrees of wetness. These shallow depressed sites vary from one to 10 acres in size. Hartweg paspalum and spike lovegrass grow near the edge of the areas. Buffalograss can appear when the areas are dry for long periods.

The composition by weight is 95 percent grasses and 5 percent forbs. No woody plants are present on this site in its climax stage.

The predominant grass is Hartweg paspalum. Other grasses better suited to moist areas include switchgrass, white tridens, knotroot bristlegrass, spike lovegrass, and sedges and rushes. These species generally are present in smaller amounts.

As the site is overused, mesquite, huisache, and retama invade and form a dense canopy. Other common invaders include spiny aster, sesbania, bermudagrass, and annual forbs.

Loamy Bottomland range site. The Odem, Sinton, and Zunker soils, map units Od, St, and Zu, are in the Loamy Bottomland range site. The climax plant community is a tall grass savannah. Trees shade about 20 percent of the ground. The overstory consists of oaks, pecan, hackberry, elm, cottonwood, and hickory or ash. The understory is hawthorns, greenbriar, honeysuckle, grapes, and peppervines. Cool-season grasses and sedges dominate the shaded areas, and warm-season grasses dominate the other areas. The composition by weight is 80 percent grasses, 15 percent woody plants, and 5 percent forbs.

Switchgrass, fourflowered trichloris, big cenchrus, little bluestem, and southwestern bristlegrass grow in the open areas and make up most of the plant community, followed by vine-mesquite, sideoats grama, low panicums, pink pappusgrass, buffalograss, plains bristlegrass, and other grasses. Virginia wildrye, Texas wintergrass, sedges, and white tridens grow in the shaded and wet areas, and comprise a lesser amount of the total grass composition. The forbs are bundleflower, lespedeza, Engelmanndaisy, hairy ruellia, partridge pea, and gayfeather.

This site is preferred by livestock. The warm season grasses and forbs are reduced by overgrazing and fire suppression, which increase the tree and brush canopy. Shade-tolerant grasses and forbs then dominate and forage production is drastically reduced.

Loamy Sand range site. The Papalote soil, map unit PaB, makes up the Loamy Sand range site. The climax plant community is an open grassland. Some mesquite and live oak are present. Tall grasses grow between the oaks. The composition by weight is 85 percent grasses, 10 percent woody plants, and 5 percent forbs.

The predominant grasses on this site are little bluestem, switchgrass, and crinkleawn, followed by brownseed paspalum, tanglehead, and sideoats grama. Other grasses adapted to this site are cottontop, feathery bluestem, spike and plains bristlegrass, hooded windmillgrass, and other low panicums and paspalums.

With overgrazing, this site loses decreaser plants, such as bluestems, crinkleawn, and switchgrass. These plants are replaced by many annual forbs, red lovegrass, hairy grama, signalgrass, threeawns, and grassbur. Mesquite, spiny hackberry, pricklypear, and lantana also increase with continued overuse.

Rolling Blackland range site. The Coy, Eloso, Monteola, Rosenbrock, and Tordia soils, map units CoA, CoB, CoC, EsB, EsC, MoA, MoB, MoC, MoD, RoA, RoB, Rr, TrB, and TrC, are in the Rolling Blackland range site.

The climax plant community is an open prairie. This site is dominated by mid and short grasses. The composition by weight is 95 percent grasses and 5 percent forbs. Woody plants are present only in small amounts.

The dominant decreaser grasses are sideoats grama, vine-mesquite, bristlegrass species, Texas wintergrass, and Arizona cottontop. Other desirable grasses, present in lesser amounts, are Texas cupgrass, pinhole and silver bluestem, buffalograss, and the trichloris species.

As retrogression occurs, Texas wintergrass, plains bristlegrass, curly mesquite, and buffalograss are likely to increase. With continued deterioration, invader plants, such as red grama, red threeawn, Texas grama, and windmillgrasses, can dominate the site. Mesquite, spiny hackberry, whitebrush, agarita, and pricklypear frequently increase or invade and can eventually dominate the site.

Sandstone Hills range site. The Weigang-Gillette complex, map unit WtF, is in the Sandstone Hills range site. The climax plant community is a savannah of moderate size with stunted post oak and blackjack in association with an open stand of mid to tall grasses. Grasses are spaced to use the limited moisture. The composition by weight is 80 percent grasses, 5 percent forbs, and 15 percent woody plants.

Little bluestem is the dominant grass under climax conditions. Open areas are dominated by grasses, such as little bluestem, Indiangrass, sand lovegrass, tanglehead, and silver bluestem. Shaded areas are dominated by bluestems, purpletop, and Canada wildrye. Forbs, legumes, woody vines, and shrubs add variety to the climax plant community.

As retrogression occurs, the surface soil compacts and sheet erosion can occur as the amount of bare ground increases. The tall grasses decrease and are replaced by less palatable and robust plants, such as annual threeawan, red lovegrass, and gummy lovegrass. Understory brush, such as American beautyberry and yaupon can invade the more wooded areas. Small numbers of mesquite can invade open areas. The landscape can be beautifully decorated with flowering plants, such as bluebonnets, Indian paintbrush, Liatris, and primroses. Unique to the site is the abundance of odd, egg-shaped rocks on the soil surface.

Sandy range site. The Nusil and Rhymes soils, map units NuC and RhC, are in the Sandy range site. The climax vegetation is an open grassland. Mesquite and occasional liveoak are scattered over the area. The interspaces are predominantly tall and mid grasses. The composition by weight is 90 percent grasses, 5 percent woody plants, and 5 percent forbs.

Little bluestem makes up about half of the total grass composition. Indiangrass, switchgrass, crinkleawn, tanglehead, fringeleaf paspalum, and brownseed paspalum make up lesser amounts. Other grasses are balsamscale, hooded windmillgrass, tall dropseed, and low panicums. The forbs are western indigo, sensitivebriar, snoutbean, partridge pea, and western ragweed. The abundance of forbs makes this a preferred site for dove and quail.

With continuous overgrazing and the lack of natural fires, the taller grasses are grazed out. Little bluestem, indiangrass, and switchgrass are replaced by brownseed paspalum, tall dropseed, fall witchgrass, and other increasing species. They, in turn, are grazed out and replaced by red lovegrass, yankeeweed, bullnettle, snakecotton, and croton. Other invading plants are tumble lovegrass, sandbur, pricklypear, queensdelight, beebalm, pricklypoppy, and baccharis.

Sandy Loam range site. The Weesatche soil, map unit WaC, is in the Sandy Loam range site. The climax plant community is an open grassland. The site consists of mid and tall grasses and is dominated by little bluestem and twoflowered and fourflowered trichloris. The total composition by weight is 90 percent grasses, 5 percent woody plants, and 5 percent forbs.

Arizona cottontop and feathery bluestem are the next dominant grasses, followed by plains bristlegrass, hooded windmillgrass, and Nash windmillgrass. Numerous other grasses make up lesser amounts. Condalias, blackbrush, and kidneywood, are woody shrubs. The forbs include Engelmann daisy, gayfeather, sensitivebriar, and native legumes.

If wildfires are reduced and overgrazing continues, this range site deteriorates. Woody canopy increases and tall grasses, such as little bluestem, indiangrass, twoflowered and fourflowered trichloris, decline. They are replaced by plants, such as brownseed paspalum. If overgrazing persists, the site deteriorates to threeawns, red grama, red lovegrass, annual grasses, forbs, and grassburs. As grass cover is reduced, invader brush, such as mesquite, whitebrush, spiny hackberry, and blackbrush, form a dense canopy.

Shallow range site. The Condido, Ecleto, Fashing, and Weigang soils, map units CdA, EcB, EcC, FaC, and WgC, make up the Shallow range site. This plant community is an open, mixed-grass prairie, characterized by mid to tall grasses and scattered oak motts.

The dominant grasses are Arizona cottontop and sideoats grama. Plains lovegrass, plains bristlegrass, Texas cupgrass, vine-mesquite, and cane or silver bluestem are present in lesser amounts. Buffalograss, curly mesquite, Texas wintergrass, and sand dropseed are dominant increasers.

As retrogression occurs, woody plants dominate the site. Mid and tall grasses are replaced by short grasses, such as curly mesquite, buffalograss, fall witchgrass, threeawns, red grama, Texas grama, annual forbs, and grasses. Woody invaders are spiny hackberry, blackbrush, lote, persimmon, and huisache. Woody increasers are kidneywood, vine ephedra, and guajillo.

Shallow Ridge range site. The Olmos, Pavelek, and Pettus soils, map units OmD, PkB, PkC, and PtC, are in the Shallow Ridge range site. The climax plant community is a grassland with scattered, low growing brush, such as guajillo, cenizo, kidneywood, ephedra, and mescalbean. Composition by weight for this site is 85 percent grasses, 5 percent forbs, and 10 percent woody plants.

The site is dominated by mid grasses, such as Arizona cottontop, sideoats grama, little bluestem, and green sprangletop. Decreaser plants include trichloris, sand dropseed, and Texas bristlegrass.

As retrogression occurs, slim tridens, fall witchgrass, and Nash windmillgrass increase. With further overgrazing and onsite deterioration, invaders such as threeawns, red grama, Texas grama, and tumble windmillgrass increase. Woody invaders include guajillo, cenizo, blackbrush, brazil, lote, and acacia species.

Shallow Sandy Loam range site. The Parrita soil, map unit PcB, makes up the Shallow Sandy Loam range site. The climax plant community is an open grassland with a few scattered woody plants and many forbs. The composition by weight is 85 percent grasses, 10 percent forbs, and 5 percent woody plants.

The dominant decreasers are feathery bluestem, tanglehead, cottontop, bristlegrass, and little bluestem. Increaser plants, such as fall witchgrass, hooded windmillgrass, sand dropseed, and slim tridens are present in lesser amounts.

As retrogression occurs, the mid grasses are replaced by short grasses, which are invaders or annuals. Guajillo and blackbrush increase temporarily until further overgrazing causes blackbrush to dominate over guajillo.

Sloping Clay Loam range site. The Schattel series, map unit ShC, is in the Sloping Clay Loam range site.

The climax plant community is an open grassland with a scattering of blackbrush or woody shrubs. Mid grasses are dominant. The site supports climax forbs, such as bushsunflower, orange zexmenia, and bundleflower. This site is on summits and upper side slopes of hills, generally surrounded by the Rolling Blackland range site. The soils are slightly to moderately saline at a depth of about 4 feet; however, salinity levels are not high enough to produce salt-tolerant species. The climax composition by weight is 90 percent grasses, 5 percent forbs, and 5 percent woody plants.

The dominant decreaser grasses are pink pappusgrass, Arizona cottontop, sideoats grama, twoflower trichloris, and bristlegrass. Other desirable grasses are Texas wintergrass, plains lovegrass, slim tridens, and buffalograss.

This site is slow to recover after the grass cover is removed, leaving a soil crust that retards rainfall. As retrogression occurs, blackbrush, mesquite, and other mixed brush and cacti form a dense canopy. Common invaders are red grama, Texas grama, Hall’s panicum, and threeawn.

Tight Sandy Loam range site. The Bryde, Gillett, Imogene, Miguel, and Papalote soils, map units BrB, GtB, Im, MgB, MgC, PbB, and PbC, are in the Tight Sandy Loam range site.

The climax plant community is an open grassland with scattered mesquite and other woody brush. Mid grasses dominate the site. Climax forbs and legumes grow well on this site. Composition by weight is 90 percent grasses, 5 percent forbs, and 5 percent woody plants.

The dominant decreaser grasses are sideoats grama, Arizona cottontop, tanglehead, feathery bluestem, and twoflowered trichloris. The dominant increaser plants are plains bristlegrass, Nash and hooded windmillgrass, and pink pappusgrass.

As retrogression occurs, mesquite, condalias, spiny hackberry, and other woody plants form a moderate to dense canopy. Common invaders are broomweed, crotons, cactus, red grama, Texas grama, sandbur, and tallowweed.

Recreation

The soils of the survey area are rated in table 8 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 8, 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 8 can be supplemented by other information in this survey, for example, interpretations for septic tank absorption fields in table 11 and interpretations for dwellings without basements and for local roads and streets in table 10.

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 gentle slopes and are not wet or subject to flooding during the period of use. The surface has few or no stones or boulders, absorbs rainfall readily but remains firm, and is not dusty when dry. Strong slopes and stones or boulders can greatly increase the cost of constructing campsites.

Picnic areas are subject to heavy foot traffic. Most vehicular traffic is confined to access roads and parking areas. The best soils for picnic areas are firm when wet, are not dusty when dry, are not subject to flooding during the period of use, and do not have slopes or stones or boulders that increase the cost of shaping sites or of building access roads and parking areas.

Playgrounds require soils that can withstand intensive foot traffic. The best soils are almost level and are not wet or subject to flooding during the season of use. The surface is free of stones and boulders, is firm after rains, and is not dusty when dry. If grading is needed, the depth of the soil over bedrock or a hardpan should be considered.

Paths and trails for hiking and horseback riding should require little or no cutting and filling. The best soils are not wet, are firm after rains, are not dusty when dry, and are not subject to flooding more than once a year during the period of use. They have moderate slopes and few or no stones or boulders on the surface.

Golf fairways are subject to heavy foot traffic and some light vehicular traffic. Cutting or filling may be required. The best soils for use as golf fairways are firm when wet, are not dusty when dry, and are not subject to prolonged flooding during the period of use. They have moderate slopes and no stones or boulders on the surface. The suitability of the soil for tees or greens is not considered in rating the soils.

Wildlife Habitat

Robert M. Stellbauer, biologist, Natural Resources Conservation Service, Bryan, Texas, helped prepare this section.

Soils, climate, and to a large degree, human activity, directly affect basic wildlife habitat requirements for food, water, and cover. Terrestrial wildlife, such as deer, turkey, squirrel, and cottontail rabbits, depend upon vegetation for food and cover. The kinds of soil in an area determine the amounts and kinds of vegetation, thus directly influencing the kinds and numbers of wildlife present.

Aquatic wildlife, such as largemouth bass, sunfish, and catfish, as well as wetland wildlife, such as ducks, geese, herons, and beavers, are also affected by the soils present. The kinds of soil determine if water can be held on the surface, and also determine the amount and kind of vegetation that will grow in aquatic and wetland habitats.

In Karnes County, sixteen watershed structures, numerous reclaimed uranium mine pits, and the many farm and ranch ponds provide habitat for fish, waterfowl, and upland wildlife.

Natural ponds are in scattered upland depressions where Tiocano clay is the primary soil. These waters are used by upland wildlife and migrating waterfowl in years of average to above average rainfall.

Drainageways are additional sources of surface water. Buchel and Sinton soils are examples of soils in the major drainageways, which include the San Antonio River and Cibolo Creek. Tributaries of these major drainageways include Ecleto Creek, Escondido Creek, and Rhymes Creek. These bottom lands provide habitat for white-tailed deer, fox squirrels, and Rio Grande turkey; furbearers, such as coyotes, bobcats, raccoons, and beaver; waterfowl, such as ducks, geese, and herons; and for aquatic wildlife, such as bass, catfish, crappie, and sunfish.

The Elmendorf-Denhawken complex soils, along with Monteola, Tordia, Shiner, and Clareville soils, are examples of upland prairie soils that developed under native tall grasses. The prairie provided habitat for white-tailed deer, bison, coyote, wolf, and wild turkey. Most of the upland prairies were converted to cropland. As cropland, the principal habitat value is to migratory birds, such as mourning doves and waterfowl that feed on waste grain left after harvest. Wild turkey, white-tailed deer, and bobwhite quail also use these areas if sufficient tree or shrub cover is present. The habitat value of these cropland areas can be improved through minimum tillage, crop residue use, cover crops, or food plots.

Gillett, Miguel, and Papalote soils are examples of post oak upland soils that are in the northern part of the county. Under natural conditions, these post oak uplands were a savannah of grass and scattered trees that provided habitat to deer, quail, and wild turkey. Periodic fires were important in maintaining the savannah landscape. The post oak and its accompanying shrubs and vines provide cover and food in years of adequate moisture to deer, turkey, and squirrels. Thinning of the post oak stands in strips or motts by mechanical or approved chemical methods, along with prescribed burning, can significantly improve the wildlife value of this habitat.

Colibro, Pernitas, Sarnosa, and Weesatche soils are examples of loamy upland soils. These loamy uplands are naturally an open grassland with scattered woody plants. Much of this area was converted to cropland. This provides food for migratory wildlife as well as deer, quail, and turkey when woody cover is available.

Abandoned cropland and poorly managed range and pasture become infested with invading woody plants, such as huisache and mesquite, as well as introduced grasses, such as King Ranch bluestem.

The quality of habitat for wildlife deteriorates as the lack of plant diversity reduces the abundance of food. Reducing the density of invading woody plants, managing livestock grazing, and periodic prescribed burning are methods of improving the habitat on these loamy uplands.

Ecleto, Condido, Olmos, and Parrita soils are examples of shallow upland soils. These soils usually have restrictive layers that limit moisture infiltration and plant root penetration. Under natural conditions, these soils supported an open grassland with scattered shrubs. Poor management of livestock grazing and the lack of fire reduced the grass cover and allowed mixed brush to dominate most of these shallow upland soils that provide food and cover to deer, dove, and quail. However, the habitat of these shallow uplands can be greatly improved by reducing the density of the brush and allowing grasses and forbs to reestablish. Mechanical or chemical brush control, along with prescribed burning and proper livestock grazing management, are effective conservation measures that can improve the habitat on these soils.

Nusil and Rhymes soils are examples of deep sandy upland soils. These soils naturally supported a savannah of tall grasses, perennial and annual forbs, and scattered motts of trees. The presence of perennial and annual forbs, native bunch grasses, and the accompanying spaces of bare ground between plants make these deep sandy uplands valuable food and cover habitat for bobwhite quail. The conversion of these areas to introduced pasture grasses severely limits their value as habitat for quail. Proper grazing management, prescribed burning, and limited annual disking to encourage forb production are acceptable conservation measures that will improve the wildlife habitat of these deep sandy uplands.

In table 9, 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 grain sorghum.

Grasses and legumes are domestic perennial grasses and herbaceous legumes. Soil properties and features that affect the growth of grasses and legumes are depth of the root zone, texture of the surface layer, available water capacity, wetness, surface stoniness, flooding, and slope. Soil temperature and soil moisture are also considerations. Examples of grasses and legumes are fescue, lovegrass, bromegrass, 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 bluestem, goldenrod, beggarweed, wheatgrass, and grama.

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 agarita, anagua, granjeno, grape, guajillo, mesquite, oaks, persimmon, and hackberry.

Wetland plants are annual and perennial wild herbaceous plants that grow on moist or wet sites. Submerged or floating aquatic plants are excluded. Soil properties and features affecting wetland plants are texture of the surface layer, wetness, reaction, salinity, slope, and surface stoniness. Examples of wetland plants are smartweed, wild millet, wildrice, rushes, sedges, and reeds.

Shallow water areas have an average depth of less than 5 feet. Some are naturally wet areas. Others are created by dams, levees, or other water-control structures. Soil properties and features affecting shallow water areas are depth to bedrock, wetness, surface stoniness, slope, and permeability. Examples of shallow water areas are marshes, waterfowl feeding areas, and ponds.

The habitat for various kinds of wildlife is described in the following paragraphs.

Habitat for openland wildlife consists of cropland, pasture, meadows, and areas that are overgrown with grasses, herbs, shrubs, and vines. These areas produce grain and seed crops, grasses and legumes, and wild herbaceous plants. Wildlife attracted to these areas include bobwhite quail, mourning dove, sandhill crane, meadowlark, field sparrow, cottontail, and fox.

Habitat for wetland wildlife consists of open, marshy or swampy shallow water areas. Some of the wildlife attracted to such areas are ducks, geese, herons, and shore birds.

Habitat for rangeland wildlife consists of areas of shrubs and wild herbaceous plants. Wildlife attracted to rangeland include white-tailed deer, jackrabbit, meadowlark, bobcat, badger, javelina, coyote, wild hogs, and wild turkey.

Engineering

This section provides information for planning land uses related to urban development and to water management. Soils are rated for various uses, and the most limiting features are identified. Ratings are given for building site development, sanitary facilities, construction materials, and water management. The ratings are based on observed performance of the soils and on the estimated data and test data in the “Soil Properties” section.

Information in this section is intended for land use planning, for evaluating land use alternatives, and for planning site investigations prior to design and construction. The information, however, has limitations. For example, estimates and other data generally apply only to that part of the soil within a depth of 5 or 6 feet. Because of the map scale, small areas of different soils may be included within the mapped areas of a specific soil.

The information is not site specific and does not eliminate the need for onsite investigation of the soils or for testing and analysis by personnel experienced in the design and construction of engineering works.

Government ordinances and regulations that restrict certain land uses or impose specific design criteria were not considered in preparing the information in this section. Local ordinances and regulations should be considered in planning, in site selection, and in design.

Soil properties, site features, and observed performance were considered in determining the ratings in this section. During the fieldwork for this soil survey, determinations were made about grain-size distribution, liquid limit, plasticity index, soil reaction, depth to bedrock, hardness of bedrock within 5 or 6 feet of the surface, soil wetness, depth to a seasonal high water table, slope, likelihood of flooding, natural soil structure aggregation, and soil density. Data were collected about kinds of clay minerals, mineralogy of the sand and silt fractions, and the kinds of adsorbed cations. Estimates were made for erodibility, permeability, corrosivity, shrink-swell potential, available water capacity, and other behavioral characteristics affecting engineering uses.

This information can be used to evaluate the potential of areas for residential, commercial, industrial, and recreational uses; make preliminary estimates of construction conditions; evaluate alternative routes for roads, streets, highways, pipelines, and underground cables; evaluate alternative sites for sanitary landfills, septic tank absorption fields, and sewage lagoons; plan detailed onsite investigations of soils and geology; locate potential sources of gravel, sand, earthfill, and topsoil; plan drainage systems, irrigation systems, ponds, terraces, and other structures for soil and water conservation; and predict performance of proposed small structures and pavements by comparing the performance of existing similar structures on the same or similar soils.

The information in the tables, along with the soil maps, the soil descriptions, and other data provided in this survey, can be used to make additional interpretations.

Some of the terms used in this soil survey have a special meaning in soil science and are defined in the “Glossary.”

Building Site Development

Table 10 shows the degree and kind of soil limitations that affect shallow excavations, dwellings with and without basements, small commercial buildings, local roads and streets, and lawns and landscaping. The limitations are considered *slight* if soil properties and site features are generally favorable for the indicated use and limitations are minor and easily overcome; *moderate* if soil properties or site features are not favorable for the indicated use and special planning, design, or maintenance is needed to overcome or minimize the limitations; and *severe* if soil properties or site features are so unfavorable or so difficult to overcome that special design, significant increases in construction costs, and possibly increased maintenance are required. Special feasibility studies may be required where the soil limitations are severe.

Shallow excavations are trenches or holes dug to a maximum depth of 5 or 6 feet for basements, graves, utility lines, open ditches, and other purposes. The ratings are based on soil properties, site features, and observed performance of the soils. The ease of digging, filling, and compacting is affected by the depth to bedrock, a cemented pan, or a very firm dense layer; stone content; soil texture; and slope. The time of the year that excavations can be made is affected by the depth to a seasonal high water table and the susceptibility of the soil to flooding. The resistance of the excavation walls or banks to sloughing or caving is affected by soil texture and depth to the water table.

Dwellings and *small commercial buildings* are structures built on shallow foundations on undisturbed soil. The load limit is the same as that for single-family dwellings no higher than three stories. Ratings are made for small commercial buildings without basements, for dwellings with basements, and for dwellings without basements. The ratings are based on soil properties, site features, and observed performance of the soils. A high water table, flooding, shrinking and swelling, and organic layers can cause the movement of footings. A high water table, depth to bedrock or to a cemented pan, large stones, slope, and flooding affect the ease of excavation and construction. Landscaping and grading that require cuts and fills of more than 5 or 6 feet are not considered.

Local roads and streets have an all-weather surface and carry automobile and light truck traffic all year. They have a subgrade of cut or fill soil material; a base of gravel, crushed rock, or stabilized soil material; and a flexible or rigid surface. Cuts and fills are generally limited to less than 6 feet. The ratings are based on soil properties, site features, and observed performance of the soils. Depth to bedrock or to a cemented pan, a high water table, flooding, large stones, and slope affect the ease of excavating and grading. Soil strength (as inferred from the engineering classification of the soil), shrink-swell potential, and depth to a high water table affect the traffic-supporting capacity.

Lawns and landscaping require soils on which turf and ornamental trees and shrubs can be established and maintained. The ratings are based on soil properties, site features, and observed performance of the soils. Soil reaction, a high water table, depth to bedrock or to a cemented pan, the available water capacity in the upper 40 inches, and the content of salts, sodium, and sulfidic materials affect plant growth. Flooding, wetness, slope, stoniness, and the amount of sand, clay, or organic matter in the surface layer affect trafficability after vegetation is established.

Sanitary Facilities

Table 11 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 11 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 11 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 11 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 12 gives information about the soils as a source of roadfill, sand, gravel, and topsoil. The soils are rated *good, fair,* or *poor* as a source of roadfill and topsoil. They are rated as a *probable* or *improbable* source of sand and gravel. The ratings are based on soil properties and site features that affect the removal of the soil and its use as construction material. Normal compaction, minor processing, and other standard construction practices are assumed. Each soil is evaluated to a depth of 5 or 6 feet.

Roadfill is soil material that is excavated in one place and used in road embankments in another place. In this table, the soils are rated as a source of roadfill for low embankments, generally less than 6 feet high and less exacting in design than higher embankments.

The ratings are for the soil material below the surface layer to a depth of 5 or 6 feet. It is assumed that soil layers will be mixed during excavating and spreading. Many soils have layers of contrasting suitability within their profile. The table showing engineering index properties provides detailed information about each soil layer. This information can help to determine the suitability of each layer for use as roadfill. The performance of soil after it is stabilized with lime or cement is not considered in the ratings.

The ratings are based on soil properties, site features, and observed performance of the soils. The thickness of suitable material is a major consideration. The ease of excavation is affected by large stones, a high water table, and slope. How well the soil performs in place after it has been compacted and drained is determined by its strength (as inferred from the engineering classification of the soil) and shrink-swell potential.

Soils rated *good* contain significant amounts of sand or gravel or both. They have at least 5 feet of suitable material, a low shrink-swell potential, few cobbles and stones, and slopes of 15 percent or less. Depth to the water table is more than 3 feet. Soils rated *fair* are more than 35 percent silt- and clay-sized particles and have a plasticity index of less than 10. They have a moderate shrink-swell potential, slopes of 15 to 25 percent, or many stones. Depth to the water table is 1 to 3 feet. Soils rated *poor* have a plasticity index of more than 10, a high shrink-swell potential, many stones, or slopes of more than 25 percent; or they are wet and have a water table at a depth of less than 1 foot. They may have layers of suitable material, but the material is less than 3 feet thick.

Sand and *gravel* are natural aggregates suitable for commercial use with a minimum of processing. They are used in many kinds of construction. Specifications for each use vary widely. In table 12, 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 13 gives information on the soil properties and site features that affect water management. The degree and kind of soil limitations are given for pond reservoir areas; embankments, dikes, and levees. The limitations are considered *slight* if soil properties and site features are generally favorable for the indicated use and limitations are minor and are easily overcome; *moderate* if soil properties or site features are not favorable for the indicated use and special planning, design, or maintenance is needed to overcome or minimize the limitations; and *severe* if soil properties or site features are so unfavorable or so difficult to overcome that special design, significant increase in construction costs, and possibly increased maintenance are required.

This table also gives for each soil the restrictive features that affect drainage, irrigation, terraces and diversions, and grassed waterways.

Pond reservoir areas hold water behind a dam or embankment. Soils best suited to this use have low seepage potential in the upper 60 inches. The seepage potential is determined by the permeability of the soil and the depth to fractured bedrock or other permeable material. The underlying material is not rated and should be evaluated during an onsite investigation. Excessive slope can affect the storage capacity of the reservoir area.

Embankments, dikes, and levees are raised structures of soil material, generally less than 20 feet high, constructed to impound water or to protect land against overflow. In this table, the soils are rated as a source of material for embankment fill. The ratings apply to the soil material below the surface layer to a depth of about 5 feet. It is assumed that soil layers will be uniformly mixed and compacted during construction.

The ratings do not indicate the ability of the natural soil to support an embankment. Soil properties to a depth even greater than the height of the embankment can affect performance and safety of the embankment. Generally, deeper onsite investigation is needed to determine these properties.

Soil material in embankments must be resistant to seepage, piping, and erosion and have favorable compaction characteristics. Unfavorable features include less than 5 feet of suitable material and a high content of stones or boulders, organic matter, or salts or sodium. A high water table affects the amount of usable material. It also affects trafficability.

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. The data and the estimates of soil and water features, listed in tables, are explained on the following pages.

Soil properties are determined by field examination of the soils and by laboratory index testing of some benchmark soils. Established standard procedures are followed. During the survey, many shallow borings are made and examined to identify and classify the soils and to delineate them on the soil maps. Samples are taken from some typical profiles and tested in the laboratory to determine grain-size distribution, plasticity, and compaction characteristics.

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 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 14 gives estimates of the engineering classification and of the range of index properties for the major layers of each soil in the survey area. Most soils have layers of contrasting properties within the upper 5 or 6 feet.

Depth to the upper and lower boundaries of each layer is indicated. The range in depth and information on other properties of each layer are given for each soil series under the heading “Soil Series and Their Morphology.”

Texture is given in the standard terms used by the U.S. Department of Agriculture. These terms are defined according to percentages of sand, silt, and clay in the fraction of the soil that is less than 2 millimeters in diameter. “Loam,” for example, is soil that is 7 to 27 percent clay, 28 to 50 percent silt, and less than 52 percent sand. If the content of particles coarser than sand is as much as about 15 percent, an appropriate modifier is added, for example, “gravelly.” Textural terms are defined in the Glossary.

Classification of the soils is determined according to the Unified soil classification system *(2)* and the system adopted by the American Association of State Highway and Transportation Officials *(1)*.

The Unified system classifies soils according to properties that affect their use as construction material. Soils are classified according to grain-size distribution of the fraction less than 3 inches in diameter and according to plasticity index, liquid limit, and organic matter content. Sandy and gravelly soils are identified as GW, GP, GM, GC, SW, SP, SM, and SC; silty and clayey soils as ML, CL, OL, MH, CH, and OH; and highly organic soils as PT. Soils exhibiting engineering properties of two groups can have a dual classification, for example, CL-ML.

The AASHTO system classifies soils according to those properties that affect roadway construction and maintenance. In this system, the fraction of a mineral soil that is less than 3 inches in diameter is classified in one of seven groups from A-1 through A-7 on the basis of grain-size distribution, liquid limit, and plasticity index. Soils in group A-1 are coarse grained and low in content of fines (silt and clay). At the other extreme, soils in group A-7 are fine grained. Highly organic soils are classified in group A-8 on the basis of visual inspection.

If laboratory data are available, the A-1, A-2, and A-7 groups are further classified as A-1-a, A-1-b, A-2-4, A-2-5, A-2-6, A-2-7, A-7-5, or A-7-6. As an additional refinement, the suitability of a soil as subgrade material can be indicated by a group index number. Group index numbers range from 0 for the best subgrade material to 20 or higher for the poorest. The AASHTO classification for soils tested, with group index numbers in parentheses, is given in table 14.

Rock fragments larger than 10 inches in diameter and 3 to 10 inches in diameter are indicated as a percentage of the total soil on a dry-weight basis. The percentages are estimates determined mainly by converting volume percentage in the field to weight percentage.

Percentage (of soil particles) passing designated *sieves* is the percentage of the soil fraction less than 3 inches in diameter based on an ovendry weight. The sieves, numbers 4, 10, 40, and 200 (USA Standard Series), have openings of 4.76, 2.00, 0.420, and 0.074 millimeters, respectively. Estimates are based on laboratory tests of soils sampled in the survey area and in nearby areas and on estimates made in the field.

Liquid limit and *plasticity index* (Atterberg limits) indicate the plasticity characteristics of a soil. The estimates are based on test data from the survey area or from nearby areas and on field examination.

The estimates of grain-size distribution, liquid limit, and plasticity index are generally rounded to the nearest 5 percent. Thus, if the ranges of gradation and Atterberg limits extend a marginal amount (1 or 2 percentage points) across classification boundaries, the classification in the marginal zone is omitted in the table.

Physical and Chemical Properties

Table 15 shows estimates of some characteristics and features that affect soil behavior. These estimates are given for the major layers of each soil in the survey area. The estimates are based on field observations and on test data for these and similar soils.

Clay as a soil separate consists of mineral soil particles that are less than 0.002 millimeter in diameter. In this table, the estimated clay content of each major soil layer is given as a percentage, by weight, of the soil material that is less than 2 millimeters in diameter.

The amount and kind of clay greatly affect the fertility and physical condition of the soil. They determine the ability of the soil to adsorb cations and to retain moisture. They influence shrink-swell potential, permeability, plasticity, the ease of soil dispersion, and other soil properties. The amount and kind of clay in a soil also affect tillage and earthmoving operations.

Moist bulk density is the weight of soil (ovendry) per unit volume. Volume is measured when the soil is at field moisture capacity, that is, the moisture content at $^{1}/_{3}$-bar moisture tension. Weight is determined after drying the soil at 105 degrees C. In this table, the estimated moist bulk density of each major soil horizon is expressed in grams per cubic centimeter of soil material that is less than 2 millimeters in diameter. Bulk density data are used to compute shrink-swell potential, available water capacity, total pore space, and other soil properties. The moist bulk density of a soil indicates the pore space available for water and roots. A bulk density of more than 1.6 can restrict water storage and root penetration. Moist bulk density is influenced by texture, kind of clay, content of organic matter, and soil structure.

Permeability refers to the ability of a soil to transmit water or air. The estimates indicate the rate of downward movement of water when the soil is saturated. They are based on soil characteristics observed in the field, particularly structure, porosity, and texture. Permeability is considered in the design of soil drainage systems and septic tank absorption fields.

Available water capacity refers to the quantity of water that the soil is capable of storing for use by plants. The capacity for water storage is given in inches of water per inch of soil for each major soil layer. The capacity varies, depending on soil properties that affect the retention of water and the depth of the root zone. The most important properties are the content of organic matter, soil texture, bulk density, and soil structure. Available water capacity is an important factor in the choice of plants or crops to be grown and in the design and management of irrigation systems. Available water capacity is not an estimate of the quantity of water actually available to plants at any given time.

Soil reaction is a measure of acidity or alkalinity and is expressed as a range in pH values. The range in pH of each major horizon is based on many field tests. For many soils, values have been verified by laboratory analyses. Soil reaction is important in selecting crops and other plants, in evaluating soil amendments for fertility and stabilization, and in determining the risk of corrosion.

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.

Shrink-swell potential is the potential for volume change in a soil with a loss or gain in moisture. Volume change occurs mainly because of the interaction of clay minerals with water and varies with the amount and type of clay minerals in the soil. The size of the load on the soil and the magnitude of the change in soil moisture content influence the amount of swelling of soils in place. Laboratory measurements of swelling of undisturbed clods were made for many soils. For others, swelling was estimated on the basis of the kind and amount of clay minerals in the soil and on measurements of similar soils.

If the shrink-swell potential is rated moderate to very high, shrinking and swelling can cause damage to buildings, roads, and other structures. Special design is often needed.

Shrink-swell potential classes are based on the change in length of an unconfined clod as moisture content is increased from air-dry to field capacity. The classes are *low*, a change of less than 3 percent; *moderate*, 3 to 6 percent; *high*, more than 6 percent; and *very high*, greater than 9 percent.

Erosion factor K indicates the susceptibility of a soil to sheet and rill erosion by water. Factor K is one of six factors used in the Universal Soil Loss Equation (USLE) to predict the average annual rate of soil loss by sheet and rill erosion in tons per acre per year. The estimates are based primarily on percentage of silt, sand, and organic matter (up to 4 percent) and on soil structure and permeability. Values of K for soils in Karnes County range from 0.10 to 0.43. Other factors being equal, the higher the value, the more susceptible the soil is to sheet and rill erosion by water.

Erosion factor T is an estimate of the maximum average annual rate of soil erosion by wind or water that can occur without affecting crop productivity over a sustained period. The rate is in tons per acre per year.

Wind erodibility groups are made up of soils that have similar properties affecting their resistance to wind erosion in cultivated areas. The groups indicate the susceptibility of soil to wind erosion. 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.

Organic matter is the plant and animal residue in the soil at various stages of decomposition. In table 15, the estimated content of organic matter is expressed as a percentage, by weight, of the soil material that is less than 2 millimeters in diameter.

The content of organic matter in a soil can be maintained or increased by returning crop residue to the soil. Organic matter affects the available water capacity, infiltration rate, and tilth. It is a source of nitrogen and other nutrients for crops.

Soil and Water Features

Table 16 gives estimates of various soil and water features. The estimates are used in land use planning that involves engineering considerations.

Hydrologic soil groups are based on estimates of runoff potential. Soils are assigned to one of four groups according to the rate of water infiltration when the soils are not protected by vegetation, are thoroughly wet, and receive precipitation from long-duration storms.

The four hydrologic soil groups are:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of 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.

Flooding, the temporary inundation of an area, is caused by overflowing streams, by runoff from adjacent slopes, or by tides. Water standing for short periods after rainfall or snowmelt is not considered flooding, and water standing in swamps and marshes is considered ponding rather than flooding.

Table 16 gives the frequency and duration of flooding and the time of year when flooding is most likely.

Frequency, duration, and probable dates of occurrence are estimated. Frequency is expressed as none, rare, occasional, and frequent. *None* means that flooding is not probable; *rare* that it is unlikely but possible under unusual weather conditions (the chance of flooding is nearly 0 percent to 5 percent in any year); *occasional* that it occurs, on the average, once or less in 2 years (the chance of flooding is 5 to 50 percent in any year); and *frequent* that it occurs, on the average, more than once in 2 years (the chance of flooding is more than 50 percent in any year). *Common* is used when the occasional and frequent classes are grouped for certain purposes. Duration is expressed as *very brief* if less than 2 days, *brief* if 2 to 7 days, *long* if 7 days to 1 month, and *very long* if more than 1 month. Probable dates are expressed in months. About two-thirds to three-fourths of all flooding occurs during the stated period.

The information is based on evidence in the soil profile, namely thin strata of gravel, sand, silt, or clay deposited by floodwater; irregular decrease in organic matter content with increasing depth; and little or no horizon development.

Also considered are local information about the extent and levels of flooding and the relation of each soil on the landscape to historic floods. Information on the extent of flooding based on soil data is less specific than that provided by detailed engineering surveys that delineate flood-prone areas at specific flood frequency levels.

High water table (seasonal) is the highest level of a saturated zone in the soil in most years. The estimates are based mainly on observations of the water table at selected sites and on the evidence of a saturated zone, namely grayish colors or mottles (redoximorphic features) in the soil. Indicated in table 16 are the depth to the seasonal high water table; the kind of water table—that is, perched, apparent, or artesian; and the months of the year that the water table commonly is high. A water table that is seasonally high for less than 1 month is not indicated in table 16.

An *apparent* water table is a thick zone of free water in the soil. It is indicated by the level at which water stands in an uncased borehole after adequate time is allowed for adjustment in the surrounding soil. A *perched* water table is water standing above an unsaturated zone. In places an upper, or perched, water table is separated from a lower one by a dry zone. An *artesian* water table is under hydrostatic head, generally below an impermeable layer. When this layer is penetrated, the water level rises in an uncased borehole.

Two numbers in the column showing depth to the water table indicate the normal range in depth to a saturated zone. Depth is given to the nearest half foot. The first numeral in the range indicates the highest water level. A plus sign preceding the range in depth indicates that the water table is above the surface of the soil. “More than 6.0” indicates that the water table is below a depth of 6 feet or that it is within a depth of 6 feet for less than a month.

Depth to bedrock is given if bedrock is within a depth of 5 feet. The depth is based on many soil borings and on observations during soil mapping. The rock is either soft or hard. If the rock is soft or fractured, excavations can be made with trenching machines, backhoes, or small rippers. If the rock is hard or massive, blasting or special equipment generally is needed for excavation.

A *cemented pan* is a cemented or indurated subsurface layer within a depth of 5 feet. Such a pan causes difficulty in excavation. Pans are classified as thin or thick. A thin pan is less than 3 inches thick if continuously indurated or less than 18 inches thick if discontinuous or fractured. Excavations can be made by trenching machines, backhoes, or small rippers. A thick pan is more than 3 inches thick if continuously indurated or more than 18 inches thick if discontinuous or fractured. Such a pan is so thick or massive that blasting or special equipment is needed in excavation.

Risk of corrosion pertains to potential soil-induced electrochemical or chemical action that dissolves or weakens uncoated steel or concrete. The rate of corrosion of uncoated steel is related to such factors as soil moisture, particle-size distribution, acidity, and electrical conductivity of the soil. The rate of corrosion of concrete is based mainly on the sulfate and sodium content, texture, moisture content, and acidity of the soil. Special site examination and design may be needed if the combination of factors results in a severe hazard of corrosion. The steel in installations that intersect soil boundaries or soil layers is more susceptible to corrosion than steel in installations that are entirely within one kind of soil or within one soil layer.

For uncoated steel, the risk of corrosion, expressed as *low, moderate,* or *high,* is based on soil drainage class, total acidity, electrical resistivity near field capacity, and electrical conductivity of the saturation extract.

For concrete, the risk of corrosion is also 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 17. The results of chemical analysis are given in table 18, and the results of clay mineralogy analysis in table 19. The data are for soils sampled at carefully selected sites. Unless otherwise indicated, the pedons are typical of the series unless otherwise indicated. They are described in the section “Soil Series and Their Morphology.” Soil samples were analyzed by the National Soil Survey Laboratory, Natural Resources Conservation Service, Lincoln, Nebraska, and Soil Characterization Laboratory, Texas Agricultural Experiment Station, College Station, Texas.

Most determinations, except those for grain-size analysis and bulk density, were made on soil material smaller than 2 millimeters in diameter. Measurements reported as percent or quantity of unit weight were calculated on an ovendry basis. The methods used in obtaining the data are indicated in the list that follows. The codes in parentheses refer to published methods *(18)*.

Sand—(0.05-2.0 mm fraction) weight percentages of material less than 2 mm (3A1).

Silt—(0.002-0.05 mm fraction) pipette extraction, weight percentages of all material less than 2 mm (3A1).

Clay—(fraction less than 0.002 mm) pipette extraction, weight percentages of material less than 2 mm (3A1).

Water retained—pressure extraction, percentage of ovendry weight of less than 2 mm material; 1/3 or 1/10 bar (4B1), 15 bars (4B2).

Moist bulk density—of less than 2 mm material, saran-coated clods (4A1).

Organic carbon—dichromate, ferric sulfate titration (6A1a).

Exchangeable sodium percentage (ESP)—ammonium acetate pH 7.0 (5D2).

Extractable cations—ammonium acetate pH 7.0, uncorrected; calcium (6N2), magnesium (6O2), sodium (6P2), potassium (6Q2).

Extractable acidity—barium chloride-triethanolamine II (6H2a).

Cation-exchange capacity—ammonium acetate, pH 7.0 (5A6a).

Base saturation—ammonium acetate, pH 7.0 (5C1).

Reaction (pH)—1:1 water dilution (8C1a).

Reaction (pH)—calcium chloride (8C1e).

Electrical conductivity—saturation extract (8A1a).

Sodium adsorption ratio (5E).

Clay minerology—(7A2)

Classification of the Soils

The system of soil classification used by the National Cooperative Soil Survey has six categories *(17)*. 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 shows the classification of the soils in the survey area. The categories are defined in the following paragraphs.

ORDER. Twelve soil orders are recognized. The differences among orders reflect the dominant soil-forming processes and the degree of soil formation. Each order is identified by a word ending in *sol*. An example is Mollisol.

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 Ustoll (*Ust*, meaning dryness, plus *oll*, from Mollisol).

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 Argiustolls (*Arg*, meaning having a layer of clay accumulation, plus *ustolls*, the suborder of the Mollisols that has an ustic moisture regime).

SUBGROUP. Each great group has a typic subgroup. Other subgroups are intergrades or extragrades. The typic subgroup is the central concept of the great group; it is not necessarily the most extensive. Intergrades are transitions to other orders, suborders, or great groups. Extragrades have some properties that are not representative of the great group but do not indicate transitions to any other taxonomic class. Each subgroup is identified by one or more adjectives preceding the name of the great group. The adjective *Typic* identifies the subgroup that typifies the great group. An example is Typic Argiustolls.

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, mixed, hyperthermic Typic Argiustolls.

SERIES. The series consists of soils within a family that have horizons similar in color, texture, structure, reaction, consistence, mineral and chemical composition, and arrangement in the profile. An example is the Weesatche series, which is a member of the fine-loamy, mixed, hyperthermic family of Typic Argiustolls.

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”*(20)*. Many of the technical terms used in the descriptions are defined in “Soil Taxonomy” *(17)* and in “Keys to Soil Taxonomy” *(19)*. 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.

The map units of each soil series are described in the section “Detailed Soil Map Units.”

Bryde Series

The Bryde series consists of deep soils underlain by weakly consolidated sandstone (fig. 15). These well drained, slowly permeable soils are on gently sloping uplands. They formed in loamy and clayey sediments over thinly interbedded, weakly consolidated sandstone. Slopes range from 1 to 4 percent.

The soils of this series are fine, montmorillonitic, hyperthermic Vertic Paleustalfs.

Typical pedon of Bryde fine sandy loam, 1 to 4 percent slopes; from the intersection of Texas Highway 119 and Texas Highway 80 in Gillett, 4.4 miles southeast on Texas Highway 119, 0.8 mile east on county road, and 0.3 mile north in rangeland. Latitude is 29 degrees 06 minutes 57 seconds North; longitude is 97 degrees 42 minutes 06 seconds West. Elevation is 420 feet above sea level.

A—0 to 9 inches; grayish brown (10YR 5/2) fine sandy loam, very dark grayish brown (10YR 3/2) moist; massive; very hard, very friable, nonsticky, nonplastic; common fine and few medium roots; few fine tubular pores; few wormcasts; slightly acid; abrupt wavy boundary.

Bt1—9 to 17 inches; dark gray (10YR 4/1) clay, very dark gray (10YR 3/1) moist; moderate medium prismatic structure parting to moderate medium and coarse angular blocky; extremely hard, extremely firm, very sticky, very plastic; common fine roots; few fine tubular pores; few wormcasts; common thick faint continuous black clay films; common prominent pressure faces; fine sand and silt coating on tops of prisms; neutral; gradual wavy boundary.

Bt2—17 to 25 inches; dark gray (10YR 4/1) clay, very dark gray (10YR 3/1) moist; weak coarse prismatic structure parting to moderate medium angular blocky; extremely hard, extremely firm, very sticky, very plastic; common fine roots; few fine tubular pores; few cracks; common thick faint continuous black clay films; common prominent pressure faces; few small slickensides; few wedge-shape peds; few fine rounded siliceous pebbles; slightly alkaline; gradual wavy boundary.

Bt3—25 to 35 inches; dark gray (10YR 4/1) sandy clay, very dark gray (10 YR 3/1) moist; weak medium and coarse prismatic structure parting to moderate medium angular blocky; very hard, very firm, very sticky, very plastic; common fine roots; few fine tubular pores; common thick faint continuous black clay films; common distinct pressure faces; few small slickensides; slightly alkaline; gradual wavy boundary.

Btk—35 to 41 inches; grayish brown (10YR 5/2) clay loam, dark grayish brown (10YR 4/2) moist; weak medium prismatic structure parting to weak fine and medium angular blocky; hard, firm, sticky, plastic; few fine roots; few fine tubular pores; common thick distinct continuous dark grayish brown clay films; few distinct pressure faces; few fine and medium masses of calcium carbonate; slightly alkaline; gradual wavy boundary.

Bt/2Cr— 41 to 47 inches; grayish brown (2.5Y 5/2) sandy clay loam, dark grayish brown (2.5Y 4/2) moist; weak fine and medium angular blocky structure; hard, firm, slightly sticky and slightly plastic; few fine roots; few very fine tubular pores; few thick faint discontinuous dark grayish brown clay films on vertical faces of peds; about 40 percent 2Cr horizon material of weakly consolidated sandstone that has fine sandy loam texture; slightly alkaline; clear smooth boundary.

2Cr—47 to 80 inches; light gray (5Y 7/2) weakly consolidated sandstone that has texture of fine sandy loam, pale olive (5Y 6/3) moist; massive; very hard, friable, nonsticky, nonplastic; few very fine roots; dark grayish brown Bt horizon material coats some of the horizontal and vertical fractures in the upper part; Bt material is as much as 2.0 inches in diameter and 0.5 inch thick with weak fine subangular blocky structure; few fine and medium yellow stains in 2Cr horizon material; neutral.

The solum is 40 to 60 inches thick. Depth to calcium carbonate in the form of threads, films, and masses ranges from 18 to 40 inches. COLE averages between 0.07 and 0.16 in the Bt horizon and PLE of the upper 50 inches is more than 2.5 inches. When the soil is dry, cracks as much as 0.5 inch wide extend to a depth of 20 inches or more.

The A horizon is in shades of gray or brown in hue of 10YR, value of 3 to 5, and chroma of 1 to 3. Some pedons have as much as 2 percent siliceous pebbles. Some pedons have a thin sandy clay loam BA horizon in hue of 10YR, value of 3, and chroma of 1 or 2. The organic matter content ranges from 0.4 to less than 2 percent. Reaction is slightly acid or neutral.

The Bt horizons are in shades of black, brown, or gray in hue of 10YR, value of 2 to 5, and chroma of 1 to 3. These horizons are clay or sandy clay. Some pedons have brown mottles. Reaction is neutral or slightly alkaline.

The Btk horizon is in shades of black, gray, or brown in hue of 10YR, value of 2 to 5, and chroma of 1 or 2. This horizon is clay, sandy clay, or clay loam. Some pedons have brown mottles. Films, threads or masses of calcium carbonate range up to 4 percent . Reaction is slightly alkaline or moderately alkaline.

The Bt/2Cr horizon is in shades of gray or brown in hue of 10YR or 2.5Y, value of 3 to 6, and chroma 1 to 4. The Bt part of the horizon is clay, sandy clay, clay loam, or sandy clay loam. The 2Cr part is weakly consolidated sandstone that has texture of fine sandy loam or very fine sandy loam. Some pedons have mottles in shades of yellow, gray, black, or brown. Films, threads and masses of calcium carbonate and pockets of salt and gypsum crystals range up to 10 percent . Gravel-size fragments of shale range up to 15 percent . This horizon is calcareous in some pedons. Reaction is slightly alkaline or moderately alkaline.

The 2Cr horizon is in shades of gray, brown or white and is weakly consolidated sandstone. This horizon is fine sandy loam or very fine sandy loam. Some pedons have soft shale or shale thinly interbedded with weakly consolidated sandstone. Some pedons have as much as 5 percent films, threads, and masses of calcium carbonate and pockets of salt crystals. Reaction ranges from neutral to moderately alkaline.

Buchel Series

The Buchel series consists of very deep, moderately well drained, very slowly permeable soils that formed in clayey, calcareous alluvium. These soils are on nearly level flood plains. Slopes are less than 1 percent.

The soils of the Buchel series are fine, montmorillonitic, hyperthermic Typic Pellusterts.

Typical pedon of Buchel clay, occasionally flooded; from the intersection of Texas Highway 72 and Farm Road 792 in Kenedy, 1.1 miles north on Farm Road 792 to intersection with unpaved county road, 6.1 miles east on county road, and 100 feet north in cropland. Latitude is 28 degrees 53 minutes 50 seconds North; longitude is 97 degrees 46 minutes 15 seconds West. Elevation is 230 feet above sea level.

Ap—0 to 6 inches; dark gray (10YR 4/1) clay, very dark gray (10YR 3/1) moist; weak very fine granular structure; very hard, friable, very sticky, very plastic; many very fine and fine roots throughout; common very fine and fine tubular pores; few snail shell fragments; strongly effervescent; moderately alkaline; abrupt smooth boundary.

A—6 to 16 inches; dark gray (10YR 4/1) clay, very dark gray moist; moderate coarse angular blocky structure parting to moderate very fine angular blocky; very hard, very firm, very sticky, very plastic; many very fine and fine roots between peds; common very fine and fine tubular pores; few snail shell fragments; few pressure faces; strongly effervescent; moderately alkaline; gradual smooth boundary.

Bss1—16 to 42 inches; dark gray (10YR 4/1) clay, very dark gray (10YR 3/1) moist; moderate coarse angular blocky structure parting to moderate fine angular blocky; very hard, very firm, very sticky, very plastic; common very fine and fine roots between peds; common very fine and fine tubular pores; few snail shell fragments; few very dark gray (10YR 3/1) intersecting slickensides; common medium pressure faces; few cracks 0.5 to 1.0 inch wide; common medium very dark gray masses of iron-manganese; strongly effervescent; moderately alkaline; gradual wavy boundary.

Bss2—42 to 60 inches; grayish brown (10YR 5/2) clay, dark grayish brown (10YR 4/2) moist; moderate coarse angular blocky structure; very hard, very firm, very sticky, very plastic; common very fine and fine roots between peds; common very fine and fine tubular pores; few snail shell fragments; common very dark gray (10YR 3/1) worm krotovina; common dark grayish brown (10YR 4/2) slickensides; few fine rounded masses of iron-manganese; strongly effervescent; moderately alkaline; gradual wavy boundary.

Bkss—60 to 77 inches; pale brown (10YR 6/3) clay, brown (10YR 5/3) moist; common fine faint grayish brown (10YR 5/2) and few yellowish brown (10YR 5/4) mottles; weak coarse angular blocky structure parting to weak fine angular blocky; few very fine and fine roots between peds; common very fine and fine tubular pores; few grayish brown (10YR 5/2) slickensides; common fine cylindrical threads of calcium carbonate; few fine rounded masses of calcium carbonate; few fine rounded masses of iron-manganese; strongly effervescent; moderately alkaline; gradual wavy boundary.

B´ss—77 to 80 inches; pale brown (10YR 6/3) clay, brown (10YR 5/3) moist; common fine and medium faint brown (10YR 5/2) mottles; weak medium angular blocky structure parting to weak fine angular blocky; very hard, very firm, very sticky, very plastic; few very fine and fine roots between peds; common very fine and fine tubular pores; few snail shell fragments; few very dark gray (10YR 3/1) worm krotovina; few grayish brown (10YR 5/2) slickensides; few fine rounded masses of carbonate; strongly effervescent; moderately alkaline.

The solum is more than 60 inches thick. It is clay or silty clay that has a clay content of 40 to 60 percent. Reaction is slightly or moderately alkaline throughout. Slickensides are at a depth of 8 to 30 inches. When dry, cracks as much as 1.5 inches wide extend to a depth of more than 20 inches.

The Ap or A horizon is in shades of black, brown, or gray in hue of 10YR, value of 2 to 4, and chroma of 1 or 2, or N 2/0.

The Bss horizons are in shades of black, gray, or brown, in hue of 10YR, value of 2 to 5, and chroma of

1 or 2. These horizons have few to common slickensides and few or common fine rounded masses of iron-manganese.

The Bkss horizon is in shades of gray or brown in hue of 10YR, value of 3 to 6, and chroma of 1 to 3. This horizon has none to common fine brown and gray mottles, few to common intersecting slickensides, and few to common fine rounded masses of iron-manganese and calcium carbonate.

The B’ss horizon is in shades of gray or brown in hue of 10YR, value of 4 to 7, and chroma of 1 to 4. This horizon has slickensides that range from few to common and has none to common fine brown mottles.

Clareville Series

The Clareville series consists of very deep, well drained, moderately slowly permeable soils that formed in ancient alluvial sediments. These soils are on nearly level stream terraces. Slopes range from 0 to 1 percent.

The soils of the Clareville series are fine, montmorillonitic, hyperthermic Pachic Argiustolls.

Typical pedon of Clareville clay loam, 0 to 1 percent slopes; from the intersection of U.S. 181 and Texas Highway 72 in Kenedy, 10 miles south on U.S. 181 to intersection with Farm Road 743, 1.6 miles east on Farm Road 743 to private ranch road, 0.6 mile north and then 0.4 mile west on ranch road, 250 feet south in pasture. Latitude is 28 degrees 40 minutes 59 seconds North; longitude is 97 degrees 48 minutes West. Elevation is 403 feet above sea level.

A—0 to 10 inches; black (10YR 2/1) clay loam, black (10YR 2/1) moist; weak fine and medium subangular blocky structure; hard, friable, sticky, plastic; common fine roots throughout; few fine discontinuous tubular pores; neutral; clear smooth boundary.

Bt1—10 to 19 inches; black (10YR 2/1) clay, black (10YR 2/1) moist; weak fine prismatic structure parting to moderate fine and medium angular blocky; very hard, very firm, very sticky, very plastic; common fine roots throughout; common fine discontinuous tubular pores; very few black (10YR 2/1) continuous clay films (cutans) throughout; few fine rounded wormcasts; neutral; gradual wavy boundary.

Bt2—19 to 33 inches; black (10YR 2/1) clay, black (10YR 2/1) moist; moderate medium prismatic structure parting to moderate medium angular blocky; very hard, very firm, very sticky, very plastic; few fine roots throughout; common fine discontinuous tubular pores; very few black (10YR 2/1) continuous clay films (cutans) throughout; few fine rounded wormcasts; neutral; gradual wavy boundary.

Btk—33 to 43 inches; very dark gray (10YR 3/1) clay, very dark gray (10YR 3/1) moist; weak fine prismatic structure parting to moderate fine and medium angular blocky; very hard, very firm, very sticky, very plastic; few fine roots throughout; few fine discontinuous tubular pores; very few black (10YR 2/1) patchy clay films (cutans) throughout; few fine threads and films of calcium carbonate; moderately alkaline; gradual wavy boundary.

Bk1—43 to 56 inches; grayish brown (10YR 5/2) clay loam, dark grayish brown (10YR 4/2) moist; moderate medium angular blocky structure; hard, firm, moderately sticky, moderately plastic; few fine roots throughout; few fine discontinuous tubular pores; few fine threads and common fine and medium masses of calcium carbonate; slightly effervescent; moderately alkaline; gradual wavy boundary.

Bk2—56 to 64 inches; pale brown (10YR 6/3) clay loam, brown (10YR 5/3) moist; few fine faint brown to dark brown (10YR 4/3) mottles; weak fine and medium subangular blocky structure; hard, firm, moderately sticky, moderately plastic; few fine roots throughout; few fine discontinuous tubular pores; common fine and medium masses of calcium carbonate; strongly effervescent; moderately alkaline; gradual wavy boundary.

BCk—64 to 80 inches; very pale brown (10YR 8/4) sandy clay loam, very pale brown (10YR 7/4) moist; weak fine subangular blocky structure; hard, firm, slightly sticky, slightly plastic; very dark gray material in small pockets in upper part; common fine and medium masses and fine rounded concretions of calcium carbonate; moderately alkaline; strongly effervescent.

The solum thickness ranges from 60 to 80 inches thick. Depth to secondary carbonates is 28 to 35 inches. The mollic epipedon is 20 to 40 inches thick.

The A horizon is in shades of black, gray, or brown in hue of 10YR, value of 2 or 3, and chroma of 1 or 2. Reaction is neutral or slightly alkaline.

The Bt horizon is in shades of black, gray, or brown in hue of 10YR, value of 2 to 4, and chroma of 1 to 3. It is noncalcareous clay, clay loam, or sandy clay. Reaction is neutral or slightly alkaline. Some pedons have as much as 10 percent fine concretions or masses of calcium carbonate.

The Btk or Bk horizon is in shades of black, gray, or brown in hue of 10YR, value of 3 to 6, and chroma of 1 to 4. It is noncalcareous clay, clay loam, or sandy clay. Reaction is moderately alkaline. It has as much as 15 percent fine concretions or masses of calcium carbonate.

The BCk horizon is in shades of gray or brown in hue of 10YR, value of 5 to 8, and chroma of 2 to 4. It is calcareous sandy clay loam or clay loam. Reaction is moderately alkaline. It has as much as 15 percent fine concretions or masses of calcium carbonate. Some pedons do not have a BCk horizon.

Some pedons have a C horizon that is in shades of white, gray, or brown, in hue of 10YR, value of 4 to 8, and chroma of 2 to 4. It is calcareous sandy clay loam, clay loam, or clay. Reaction is moderately alkaline. It has as much as 15 percent fine and medium concretions and masses of calcium carbonate.

Colibro Series

The Colibro series consists of very deep, well drained, moderately permeable soils on gently sloping to strongly sloping uplands. These soils formed in calcareous loamy material on ancient alluvial terraces. Slopes range from 3 to 12 percent.

The soils of the Colibro series are fine-loamy, carbonatic, hyperthermic Typic Ustochrepts.

Typical pedon of Colibro sandy clay loam, 3 to 5 percent slopes; from the intersection of Farm Road 791 and Farm Road 887, west 1.2 miles on Farm Road 791, and 100 feet north in pasture. Latitude is 28 degrees 57 minutes 31 seconds North; longitude is 98 degrees 2 minutes 35 seconds West. Elevation is 340 feet above sea level.

A—0 to 9 inches; dark grayish brown (10YR 5/2) sandy clay loam, dark grayish brown (10YR 4/2) moist; weak fine subangular blocky structure parting to weak fine granular; slightly hard, friable, slightly sticky, slightly plastic; common fine roots throughout; few fine and medium tubular pores; few snail shell fragments; violently effervescent; moderately alkaline; clear smooth boundary.

Bk1—9 to 17 inches; brown (10YR 5/3) sandy clay loam, dark brown (10YR 4/3) moist; weak fine subangular blocky structure; slightly hard, friable, slightly sticky, slightly plastic; few fine roots throughout; few fine and medium tubular pores; few snail shell fragments; common fine films and threads, few fine masses and concretions of calcium carbonate; violently effervescent; moderately alkaline; gradual smooth boundary.

Bk2—17 to 34 inches; light yellowish brown (10YR 6/4) sandy clay loam, yellowish brown (10YR 5/4) moist; weak fine subangular blocky structure; slightly hard, friable, slightly sticky, slightly plastic; few fine roots throughout; few fine tubular pores; common fine films, threads, and masses of calcium carbonate, few fine and medium rounded concretions of calcium carbonate; violently effervescent; moderately alkaline; gradual smooth boundary.

Bk3—34 to 56 inches; very pale brown (10YR 7/4) fine sandy loam, yellowish brown (10YR 5/4) moist; weak fine subangular blocky structure parting to weak fine granular; loose, very friable, nonsticky, nonplastic; many fine roots throughout; common fine and medium rounded calcium carbonate concretions, common fine threads and masses of calcium carbonate; violently effervescent; moderately alkaline, gradual smooth boundary.

2C—56 to 80 inches; very pale brown (10YR 7/4) loamy fine sand, light yellowish brown (10YR 6/4) moist; single grain; loose, nonsticky, nonplastic; violently effervescent, moderately alkaline.

The solum is 40 to 60 inches thick. Calcium carbonate equivalent average is 40 to 75 percent, but ranges from 30 to 75 percent. Reaction is moderately alkaline.

The A horizon is in shades of gray or brown in hue of 10YR, value of 4 to 6, and chroma of 2 to 4. It has as much as 2 percent fine threads, masses, or concretions of calcium carbonate.

The Bk horizon is in shades of brown in hue 10YR, value of 5 to 7, and chroma of 3 or 4. It is fine sandy loam, loam, or sandy clay loam. It has as much as 10 percent fine threads, masses, or concretions of calcium carbonate. Some pedons have a BCk horizon that has the same textures and colors of the Bk horizon.

The 2C horizon is very pale brown or light yellowish brown in hue of 10YR, value of 6 to 8, and chroma of 3 or 4. It is loamy fine sand, fine sandy loam, or loam. Some pedons have as much as 10 percent fine threads, masses, or concretions of calcium carbonate.

Condido Series

The Condido series consists of soils that are shallow to a petrocalcic horizon. They are well drained, very slowly permeable soils that formed in clayey sediments over noncalcareous siltstone interbedded with layers of calcium carbonate. These soils are on nearly level to very gently sloping uplands. Slopes range from 0 to 2 percent.

The soils of the Condido series are clayey, montmorillonitic, hyperthermic, shallow Petrocalcic Paleustolls.

Typical pedon of Condido clay, 0 to 2 percent slopes; from the intersection of U.S. Highway 181 and Farm Road 99 in Karnes City, 8.2 miles west on Farm Road 99 to county road in Coy City, 3 miles north on county road, and 0.5 mile northeast in pasture. Latitude is 28 degrees 51 minutes 10 seconds North; longitude is 98 degrees 03 minutes 57 seconds West. Elevation is 465 feet above sea level.

A1—0 to 6 inches; black (10YR 2/1) clay, black (10YR 2/1) moist; moderate medium angular blocky structure; very hard, very firm, very sticky, very plastic; many very fine roots; few very fine and fine tubular pores; noncalcareous; neutral; abrupt smooth boundary.

A2—6 to 15 inches; very dark gray (10YR 3/1) clay, very dark gray (10YR 3/1) moist; strong medium angular blocky structure; very hard, very firm, very sticky, very plastic; few fine roots; few very fine and fine tubular pores; noncalcareous; neutral; abrupt wavy boundary.

A3—15 to 18 inches; very dark gray (10YR 3/1) gravelly clay, very dark gray (10YR 3/1) moist; strong fine and medium angular blocky structure; very hard, very firm, very sticky, very plastic; about 20 percent white (10 YR 8/1) platelike fragments 0.25 to 1.0 inch across in the lower part, noncalcareous soil material, strongly effervescent fragments; moderately alkaline; abrupt wavy boundary.

Bkm—18 to 24 inches; white (10YR 8/1) strongly cemented caliche, very pale brown (10YR 8/3) moist; massive; laminar cap 0.25 to 0.50 inch thick; many very fine and fine roots matted on surface of laminar cap; calcium carbonates decrease in lower part; violently effervescent; moderately alkaline; gradual wavy boundary.

BCk—24 to 40 inches; very pale brown (10YR 8/3) weakly consolidated, calcareous siltstone that has silt loam texture, pale brown (10YR 6/3) moist; massive; calcium carbonate equivalent is 35 percent; about 25 percent films and threads of calcium carbonate along horizontal beds, about 10 percent masses of calcium carbonate; violently effervescent; moderately alkaline; gradual wavy boundary.

2Cr— 40 to 80 inches; very pale brown (10YR 8/3) weakly consolidated siltstone that has silt loam texture; massive; few threads and films of calcium carbonate; moderately alkaline.

The solum is clay that is 10 to 20 inches thick over a petrocalcic horizon. Clay content in the A horizon ranges from 40 to 55 percent.

The A1 and A2 horizons are black to dark grayish brown in hue of 10YR, value of 2 to 4, and chroma of 1 or 2, or N 2/0. Reaction is neutral or slightly alkaline.

The A3 horizon is black, very dark gray, dark grayish brown, or grayish brown in hue of 10YR, value of 2 to 5, and chroma of 1 or 2, or N 2/0. It has 15 to 25 percent angular and platelike caliche fragments. Fragments are 0.125 to 1.0 inch wide and 0.125 to 0.5 inch thick and 0.25 to 1.5 inches long. Some of these fragments slake in water. Reaction is slightly alkaline or moderately alkaline. Some pedons do not have an A3 horizon.

The Bkm horizon is moderately or strongly cemented caliche interbedded with noncalcareous siltstone in the lower part. The Bk horizon is light gray, very pale brown, pink, light brown, or white in hue of 10YR or 7.5YR, value of 6 to 8, and chroma of 1 to 4. It has a laminar cap that is 0.125 to 1.5 inches thick. Reaction is slightly alkaline or moderately alkaline.

The BCk horizon has hue of 7.5YR, 10YR, or 2.5Y, value of 7 or 8, and chroma of 0 to 3. It is silt loam or loam. This layer slakes in water. Calcium carbonate films, threads, and masses range from 5 to 35 percent. The films and threads are as much as 0.5 inch thick and are 0.5 to 8.0 inches apart and decrease in the lower part. Calcium carbonate equivalent ranges from 15 to 45 percent.

The 2Cr horizon is in shades of gray, brown, pink, or white in hue of 7.5YR, 10YR, or 2.5Y; value of 6 to 8; and chroma of 2 to 4. It is weakly consolidated siltstone that has silt loam or loam texture. This material slakes in water. Some pedons have soft layers of calcium carbonate accumulations within bedded layers. They range from thin films to 0.5 inch thick seams, mainly in the upper part of the horizon.

Conquista Series

The Conquista series consists of very deep, well drained, very slowly permeable reclaimed mine soils. They are forming from loamy materials that were reconstructed from uranium mining operations. The original surface layer was removed, stockpiled, and then replaced during the reclamation process. These soils are on gently sloping to steep uplands. Slopes range from 1 to 40 percent.

The soils of the Conquista series are fine-loamy, mixed, hyperthermic Entic Haplustolls.

Typical pedon of Conquista clay, 20 to 40 percent slopes; from the intersection of Farm Road 81 and Texas Highway 80 in Helena, 0.7 mile north on Texas Highway 80 to intersection with county road, 0.85 mile west, north and west on county road, and 240 feet southwest in pasture. Latitude is 28 degrees 58 minutes 20 seconds North; longitude is 97 degrees 49 minutes 45 seconds West. Elevation is 365 feet above sea level.

Ap—0 to 12 inches; black (10YR 2/1) clay, black (10YR 2/1) moist; weak fine and medium subangular blocky structure; many medium and coarse faint dark gray (10YR 4/1) and very dark gray (10YR 3/1) and few medium distinct brownish gray (10YR 5/2) spots; extremely hard, extremely firm, very sticky, very plastic; common medium and many very fine and fine roots; common very fine tubular pores; few pressure faces; strongly effervescent; moderately alkaline; abrupt smooth boundary.

2C—12 to 80 inches; pinkish white (5YR 8/2) gravelly loam, pink (7.5YR 7/4) moist; massive; slightly hard, very friable, slightly sticky, plastic; few very fine roots; common fine and coarse masses of calcium carbonate; 30 percent hard siltstone fragments from 0.25 to 3.0 inches across; strongly effervescent; moderately alkaline.

Rooting depth ranges from 60 to more than 80 inches. A few areas are highly compacted because of the high traffic of heavy mining equipment. Roots have difficulty penetrating the compacted layers. The clay content of the control section ranges from 18 to 35 percent silicate clay. Some of the coarse fragments of shale and siltstone slake readily in water. Fragments of hard shale and sandstone larger than 3 inches across range from none to few.

The A horizon ranges from black to dark grayish brown in hue of 10YR, value 2 to 4, and chroma 1 or 2. Clay content ranges from 40 to 55 percent. The A horizon is 10 to 16 inches thick. A few masses of calcium carbonate are in some pedons. Coarse fragments of soft shale, siltstone, or siliceous pebbles are as much as 5 percent in some pedons. The A horizon is calcareous, noncalcareous, or mixed after the reclamation process. Reaction is slightly alkaline or moderately alkaline.

The 2C horizon ranges from pinkish white to light gray in hue of 5YR to 2.5Y, value 6 to 8, and chroma 2 to 4. It is loam, very fine sandy loam, sandy clay loam, or their gravelly counterparts. Coarse fragments consisting of weakly to strongly cemented siltstone and sandstone 0.25 to 3.0 inches across range from 5 to 35 percent. The interior of most coarse fragments is noncalcareous. The SAR is less than 8. Reaction is moderately alkaline or strongly alkaline.

Coy Series

The Coy series consists of very deep, well drained, very slowly permeable soils that developed in clayey marine shale. These soils are on nearly level to gently sloping uplands. Slopes range from 0 to 5 percent.

The soils of the Coy series are fine, montmorillonitic, hyperthermic, Vertic Argiustolls.

Typical pedon of Coy clay loam, 1 to 3 percent slopes; from the intersection of U.S. Highway 181 and Texas Highway 72 in Kenedy, 11.5 miles west on Texas Highway 72 to Farm Road 626, 1.1 mile north on Farm Road 626, and 50 feet east in cultivated land. Latitude is 28 degrees 43 minutes 01 seconds North; longitude is 97 degrees 59 minutes 41 seconds West. Elevation is 445 feet above sea level.

Ap—0 to 6 inches; very dark gray (10YR 3/1) clay loam, very dark gray (10YR 3/1) moist; weak fine subangular blocky structure; hard, firm, sticky, plastic; common fine roots throughout; many very fine and fine tubular pores; few snail shell fragments; slightly effervescent; moderately alkaline; clear smooth boundary.

Bt1—6 to 25 inches; very dark gray (10YR 3/1) clay, very dark gray (10YR 3/1) moist; weak fine and medium prismatic structure parting to moderate medium angular blocky; very hard, very firm, very sticky, very plastic; few fine roots throughout; few very fine and fine tubular pores; few snail shell fragments; very few distinct very dark gray (10YR 3/1) slickensides, very few pressure faces, few continuous clay films (cutans); strongly effervescent; moderately alkaline; gradual wavy boundary.

Bt2—25 to 38 inches; dark grayish brown (10YR 4/2) clay, very dark grayish brown (10YR 3/2) moist; moderate fine and medium prismatic structure parting to moderate medium angular blocky; very hard, very firm, very sticky, very plastic; few fine roots throughout; few very fine and fine tubular pores; few snail shell fragments; very few distinct very dark grayish brown (10YR 3/2) discontinuous slickensides, few pressure faces; few cracks 0.5 inch wide; continuous clay films (cutans); few fine masses of calcium carbonate; strongly effervescent; moderately alkaline; gradual wavy boundary.

Bky—38 to 47 inches; grayish brown (10YR 5/2) clay, dark grayish brown (10YR 4/2) moist; moderate fine and medium angular blocky structure; very hard, very firm, very sticky, very plastic; common fine and medium masses of brownish yellow material throughout; few faint discontinuous pressure faces; distinct patchy clay films (cutans); common fine and medium plate-like gypsum crystals; few fine and medium masses of calcium carbonate; strongly effervescent; moderately alkaline; gradual wavy boundary.

BCky—47 to 80 inches; very pale brown (10YR 7/4) clay, light yellowish brown (10YR 6/4) moist; weak medium angular blocky structure; very hard, very firm, very sticky, very plastic; few fine masses of brownish yellow material in upper part; common medium and coarse masses of calcium carbonate; few fine gypsum crystals; violently effervescent; moderately alkaline.

The solum is 60 to 80 inches thick. Reaction is moderately alkaline. Clay content in the control section ranges from 35 to 55 percent. When dry, cracks as much as 2 inches wide extend to a depth of more than 40 inches.

The A horizon is in shades of black, gray, or brown in hue of 10YR, value of 2 or 3, and chroma of 1 or 2. In some pedons, the upper part of the horizon is noncalcareous.

The Bt horizon is in shades of black, gray, or brown in hue of 10YR, value of 3 to 5, and chroma of 1 to 4. It is clay, sandy clay, or clay loam. Calcium carbonate concretions and masses range from 0 to 10 percent.

The Bk horizon is in shades of gray or brown in hue of 10YR, value of 5 to 7, and chroma of 2 to 4. It is clay, sandy clay, or clay loam. Fine crystals of gypsum range up to 5 percent. Calcium carbonate concretions and masses range up to 15 percent. Some pedons do not have a Bk horizon.

The BC horizon is mottled in shades of gray or brown in hue of 10YR, value of 5 to 7, and chroma of 2 to 4. It is clay or silty clay. Fine crystals of gypsum range up to 10 percent. Calcium carbonate concretions and masses range up to 20 percent.

Denhawken Series

The Denhawken series consists of very deep, well drained, very slowly permeable soils that formed in clay weathered from shale. These very gently sloping soils are on uplands. Slopes range from 1 to 3 percent.

The soils of the Denhawken series are fine, montmorillonitic, hyperthermic Vertic Ustochrepts.

Typical pedon of Denhawken sandy clay loam, from an area of Elmendorf-Denhawken complex, 1 to 3 percent slopes; from the intersection of Texas Highway 119 and Texas Highway 123 in Gillett, 7.5 miles east on Texas Highway 119 to intersection with county road, 0.7 mile north and 1.8 miles east on county road to private ranch road, 0.3 mile north on ranch road, and 100 feet north in improved pasture. Latitude is 29 degrees 05 minutes 42 seconds North; longitude is 97 degrees 38 minutes 09 seconds West. Elevation is 530 feet above sea level.

A—0 to 7 inches; dark gray (10YR 4/1) sandy clay loam, dark grayish brown (10YR 4/2) moist; weak fine subangular blocky structure; hard, friable, slightly sticky, slightly plastic; common fine roots throughout; few fine tubular pores; common snail shell fragments; few fine rounded calcium carbonate concretions; violently effervescent; moderately alkaline; clear smooth boundary.

Bk1—7 to 18 inches; grayish brown (10YR 5/2) clay, grayish brown (10YR 5/2) moist; weak fine and medium subangular blocky structure; very hard, very firm, very sticky, very plastic; few fine roots throughout; few fine tubular pores; few streaks of dark grayish brown (10YR 4/2) material along vertical cracks; few faint pressure faces on faces of peds; few fine and medium irregular calcium carbonate concretions; violently effervescent; moderately alkaline; gradual wavy boundary.

Bk2—18 to 54 inches; light gray (10YR 7/2) clay, light brownish gray (10YR 6/2) moist; common wedge-shape peds tilted at 15 to 35 degrees from horizontal parting to moderate fine and medium angular blocky structure; extremely hard, extremely firm, very sticky, very plastic; few fine roots throughout; few distinct pressure faces on faces of peds, few cracks 0.5 inch wide; few faint manganese or iron-manganese stains throughout; common fine and medium irregular masses and concretions of calcium carbonate; violently effervescent; moderately alkaline; gradual wavy boundary.

BCkyz—54 to 80 inches; light gray (2.5Y 7/2) clay, light brownish gray (2.5Y 6/2) moist; few fine and medium faint yellow (10YR 7/6) mottles; weak fine angular blocky structure; extremely hard, extremely firm, sticky, plastic; very few distinct iron stains throughout; few calcium carbonate coatings on faces of peds; common medium and coarse irregular masses of calcium carbonate; few fine gypsum crystals; violently effervescent; moderately alkaline.

The solum is 60 to 80 inches thick. Clay content in the 10- to 40-inch control section ranges from 40 to 50 percent. When dry, cracks as much as 1 inch wide extend to a depth of 25 to 45 inches. Linear extensibility ranges from 2.4 to 2.6 inches to a depth of 40 inches. Reaction is slightly alkaline or moderately alkaline.

The A horizon is dark gray or dark grayish brown in hue of 10YR or 2.5Y, value of 4, and chroma of 1 or 2. Some pedons have a very dark gray A horizon that is less than 10 inches thick. Some pedons are noncalcareous in the upper part.

The B horizon is in shades of gray or brown in hue of 10YR or 2.5Y, value of 5 to 7, and chroma of 2 to 6. It has as much as 20 percent fine and medium masses of calcium carbonate. Some pedons have as much as 2 percent small slickensides.

The BC horizon is grayish brown, light brownish gray or light gray in hue of 2.5Y, value of 5 to 7, and chroma of 2. It is weathered shale that has clay texture and is calcareous. It has as much as 10 percent pockets, threads, and crystals of gypsum. It has as much as 20 percent fine and medium masses of calcium carbonate.

Devine Series

The Devine series consists of very deep, well drained, moderately slowly permeable soils on gently sloping stream terraces. They formed in thick beds of sand and gravel sediments. Slopes range from 1 to 4 percent.

The soils of the Devine series are clayey-skeletal, mixed, hyperthermic, Typic Paleustalfs.

Typical pedon of Devine very gravelly fine sandy loam, 1 to 4 percent slopes; from the intersection of Texas Highway 119 and Texas Highway 80 in Gillett, 5.5 miles east on Texas Highway 119 to county road, 1.5 miles northeast and 0.1 mile southeast on county road, and 50 feet west in rangeland. Latitude is 29 degrees 06 minutes 50 seconds North; longitude is 97 degrees 40 minutes 50 seconds West. Elevation is 475 feet above sea level.

A1—0 to 13 inches; dark reddish brown (5YR 3/4) very gravelly fine sandy loam, dark reddish brown (2.5YR 2.5/4) moist; weak fine granular structure; hard, very friable, nonsticky, nonplastic; common fine roots; contains about 35 percent rounded siliceous pebbles; slightly acid; gradual smooth boundary.

A2—13 to 22 inches; reddish brown (5YR 4/4) very gravelly sandy loam, reddish brown (2.5YR 4/4) moist; weak fine granular structure; hard, very friable, nonsticky, nonplastic; few fine roots; contains about 60 percent rounded siliceous pebbles; about 1 percent cobbles; slightly acid; abrupt smooth boundary.

Bt1—22 to 42 inches; red (2.5YR 4/6) very gravelly clay, red (2.5YR 4/6) moist; weak fine and medium angular blocky structure; extremely hard, extremely firm, very sticky, very plastic; few fine roots; about 45 percent rounded gravel; about 5 percent cobbles; common thick continuous clay films on faces of peds; slightly acid; gradual wavy boundary.

Bt2—42 to 60 inches; red (2.5YR 4/6) very gravelly clay, red (2.5YR 4/6) moist: moderate fine and medium angular blocky structure; extremely hard, extremely firm, very sticky, very plastic; few fine roots; about 50 percent rounded gravel; about 5 percent cobbles; common thick continuous clay films on faces of peds; slightly acid; gradual wavy boundary.

Bt3—60 to 80 inches; red (2.5YR 5/8) gravelly sandy clay loam, red (2.5YR 5/8) moist; moderate fine and medium angular blocky structure; hard, firm, slightly sticky, slightly plastic; very few fine roots; about 20 percent rounded gravel; about 5 percent cobbles; common patchy clay films on faces of peds; slightly acid.

The solum is more than 80 inches thick. Reaction is slightly acid or neutral.

The A horizon is reddish brown or dark reddish brown in hue of 2.5YR or 5YR, value of 2.5 to 4, and chroma of 2 to 4. Gravel ranges from 35 to 60 percent; cobbles range from 0 to 2 percent.

The Bt horizon is in shades of red, yellow, or brown in hue of 10R, 2.5YR, or 5YR, value of 4 to 6, and chroma of 4 to 8. It is very gravelly sandy clay or very gravelly clay. Gravel ranges from 35 to 55 percent; cobbles range from 0 to 5 percent. Some pedons have common brown or yellow mottles.

Some pedons have a BCt horizon that is strong brown in hue of 7.5YR, value of 5, and chroma of 6. It is gravelly sandy clay loam. Gravel ranges from 15 to 30 percent and is made up of sandstone fragments. Some pedons have yellow or red sandy clay loam in the lower part.

Ecleto Series

The Ecleto series consists of soils that are shallow over weakly cemented sandstone (fig. 16). They are well drained, slowly permeable soils on gently sloping uplands. They formed in clayey materials over thick beds of sandstone or sandstone interbedded with siltstone or shale. Slopes range from 1 to 5 percent.

The soils of the Ecleto series are clayey, montmorillonitic, hyperthermic shallow Typic Argiustolls.

Typical pedon of Ecleto sandy clay loam, 1 to 3 percent slopes; from the intersection of Texas Highway 80 and Texas Highway 119 in Gillett, 4.4 miles south on Texas Highway 119 to county road, 400 feet east on county road, and 400 feet north in rangeland. Latitude is 29 degrees 06 minutes 35 seconds North; longitude is 97 degrees 43 minutes 29 seconds West. Elevation is 435 feet above sea level.

A—0 to 3 inches; dark grayish brown (10YR 4/2) sandy clay loam, very dark grayish brown (10YR 3/2) moist; weak fine and medium angular blocky structure; hard, firm, sticky, plastic; many fine roots; common fine pores; few insect tunnels and castings; neutral; abrupt smooth boundary.

Bt1—3 to 14 inches; very dark gray (10YR 3/1) sandy clay, black (10YR 2/1) moist; strong fine and medium angular blocky structure; very hard, very firm, very sticky, very plastic; many fine roots; common fine pores; common thin clay films on faces of peds; few insect tunnels and castings; neutral; clear smooth boundary.

Bt2—14 to 18 inches; dark gray (10YR 4/1) gravelly sandy clay, very dark gray (10YR 3/1) moist; strong medium angular blocky structure; very hard, very firm, sticky, plastic; common fine roots; few fine pores; common thin clay films on faces of peds; few insect tunnels and castings; about 30 percent white, weakly cemented sandstone fragments mainly 0.5 to 1.5 inches across; moderately alkaline; abrupt smooth boundary.

Cr—18 to 60 inches; white (10YR 8/2) weakly cemented, coarsely fractured sandstone, light gray (10YR 7/2) moist; soft, brittle; can be dug with sharpshooter and auger; moderately alkaline; interbedded with a few thin strata of white (10YR 8/1) calcium carbonate; noncalcareous; moderately alkaline.

The solum is 10 to 20 inches thick.

The A horizon ranges from very dark brown to very dark gray in hue of 10YR, value of 2 to 4, and chroma of 1 or 2. As much as 10 percent hardened sandstone fragments. Reaction ranges from slightly acid to slightly alkaline.

The Bt1 horizon ranges from very dark gray to grayish brown in hue of 10YR, value of 2 to 6, and chroma of 1 to 3. It is clay, sandy clay, or clay loam with clay content of 35 to 45 percent. It may have as much as 14 percent hardened sandstone fragments. Fine calcium carbonate concretions and masses range from 0 to 2 percent in the lower part. Reaction ranges from slightly acid to moderately alkaline.

The Bt2 horizon ranges from very dark gray to grayish brown in hue of 10YR, value of 3 to 5, and chroma of 1 or 2. It is clay, gravelly sandy clay, clay loam, or gravelly clay loam that has clay content of 35 to 42 percent. Weakly cemented sandstone fragments make up 15 to 35 percent. Fine and medium calcium carbonate concretions and masses range from 0 to 10 percent. Reaction is slightly alkaline or moderately alkaline. Some pedons do not have a Bt2 horizon.

The Cr horizon is weakly cemented gray to very pale brown sandstone in hue of 10YR, value of 6 to 8, and chroma of 1 to 3, or weakly cemented sandstone interbedded with light gray, very pale brown, or white shale or siltstone and thin strata of white calcium carbonate.

Elmendorf Series

The Elmendorf series consists of very deep, well drained, very slowly permeable soils on very gently sloping uplands. These soils formed in calcareous clayey marine shales. Slopes are 1 to 3 percent.

The soils of the Elmendorf series are fine, montmorillonitic, hyperthermic, Vertic Argiustolls.

Typical pedon of Elmendorf sandy clay loam, from an area of Elmendorf-Denhawken complex, 1 to 3 percent slopes; from the intersection of Texas Highway 119 and Texas Highway 123 in Gillett, 7.5 miles east on Texas Highway 119 to intersection with county road, 0.7 mile north and 1.8 miles east on county road to private ranch road, 0.3 mile north on ranch road, and 100 feet north in improved pasture. Latitude is 29 degrees 05 minutes 42 seconds North; longitude is 97 degrees 38 minutes 09 seconds West. Elevation is 530 feet above sea level.

A—0 to 7 inches; very dark gray (10YR 3/1) sandy clay loam, black (10YR 2/1) moist; weak fine subangular blocky structure; slightly hard, friable, slightly sticky, slightly plastic; common fine roots throughout; common fine tubular pores; few fine and medium irregular calcium carbonate concretions; slightly alkaline; clear smooth boundary.

Bt1—7 to 22 inches; black (10YR 2/1) clay loam, black (10YR 2/1) moist; weak fine and medium angular blocky structure; hard, firm, sticky, plastic; few fine roots throughout; few fine tubular pores; common continuous clay films (cutans) on faces of peds; few fine irregular calcium carbonate concretions; moderately alkaline; clear smooth boundary.

Btk1—22 to 34 inches; dark gray (10YR 4/1) clay, very dark gray (10YR 3/1) moist; common wedge-shape peds parting to moderate fine and medium angular blocky structure; very hard, very firm, very sticky, very plastic; few fine roots throughout; few fine tubular pores; common continuous clay films (cutans) on faces of peds; distinct pressure faces on faces of peds; few cracks 0.5 inch wide; few thin calcium carbonate coatings; few fine rounded calcium carbonate concretions; strongly effervescent; moderately alkaline; clear smooth boundary.

Btk2—34 to 48 inches; grayish brown (10YR 5/2) clay, dark grayish brown (10YR 4/2) moist; weak fine and medium angular blocky structure; very hard, very firm, very sticky, very plastic; many fine roots throughout; few snail shell fragments; very few continuous clay films (cutans) on ped surfaces;

distinct pressure faces on faces of peds; common fine and medium irregular masses of calcium carbonate, few fine irregular calcium carbonate concretions; strongly effervescent; moderately alkaline; gradual smooth boundary.

BCky—48 to 59 inches; light gray (10YR 7/2) clay, light brownish gray (10YR 6/2) moist; common fine and medium distinct yellowish brown (10YR 5/6) mottles; weak fine subangular blocky structure; extremely hard, extremely firm, very sticky, very plastic; few streaks of dark grayish brown material along vertical faces of peds; few fine rounded calcium carbonate concretions; common fine and medium irregular masses of calcium carbonate; common fine irregular gypsum crystals; strongly effervescent; moderately alkaline; gradual smooth boundary.

Cky—59 to 80 inches; pale yellow (2.5Y 7/4) marine shale that has clay texture, light yellowish brown (2.5Y 6/4) moist; few fine faint yellowish brown mottles; massive; extremely hard, extremely firm; common medium and coarse irregular masses of calcium carbonate; common fine irregular gypsum crystals; violently effervescent; moderately alkaline.

The solum is 60 to 100 inches thick. When dry, cracks as much as 1.5 inches wide extend to a depth of 22 inches. Linear extensibility ranges from 2.4 to 2.6 to a depth of 40 inches. Depth to secondary carbonates ranges from 16 to 36 inches.

The A horizon is black, very dark gray, or very dark grayish brown in hue of 10YR, value of 2 or 3, and chroma of 1 or 2. Reaction is neutral or slightly alkaline.

The Bt horizon is black or very dark gray in hue of 10YR, value of 2 or 3, and chroma of 1. It is clay or clay loam that has a clay content that ranges from 35 to 50 percent. Reaction is neutral to moderately alkaline.

The Btk horizon is in shades of black, gray, or brown in hue of 10YR, value of 4 or 5, and chroma of 1 to 4. Clay content ranges from 40 to 50 percent. This horizon has as much as 10 percent fine or medium masses and concretions of calcium carbonate. Reaction is slightly alkaline or moderately alkaline. Some pedons have a few small slickensides.

The BCky horizon is in shades of gray or brown in hue of 10YR and 2.5Y, value of 5 or 6, and chroma of 1 to 4. Clay content ranges from 40 to 55 percent. This horizon has as much as 10 percent fine or medium masses and concretions of calcium carbonate. Reaction is moderately alkaline

The Cky horizon is light brownish gray, light gray, or pale yellow in hue of 2.5Y, value of 6 or 7, and chroma of 2 to 4. It is shale or shale interbedded with thin layers of weakly consolidated sandstone. It has as much as 10 percent fine or medium masses and concretions of calcium carbonate. This horizon has yellowish brown mottles and has as much as 20 percent fine gypsum crystals. Reaction is moderately alkaline.

Eloso Series

The Eloso series consists of soils that are moderately deep over siltstone (fig. 17). They are well drained, very slowly permeable clayey soils on gently sloping uplands. These soils formed from clayey sediments over noncalcareous weakly consolidated siltstone interbedded with thin layers of calcium carbonate. Slope ranges from 1 to 5 percent.

The soils of the Eloso series are fine montmorillonitic, hyperthermic Vertic Haplustolls.

Typical pedon of Eloso clay, 1 to 3 percent slopes; from the intersection of U.S. Highway 181 and Farm Road 99 in Karnes City, 8.2 miles west on Farm Road 99 to county road in Coy City, 2 miles north on county road, and 0.4 mile east in pasture. Latitude is 28 degrees 51 minutes 20 seconds North; longitude is 98 degrees 02 minutes 45 seconds West. Elevation is 495 feet above sea level.

Ap—0 to 5 inches; very dark gray (10YR 3/1) clay, black (10YR 2/1) moist; weak medium prismatic structure parting to weak medium subangular blocky; very hard, extremely firm, very sticky, very plastic; common fine roots; common fine tubular pores; few fine concretions of calcium carbonate; slightly alkaline; clear smooth boundary.

A—5 to 12 inches; very dark gray (10YR 3/1) clay, black (10 YR 2/1) moist; moderate medium prismatic structure parting to moderate medium and coarse subangular blocky; very hard, extremely firm, very sticky, very plastic; common fine roots; few fine and medium tubular pores; few faint pressure faces; few fine and medium concretions of calcium carbonate; slightly effervescent; slightly alkaline; gradual wavy boundary.

Bk—12 to 28 inches; dark gray (10YR 4/1) clay, very dark gray (10YR 3/1) moist; moderate coarse prismatic structure parting to moderate medium and coarse subangular blocky; very hard, extremely firm, very sticky, very plastic; common fine roots concentrated along vertical faces of peds; few fine and medium tubular pores; common rounded and platelike fragments and few fine masses of calcium carbonate; common black and very dark gray wormcasts; few small cracks;

common prominent pressure faces; few small slickensides; strongly effervescent; slightly alkaline; gradual wavy boundary.

BCk—28 to 37 inches; light gray (10YR 6/1) silty clay, gray (10YR 5/1) moist; weak medium and coarse prismatic structure parting to moderate fine subangular blocky; hard, very firm, sticky, plastic; common fine roots; few fine tubular pores; common fine very dark gray worm casts; few fine threads and coatings of calcium carbonate on vertical faces of peds; common fine and medium concretions of calcium carbonate; common prominent pressure faces; strongly effervescent; slightly alkaline; gradual wavy boundary.

2Cr—37 to 80 inches; white (10YR 8/2) noncalcareous weakly consolidated siltstone that has silt loam texture, light gray (10YR 7/2) moist; massive; few fine roots; common thick continuous coats of calcium carbonate along vertical cracks in upper part; distinct bedding planes; slightly alkaline.

The solum is 26 to 40 inches thick.

The A horizon is black, very dark gray, or dark grayish brown in hue of 10YR, value of 2 or 3, and chroma of 1 or 2. Matrix is calcareous except in a few pedons that are noncalcareous. Reaction is neutral or slightly alkaline.

The Bk horizon is black, very dark gray, or dark gray in hue of 10YR, value of 3 to 7, and chroma of 1 or 2. It is clay or silty clay. Some pedons have as much as 10 percent fine concretions, masses, films, and threads of calcium carbonate. A few pedons are noncalcareous. Reaction is slightly or moderately alkaline.

The BCk horizon is very dark gray, dark gray, light gray, or dark grayish brown in hue of 10YR or 2.5Y, value of 3 to 6, and chroma of 1 or 2. It is clay, clay loam, or silty clay. Some pedons have as much as 10 percent fine concretions, masses, films, and threads of calcium carbonate. Reaction is slightly alkaline or moderately alkaline.

The 2Cr horizon is light brownish gray, pale brown, very pale brown, or white in hue of 10YR or 2.5Y, value of 6 to 8, and chroma of 1 to 3. It is noncalcareous, weakly consolidated siltstone that has loam or silt loam texture interbedded with thin layers of calcium carbonate. Some pedons have as much as 5 percent fine concretions and masses of calcium carbonate in the upper part. Reaction is slightly alkaline or moderately alkaline.

Fashing Series

The Fashing series consists of well drained, slowly permeable soils that formed in clayey materials over thick beds of shale or interbedded shale and sandstone. These soils are shallow over sandstone and siltstone. They are on very gently sloping to gently sloping uplands. Slopes are 2 to 5 percent.

The soils of the Fashing series are clayey, montmorillonitic, hyperthermic shallow Entic Haplustolls.

Typical pedon of Fashing clay, 2 to 5 percent slopes; from the intersection of U.S. Highway 181 and Farm Road 887 in Falls City, 0.4 mile west on Farm Road 887, and 1400 feet north in pasture. Latitude is 29 degrees 59 minutes 10 seconds North; longitude is 98 degrees 02 minutes 06 seconds West. Elevation is 330 feet above sea level.

A1—0 to 6 inches; very dark gray (10YR 3/1) clay; weak fine subangular blocky structure; hard, firm, very sticky, very plastic; common fine roots throughout; common fine tubular pores; few siliceous pebbles; strongly effervescent; moderately alkaline; clear smooth boundary.

A2—6 to 12 inches; very dark gray (10YR 3/1) clay, very dark gray (10YR 3/1) moist; moderate fine and medium angular blocky structure; hard, firm, very sticky, very plastic; common fine roots throughout; few fine tubular pores; very few distinct patchy pressure faces on faces of peds; strongly effervescent; moderately alkaline; gradual smooth boundary.

BC—12 to 18 inches; very dark gray (10YR 3/1), and light gray (2.5Y 7/2) clay, very dark gray (10YR 3/1) and light brownish gray (2.5Y 6/2) moist; weak fine subangular blocky structure; hard, firm, very sticky, very plastic; few fine roots throughout; few fine masses of brownish yellow (10YR 6/8) material; C horizon material makes up 30 percent of BC horizon; few fine rounded masses of calcium carbonate; strongly effervescent; moderately alkaline; gradual smooth boundary.

2Cr—18 to 80 inches; light brownish gray (2.5Y 6/2) weakly cemented siltstone, grayish brown (2.5Y 5/2) moist; massive; very hard, extremely firm; few very dark gray (10YR 3/1) coatings on horizontal fractures; common coatings of brownish yellow (10YR 6/8) material; moderately alkaline.

The solum is 10 to 20 inches thick. It is clay throughout. Reaction is moderately alkaline.

The A horizon is very dark gray, or very dark grayish brown in hue of 10YR, value of 3, and chroma of 1 or 2. Some pedons have as much as 2 percent fine concretions of calcium carbonate.

The BC horizon is in shades of gray, brown, or black in hue of 10YR, value of 3 to 5, and chroma of 1. Some pedons have a C horizon in shades of white, gray, or brown.

The 2Cr horizon is in shades of white, gray, or brown in hue of 10YR or 2.5Y, value of 6 to 8, and chroma of 1 to 3. It is weakly cemented siltstone with thin layers of sandstone. Some pedons have as much as 15 percent fine masses or concretions of calcium carbonate.

Gillett Series

The Gillett series consists of soils that are moderately deep over sandstone. They are well drained, slowly permeable soils on very gently sloping to gently sloping uplands. They formed in loamy and clayey sediments over weakly consolidated sandstone. Slopes range from 1 to 4 percent.

The soils of the Gillett series are fine, montmorillonitic, hyperthermic Typic Paleustalfs.

Typical pedon of Gillett fine sandy loam, 1 to 4 percent slopes; from the intersection of Texas Highway 80 and Farm Road 887 in Gillett; 2.1 miles west on Farm Road 887 and 250 feet north in rangeland. Longitude is 29 degrees 07 minutes 10 seconds North; latitude is 97 degrees 48 minutes 50 seconds west. Elevation is 385 feet above sea level.

A—0 to 7 inches; grayish brown (10YR 5/2) fine sandy loam, very dark grayish brown (10YR 3/2) moist; massive; hard, firm, nonsticky, nonplastic; common fine roots; few fine tubular pores; slightly acid; abrupt wavy boundary.

Bt1—7 to 13 inches; dark brown (7.5YR 3/4) clay, dark brown (7.5YR 3/4) moist; common fine and medium distinct red (2.5YR 4/6) mottles; moderate medium and coarse prismatic structure parting to moderate medium and coarse angular blocky; extremely hard, extremely firm, very sticky, very plastic; common fine roots; common continuous brown clay films; common pressure faces; prisms capped with fine coatings of fine sand; slightly acid; clear wavy boundary.

Bt2—13 to 19 inches; reddish brown (5YR 4/4) clay, yellowish red (5YR 6/6) moist; common fine and medium faint red (2.5YR 4/6) mottles; moderate medium and coarse prismatic structure parting to moderate medium and coarse angular blocky; extremely hard, extremely firm, very sticky, very plastic; common fine roots; common pressure faces; common distinct, continuous dark brown clay films; vertical faces of peds coated with thin layer of fine sand; slightly acid; clear wavy boundary.

Btk—19 to 27 inches; brown (10YR 5/3) clay, dark brown (10YR 4/3) moist; moderate medium and coarse angular blocky structure; extremely hard, extremely firm, very sticky, very plastic; few fine roots; few pressure faces; common continuous dark brown clay films; common fine and medium masses of calcium carbonate; few fine concretions of calcium carbonate; few dark krotovinas; strongly effervescent; moderately alkaline; clear wavy boundary.

2BCtk—27 to 34 inches; light yellowish brown (10YR 6/4), gravelly sandy clay loam, yellowish brown (10YR 5/4) moist; weak fine subangular blocky structure; hard, firm, slightly sticky, slightly plastic; few fine roots; few thin discontinuous dark brown clay films; few fine and medium concretions of calcium carbonate; about 20 percent moderately cemented sandstone fragments coated with calcium carbonate; sandstone has common yellow streaks and spots; weakly effervescent; moderately alkaline; clear wavy boundary.

2Cr—34 to 80 inches; white (10YR 8/1) weakly consolidated sandstone that has texture of fine sandy loam, white (10YR 8/1) moist; massive; very hard; few strong brown stains on surface of 2Cr material at a depth of 34 to 40 inches; few fine and medium streaks and spots of yellow material at a depth of 34 to 38 inches; slightly alkaline.

The solum is 20 to 40 inches thick. Masses of calcium carbonate are between depths of 14 and 27 inches. Electrical conductivity ranges from 2 to 4 mmhos in lower part of the profile. Clay content of the control section ranges from 40 to 55 percent.

The A horizon is very dark brown, very dark grayish brown, dark brown, dark gray, dark grayish brown, brown, grayish brown, light brownish gray, or pale brown in hue of 10YR, value of 2 to 6, and chroma of 1 to 3. The surface is hard or very hard and massive when dry. Some pedons have as much as 5 percent siliceous pebbles and sandstone fragments as much as 5 inches across. Reaction is slightly acid or neutral.

The Bt1 horizon has colors in shades of brown in hue of 7.5YR or 10YR, value of 3 to 5, and chroma of 2 to 6. It is clay or sandy clay. Mottles are in shades of red, yellow, brown, or gray. Dark clay films and coatings are in most pedons. Reaction ranges from slightly acid to slightly alkaline.

The Bt2 horizon has colors in shades of red and brown in hue of 5YR, 7.5YR, or 10YR, value of 3 to 5, and chroma of 3 or 4. It is clay, sandy clay, clay loam, or sandy clay loam that has mottles in shades of red, yellow, and brown and a few films and threads of calcium carbonate. Reaction ranges from neutral to moderately alkaline.

The 2BCtk horizon is dark gray to very pale brown in hue of 10YR, value of 4 to 7, and chroma of 2 to 4. It is sandy clay, clay loam, or sandy clay loam or their gravelly counterparts that have mottles in shades of yellow or brown and a few masses of calcium carbonate. Some pedons contain pockets or clusters of salt, gypsum, other salts in the lower part. Reaction is slightly alkaline or moderately alkaline.

The 2Cr horizon is light gray or white in hue of 10YR, value of 7 or 8, and chroma of 1 or 2. The material is weakly consolidated sandstone that has fine sandy loam or very fine sandy loam texture. Some pedons have thin layers of weakly cemented sandstone or sandstone interbedded with thin platy layers of soft shale. Some pedons contain B horizon material in small pockets or channels and streaks and spots in shades of yellow and brown. Some pedons have a few masses of calcium carbonate. Reaction is neutral to moderately alkaline.

Imogene Series

The Imogene series consists of very deep, moderately well drained, very slowly permeable soils that formed in saline, calcareous sediments. These nearly level soils are on uplands and low stream terraces. Slopes range from 0 to 1 percent.

The soils of the Imogene series are fine-loamy, mixed, hyperthermic Mollic Natrustalfs.

Typical pedon of Imogene fine sandy loam, 0 to 1 percent slopes; from the intersection of Texas Highway 123 and Farm Road 887 in Pawelekville, 6.3 miles east on Farm Road 887, and 100 feet east in pasture. Latitude is 29 degrees 04 minutes 41 seconds North; longitude is 97 degrees 51 minutes 05 seconds West. Elevation is 325 feet above sea level.

A—0 to 8 inches; gray (10YR 5/1) fine sandy loam; very dark grayish brown (10YR 3/2) moist; massive; hard, firm, nonsticky, nonplastic; common fine roots throughout; few fine discontinuous tubular pores; few fine root channels; slightly acid; abrupt smooth boundary.

Btn—8 to 17 inches; very dark gray (10YR 3/1) sandy clay loam; very dark gray (10YR 3/1) moist; moderate medium columnar structure parting to moderate medium angular blocky; extremely hard, extremely firm, slightly sticky, slightly plastic; common fine roots throughout; few fine discontinuous tubular pores; very few distinct continuous clay films (cutans) on faces of peds; slightly alkaline; clear wavy boundary.

Btnz1—17 to 28 inches; grayish brown (10YR 5/2) sandy clay loam; dark grayish brown (10YR 4/2) moist; moderate fine and medium columnar structure parting to moderate medium angular blocky; very hard, very firm, slightly sticky, slightly plastic; few fine roots throughout; few fine discontinuous tubular pores; very few distinct patchy clay films (cutans) on faces of peds; few fine salt masses; slightly alkaline; gradual wavy boundary.

Btnz2—28 to 45 inches; light yellowish brown (10YR 6/4) sandy clay loam; pale brown (10YR 6/3) moist; moderate fine and medium angular blocky structure; very hard, very firm, slightly sticky, slightly plastic; few fine roots throughout; few fine discontinuous tubular pores; very few distinct patchy clay films (cutans) on faces of peds; common fine and medium salt masses; moderately alkaline; gradual wavy boundary.

BCnz—45 to 80 inches; light gray (2.5Y 7/2) sandy clay loam; light brownish gray (2.5Y 6/2) moist; weak medium subangular blocky structure; few fine streaks of Bt horizon material between depths of 45 and 48 inches; common fine and medium salt threads and masses; few fine rounded iron-manganese concretions; moderately alkaline.

The solum is 60 to 80 inches thick. Soil salinity ranges from 8 to 12 mmhos within a depth of 40 inches.

The A horizon is in shades of gray and brown in hue of 10YR, value of 3 to 5, and chroma of 1 to 3. Reaction is slightly acid or neutral. SAR and ESP range from 0 to 5.

The Btn horizon is in shades of black, gray, or brown in hue of 10YR, value of 3 or 4, and chroma of 1 or 2. It is sandy clay loam, or clay loam. Reaction is slightly alkaline or moderately alkaline. SAR ranges from 10 to 20. Some pedons have as much as 2 percent fine masses of calcium carbonate.

The Btnz horizon is in shades of black, gray, or brown in hue of 10YR, value of 4 to 6, and chroma of 2 to 4. It is sandy clay loam or clay loam. It contains as much as 20 percent masses or threads of neutral salts. Reaction is slightly alkaline or moderately alkaline. SAR ranges from 25 to 30. Some pedons have up to 2 percent fine masses of calcium carbonate.

The BCnz horizon is in shades of gray and brown in hue of 10YR or 2.5Y, value of 4 to 7, and chroma of 2 or 3. It is sandy clay loam. It contains as much as 20 percent masses and threads of neutral salts. It has as much as 2 percent fine black concretions. Reaction ranges from neutral to moderately alkaline. SAR ranges from 20 to 25. Some pedons have as much as 2 percent fine masses of calcium carbonate.

Miguel Series

The Miguel series consists of very deep, well drained, slowly permeable soils that formed in clayey and loamy sediments (fig. 18). These soils are on gently sloping uplands. Slopes range from 1 to 5 percent.

The soils of the Miguel series are fine, mixed, hyperthermic, Typic Paleustalfs.

Typical pedon of Miguel fine sandy loam, 1 to 3 percent slopes; from the intersection of Texas Highway 80 and Texas Highway 887 in Gillett, 0.2 mile west on Texas Highway 887 to county road, 1.4 miles west on county road, and 50 feet south in pasture. Latitude is 29 degrees 08 minutes 15 seconds North; longitude is 97 degrees 48 minutes 21 seconds West. Elevation is 357 feet above sea level.

A—0 to 8 inches; yellowish brown (10YR 5/4) fine sandy loam, dark brown (10YR 4/3) moist; massive; hard, friable, nonsticky, nonplastic; common fine roots; few fine black pebbles on surface; few fine siliceous pebbles on surface; slightly acid; abrupt smooth boundary.

Bt1—8 to 16 inches; dark grayish brown (10YR 4/2) clay, dark grayish brown (10YR 4/2) moist; common medium distinct red (2.5YR 4/6) mottles, common fine faint strong brown (7.5YR 5/6) mottles; moderate medium prismatic parting to moderate medium angular blocky structure; very hard, firm, very sticky, very plastic; common fine roots; few fine siliceous pebbles; many distinct thin continuous clay films on surfaces of peds; neutral; clear smooth boundary.

Bt2—16 to 28 inches; yellowish red (5YR 5/6) sandy clay, reddish brown (5YR 4/4) moist; moderate medium prismatic structure parting to moderate medium angular blocky; very hard, firm, sticky, plastic; few fine faint reddish yellow (7.5YR 6/6) mottles, few fine faint strong brown (7.5YR 5/6) mottles; common thin continuous clay films on surfaces of peds; few fine roots; few fine siliceous pebbles; slightly alkaline; clear smooth boundary.

Btk—28 to 37 inches; strong brown (7.5YR 5/6) sandy clay loam, strong brown (7.5YR 5/6) moist; few fine faint strong brown (7.5YR 5/8) mottles; weak fine and medium subangular blocky structure; very hard, firm, slightly sticky, slightly plastic; few fine roots; few thin distinct clay films on surfaces of peds; few fine masses of calcium carbonate; slightly effervescent; moderately alkaline; gradual smooth boundary.

BC—37 to 48 inches; yellowish brown (10YR 5/6) sandy clay loam, dark yellowish brown (10YR 4/6) moist; few fine faint strong brown mottles; weak fine subangular blocky structure; hard, firm, slightly sticky, slightly plastic; few fine roots; few fine pores; few fine concretions and masses of calcium carbonate; few fine dark yellowish brown (10YR 4/6) material in cracks on surfaces of peds; strongly effervescent; moderately alkaline; gradual smooth boundary.

BCk—48 to 80 inches; brownish yellow (10YR 6/8) sandy clay loam, yellowish brown (10YR 5/8) moist; weak fine subangular blocky structure; hard, firm, slightly sticky, slightly plastic; few fine pores; common fine masses and concretions of calcium carbonate; few fine dark yellowish brown (10 YR 4/6) material in cracks on surfaces of peds; moderately alkaline.

The solum is 60 to more than 80 inches thick. Depth to secondary carbonates ranges from 28 to 40 inches.

The A horizon is dark yellowish brown, dark brown, yellowish brown, or reddish brown in hue of 10YR, 7.5YR, or 5YR; value of 4 or 5; and chroma of 3 or 4.

The Bt horizon is dark brown, dark grayish brown, dark reddish brown, reddish brown or yellowish red in hue of 10YR, 7.5YR, or 5YR; value of 4 to 6; and chroma of 2 to 6. It is clay or sandy clay. Clay content ranges from 35 to 50 percent. The Bt horizon has few to many fine to coarse mottles in shades of red, yellow, and brown in hue of 2.5YR to 10YR, value of 3 to 6, and chroma of 3 to 8. Reaction is neutral or slightly alkaline.

The Btk horizon is brown, strong brown, dark yellowish brown, brownish yellow, or dark brown in hue of 7.5YR or 10YR, value of 5 or 6, and chroma of 4 to 8. It is sandy clay loam or sandy clay. Clay content ranges from 20 to 45 percent. The Btk horizon has few to common fine to coarse mottles in shades of brown or yellow in hue of 7.5YR or 5YR, value of 5 or 6, and chroma of 8. This horizon contains as much as 10 percent concretions and masses of calcium carbonate. Some pedons have 2 percent iron stains and concretions. Reaction is slightly alkaline or moderately alkaline.

The BC horizon is in shades of brown in hue of 7.5YR or 10YR, values of 5 or 6, and chroma of 4 to 8. It is sandy clay loam or sandy clay. Clay content ranges from 20 to 38 percent. The BC horizon has few to common fine to coarse mottles in shades of brown. The horizon contains as much as 20 percent concretions and masses of calcium carbonate. Some pedons have 2 percent iron stains and concretions. Some pedons do not have a BC horizon.

The BCk horizon is in shades of brown, yellow, or gray in hue of 10YR, value of 5 to 7, and chroma of 2 to 8. Some pedons have few to common fine or medium mottles in shades of yellow or brown. This horizon contains 2 to 10 percent concretions, films, threads, or masses of calcium carbonate.

Monteola Series

The Monteola series consists of very deep, moderately well drained, very slowly permeable soils that formed in sediments of clays and clays interbedded with shale (fig. 19). These soils are on nearly level to moderately sloping uplands. Slopes range from 0 to 8 percent.

The soils of the Monteola series are fine, montmorillonitic, hyperthermic Typic Pellusterts.

Typical pedon of Monteola clay, 1 to 3 percent slopes; from the intersection of U.S. Highway 181 and Texas Highway 72 in Kenedy, 9.6 miles west on Texas Highway 72 to county road, 0.8 mile north on county road, and 100 feet east in cropland. Latitude is 28 degrees 44 minutes 35 seconds North; longitude is 97 degrees 58 minutes 28 seconds West. Elevation is 455 feet above sea level.

Ap—0 to 5 inches; very dark gray (10YR 3/1) clay, black (10YR 2/1) moist; moderate fine and very fine subangular blocky structure; surface has mulch of very hard discrete fine granules; very hard, very firm, very plastic, very sticky; many fine roots; few snail shell fragments; few very fine strongly cemented calcium carbonate concretions; strongly effervescent; moderately alkaline; abrupt smooth boundary.

A—5 to 12 inches; very dark gray (10YR 3/1) clay, black (10YR 2/1) moist; moderate fine and very fine subangular blocky structure; very hard, very firm, very sticky, very plastic; many fine roots; few snail shell fragments; few very fine strongly cemented calcium carbonate concretions; strongly effervescent; moderately alkaline; gradual wavy boundary.

Bss—12 to 26 inches; very dark gray (10YR 3/1) clay, black (10YR 2/1) moist; common parallelepipeds tilted about 10 degrees to 30 degrees parting to moderate fine and very fine angular blocky structure; extremely hard, very firm, very sticky, very plastic; many fine roots; few slickensides as much as 6 inches across the long axes; few snail shell fragments; few fine strongly cemented calcium carbonate concretions; strongly effervescent; moderately alkaline; gradual wavy boundary.

Bkssy1—26 to 37 inches; grayish brown (10YR 5/2) clay, dark grayish brown (10YR 4/2) moist; many distinct parallelepipeds tilted about 30 degrees parting to moderate fine angular blocky structure; extremely hard, very firm, very sticky, very plastic; common fine roots; few intersecting slickensides as much as 6 inches across the long axes; cracks partly filled with very dark gray clay; few fine shell fragments; few fine weakly cemented calcium carbonate concretions; few seams and pockets of gypsum and other salts in lower part; cracks partly filled with very dark gray (10YR 3/1) moist clay; strongly effervescent; moderately alkaline; gradual wavy boundary.

Bkssy2—37 to 50 inches; very pale brown (10YR 7/3) clay, pale brown (10YR 6/3) moist; common parallelepipeds tilted about 30 degrees parting to weak medium angular blocky structure; extremely hard, very firm, very sticky, very plastic; few fine roots; few slickensides as much as 4 inches across the long axes; few vertical streaks of very dark gray (10YR 3/1) moist clay along apparently filled cracks; few seams of gypsum crystals; few weakly cemented calcium carbonate concretions; slightly saline; strongly effervescent; moderately alkaline; clear wavy boundary.

BCkyz—50 to 80 inches; light gray (5Y 7/1) clay, gray (5Y 6/1) moist; structureless, but has vertical and horizontal fractures of the clay, especially along apparent bedding planes; extremely hard, extremely firm, very sticky, very plastic; the soil is coated with powdery calcium carbonate along fracture planes; contains 2 percent calcium carbonate-coated siliceous pebbles as much as 3 centimeters in diameter; few fine weakly cemented calcium carbonate concretions; few fine barite masses; few seams of gypsum crystals; slightly saline; strongly effervescent; moderately alkaline.

The solum is more than 80 inches thick. It is clay. The clay content of the 10- to 40-inch control section ranges from 40 to 60 percent. Soil salinity ranges from none in the A horizon to slightly saline in the BCkyz horizon. The soils are slightly alkaline or moderately alkaline.

In more than half of each pedon, the A horizon has hue of 10YR, value of 3 or 4, and chroma of 0 or 1, or is N 2/0 to depths ranging from 10 to 30 inches. In some pedons there are up to 25 percent siliceous pebbles and cobbles. The thickness of the A horizon in individual pedons varies from the microknolls to the microlows, being thinnest in the microknolls and thickest in the microlows. The amplitude of the boundary between the A and B horizons ranges from 5 to 14 inches. Soil cracks are 0.4 to 2.0 inches wide at the surface when dry and extend to a depth of more than 20 inches or more.

The B horizon has hue of 2.5Y or 10YR, value of 4 to 7, and chroma of 0 to 4. Most pedons have streaks

Figure 15.—Profile of Bryde fine sandy loam. The dry-weather cracks in this soil are an indication of a very high shrink-swell potential.

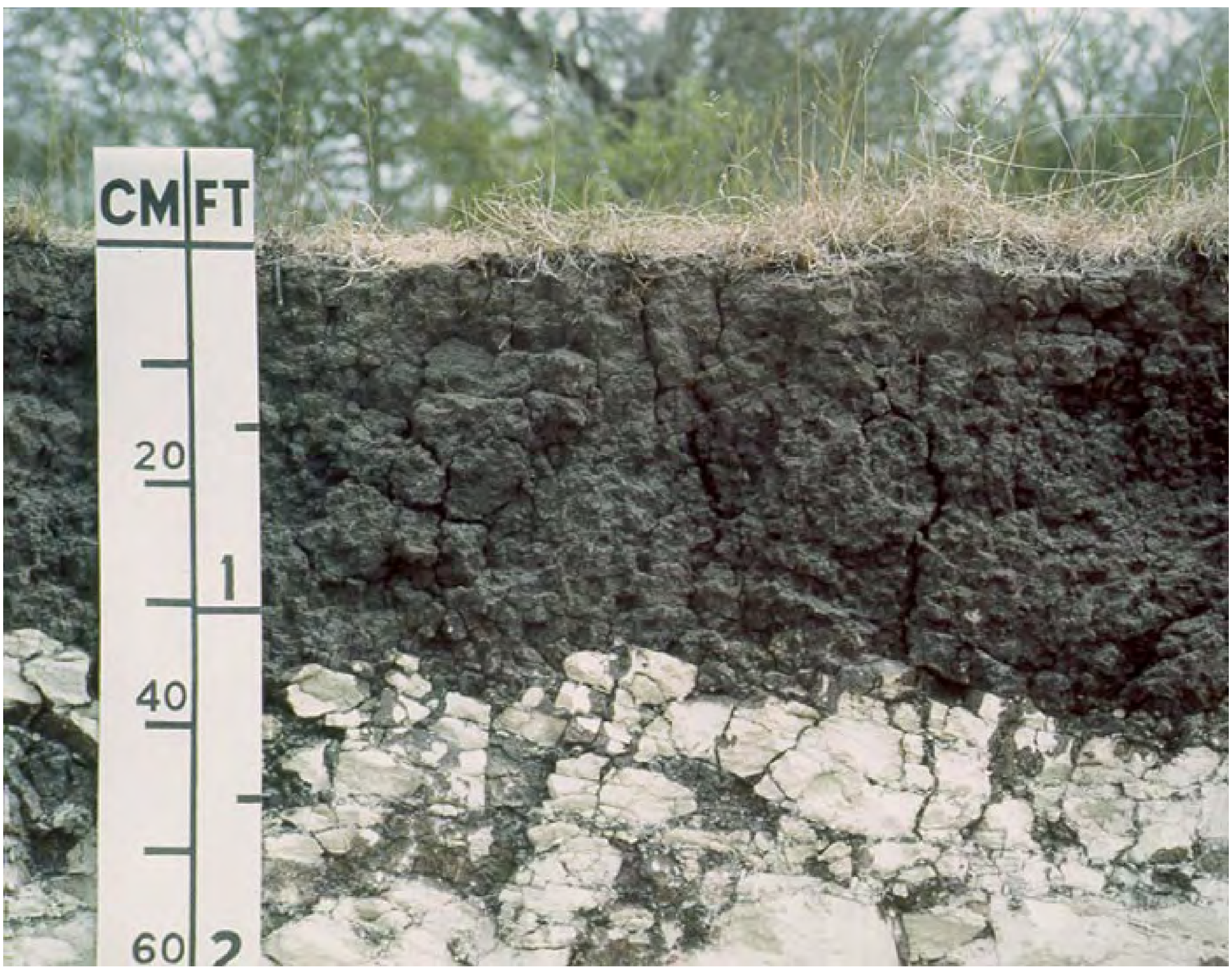


Figure 16.—Profile of Ecleto sandy clay loam. Plants growing in this shallow soil have a very restrictive rooting zone.

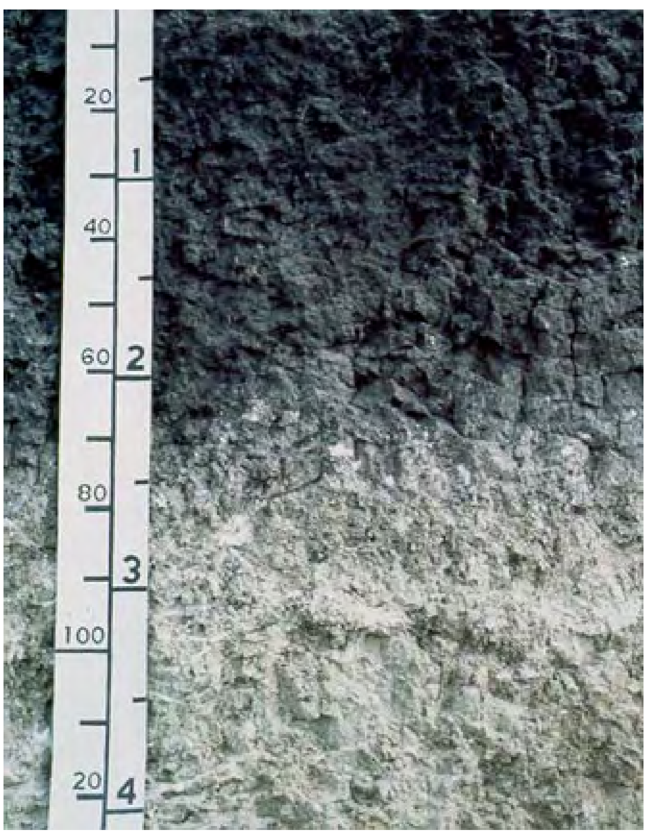


Figure 17.—Profile of Eloso clay. This moderately deep soil is underlain by weakly consolidated siltstone at a depth of 37 inches.

Figure 18.—Profile of Miguel fine sandy loam. A concentration of calcium carbonate is in the lower part of the subsoil.

Figure 19.—Profile of Monteola clay. Deep cracks and clay texture are two of the properties of vertisols.

Figure 20.—Profile of Nusil fine sand. The thick sandy surface layer rests abruptly over a sandy clay loam subsoil that has prismatic and angular blocky structure.

Figure 21.—Profile of Papalote loamy coarse sand. The sandy surface layer is much thinner in this pedon than is typical for the Papalote soil.

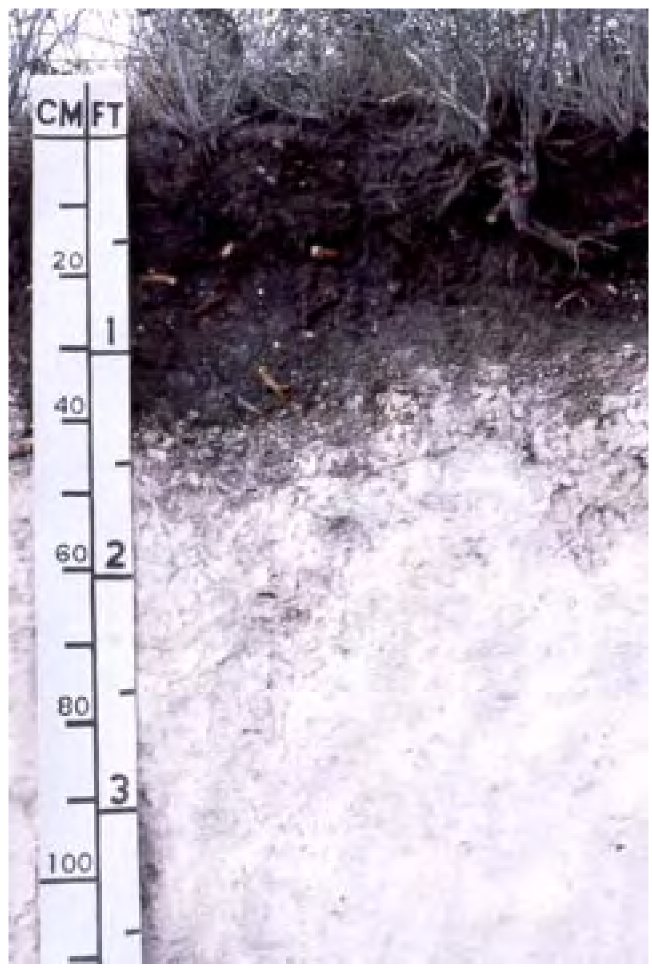


Figure 22.—Profile of Pavelek clay. A naturally cemented layer (petrocalcic horizon) is at a depth of 10 to 20 inches.

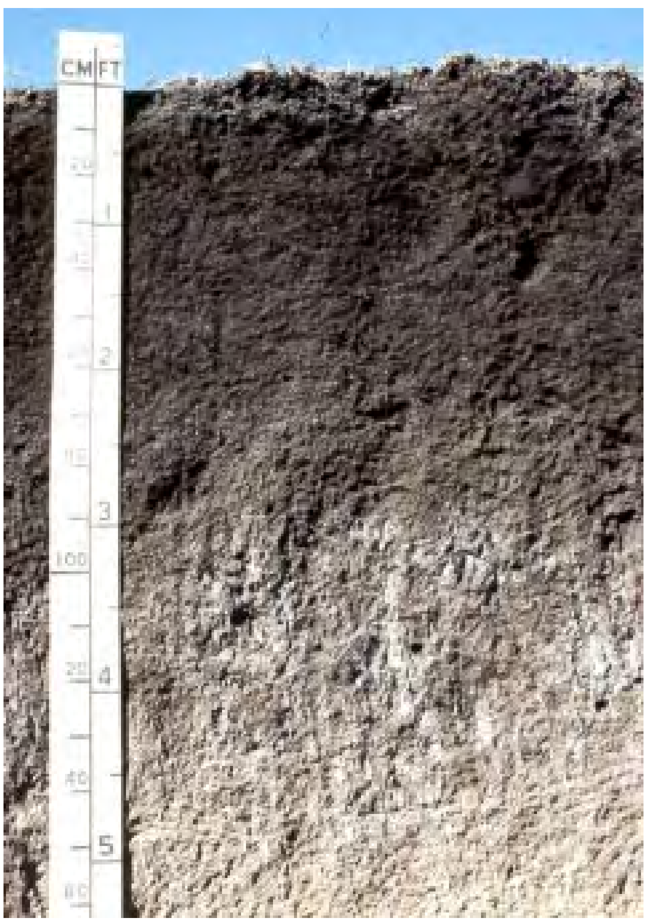


Figure 23.—Profile of Rosenbrock clay. This naturally fertile soil has some of the highest potential for crop yields in Karnes County.

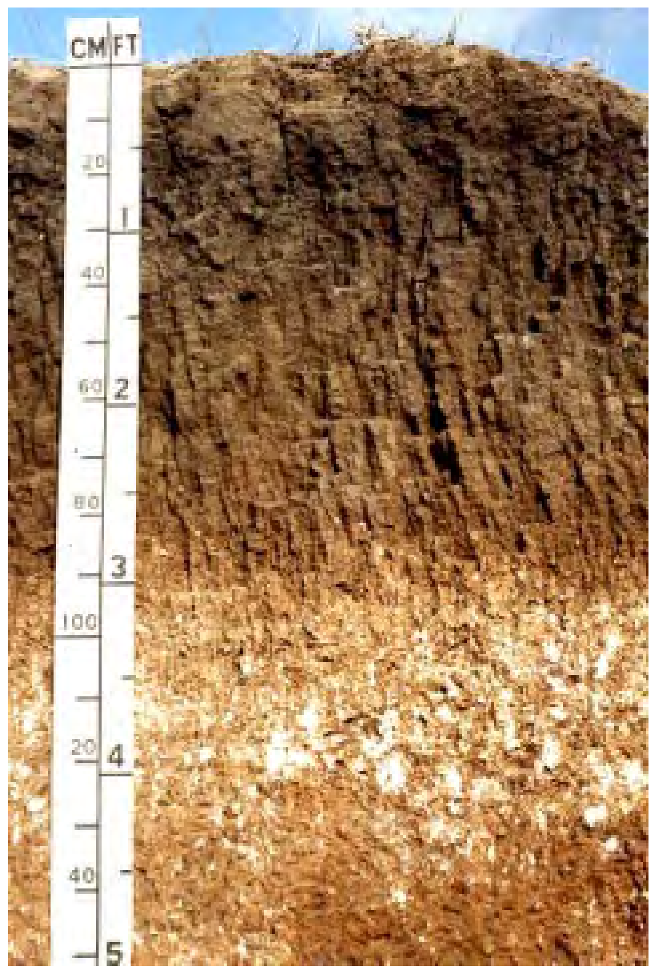


Figure 24.—Profile of Weesatche sandy clay loam. An accumulation of calcium carbonate begins at a depth of about 3 feet.

or mottles in various shades of brown, yellow, and gray. Siliceous pebbles make up 0 to 10 percent. Crystals, concretions, and powdery masses of calcium carbonate, barite, gypsum, and other salts in the B and BC horizons are few to common.

The BC horizon has hue of 2.5Y to 10YR, value of 6 to 8, and chroma of 1 to 8. Some pedons have mottles in various shades of gray, brown, and yellow.

Nusil Series

The Nusil series consists of very deep, moderately well drained, slowly permeable soils that formed in sandy eolian material over loamy sediments (fig. 20). These soils are on gently sloping stream terraces. Slopes range from 1 to 5 percent.

The soils of the Nusil series are loamy, siliceous, hyperthermic Arenic Paleustalfs.

Typical pedon of Nusil fine sand, 1 to 5 percent slopes; from the intersection of Texas Highway 72 and Farm Road 81 in Runge, 6.4 miles east on Farm Road 81 to county road, 0.9 mile south on county road, 0.7 mile east on county road, 0.3 mile south on county road, and 50 feet north in pasture. Latitude is 28 degrees 47 minutes 44 seconds North; longitude is 97 degrees 40 minutes 20 seconds West. Elevation is 245 feet above sea level.

A1—0 to 10 inches; pale brown (10YR 6/3) fine sand, dark brown (10YR 4/3) moist; single grain; loose, very friable, nonsticky, nonplastic; common fine roots throughout; slightly acid; clear smooth boundary.

A2—10 to 30 inches; light yellowish brown (10YR 6/4) fine sand, yellowish brown (10YR 5/4) moist; single grain; loose, very friable, nonsticky, nonplastic; common fine roots throughout; slightly acid; clear smooth boundary.

E—30 to 36 inches; very pale brown (10YR 7/3) fine sand, brown (10YR 5/3) moist; few medium distinct brownish yellow (10YR 6/6) mottles; single grain; loose, very friable, nonsticky, nonplastic; common fine roots throughout; slightly acid; abrupt smooth boundary.

Bt1—36 to 44 inches; light brownish gray (10YR 6/2) sandy clay loam; grayish brown (10YR 5/2) moist; common fine and medium prominent red (2.5YR 4/6) and distinct yellow (2.5Y 7/6) mottles; weak medium prismatic structure parting to moderate fine angular blocky; hard, firm, slightly sticky, slightly plastic; few fine roots throughout; very few clay films (cutans) on surfaces of peds; neutral; gradual wavy boundary.

Bt2—44 to 54 inches; light gray (10YR 7/2) sandy clay loam; light brownish gray (10YR 6/2) moist; common medium prominent red (2.5YR 4/6) and common medium distinct yellow (2.5Y 7/6) mottles; moderate medium prismatic structure parting to moderate medium angular blocky; hard, firm, slightly sticky, slightly plastic; few fine roots throughout; few patchy clay films (cutans) on surfaces of peds; slightly alkaline; gradual wavy boundary.

Bt3—54 to 72 inches; very pale brown (10YR 7/3) sandy clay loam; pale brown (10YR 6/3) moist; common medium and coarse prominent yellowish red (5YR 5/8), common medium distinct yellow (10YR 7/8), and yellowish brown (10YR 5/6) mottles; moderate fine and medium prismatic structure parting to moderate fine and medium angular blocky; hard, firm, slightly sticky, slightly plastic; few fine roots throughout; few patchy clay films (cutans) on surfaces of peds; few fine rounded iron-manganese concretions; moderately alkaline; gradual wavy boundary.

BC—72 to 80 inches; very pale brown (10YR 8/3) sandy clay loam; very pale brown (10YR 7/3) moist; few fine and medium prominent red (2.5YR 4/8) and common medium distinct yellow (10YR 7/8) mottles; moderate fine and medium subangular blocky structure; hard, firm, nonsticky, nonplastic; moderately alkaline.

The solum is more than 80 inches thick. Clay content in the control section ranges from 18 to 35 percent. Some pedons have secondary carbonates at a depth of 45 to 60 inches.

The A horizon is in shades of gray and brown in hue of 10YR, value of 4 to 6, and chroma of 2 to 4. Reaction is slightly acid to slightly alkaline.

The E horizon is in shades of gray and brown in hue of 10YR, value of 6 or 7, and chroma of 2 to 4. It is fine sand or loamy fine sand. None to common, faint or distinct, fine or medium yellow or brown mottles are in the lower part. Reaction is slightly acid to slightly alkaline.

The Bt horizon is in shades of gray and brown in hue of 10YR, value of 4 to 7, and chroma of 2 to 4. It has few to many fine to coarse mottles in shades of red, yellow, gray, and brown. It is sandy clay loam. The lower part has as much as 2 percent fine rounded iron-manganese concretions. Reaction ranges from slightly acid to slightly alkaline in the upper part and ranges from slightly acid to moderately alkaline in the lower part.

Some pedons have a Btk horizon that has colors and textures the same as the Bt horizons. The Btk horizon has as much as 10 percent fine or medium concretions and masses of calcium carbonate.

The BC horizon is pale brown, very pale brown, or light brown in hue of 10YR or 2.5Y, value of 6 to 8, and chroma of 3 or 4. It has few to common fine to coarse mottles in shades of red, yellow, or brown. Some pedons do not have a BC horizon.

Some pedons have a BCk horizon that has the same colors and textures as the BC horizon. The BCk horizon has as much as 20 percent fine and medium masses of calcium carbonate.

Odem Series

The Odem series consists of very deep, well drained, moderately rapidly permeable soils that formed in alluvium. These soils are on nearly level flood plains. Slopes are less than 1 percent.

The soils of the Odem series are coarse-loamy, mixed, hyperthermic Cumulic Haplustolls.

Typical pedon of Odem fine sandy loam, occasionally flooded; from the intersection of Texas Highway 72 and Farm Road 81 in Runge, 0.25 mile west on Texas Highway 72 to county road, 3 miles west on county road to intersection with private ranch road, 0.3 mile east on ranch road, 50 feet west in cultivated land. Latitude is 28 degrees 53 minutes 16 seconds North; longitude is 97 degrees 44 minutes 56 seconds West. Elevation 228 feet above sea level.

Ap—0 to 8 inches; very dark gray (10YR 3/1) fine sandy loam; black (10YR 2/1) moist; weak fine subangular blocky structure; slightly hard, friable, nonsticky, nonplastic; few fine and medium roots throughout; neutral; abrupt smooth boundary.

A1—8 to 27 inches; dark grayish brown (10YR 4/2) fine sandy loam; very dark grayish brown (10YR 3/2) moist; weak fine subangular blocky structure; slightly hard, friable, nonsticky, nonplastic; few fine and medium roots throughout; slightly alkaline; gradual smooth boundary.

A2—27 to 45 inches; grayish brown (10YR 5/2) fine sandy loam; dark grayish brown (10YR 4/2) moist; weak fine subangular blocky structure; slightly hard, friable, nonsticky, nonplastic; few fine and medium roots throughout; few shell fragments; few thin layers of sandy clay loam; few fine threads and masses of calcium carbonate; strongly effervescent; moderately alkaline; clear smooth boundary.

Bw—45 to 80 inches; pale brown (10YR 6/3) fine sandy loam; brown (10YR 5/3) moist; weak very fine subangular blocky structure; slightly hard, friable, nonsticky, nonplastic; common shell fragments; few fine threads and masses of calcium carbonate, strongly effervescent; moderately alkaline.

The solum is 40 to 60 inches thick. Clay content ranges from 10 to 18 percent.

The A horizon is 40 to 50 inches thick. It is in shades of black, gray, or brown in hue of 10YR, value of 3 to 5, and chroma of 1 to 3. It has as much as 10 percent fine concretions, masses, or threads of calcium carbonate. It is stratified with sandy clay loam or loamy fine sandy layers in the lower part. Reaction is neutral to moderately alkaline.

The Bw horizon is in shades of gray or brown in hue of 10YR, value of 4 to 7, and chroma of 2 or 3. It is fine sandy loam. It has as much as 10 percent fine concretions, masses, or threads of calcium carbonate. Reaction is slightly or moderately alkaline.

Olmos Series

The Olmos series consists of soils that are shallow over a petrocalcic horizon. They are well drained and moderately permeable. They formed in calcareous loamy sediments. These soils are on very gently sloping to moderately sloping convex uplands. Slopes range from 1 to 8 percent.

The soils of the Olmos series are loamy-skeletal, carbonatic, hyperthermic, shallow Petrocalcic Calciustolls.

Typical pedon of Olmos very gravelly loam, 1 to 8 percent slopes; from the intersection of U.S. Highway 181 and Texas Highway 72 in Kenedy, 7.6 miles south on U.S. Highway 181 to intersection of private ranch road, 1.5 miles northeast on ranch road, and 100 feet east in rangeland. Latitude is 28 degrees 42 minutes 58 seconds North; longitude is 97 degrees 47 minutes 58 seconds West. Elevation is 455 feet above sea level.

A—0 to 5 inches; very dark grayish brown (10YR 3/2) very gravelly loam, very dark grayish brown (10YR 3/2) moist; weak fine subangular blocky structure; slightly hard, friable, slightly sticky, slightly plastic; common fine roots, few fine pores; about 40 percent indurated caliche fragments that range from 0.25 to 2.0 inches across and 0.25 to 1.0 inch thick; effervesces strongly, moderately alkaline; clear smooth boundary.

Ak—5 to 11 inches; very dark grayish brown (10YR 3/2) very gravelly loam, very dark grayish brown (10YR 3/2) moist; weak fine subangular blocky structure; slightly hard, friable, slightly sticky, slightly plastic; few fine roots; few fine pores; about 50 percent indurated caliche fragments that range from 0.25 to 3.0 inches across and 0.25 to 1.50 inches thick; about 10 percent of indurated caliche fragments at a depth of 8 to 11 inches are plate-like; effervesces violently; moderately alkaline; abrupt smooth boundary.

Bkm—11 to 24 inches; strongly cemented white (10YR 8/1) laminar caliche, white (10YR 8/1) moist; massive; roots matted on surface of petrocalcic, few fine roots along fractures; upper 7 inches of petrocalcic fractured into plate-like laminar fragments of 0.25 to 2.0 inches thick and 3.0 to 8.0 inches across, interstices filled with 10YR 3/2 loamy material, lower 6 inches of petrocalcic is indurated caliche with few medium and coarse caliche fragments; lower part of horizon moderately to weakly cemented; effervesces violently; moderately alkaline; gradual smooth boundary.

BCk—24 to 80 inches; white (10YR 8/1) soft caliche, white (10YR 8/1) moist; massive; upper part is very weakly cemented; effervesces violently; moderately alkaline.

The solum is 5 to 18 inches thick over strongly cemented caliche. Some pedons have siliceous gravel.

The A horizon is in shades of gray or brown in hue of 10YR, value of 3 or 4, and chroma of 1 to 3. Reaction is slightly or moderately alkaline.

The Bkm horizon is white or very pale brown in hue of 10YR, value of 8, and chroma of 1 to 3. It is strongly cemented caliche that has a laminar cap in upper part.

The BCk horizon is white in hue of 10YR, value of 8, and chroma of 1 or 2. It is weakly or very weakly consolidated caliche.

Papalote Series

The Papalote series consists of very deep, moderately well drained, slowly permeable soils that formed in loamy and clayey marine sediments (fig. 21). These soils are on nearly level to gently sloping uplands. Slopes range from 0 to 5 percent.

The soils of the Papalote series are fine, mixed, hyperthermic Typic Paleustalfs.

Typical pedon of Papalote loamy coarse sand, 0 to 3 percent slopes; from the intersection of Texas Highway 123 and Texas Highway 80 in Karnes City, 1.0 mile east on Texas Highway 80 to intersection with county road, 0.9 mile south on county road, and 150 feet south in pasture. Latitude is 28 degrees 53 minutes 30 seconds North; longitude is 97 degrees 52 minutes 03 seconds West. Elevation is 420 feet above sea level.

A—0 to 15 inches; light brownish gray (10YR 6/2) loamy coarse sand, dark brown (10YR 4/3) moist; single grain; soft, very friable, nonsticky, nonplastic; common fine roots throughout; neutral; clear smooth boundary.

E—15 to 19 inches; light gray (10YR 7/2) loamy coarse sand, light yellowish brown (10YR 6/4) moist; single grain; soft, very friable, nonsticky, nonplastic; common fine roots throughout; neutral; abrupt smooth boundary.

Bt1—19 to 26 inches; grayish brown (10YR 5/2) sandy clay, dark grayish brown (10YR 4/2) moist; few fine faint gray, common fine and medium distinct brownish yellow (10YR 6/8) and few fine prominent red (2.5YR 4/8) mottles; moderate fine and medium prismatic structure parting to moderate medium angular blocky; very hard, very firm, sticky, plastic; common fine roots between peds; few fine tubular pores; few thin films of fine sand along vertical faces of peds; few continuous clay films (cutans) on faces of peds; slightly alkaline; gradual wavy boundary.

Bt2—26 to 33 inches; pale brown (10YR 6/3) sandy clay, brown (10YR 5/3) moist; common fine and medium prominent red (2.5YR 4/8), distinct yellow (2.5Y 7/8), and few fine faint gray mottles; moderate medium prismatic structure parting to moderate medium and coarse angular blocky; very hard, very firm, sticky, plastic; few fine roots between peds; few fine tubular pores; few continuous clay films (cutans) on faces of peds; moderately alkaline; gradual wavy boundary.

Bt3—33 to 45 inches; light gray (10YR 7/2) sandy clay loam, light brownish gray (10YR 6/2) moist; common fine and medium prominent red (2.5YR 4/8), few coarse red (2.5YR 4/8), and common fine and medium distinct yellow (2.5Y 7/8) mottles; moderate medium prismatic structure parting to moderate medium angular blocky; hard, firm, slightly sticky, slightly plastic; few fine roots between peds; few continuous clay films (cutans) on faces of peds; moderately alkaline; gradual wavy boundary.

Btk—45 to 60 inches; strong brown (7.5YR 5/6) sandy clay loam, strong brown (7.5YR 4/6) moist; common medium and coarse distinct red (2.5YR 4/8) mottles; weak fine and medium prismatic structure parting to moderate fine and medium subangular blocky; hard, firm, slightly sticky, slightly plastic; few fine roots throughout; few rounded siliceous pebbles; few fine masses of yellow (2.5Y 7/8) material; few patchy clay films (cutans); few fine masses of calcium carbonate; slightly effervescent; moderately alkaline; gradual wavy boundary.

BC—60 to 80 inches; strong brown (7.5YR 6/6) sandy clay loam, strong brown (7.5YR 5/6) moist; weak fine subangular blocky structure; slightly hard, friable, slightly sticky, slightly plastic; many fine roots throughout; few rounded siliceous pebbles; few fine masses of yellow (2.5Y 7/8) material, moderately alkaline.

The solum is more than 80 inches thick. Depth to secondary carbonates ranges from 28 to 45 inches.

The A horizon is in shades of brown or gray in hue of 10YR, value of 4 to 6, and chroma of 2 to 4. Reaction is slightly acid or neutral.

The E horizon is in shades of brown or gray in hue of 10YR, value of 4 to 8, and chroma of 1 to 4. It is loamy coarse sand or fine sandy loam. Reaction is slightly acid or neutral. Some pedons do not have an E horizon.

The Bt horizon is in shades of brown or gray in hue of 7.5YR or 10YR, value of 4 to 7, and chroma of 2 to 4. It has few to many fine to coarse mottles in shades of red, yellow, gray, or brown in hue of 2.5YR, 5YR, 7.5YR, 10YR, or 2.5Y; value of 4 to 7; and chroma of 1 to 8. It is sandy clay or clay in the upper part and sandy clay loam in the lower part. Reaction is moderately alkaline or slightly alkaline.

The Btk horizon is in shades of gray or brown in hue of 10YR or 7.5YR, value of 4 to 6, and chroma of 2 to 6. It has few to common fine to coarse mottles in shades of red or brown. It is sandy clay or sandy clay loam. This horizon has as much as 5 percent fine and medium masses of calcium carbonate. Reaction is slightly alkaline or moderately alkaline. Some pedons do not have a Btk horizon.

The BC horizon is in shades of gray, red or brown in hue of 5YR, 7.5YR, or 10YR; value of 5 to 7; and chroma of 2 to 6. In some pedons, the BC horizon has few to common fine to medium mottles in shades of red, yellow, gray, or brown. It is sandy clay loam.

Some pedons have a BCk horizon that has as much as 15 percent fine and medium masses of calcium carbonate. Reaction is slightly alkaline or moderately alkaline.

Parrita Series

The Parrita series consists of soils that are shallow to a petrocalcic horizon. They are well drained, moderately slowly permeable soils that formed in clayey sediments. These soils are on very gently sloping upland ridgetops and upper side slopes. Slopes range from 1 to 3 percent.

The soils of the Parrita series are clayey, mixed, hyperthermic, shallow Petrocalcic Paleustolls.

Typical pedon of Parrita sandy clay loam, 1 to 3 percent slopes; from the intersection of U.S. Highway 181 and Texas Highway 72 in Kenedy, 10.0 miles south on U.S. Highway 181 to intersection with Farm Road 743, 1.6 miles east on Farm Road 743 to main entrance of ranch, 0.3 mile north on caliche ranch road, 0.7 mile east on caliche and dirt road, 0.3 mile north on dirt road, and 100 feet west in rangeland. Latitude is 28 degrees 41 minutes 27 seconds North; longitude is 97 degrees 47 minutes 28 seconds West. Elevation is 444 feet above sea level.

A—0 to 4 inches; very dark grayish brown (10YR 3/2) sandy clay loam, very dark grayish brown (10YR 3/2) moist; moderate medium subangular blocky structure; slightly hard, friable, slightly sticky, slightly plastic; many very fine and few fine and medium roots; common very fine pores; few insect nests and tunnels; slightly alkaline; clear smooth boundary.

Bt1—4 to 10 inches; dark reddish brown (5YR 3/2) sandy clay loam, dark reddish brown (5YR 3/2) moist; common fine distinct dark brown (7.5YR 3/4) mottles; moderate medium prismatic structure parting to moderate medium angular blocky; hard, firm, sticky, plastic; common very fine roots; common very fine pores; common distinct clay films on surfaces of peds; moderately alkaline; gradual smooth boundary.

Bt2—10 to 19 inches; dark reddish gray (5YR 4/2) clay, dark reddish brown (5YR 3/2) moist; common fine distinct reddish brown (5YR 4/4) mottles; strong fine and medium angular blocky structure; very hard, very firm, very sticky, very plastic; common very fine roots; few very fine pores; few thin black (10YR 2/1) streaks; many distinct clay films on surfaces of peds; common distinct pressure faces; few fine concretions of calcium carbonate; common medium caliche fragments in lower part of horizon; moderately alkaline; clear wavy boundary.

Bkm—19 to 24 inches; strongly cemented white (10YR 8/1) caliche; thin laminar cap; strongly effervescent; moderately alkaline, clear smooth boundary.

BCk—24 to 80 inches; white (10YR 8/1) soft caliche that has loam texture, white (10YR 8/1) moist; massive; violently effervescent; moderately alkaline.

The solum is 13 to 20 inches thick.

The A horizon is very dark brown, very dark grayish brown, dark brown, or dark reddish brown in hue of 10YR, 7.5YR, or 5YR; value of 3; and chroma of 2.

The Bt and Btk horizons are very dark brown, dark reddish brown or reddish brown in hue of 7.5YR or 5YR, value of 3 or 4, and chroma of 2 to 4. It is sandy clay loam or sandy clay in the upper part and sandy clay or clay in the lower part. Some pedons have a thin, calcareous, gravelly or very gravelly layer 2 or 3 inches thick in the lower part.

The Bkm horizon is white, very pale brown, or pink in hue of 10YR or 7.5YR, value of 7 or 8, and chroma of 1 to 4. It is strongly cemented caliche that breaks into plate-like fragments. Some pedons are weakly cemented at lower depths. Roots are matted on the upper part of fragments.

The BCk horizon is white in hue of 10YR, value of 8, and chroma of 1 or 2. It is softly or very weakly consolidated caliche that has a loam texture.

Pavelek Series

The Pavelek series consists of well drained, slowly permeable soils that formed in clayey materials over noncalcareous siltstone interbedded with layers of soft calcium carbonate (fig. 22). They are shallow to a petrocalcic horizon. These soils are on nearly level to gently sloping uplands. Slopes range from 0 to 5 percent.

The soils of the Pavelek series are clayey, montmorillonitic, hyperthermic, shallow Petrocalcic Calciustolls.

Typical pedon of Pavelek clay, 0 to 3 percent slopes; from the intersection of U.S. Highway 181 and Farm Road 1144 in Karnes City, 4.9 miles west on Farm Road 1144, and 50 feet north in rangeland. Longitude is 28 degrees 52 minutes 36 seconds North; latitude is 97 degrees 59 minutes 02 seconds West. Elevation is 430 feet above sea level.

A—0 to 7 inches; very dark gray (10YR 3/1) clay, black (10YR 2/1) moist; strong fine angular blocky structure; very hard, very firm, very sticky, very plastic; many very fine and few fine and coarse roots; few very fine and fine tubular pores; 2 percent weakly cemented fragments of caliche 0.25 inch across; slightly effervescent; moderately alkaline; clear wavy boundary.

Bk—7 to 14 inches; very dark gray (10YR 3/1) gravelly clay, very dark gray (10YR 3/1) moist; moderate fine and very fine angular blocky structure; very hard, very firm, very sticky, very plastic; many very fine roots; few very fine and fine tubular pores; about 5 percent concretions and masses of calcium carbonate less than 0.25 inch in size, about 15 percent plate-like fragments of weakly cemented calcium carbonate 1 to 3 inches across and 0.125 to 0.5 inches thick; strongly effervescent; moderately alkaline; abrupt wavy boundary.

Bkm—14 to 20 inches; white (10YR 8/1) strongly cemented caliche, white (10YR 8/2) moist; massive; extremely hard, extremely firm, many fine and medium roots matted on top of laminar cap; laminar cap is 0.25 to 0.5 inch thick; horizon is fractured in upper 2 inches; about 5 percent very dark gray clay with few fine roots in fractures; violently effervescent; moderately alkaline; abrupt smooth boundary.

BCk—20 to 46 inches; very pale brown (10YR 8/3) consolidated, calcareous caliche that has silt loam texture, pale brown (10YR 6/3) moist; massive; calcium carbonate equivalent is 45 percent; about 35 percent films and threads of calcium carbonate along horizontal beds; about 15 percent masses of calcium carbonate; common fine calcium carbonate filled krotovinas; violently effervescent; moderately alkaline; gradual wavy boundary.

2Cr—46 to 80 inches; very pale brown (10YR 7/4) noncalcareous weakly consolidated siltstone that has silt loam texture, yellowish brown (10YR 6/4) moist; massive; fractures are 0.5 to 4.0 inches apart, interstices have few threads and films of calcium carbonate that decrease with depth; common fine calcium carbonate-filled krotovinas; moderately alkaline.

The solum is 10 to 20 inches thick over a petrocalcic horizon. The average clay content of the control section ranges from 40 to 50 percent. Reaction is slightly alkaline or moderately alkaline.

The A horizon has hue of 10YR, value of 2 to 4, and chroma of 1 or 2. Some pedons have as much as 12 percent fine caliche fragments and calcium carbonate concretions.

The Bk horizon has hue of 10YR, value of 3 to 6, and chroma of 1 or 2. It is gravelly clay or gravelly clay loam. Caliche fragments range from 15 to 30 percent.

The Bkm horizon has hue of 10YR or 2.5Y, value of 6 to 8, and chroma of 1 to 3. It is weakly to strongly cemented caliche. Cemented caliche fragments range from 1 to 8 inches across and 0.125 to 3.0 inches thick.

The BCk horizon has hue of 7.5YR, 10YR, or 2.5Y; value of 7 or 8; and chroma of 0 to 3. It is weakly consolidated caliche or calcareous siltstone that has silt loam or loam texture. This layer slakes in water. Calcium carbonate films, threads, and masses range from 5 to 45 percent. Calcium carbonate films and threads range from thin films to 0.5 inch thick and are 0.5 to 8.0 inches apart and decrease in the lower part. Calcium carbonate-filled fine and medium krotovinas range from few to many. Calcium carbonate equivalent ranges from 20 to 50 percent.

The 2Cr horizon has hue of 10YR, 7.5YR, or 2.5Y; value of 6 to 8; and chroma of 1 to 4. It is fractured noncalcareous, siltstone that has texture of silt loam or loam. This layer slakes in water. A few thin films and threads of calcium carbonate are mainly in the upper part of the horizon.

Pernitas Series

The Pernitas series consists of very deep, well drained, moderately permeable soils that formed in calcareous loamy sediments. These soils are on very gently sloping to moderately sloping uplands. Slopes range from 2 to 8 percent.

The soils of the Pernitas series are fine-loamy, mixed, hyperthermic Typic Argiustolls.

Typical pedon of Pernitas sandy clay loam, 2 to 5 percent slopes; from the intersection of U.S. Highway 181 and Texas Highway 72 in Kenedy, 4.4 miles west on Texas Highway 72, and 570 feet north in pasture. Latitude is 28 degrees 46 minutes 04 seconds North; longitude is 97 degrees 54 minutes 41 seconds West. Elevation is 415 feet above sea level.

A—0 to 7 inches; dark gray (10YR 4/1) sandy clay loam, very dark gray (10YR 3/1) moist; weak fine subangular blocky structure; slightly hard, firm, slightly sticky, slightly plastic; common fine roots; common fine pores; few termite and wormcasts; slightly effervescent; slightly alkaline; clear smooth boundary.

Bt1—7 to 15 inches; dark grayish brown (10YR 4/2) sandy clay loam, very dark grayish brown (10YR 3/2) moist; weak fine prismatic structure parting to moderate fine and medium angular blocky; hard, firm, slightly sticky, slightly plastic; common fine roots; few fine pores; common thin discontinuous clay films on surfaces of peds; few termite and wormcasts; slightly effervescent; slightly alkaline; clear smooth boundary.

Bt2—15 to 21 inches; brown (10YR 5/3) sandy clay loam, dark brown (10YR 4/3) moist; weak fine prismatic structure parting to moderate fine and medium angular blocky; hard, firm, slightly sticky, slightly plastic; common fine roots; few fine pores; common thin discontinuous clay films on surfaces of peds; few fine threads and masses of calcium carbonate; few snail shell fragments; few wormcasts filled with very dark grayish brown material; slightly effervescent; slightly alkaline; clear smooth boundary.

Btk—21 to 33 inches; dark brown (7.5YR 4/4) sandy clay loam, dark brown (7.5YR 4/4) moist; moderate fine and medium angular blocky structure; very hard, very firm, slightly sticky, slightly plastic; few fine roots; few fine pores; common thin continuous clay films on surfaces of peds; few fine threads and common fine and medium masses of calcium carbonate; very dark gray material filled in cracks; few snail shells fragments; strongly effervescent; moderately alkaline; gradual smooth boundary.

Bk1—33 to 50 inches; light yellowish brown (10YR 6/4) sandy clay loam, yellowish brown (10YR 5/4) moist; moderate fine and medium subangular blocky structure; hard, firm, slightly sticky, slightly plastic; few fine and very fine roots; common medium and coarse masses of calcium carbonate, few fine threads of calcium carbonate; violently effervescent; moderately alkaline; gradual smooth boundary.

Bk2—50 to 80 inches; very pale brown (10YR 7/4) sandy clay loam, light yellowish brown (10YR 6/4) moist; weak fine subangular blocky structure; hard, firm, slightly sticky, slightly plastic; few fine and very fine roots; many medium and coarse masses of calcium carbonate; violently effervescent; moderately alkaline.

The solum is 60 to more than 80 inches thick. Reaction is slightly alkaline or moderately alkaline.

The A horizon is very dark gray, dark gray, or very dark grayish brown in hue of 10YR, value of 3 or 4, and chroma of 1 or 2.

The Bt horizon is dark grayish brown, brown, grayish brown, strong brown, pale brown, or very pale brown in hue of 10YR or 7.5YR, value of 4 to 7, and chroma of 2 to 4. It is sandy clay loam or clay loam.

The Bk horizon is dark yellowish brown, brown, pale brown, very pale brown, light yellowish brown, or white in hue of 10YR or 7.5YR, value of 6 to 8, and chroma of 2 to 4. It is sandy clay loam or clay loam.

Pettus Series

The Pettus soils consists of very deep, well drained, moderately permeable soils that formed in calcareous loamy sediments of Pleistocene or Pliocene age. These very gently sloping to gently sloping soils are on upland ridges and upper side slopes. Slopes range from 2 to 5 percent.

The soils of the Pettus series are loamy-skeletal, carbonatic, hyperthermic Typic Calciustolls.

Typical pedon of Pettus loam, 2 to 5 percent slopes; from the intersection of Texas Highway 72 and U.S. Highway 181, 11 miles south on U.S. 181 to intersection with Farm Road 743, 7 miles east on Farm Road 743 to private ranch road, 0.6 mile west on ranch road, and 600 feet east in rangeland. Latitude is 28 degrees 41 minutes 59 seconds North; longitude is

97 degrees 45 minutes 56 seconds West. Elevation is 420 feet above sea level.

A—0 to 10 inches loam; dark gray (10YR 4/1) loam, very dark gray (10YR 3/1) moist; weak fine subangular blocky structure; hard, friable, slightly sticky, slightly plastic; few fine roots throughout; few fine and medium rounded strongly cemented concretions of calcium carbonate; violently effervescent; moderately alkaline; clear smooth boundary.

Bk1—10 to 18 inches; grayish brown (10YR 5/2) gravelly loam; dark grayish brown (10YR 4/2) moist; weak fine and medium subangular blocky structure; hard, friable, slightly sticky, slightly plastic; few fine roots throughout; 20 percent fine and medium rounded calcium carbonate concretions; violently effervescent; moderately alkaline; clear smooth boundary.

Bk2—18 to 28 inches; light gray (10YR 7/2) very gravelly loam, light brownish gray (10YR 6/2) moist; slightly hard, friable, slightly sticky, slightly plastic; few fine roots throughout; 50 percent fine and medium rounded strongly cemented concretions of calcium carbonate; violently effervescent; moderately alkaline; clear smooth boundary.

BCk—28 to 80 inches; white (10YR 8/1) very gravelly loam, white (10YR 8/1) moist; weak fine subangular blocky structure; soft, friable, nonsticky, nonplastic; 60 percent medium and coarse rounded strongly cemented concretions of calcium carbonate; violently effervescent; moderately alkaline.

The solum is 60 to more than 80 inches thick. Reaction is slightly alkaline or moderately alkaline. Calcium carbonate equivalent ranges from 40 to 70 percent.

The A horizon is in shades of gray or brown in hue of 10YR, value of 4 or 5, and chroma of 1 to 3. Strongly cemented calcium carbonate concretions comprise as much as 10 percent of the horizon.

The Bk horizon is in shades of gray or brown in hue of 10YR, value of 4 to 7, and chroma of 2 or 3. It is gravelly or very gravelly intergrades of loam or sandy clay loam. Strongly cemented fine, medium, and coarse concretions of calcium carbonate comprise 15 to 60 percent of this horizon.

The BCk horizon is in shades of white, gray, or brown in hue of 10YR, value of 6 to 8, and chroma of 1 to 4. Moderately cemented fragments of calcium carbonate range from 20 to 70 percent. The BCk horizon is very gravelly loam or gravelly loam. Calcium carbonate concretions comprise 15 to 70 percent of this horizon.

Rhymes Series

The Rhymes series consists of very deep, somewhat excessively drained, moderately slowly permeable soils that formed in sandy eolian deposits over loamy sediments. These soils are on gently sloping terraces. Slopes range from 1 to 5 percent.

The soils of the Rhymes series are loamy, siliceous, hyperthermic, Grossarenic Paleustalfs.

Typical pedon of Rhymes fine sand, 1 to 5 percent slopes; from the intersection of Farm Road 81 and Farm Road 2724 in Panna Maria, 1.5 miles north on Farm Road 2724 to the intersection with private ranch road, 1 mile east on private ranch road, and 1100 feet east in pasture. Latitude is 28 degrees, 59 minutes, 11 seconds North; longitude is 97 degrees, 53 minutes, 01 seconds West. Elevation is 290 feet above sea level.

A1—0 to 10 inches; pale brown (10YR 6/3) fine sand, dark brown (10YR 4/3) moist; single grained; loose, very friable, nonsticky, nonplastic; common fine roots; slightly acid; gradual smooth boundary.

A2—10 to 36 inches; light yellowish brown (10YR 6/4) fine sand, yellowish brown (10YR 5/4) moist; single grained, loose, very friable, nonsticky, nonplastic; common fine roots; slightly acid; clear smooth boundary.

E—36 to 56 inches; very pale brown (10YR 7/3) loamy sand, light yellowish brown (10YR 6/4) moist; few, medium, distinct brownish yellow (10YR 6/6) mottles; single grained; loose, very friable, nonsticky, nonplastic; few fine roots; slightly acid; abrupt smooth boundary.

Bt1—56 to 68 inches; very pale brown(10YR 7/3) fine sandy loam, pale brown (10YR 6/3) moist; common medium and coarse prominent yellowish red (5YR 5/8), strong brown (7.5YR 5/6), and brownish yellow (10YR 6/8) mottles; moderate medium prismatic structure parting to moderate medium angular blocky; extremely hard, friable, slightly sticky, slightly plastic; few fine roots; common fine pores; few thin clay films on surfaces of peds; slightly acid; gradual smooth boundary.

Bt2—68 to 80 inches; very pale brown (10YR 7/3) sandy clay loam, very pale brown (10YR 7/3) moist; common medium and coarse distinct strong brown (7.5YR 5/6) and brownish yellow (10YR 6/8) mottles; moderate fine and medium angular blocky structure; extremely hard, friable; few fine roots; few fine pores; few thin clay films; neutral.

The solum is more than 80 inches thick. Reaction ranges from slightly acid to neutral in the upper part and neutral or slightly alkaline in the lower part.

The A horizon is in shades of brown in hue of 10YR, value of 4 to 6, and chroma of 2 to 4.

The E horizon is in shades of brown in hue of 10YR, value of 6 to 8, and chroma of 2 to 4. It is fine sand, loamy sand, or loamy fine sand. None to common, faint or distinct, fine or medium yellow or brown mottles are in the lower part.

The Bt horizon is in shades of gray or brown in hue of 10YR, value of 5 to 7, and chroma of 2 or 3. It is fine sandy loam or sandy clay loam. This horizon has few to common distinct or prominent mottles in shades of red, yellow, or brown.

Some pedons have a BC horizon that has hue of 7.5YR or 10YR, value of 5 to 8, and chroma of 2 to 6. It is fine sandy loam or sandy clay loam. Clay content is 15 to 30 percent. Reaction is moderately acid to moderately alkaline.

Some pedons have a BCk horizon that has as much as 4 percent fine or medium concretions and masses of calcium carbonate.

Some pedons have a BCt horizon that has thin clay films on peds.

Rosenbrock Series

The Rosenbrock series consists of deep, well drained, very slowly permeable soils (fig. 23). They formed over noncalcareous, weakly consolidated tuffaceous siltstone that has silt loam texture interbedded with thin layers of calcium carbonate. These soils are on nearly level to very gently sloping uplands. Slopes range from 0 to 3 percent.

The soils of the Rosenbrock series are fine, montmorillonitic, hyperthermic Vertic Haplustolls.

Typical pedon of Rosenbrock clay, 1 to 3 percent slopes; from the intersection of U.S. Highway 181 and Farm Road 99 in Karnes City, 11.1 miles west on Farm Road 99, and 400 feet south in pasture. Latitude is 28 degrees, 48 minutes, 26 seconds North; longitude is 98 degrees, 4 minutes, 16 seconds West. Elevation is 385 feet above sea level.

A—0 to 8 inches; very dark gray (10YR 3/1) clay, black (10YR 2/1) moist; moderate medium subangular blocky structure; very hard, firm, very sticky, very plastic; many fine roots; common fine tubular pores; few fine snail shell fragments; slightly alkaline; clear smooth boundary.

Bw—8 to 18 inches; very dark gray (10YR 3/1) clay, black (10YR 2/1) moist; moderate medium prismatic structure parting to moderate medium angular blocky; very hard, very firm, very sticky, very plastic; common fine roots; common fine tubular pores; few fine masses of calcium carbonate; common distinct pressure faces; slightly effervescent, slightly alkaline; gradual wavy boundary.

Bk1—18 to 31 inches; very dark gray (10YR 3/1) clay, very dark gray (10YR 3/1) moist; moderate medium prismatic structure parting to moderate medium angular blocky; very hard, very firm, very sticky, very plastic; common fine roots; few fine tubular pores; common distinct pressure faces; few small slickensides; common fine masses and few fine concretions of calcium carbonate; strongly effervescent; slightly alkaline; gradual wavy boundary.

Bk2—31 to 43 inches; grayish brown (10YR 5/2) clay, dark grayish brown (10YR 4/2) moist; moderate fine and medium angular blocky structure; very hard, very firm, very sticky, very plastic; few fine roots; few fine tubular pores; common distinct pressure faces; few small slickensides; common fine and medium masses of calcium carbonate; common wormcasts filled with very dark gray material; violently effervescent; moderately alkaline; clear wavy boundary.

2Cr/Bk—43 to 62 inches; very pale brown (10YR 7/3) weakly consolidated tuffaceous siltstone that has loam texture, pale brown (10YR 6/3) moist; slightly hard, friable, slightly sticky, slightly plastic; few fine roots; 20 percent of horizon consists of dark grayish brown (10YR 4/2) silty clay Bk material that has common wormcasts; moderately alkaline; gradual smooth boundary.

2Cr—62 to 80 inches; very pale brown (10YR 7/3) noncalcareous weakly consolidated tuffaceous siltstone that has silt loam texture, pale brown (10YR 6/3) moist; massive; common medium masses and few fine and medium rounded nodules of calcium carbonate; violently effervescent; moderately alkaline.

The solum is 40 to 60 inches thick. A few small slickensides are at a depth of 20 to 40 inches. When dry, the soil has cracks as much as 1 inch wide that extend to a depth of more than 20 inches. Reaction is slightly alkaline or moderately alkaline.

The A horizon is black or very dark gray in hue of 10YR, value of 2 or 3, and chroma of 1. Some pedons have a few fine concretions of calcium carbonate. Reaction is slightly alkaline.

The Bw horizon is black, very dark gray, or dark gray in hue of 10YR, value of 3 to 6, and chroma of 1 to 3. Some pedons have as much as 10 percent masses and concretions of calcium carbonate from 0.125 to 0.25 inch in diameter.

The Bk horizon has hue of 10YR, value of 3 to 6, and chroma of 1 to 3. It is clay or silty clay. Clay content is 45 to 60 percent. Masses and concretions of calcium carbonate from 0.125 to 0.25 inch in diameter range from 5 to 15 percent. Reaction is slightly alkaline or moderately alkaline.

Some pedons have a BCk horizon that is grayish brown, brown, or pale brown. It is clay or silty clay. Masses of calcium carbonate range from 5 to 10 percent. Reaction is slightly or moderately alkaline.

The 2Cr/Bk horizon is very dark gray, grayish brown, gray, pale brown, very pale brown, or light brown in hue of 10YR or 7.5YR, value of 3 to 8, and chroma of 1 to 4. The 2Cr part is loam or silt loam. The Bk part is clay or silty clay. This horizon slakes in water. Reaction is slightly alkaline or moderately alkaline.

The 2Cr horizon is pale brown, light brown, light gray, very pale brown, or white in hue of 10YR or 7.5YR, value of 6 to 8, and chroma of 2 to 4. It is noncalcareous, weakly consolidated, tuffaceous siltstone that has texture of loam or silt loam interbedded with thin layers of calcium carbonate. This horizon slakes in water. Reaction is slightly or moderately alkaline.

Sarnosa Series

The Sarnosa series consists of very deep, well drained, moderately permeable soils that formed in calcareous sandstone and loamy sediments. These soils are on gently sloping ridgetops or upper side slopes of uplands. Slopes range from 2 to 5 percent.

The soils of the Sarnosa series are coarse-loamy, mixed, hyperthermic Typic Calciustolls.

Typical pedon of Sarnosa fine sandy loam, 2 to 5 percent slopes; from the intersection of U.S. Highway 181 and Texas Highway 72 in Kenedy, 0.8 mile east on Texas Highway 72 to intersection with Farm Road 792, 1.0 mile north on Farm Road 792 to intersection with county road, 3.6 miles northeast on county road to private ranch road, 1.0 mile southeast on ranch road, and 850 feet southwest in pasture. Latitude is 28 degrees, 51 minutes, 07 seconds North; longitude is 97 degrees, 48 minutes, 15 seconds West. Elevation is 285 feet above sea level.

A—0 to 18; dark grayish brown (10YR 4/2) fine sandy loam, very dark grayish brown (10YR 3/2) moist; weak fine subangular blocky structure; slightly hard, friable, nonsticky, nonplastic; common fine roots; common fine pores; few snail shell fragments; slightly effervescent; moderately alkaline; clear smooth boundary.

Bk1—18 to 30 inches; grayish brown (10YR 5/2) fine sandy loam, dark grayish brown (10YR 4/2) moist; weak fine subangular blocky structure; soft, friable, nonsticky, nonplastic; few fine roots; common fine pores; few small shell fragments; common fine threads and films of calcium carbonate; slightly effervescent; moderately alkaline; gradual smooth boundary.

Bk2—30 to 45 inches; light brownish gray (10YR 6/2) fine sandy loam, brown (10YR 5/3) moist; weak fine subangular blocky structure; soft, friable, nonsticky, nonplastic; few fine roots; few fine pores; few snail shell fragments; common fine threads and films of calcium carbonate, few fine and medium fragments and concretions of calcium carbonate; strongly effervescent; moderately alkaline; gradual smooth boundary.

BCk1— 45 to 68 inches; light gray (10YR 7/2) fine sandy loam, pale brown (10YR 6/3) moist; single grain; soft, very friable, nonsticky, nonplastic, few fine pores; few snail shells; common fine threads and films of calcium carbonate, few fine and medium masses, fragments, and concretions of calcium carbonate; strongly effervescent; moderately alkaline; gradual smooth boundary.

BCk2— 68 to 85 inches; very pale brown (10YR 8/3) fine sandy loam, very pale brown (10YR 7/3) moist; single grain; loose; very friable, nonsticky, nonplastic; many fine and medium masses and concretions of calcium carbonate; few siliceous pebbles; strongly effervescent; moderately alkaline.

The solum is 60 to more than 80 inches thick. Depth to calcium carbonate accumulations ranges from 24 to 36 inches.

The A horizon is very dark grayish brown, dark gray, or dark grayish brown in hue of 10YR, value of 3 or 4, and chroma of 1 or 2.

The Bk horizon is grayish brown, brown, pale brown, light brownish gray, or light yellowish brown in hue of 10YR or 7.5 YR, value of 5 or 6, and chroma of 2 to 4. It is fine sandy loam or loam.

The BCk horizon is brown, yellowish brown, light brownish gray, light gray, or very pale brown in hue of 10YR, value of 6 to 8, and chroma of 2 to 4. It is fine sandy loam or loam. Some pedons have thin strata of very weakly cemented calcareous sandstone.

Schattel Series

The Schattel series consists of soils that are deep to shale that has clay texture. They are well drained, slowly permeable soils that formed in clayey residuum. They are on gently sloping uplands. Slopes range from 2 to 5 percent.

The soils of the Schattel series are fine, montmorillonitic, hyperthermic Vertic Ustochrepts.

Typical pedon of Schattel clay loam, 2 to 5 percent slopes; from the intersection of U.S. Highway 181 and Texas Highway 72 in Kenedy, 2.0 miles west on Texas Highway 72 to intersection with county road, 1.95 miles west and southwest on county road, and 200 feet south in pasture. Latitude is 28 degrees, 47 minutes, 42 seconds North; longitude is 97 degrees, 52 minutes, 48 seconds West. The elevation is 365 feet above sea level.

A—0 to 5 inches; light brownish gray (10YR 6/2) clay loam; grayish brown (10YR 5/2) moist; weak fine subangular blocky structure; hard, firm, sticky, plastic; common very fine and fine roots throughout; few very fine and fine discontinuous tubular pores; few worm and termite casts; violently effervescent; moderately alkaline; clear smooth boundary.

Bw1—5 to 26 inches; very pale brown (10YR 7/3) clay; light yellowish brown (10YR 6/4) moist; few fine and medium distinct yellowish brown (10YR 5/6) mottles; moderate fine angular blocky structure; very hard, very firm, very sticky, very plastic; few very fine and fine roots throughout; few very fine and fine discontinuous tubular pores; common grayish brown clay loam-filled vertical cracks 1.0 to 1.5 inches wide; very few slickensides; very few distinct pressure faces; about 5 percent medium and coarse masses of calcium carbonate; violently effervescent; moderately alkaline; gradual wavy boundary.

Bw2—26 to 37 inches; light gray (2.5Y 7/2) clay; light brownish gray (2.5Y 6/2) moist; common fine and medium yellowish brown (10YR 5/6) mottles; moderate medium angular blocky structure; very hard, very firm, very sticky, very plastic; few fine roots throughout; few very fine and fine discontinuous tubular pores; common very dark brown streaks 0.5 to 1.0 inch wide; few slickensides; few fine iron-manganese concretions; very few distinct pressure faces; violently effervescent; moderately alkaline; gradual wavy boundary.

BC—37 to 55 inches; white (2.5Y 8/2) clay; light gray (2.5Y 7/2) moist; few fine and medium distinct yellowish brown (10YR 5/6), and light gray (2.5Y 7/2) mottles; weak coarse subangular blocky structure; very hard, very firm, very sticky, very plastic; few very fine and fine roots along vertical cracks between depths of 26 and 28 inches; few very fine and fine discontinuous tubular pores; very few distinct pressure faces; few fine and medium pockets of gypsum; few fine concretions of iron-manganese; violently effervescent; moderately alkaline; gradual wavy boundary.

Cr—55 to 80 inches; white (2.5Y 8/2) weathered shale that has clay texture, light gray (2.5Y 7/2) moist; few fine and medium distinct yellowish brown (10YR 5/6) mottles; massive; extremely hard, very firm, very sticky, very plastic; few fine and medium gypsum crystals; violently effervescent; moderately alkaline.

The solum is 40 to 60 inches thick. A few slickensides are at a depth of 20 to 40 inches. When dry, the soil has cracks as much as 1 inch wide that extend to a depth of more than 20 inches. Reaction is slightly alkaline or moderately alkaline.

The A horizon is in shades of gray or brown in hue of 10YR, value of 3 to 6, and chroma of 1 or 2.

The Bw horizon is in shades of gray or brown in hue of 2.5Y or 10YR, value of 4 to 7, and chroma of 1 to 4. It is mottled in shades of gray or brown. Some pedons are not mottled. This horizon has as much as 10 percent fine or medium masses or concretions of calcium carbonate. Some pedons have as much as 2 percent fine rounded iron-manganese concretions.

The BC horizon is in shades of gray, white, or brown in hue of 2.5Y or 10YR, value of 6 to 8, and chroma of 2 to 4. It is mottled in shades of gray or brown. Some pedons are not mottled. It has as much as 30 percent fine or medium masses or concretions of calcium carbonate.

The Cr or C horizon is in shades of gray or brown in hue of 7.5YR, 10YR, 2.5Y, or 5Y; value of 6 to 8; and chroma of 2 to 4. It is clay that has few to common mottles in shades of brown. It has as much as 30 percent fine or medium masses of calcium carbonate. This horizon has as much as 10 percent fine crystals of gypsum.

Shiner Series

The Shiner series consists of shallow, well drained, moderately permeable soils that formed over calcareous sandstone. These soils are on very gently sloping to moderately sloping upland ridges. Slopes range from 1 to 8 percent.

The soils of the Shiner series are loamy, carbonatic, hyperthermic shallow Typic Ustochrepts.

Typical pedon of Shiner fine sandy loam, 1 to 8 percent slopes; from the intersection of U.S. Highway 181 and Texas Highway 72 in Kenedy, 2.6 miles east on Texas Highway 72 to intersection with Texas Highway 239, 1.45 miles southeast on Texas Highway 239 to intersection with county road, 1.7 miles northeast on county road, and 100 feet southeast in pasture. Latitude is 28 degrees, 49 minutes, 07 seconds North; longitude is 97 degrees, 46 minutes, 48 seconds West. Elevation is 310 feet above sea level.

A—0 to 9 inches; brown (10YR 5/3) fine sandy loam, dark brown (10YR 4/3) moist; weak fine granular structure; slightly hard, friable, nonsticky, nonplastic; common fine and medium roots; few fine discontinuous tubular pores; few snail shell fragments; few wormcasts; few fine rounded calcareous sandstone pebbles; calcium carbonate equivalent is 50 percent; violently effervescent; moderately alkaline; clear smooth boundary.

Bk—9 to 14 inches; light yellowish brown (10YR 6/4) fine sandy loam; yellowish brown (10YR 5/4) moist; weak fine and medium granular structure; slightly hard, friable, nonsticky, nonplastic; few fine roots; few fine discontinuous tubular pores; few snail shell fragments; few worm and termite casts; few fine and medium rounded calcareous sandstone pebbles; calcium carbonate equivalent is 65 percent; violently effervescent; moderately alkaline; abrupt smooth boundary.

2Crk—14 to 31 inches; very pale brown (10YR 8/4); strongly cemented sandstone interbedded with thin lenses of fine sandy loam, very pale brown (10YR 8/4) moist; massive; extremely hard, extremely firm; few fine roots in cracks; calcium carbonate equivalent is 60 percent; strongly effervescent; moderately alkaline; clear smooth boundary.

2BCk—31 to 80 inches; very pale brown (10YR 8/4) fine sandy loam that has thin strata of weakly cemented sandstone; very pale brown (10YR 8/4) moist; massive; loose, friable, nonsticky, nonplastic; sandstone can be dug with a bucket auger; about 2 percent masses and pebbles of calcium carbonate; strongly effervescent; moderately alkaline.

The solum is 10 to 20 inches thick over sandstone. Reaction is slightly alkaline or moderately alkaline.

The A horizon is dark grayish brown, brown, grayish brown, brown, or light yellowish brown in hue of 10YR, value of 5 or 6, and chroma of 3. Sandstone fragments and calcium carbonate concretions make up 2 percent of the horizon.

The Bk horizon is brown, yellowish brown, light brownish gray, pale brown, or light yellowish brown in hue of 10YR, value of 5 or 6, and chroma of 2 to 4. It is fine sandy loam or sandy clay loam. Sandstone fragments and calcium carbonate concretions make up to 10 percent of the horizon.

The 2Crk horizon is pale brown, light yellowish brown, light gray, very pale brown, or white in hue of 10YR, value of 6 to 8, and chroma of 3 to 4. The sandstone ranges from very weakly to strongly cemented.

The 2BCk horizon is pale brown, light yellowish brown, light gray, very pale brown, or yellow in hue of 10YR, value of 6 to 8, and chroma of 2 to 6. It is fine sandy loam that is stratified with weakly cemented sandstone. Some pedons do not have a 2BCk horizon.

Sinton Series

The Sinton series consists of very deep, well drained, moderately permeable soils that formed in loamy alluvium. These soils are on nearly level flood plains of rivers and streams. Slopes are less than 1 percent.

The soils of the Sinton series are fine-loamy, mixed, hyperthermic Cumulic Haplustolls.

Typical pedon of Sinton sandy clay loam, occasionally flooded; from the intersection of U. S. Highway 181 and Farm Road 99 in Karnes City, 5.2 miles north on U. S. Highway 181 to private road entrance, and 800 feet northeast in cropland. Latitude is 28 degrees, 56 minutes, 39 seconds North; longitude is 97 degrees, 57 minutes, 39 seconds West. Elevation is 290 feet above sea level.

Ap—0 to 8 inches; dark grayish brown (10YR 4/2) sandy clay loam, very dark grayish brown (10YR 3/2) moist; weak fine subangular blocky structure; hard, friable, slightly sticky, slightly plastic; common fine roots; common fine and medium tubular pores; common fragments of snail shells; violently effervescent; moderately alkaline; abrupt smooth boundary.

A—8 to 25 inches; very dark grayish brown (10YR 3/2) sandy clay loam, very dark grayish brown (10YR 3/2) moist; weak fine and medium subangular blocky structure; hard, friable, slightly sticky, slightly plastic; common fine roots; few fine and medium tubular pores; common fragments of snail shells; few fine threads of calcium carbonate; violently effervescent; moderately alkaline; gradual smooth boundary.

Bw1—25 to 43 inches; pale brown (10YR 6/3) sandy clay loam, brown (10YR 5/3) moist; moderate fine and medium angular blocky structure; hard, friable, slightly sticky, slightly plastic; few fine roots; few fine tubular pores; few thin strata of fine sandy loam; common snail shell fragments; few threads of calcium carbonate; violently effervescent; moderately alkaline; gradual smooth boundary.

Bw2—43 to 80 inches; pale brown (10YR 6/3) sandy clay loam, brown (10YR 5/3) moist; weak fine subangular blocky structure; hard, friable, slightly sticky, slightly plastic; very few fine roots; few fine tubular pores; common snail shell fragments; common threads of calcium carbonate; few thin strata of clay; violently effervescent; moderately alkaline.

The A horizon is 20 to 40 inches thick. Thin strata of contrasting textures are at a depth of 25 to 50 inches. Reaction is slightly alkaline or moderately alkaline.

The A horizon is in shades of gray or brown in hue of 10YR, value of 3 or 4, and chroma of 2 or 3. It has few or common snail shell fragments. It is loam, clay loam, or sandy clay loam. The A horizon is typically calcareous, but is noncalcareous in some pedons.

The B horizon is in shades of gray or brown in hue of 10YR, value of 5 to 7, chroma of 1 to 3. It is loam, fine sandy loam, sandy clay loam, or clay loam with bedding planes and lenses of various textures. It has none to common snail shell fragments.

Tiocano Series

The Tiocano series consists of very deep, somewhat poorly drained, very slowly permeable soils that formed in clayey sediments. These soils are in depressions on uplands. Slopes range from 0 to 1 percent.

The soils of the Tiocano series are fine, montmorillonitic, hyperthermic Udic Pellusterts.

Typical pedon of Tiocano clay, 0 to 1 percent slopes; from the intersection of U.S. 181 and Texas Highway 72 in Kenedy, 10.0 miles south on U.S. 181 to intersection with Farm Road 743, 2.2 miles east on Farm Road 743 to unpaved county road, 0.6 mile east and north to ranch fence corner; 500 feet west and 75 feet south in pasture. Latitude is 28 degrees, 41 minutes, 18 seconds North; longitude is 97 degrees, 47 minutes, 18 seconds West. The elevation is 435 feet above sea level.

A1—0 to 8 inches; very dark gray (10YR 3/1) clay; very dark gray (10YR 3/1) moist; moderate medium angular blocky structure parting to moderate fine and very fine angular blocky; very hard, very firm, very sticky, very plastic; common very fine and fine roots throughout, few medium roots throughout; common fine tubular pores; few pressure faces; neutral; clear wavy boundary.

A2—8 to 18 inches; very dark gray (10YR 3/1) clay; very dark gray (10YR 3/1) moist; moderate coarse angular blocky structure parting to moderate very fine and fine angular blocky; very hard, very firm, very sticky, very plastic; common very fine and fine roots throughout; common very fine and fine continuous tubular pores; few slickensides in the lower part; common fine and medium pressure faces; slightly alkaline; gradual wavy boundary.

Bss—18 to 28 inches; dark gray (10YR 4/1) clay; very dark gray (10YR 3/1) moist; strong coarse and medium angular blocky structure parting to moderate fine angular blocky; very hard, very firm, very sticky, very plastic; common very fine and fine roots in cracks; common very fine and fine continuous tubular pores; common slickensides; common medium pressure faces; few fine rounded carbonate concretions; moderately alkaline; gradual wavy boundary.

Bkss1—28 to 40 inches; gray (10YR 5/1) clay; dark gray (10YR 4/1) moist; moderate medium angular blocky structure; very hard, very firm, very sticky, very plastic; few very fine and fine roots in cracks; few very fine and fine continuous tubular pores; common very dark gray (10YR 3/1) slickensides; common medium pressure faces; common fine and medium carbonate concretions; moderately alkaline; gradual wavy boundary.

Bkss2—40 to 60 inches; light brownish gray (10YR 6/2) clay; grayish brown (10YR 5/2) moist; moderate medium angular blocky structure; very hard, very firm, very sticky, very plastic; few very fine and fine roots in cracks; few fine tubular pores; common gray (10YR 5/1) slickensides; common fine and medium pressure faces; common fine and medium carbonate concretions; moderately alkaline; gradual wavy boundary.

BCss—60 to 80 inches; light gray (10YR 7/2) clay; light brownish gray (10YR 6/2) moist; weak fine and medium angular blocky structure; very hard, very firm, very sticky, very plastic; few fine roots; few fine tubular pores; few grayish brown (10YR 5/2) slickensides; few fine rounded iron-manganese concretions; moderately alkaline.

The solum is 60 to more than 80 inches thick. It is clay. Clay content is 40 to 60 percent. Amplitude between the A and B horizons is 5 to 14 inches. Slickensides are at a depth of 10 to 30 inches. When dry, cracks as much as 2.5 inches wide extend to a depth of more than 20 inches. Reaction is neutral to moderately alkaline.

The A horizon has hue of 10YR, value of 2 or 3, and chroma of 1, or N 2/0. A few slickensides occur in the lower part.

The Bss horizon has hue of 10YR or 7.5YR, value of 3 to 5, and chroma of 1, or N 2/0. This horizon has few to common slickensides.

The Bkss horizon has hue of 10YR, value of 4 to 7, and chroma of 1 or 2. The horizon has few to common fine and medium calcium carbonate concretions. It contains few or common slickensides and few fine rounded masses of iron-manganese. It has none to common fine or medium brown mottles.

The BCss horizon has hue of 10YR or 2.5Y, value of 6 or 7, and chroma of 2 or 3. It contains few or common slickensides and few fine rounded masses of iron-manganese. It has none to common, fine or medium brown mottles.

Tordia Series

The Tordia series consists of deep, well drained, very slowly permeable soils that formed in clayey sediments over shale and sandstone that contain volcanic ash and shards. These gently sloping soils are on uplands. Slopes range from 1 to 5 percent.

The soils of the Tordia series are fine, montmorillonitic, hyperthermic Vertic Haplustolls.

Typical pedon of Tordia clay, 1 to 3 percent slopes; from the intersection of Texas Highway 80 and Farm Road 627, west 2.7 miles on Farm Road 627, and 250 feet south in cropland. Latitude is 29 degrees, 02 minutes, 35 seconds North; longitude is 97 degrees, 50 minutes, 30 seconds West. The elevation is 318 feet above sea level.

Ap—0 to 8 inches; black (10YR 2/1) clay; black (10YR 2/1) moist; weak fine subangular blocky structure; very hard, very firm, very sticky, very plastic; common fine roots throughout; few fine discontinuous tubular pores; slightly alkaline; abrupt smooth boundary.

A—8 to 16 inches; black (10YR 2/1) clay; black (10YR 2/1) moist; weak fine and medium subangular blocky structure; very hard, very firm, very sticky, very plastic; common fine roots throughout; few fine discontinuous tubular pores; few faint pressure faces; moderately alkaline; clear smooth boundary.

Bw1—16 to 28 inches; black (10YR 2/1) clay; black (10YR 2/1) moist; moderate medium angular blocky structure; extremely hard, extremely firm, very sticky, very plastic; few fine roots throughout; few fine discontinuous tubular pores; few thin films of fine sand on vertical ped surfaces; very few distinct pressure faces; few slickensides; moderately alkaline; gradual wavy boundary.

Bw2—28 to 37 inches; dark gray (10YR 4/1) clay; dark gray (10YR 4/1) moist; moderate medium angular blocky structure; extremely hard, extremely firm, very sticky, very plastic; few fine roots throughout; few fine discontinuous tubular pores; few distinct pressure faces; few cracks filled with black material; few slickensides; moderately alkaline; gradual wavy boundary.

BC—37 to 43 inches; light gray to gray (10YR 6/1), and pale yellow (2.5Y 7/4) clay; gray (10YR 5/1), and light yellowish brown (2.5Y 6/4) moist; weak fine subangular blocky structure; extremely hard, extremely firm, very sticky, very plastic; few pockets of reddish yellow and yellow material in lower part; few fine and medium plate-like gypsum crystals; moderately alkaline; gradual wavy boundary.

2Cry—43 to 80 inches; light gray (2.5Y 7/2) weakly consolidated shale that has clay texture; light brownish gray (2.5Y 6/2) moist; massive; extremely hard, extremely firm; common layers of reddish yellow and yellow material throughout; common fine and medium plate-like gypsum crystals; moderately alkaline.

The solum is 40 to 60 inches thick. It is clay. Cracks 1 to 2 inches wide extend to a depth of more than 20 inches. A few slickensides occur from a depth of 16 to 36 inches. Some pedons have calcium carbonates at a depth of 27 inches. Reaction is neutral to moderately alkaline.

The A horizon is black, very dark gray, or dark gray in hue of 10YR, value of 2 to 4, and chroma of 1.

The B horizon is in shades of black, gray, or brown in hue of 10YR, value of 2 to 5, and chroma of 1 or 2. Some pedons have a Bk or a Bkz horizon that has similar colors and texture as the B horizon.

The BC horizon is in shades of gray or brown in hue of 10YR, value of 4 to 6, and chroma of 1 to 3. Some pedons have a BCk or a BCkz horizon that has similar colors and texture as the BC horizon.

The Cr horizon is in shades of brown, gray, or white in hue of 10YR or 2.5Y, value of 5 to 8, and chroma of 2 or 3. It is shale that has clay texture or shale interbedded with weakly cemented sandstone. Some pedons have a Ck or Ckz horizon that has similar colors and textures to those of the Cr horizon.

Weesatche Series

The Weesatche series consists of very deep, well drained, moderately permeable soils that formed in calcareous loamy sediments (fig. 24). These soils are on gently sloping uplands. Slopes range from 1 to 5 percent.

The soils of the Weesatche series are fine-loamy, mixed, hyperthermic Typic Argiustolls.

Typical pedon of Weesatche sandy clay loam, 1 to 3 percent slopes; from the intersection of U.S. Highway 181 and Texas Highway 72 in Kenedy, 7.6 miles south on U.S. Highway 181 to intersection with private ranch road, 0.8 mile northeast on ranch road, and 0.3 mile southeast in rangeland. Latitude is 28 degrees, 42 minutes, 18 seconds North; longitude is 97 degrees, 49 minutes, and 49 seconds West. Elevation is 420 feet above sea level.

A—0 to 8 inches; very dark gray (10YR 3/1) sandy clay loam, black (10YR 2/1) moist; weak fine subangular blocky structure; very hard, friable, slightly sticky, slightly plastic; common fine roots; few fine pores; slightly alkaline; abrupt smooth boundary.

Bt1—8 to 15 inches; very dark gray (10YR 3/1) sandy clay loam, black (10YR 2/1) moist; moderate medium angular blocky structure; very hard, firm, slightly sticky, slightly plastic; few fine roots; few fine pores; few faint discontinuous clay films on surfaces of peds; slightly alkaline; clear smooth boundary.

Bt2—15 to 24 inches; dark brown (7.5YR 3/2) sandy clay loam, dark brown (7.5YR 3/2) moist; weak fine and medium prismatic structure parting to moderate medium angular blocky; very hard, firm, slightly sticky, slightly plastic; few fine roots; few fine pores; common continuous clay films on surfaces of peds; slightly alkaline; clear smooth boundary.

Btk—24 to 33 inches; brown (7.5YR 4/4) sandy clay loam, brown (7.5YR 4/4) moist; weak fine subangular blocky structure; very hard, firm, slightly sticky, slightly plastic; very few roots; few fine pores; few thin discontinuous clay films on surfaces of peds; few fine and medium masses of calcium carbonate; few fine concretions of calcium carbonate; strongly effervescent; moderately alkaline; gradual smooth boundary.

Bk—33 to 51 inches; brown (7.5YR 5/4) sandy clay loam, brown (7.5YR 5/4) moist; weak fine subangular blocky structure; very hard, firm, slightly sticky, slightly plastic; very few fine roots; common fine, medium, and coarse masses and threads of calcium carbonate; violently effervescent; moderately alkaline; gradual smooth boundary.

BCk—51 to 80 inches; pink (7.5YR 7/4) sandy clay loam, pink (7.5YR 7/4); weak fine subangular blocky structure; very hard, firm, slightly sticky, slightly plastic; many medium and coarse masses of calcium carbonate; violently effervescent; moderately alkaline.

The solum is very deep. Threads and masses of calcium carbonate occur within a depth of 20 inches. Reaction is slightly alkaline or moderately alkaline.

The A horizon is in shades of brown or gray in hue of 10YR, 7.5YR, or 5YR; value of 3 to 5; and chroma of 1 to 3. It is sandy clay loam or fine sandy loam. Reaction is slightly alkaline.

The Bt horizon is in shades of brown, red, or gray in hue of 10YR, 7.5YR, or 5YR; value of 3 or 4; and chroma of 1 to 4. It is loam, sandy clay loam, or clay loam. Reaction is slightly alkaline or moderately alkaline.

The Bk horizon is in shades of brown, yellow, or gray in hue of 5YR, 7.5YR or 10YR; value of 3 to 6; and chroma of 2 to 6. It is loam, sandy clay loam, or clay loam. Reaction is moderately alkaline.

The BCk horizon is in shades of gray, brown, pink, or yellow in hue of 10YR, 7.5YR, or 5YR; value of 3 to 8; and chroma of 2 to 6. It is fine sandy loam, loam, sandy clay loam, or clay loam. Reaction is moderately alkaline.

Weigang Series

The Weigang series consists of soils that are shallow over sandstone. They are well drained, moderately permeable soils that formed in residuum weathered from sandstone and shale. These soils are on gently sloping to steep uplands. Slopes range from 1 to 25 percent.

The soils of the Wiegang series are loamy, mixed, hyperthermic, shallow Typic Argiustolls.

Typical pedon of Wiegang fine sandy loam, 1 to 5 percent slopes; from the intersection of Farm Road 791 and Farm Road 1344 in DeWeesville, 0.85 mile north on Farm Road 1344, and 0.2 mile east in rangeland. Longitude is 28 degrees, 54 minutes, 30 seconds North; longitude is 98 degrees, 07 minutes, 24 seconds West. Elevation is 445 feet above sea level.

A—0 to 5 inches; dark gray (10YR 4/1), fine sandy loam, very dark gray (10YR 3/1) moist; weak fine subangular blocky structure; slightly hard, very friable, nonsticky, nonplastic; few fine roots; common fine and medium pores; few fine fragments of sandstone; noncalcareous; neutral; clear smooth boundary.

Bt—5 to 18 inches; very dark gray (10YR 3/1) clay loam, very dark gray (10YR 3/1) moist; moderate medium prismatic structure parting to moderate medium angular blocky; very hard, very firm, sticky, plastic; many thin patchy clay films on surfaces of peds; few fine roots; few fine pores; few fine fragments of sandstone; noncalcareous; neutral; abrupt wavy boundary.

Cr—18 to 80 inches; white (10YR 8/1) sandstone, white (10YR 8/1) moist; moderately hard and brittle; contains yellow, yellowish brown, and brown streaks; noncalcareous; moderately alkaline.

The solum is 10 to 20 inches thick. The range in thickness is common within horizontal distances of less than 20 feet. Rock fragments of sandstone in the A and Bt horizons range from 0 to 55 percent.

The A horizon is in shades of gray or brown in hue of 10YR, value of 3 or 4, and chroma of 1 or 2.

The Bt horizon is in shades of gray or brown in hue of 10YR, value of 3 to 5, and chroma of 1 or 2. It is sandy clay loam or clay loam that has a clay content of 27 to 35 percent.

The Cr horizon is in shades of gray, brown, or white in hue of 10YR, 2.5Y, or 5Y; value of 7 or 8; and chroma of 1 to 3. The Cr horizon is sandstone interbedded with shale or thin layers of calcium carbonate. The sandstone ranges from weakly to strongly cemented.

Zunker Series

The Zunker series consists of very deep, well drained, moderately rapidly permeable soils that formed in calcareous loamy alluvial deposits. These soils are on nearly level flood plains. Slopes are less than 1 percent.

The soils of the Zunker series are coarse-loamy, siliceous, hyperthermic Fluventic Ustochrepts.

Typical pedon of Zunker fine sandy loam, occasionally flooded; from the intersection of Texas Highway 72 and Farm Road 792 in Kenedy, 1.1 miles north on Farm Road 792 to county road; 5 miles east on county road; and 75 feet south in pasture. Latitude is 28 degrees, 53 minutes, 18 seconds North; longitude is 97 degrees, 47 minutes, 08 seconds West. Elevation is 235 feet above sea level.

Ap—0 to 8 inches; grayish brown (10YR 5/2) fine sandy loam, dark grayish brown (10YR 4/2) moist; weak fine granular structure; soft, very friable, nonsticky, nonplastic; common fine roots; few snail shell fragments; about 20 percent calcium carbonate equivalent; strongly effervescent; moderately alkaline; abrupt smooth boundary.

A—8 to 18 inches; grayish brown (10YR 5/2) fine sandy loam, dark grayish brown (10YR 4/2) moist; weak fine subangular blocky structure parting to weak fine granular; soft, very friable, nonsticky, nonplastic; common fine roots; few snail shell fragments; 25 percent calcium carbonate equivalent; strongly effervescent; moderately alkaline; clear wavy boundary.

Bw1—18 to 41 inches; pale brown (10YR 6/3) fine sandy loam, brown (10YR 5/3) moist; weak fine subangular blocky structure parting to weak fine granular; soft, very friable, nonsticky, nonplastic; few fine roots; few snail shell fragments; few strata of loamy fine sand 0.25 to 3.0 inches thick in upper part; 30 percent calcium carbonate equivalent; strongly effervescent; moderately alkaline; clear wavy boundary.

Bw2—41 to 60 inches; very pale brown (10YR 7/3) loamy fine sand, very pale brown (10YR 7/3) moist; weak fine granular structure; loose, very friable, nonsticky, nonplastic; very few fine roots; few snail shell fragments; 20 percent calcium carbonate equivalent; strongly effervescent; moderately alkaline; clear wavy boundary.

Ab—60 to 80 inches; grayish brown (10YR 5/2) fine sandy loam, dark grayish brown (10YR 4/2) moist; weak fine subangular blocky structure; slightly hard, friable, slightly sticky, slightly plastic; very few fine roots in upper part; few snail shell fragments; few thin films and fine threads of calcium carbonate on surfaces of peds; 20 percent calcium carbonate equivalent; strongly effervescent; moderately alkaline.

The solum is more than 60 inches thick. Reaction is slightly or moderately alkaline. The clay content of the control section ranges from 7 to 18 percent.

The A horizon is dark grayish brown, brown, or grayish brown in hue of 10YR, value of 4 or 5, and chroma of 2 to 4.

The Bw horizon is in shades of brown and gray in hue of 10YR, value of 4 to 7, and chroma of 2 to 4. It is fine sandy loam or loamy fine sand. Most pedons have strata of very fine sandy loam, loam, or loamy fine sand that are 0.25 to 3.0 inches thick and range from few to many.

Some pedons have an Ab horizon at depths between 36 to 80 inches. It has hue of 10YR, value of 3 to 5, and chroma of 1 to 4. It is fine sandy loam or loamy fine sand. Some pedons have loam or clay loam layers below the control section.

Formation of the Soils

In this section the factors of soil formation are related to the soils in Karnes County. In addition, the processes of soil formation and soil horizon differentiation are described.

Factors of Soil Formation

Soil is produced by the action and interaction of soil-forming factors on material deposited or accumulated by geologic processes. The characteristics of the soil at any given point are determined by the physical and mineralogical composition of the parent material, the climate under which the soil material accumulated and 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 these forces have acted on the soil material. One factor, or more, may be dominant in a particular area; consequently, soils differ from place to place. The interaction among the five factors is complex, continuous and so interrelated in their effects on the soil that few generalizations can be made regarding the effect of any one factor unless conditions are specified for the other four. Each factor is discussed separately, however, and the probable effects of each are indicated.

Parent Material

Parent material is the unconsolidated mass from which a soil forms. It determines the chemical and mineral composition of the soil. The soils in Karnes County formed in parent material derived from two geologic systems, the Tertiary and Quaternary. The geology of Karnes County is discussed in more detail under the heading,“Geology.”

Deposits of the Tertiary system are sediments of the Yegua, Jackson, Catahoula, Oakville, Fleming, and Goliad formations. The sediments consist of sandstones, shales, clays, siltstones, or loams. Upland soils formed from these sediments. The soils are clayey throughout, loamy throughout, or loamy surfaces over clayey subsoils. The soils are shallow to very deep. The Miguel, Bryde, Gillett, Pavelek, Eloso, Monteola, Coy, Pernitas, Weesatche, Tordia, Ecleto, and Olmos soils are on the uplands.

Deposits of the Quaternary system are sediments from stream terraces and recent alluvium. The sediments consist of clays, loams, and sands. Many of these deposits have been reworked by wind and water. The terrace soils have a loamy or sandy surface layer over a clayey or loamy subsoil. The soils are deep or very deep. The Papalote, Nusil, and Rhymes soils are in these areas. The recent alluvium soils are clayey or loamy throughout and are very deep. The Buchel, Sinton, Zunker, and Odem soils are on flood plains.

Climate

Karnes County has a subtropical climate. Winters are mild and dry, and summers are hot and humid. Rainfall, evaporation, temperature, wind, and length of growing season are some of the climatic factors that directly affect soil formation through weathering, leaching of carbonates, downward movement of clay particles, reduction and movement of iron, and rate of erosion. Climate also determines the kind and amount of plant and animal life that exist on and in the soil.

Rainfall leaches minerals from the upper soil layers and deposits them in lower layers. As a result, some of the soils, such as Pernitas and Papalote, have an accumulation of calcium carbonate in the lower part.

Wind also affects the formation of soils in the county. Wind has reworked the soil material in which the Rhymes and Nusil soils formed.

Living Organisms

Plants, insects, earthworms, animals, micro-organisms, other organisms, and more recently, human beings, contribute to the development of soils. Living organisms cause gains in organic matter and nitrogen in soils, gains or losses in plant nutrients, and changes in soil structure and soil porosity.

Plants play a major role in soil formation in Karnes County. The fibrous root system of grasses contributes a large amount of organic matter to the soils. Roots of grasses, shrubs, and trees decay and leave holes and pores in the soil that serve as passageways for air and water.

Earthworms, insects, rodents, and other animals mix the soil. Worms and insects hasten the decay of organic matter and their tunnels improve soil structure and facilitate the movement of air and water throughout the soil. The decomposed organic matter adds humus to the soil and improves fertility and tilth.

People also influence soil formation. They change the makeup of the plant community by bringing in cattle to graze or change the soil structure by plowing and planting crops. Cultivation can result in increased runoff and erosion, thus reducing the content of organic matter and nutrients. Tillage and continuous grazing compact the clayey soils and reduce aeration, infiltration, and permeability. These actions have a definite influence on soil genesis; however, the effects may not be apparent for a long time.

Topography

Relief, or topography, influences soil development by affecting drainage, runoff, erosion, plant cover, and soil temperature.

The relief in Karnes County ranges from nearly level to gently rolling. Soil profile development depends on the amount of moisture and the depth to which moisture penetrates. Sloping soils take in less water and normally have a less developed profile than nearly level soils. Many of the more sloping soils erode almost as fast as they form.

The deepest soils in the county are the nearly level Buchel and Clareville soils. Soils of intermediate depth are the gently sloping Gillett and Eloso soils. The shallow soils are the gently sloping to moderately sloping Olmos and Shiner soils on uplands. Some of these soils have well developed horizons, others have faint or weakly developed horizons.

Relief also affects the kind and amount of vegetation on a soil. North- and east-facing slopes generally receive less direct sunlight than south- or west-facing slopes, and as a result, they are slightly cooler and lose less moisture. Vegetation is generally more dense on the north- and east-facing slopes.

Time

A great length of time is required for soils to form distinct horizons. The differences in the length of time that the parent material has been in place are commonly reflected in the degree of development of soil horizons.

The soils in Karnes County range from young to old. Young soils have very little horizon development and old soils have well developed horizons. Odem soils, for example, are young soils. They are on flood plains, and sediment is continuously added after floods. Advanced stages of development are evident in the Miguel soils. These soils have distinct horizonation.

Some older soils have a noticeable accumulation of calcium carbonate in the lower part of the profile. Aging causes the calcium carbonate to leach from the upper horizons to lower horizons; the calcium carbonate is deposited in the form of soft masses or concretions. Pernitas, Weesatche, and Coy soils are examples of soils that have calcium carbonate in the lower horizons. Some soils have a concentration of calcium carbonate in the lower horizons that, after a great length of time, has become cemented or indurated (petrocalcic horizon). The Condido, Olmos, Parrita, and Pavelek soils are examples of soils that have a petrocalcic horizon.

Geology

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Karnes County is in the West Gulf Geomorphic Region where all of the geologic units dip gulfward *(21)*. The geologic formations are Tertiary and range from the Eocene age (Yegua Formation) to the Pliocene age (Goliad Formation). These formations are overlain by younger Holocene age and Pleistocene age fluvial and eolian deposits. The orientation of the younger deposits, in most places, is oblique to or perpendicular to the outcrop patterns of the older formations.

Most of the county falls in the drainage basin of the southeastward-flowing San Antonio River. The extreme northeastern part of the county is in the Guadalupe River drainage basin and the southwestern part is in the Nueces River drainage basin.

The general soil map can serve as an approximate guide to the geology of the county.

Yegua Formation

The Yegua Formation is the uppermost or youngest formation of the Claiborne Group and is about 1,000 feet thick. The Yegua Formation sediments were deposited in a variety of environments, especially fluvial and deltaic *(11)*. The formation is the product of a marine regression, or seaward advance of the shoreline, over the previously deposited, largely Cook Mountain, formation. The dominant components of the Yegua Formation in Karnes County are sandstones, clays, and possibly lignite *(3, 11)*. In a fluvial setting, the sandy sediments are of channel, point-bar, and crevasse-splay origin, and the finer sediments are of levee and floodbasin origin. In a deltaic setting, the sandy sediments are of distributary and delta front origin and the finer sediments are of prodelta and interdistributary origins. Thin reworked strata of volcanic ash or tuff are interbedded with the finer deposits. The volcanic ash has commonly weathered to smectites.

In the Yegua Formation outcrop area, the major soils are the Miguel soils and the minor soils are the Bryde and Gillett soils. The Miguel soils have a finer grain substrate that probably belongs to the finer grain facies of a fluvial and deltaic environment. The minor Bryde and Gillett soils have substrates of sandstone and belong to the coarser grain facies of these environments.

Jackson Group

The Jackson Group consists of four formations. They are the Caddell, Manning, Wellborn, and Whitsett formations. They are Upper Eocene in age and are about 800 feet thick *(3)*.

The sediments of the Jackson Group are in the South Texas barrier/lagoon system *(5, 8, 11)*. The marginal and littoral facies is mainly fluvial and deltaic in origin. The shore-paralleling facies includes upward coarsening (mud to silt to sand) barrier island sediments. They are lagoonal, bay, mudflat, and coastal marsh mudstones and shales; sandy spit-accretion and inlet filling deposits; and thin, but areally complex, washover fan deposits *(8)*. Most of these deposits are tuffaceous.

In the Jackson Group outcrop area, the major soils are the Bryde and Gillett soils. The sandy substrates of the Bryde and Gillett soils point to the uppermost parts of the barriers and to spit and inlet filling environments. The shales and clayey substrates of the minor Tordia and Coy soils point to the mudflat, marsh, and some lagoonal environments. The mixed sandstone and shale/clay substrates of the Fashing, Ecleto, and Weigang soils point to rapidly upward-changing facies in lagoonal and bay fillings, in the lower parts of barrier island sequences, and on the landward side of barrier islands because of eolian and storm washover deposition.

Catahoula Formation

The Catahoula Formation is of Oligocene to early Miocene age *(3, 13, 14)*. This formation is about 150 to 350 feet thick *(3)*.

The Catahoula Formation has the most volcanic ash material in the Gulf Coast region; some of it is in place. The source of the volcanic ash was probably northwest Mexico and the Trans-Pecos region of Texas *(6, 12, 14)*. Some of the material was reworked by mass-wasting and colluvial processes and carried into Catahoula-age streams and appears in fluvial deposits. Much of the ash was transformed into smectic clays. The major part of this conversion to smectite could have been accomplished contemporaneously with the deposition of the Catahoula Formation *(13)*.

Karnes County is in a part of the Catahoula Formation referred to as the Gueydan fluvial system, in which sediments were deposited in mostly fluvial environments *(6)*. The channel-fill sediments are mostly sands, the crevasse splay deposits range from sandstones to mudstones, and the floodbasin sediments are mainly tuffaceous mudstones and siltstones.

In the Catahoula outcrop area, the major soils are the Eloso, Pavelek, and Rosenbrock soils. These soils, along with the Condido soils, have siltstone substrates of crevasse splay, levee, or flood basin origin. The minor Coy soil, that has a clayey substrate, may be developed on flood basin clays. Where the formation includes other soil associations, the Coy and Monteola soils that have clayey substrates can be sited on flood basin deposits. The Weesatche and Pernitas soils, which have loamy substrates, can be on crevasse-splay, levee deposits, or flood basin deposits. The Shiner and Sarnosa soils, which have sandy substrates, are on channel deposits. The Eloso-Pavelek-Rosenbrock general soil map unit has no soil with a sandy substrate representative of a channel environment.

The Oakville Sandstone and the Fleming Formation

The Oakville Sandstone and the younger, overlying Fleming Formation are of Miocene age. In the southwestern part of the county, they are not differentiated *(4)* and have a combined thickness of about 800 feet. In the northeastern part of the county where they are mapped separately *(4)*, the Oakville Sandstone is about 300 to 500 feet thick and the Fleming Formation is about 1,300 to 1,450 feet thick.

The Oakville Sandstone is a massive to cross-bedded, calcareous, medium to coarse-grained sandstone with beds of silt and clay (3, 4, 15). The formation is fluvial in origin and in Karnes County was deposited by two paleo-fluvial systems from the northeast and southwest, the New Davey Axis and the George West Axis respectively (7). These paleo-stream systems deposited a wide variety of fluvial facies, but were predominantly sand in a stream environment.

The overlying Fleming Formation, also fluvial in origin, contains more clay than the Oakville Sandstone, but the sandstone units are also massive to cross-bedded, medium- to coarse-grained and calcareous. The fluvial sediments were deposited by the paleo-Blanco and the paleo-San Antonio Rivers

(15). The Fleming Formation has a higher proportion of overbank clayey sediments than the Oakville Sandstone.

The formations are topped mainly by the Coy-Monteola and the Weesatche-Pernitas general soil map units. The Oakville Sandstone corresponds to the Coy-Monteola general soil map unit. The Fleming Formation corresponds to the Weesatche-Pernitas general soil map unit. Soils of the Coy-Monteola unit have clayey substrates and were probably formed in overbank, flood basin muds. Soils of the Weesatche-Pernitas unit have loamy substrates and were probably formed on crevasse splays and levee materials. The minor Shiner soils, which have sandstone substrates, are on coarser channel and point bar deposits.

Goliad Formation

The Goliad Formation overlies the Fleming Formation and is Miocene *(8)* or Pliocene *(15)* in age. The Goliad Formation is fluvial in origin with probable paleo-Blanco and paleo-San Antonio River sources *(15)*. The outstanding feature of the Goliad Formation is the thick surface deposits of caliche that indicate its presence in most places in south Texas. Below the caliche cap, the formation contains clays and sands, some cross-bedded, and conglomerates of siliceous gravels, most of which in near-surface, shallow exposures and quarries have calcium carbonate matrices or cements. The Goliad Formation in Karnes County crops out in isolated outliers in the southeastern part of the county. To the southeast in Goliad and Bee counties, it is exposed in continuous tracts.

The origin of the caliche in the Goliad Formation, as well as in other parts of Texas and the southwestern United States, has generated considerable literature *(10)*. The dominant viewpoint is that the caliche accumulates from the top down, mostly from atmospheric additions as dry dust falls, or from precipitation *(9)*. Several stages are recognized as the pore space in the soil is filled by precipitated calcium carbonate carried by percolating rain water. The final stages include the formation of a “plugged horizon” in which the grain-to-grain contacts of the soil or sediment are lost and the grains are “floating” in a matrix of calcium carbonate. Downward percolation is reduced, resulting in a final impervious “laminar horizon” (petrocalcic horizon) stage. This horizon, with continued impeded drainage and increments of calcium carbonate, accumulates in an upward direction.

Pleistocene Terraces, Eolian Deposits, and Holocene Alluvium

The Geologic Atlas of Texas shows Pleistocene deposits along the San Antonio River, Ecleto Creek, and Cibolo Creek *(4)*.

No single general soil map unit seems to be dedicated to the “fluviatile terrace deposits.” This is probably because the soils are a mixture of upland soils and soils that have been influenced by, or added to, by eolian activity. The closest approximation for features with a fluvial terrace morphology is the Papalote-Nusil general soil map unit. The obviously eolian-influenced soils, especially the Nusil and the Rhymes soils, are not all on terraces. Some of these materials may be the remnants of obscure unmapped terraces and some may be wind-transported from areas of well-defined terraces.

The Holocene alluvium is in the major stream valleys, including the San Antonio River. The alluvium consists of clays, silts, and fine sands. The Holocene alluvium is well defined by the Sinton-Buchel-Zunker general soil map unit. The Buchel soils are clayey and are on flood basin deposits. The loamy Sinton soils and the sandy Zunker soils are on the point bar and levee deposits.

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Glossary

AC soil. A soil having only an A and a C horizon. Commonly, such soil formed in recent alluvium or on steep, rocky slopes.

Aeration, soil. The exchange of air in soil with air from the atmosphere. The air in a well aerated soil is similar to that in the atmosphere; the air in a poorly aerated soil is considerably higher in carbon dioxide and lower in oxygen.

Aggregate, soil. Many fine particles held in a single mass or cluster. Natural soil aggregates, such as granules, blocks, or prisms, are called peds. Clods are aggregates produced by tillage or logging.

Alluvium. Material, such as sand, silt, or clay, deposited on land by streams.

Area reclaim (in tables). An area difficult to reclaim after the removal of soil for construction and other uses.

Argillic horizon; A subsoil horizon characterized by an accumulation of illuvial clay.

Association, soil. A group of soils or miscellaneous areas geographically associated in a characteristic repeating pattern and defined and delineated as a single map unit.

Available water capacity (available moisture capacity). The capacity of soils to hold water available for use by most plants. It is commonly defined as the difference between the amount of soil water at field moisture capacity and the amount at wilting point. It is commonly expressed as inches of water per inch of soil. The capacity, in inches, in a 60-inch profile or to a limiting layer is expressed as:

Very low	0 to 3
Low	3 to 6
Moderate	6 to 9
High	9 to 12
Very high	more than 12

Base saturation. The degree to which material having cation-exchange properties is saturated with exchangeable bases (sum of Ca, Mg, Na, and K), expressed as a percentage of the total cation-exchange capacity.

Bedding planes. Fine strata, less than 5 millimeters thick, in unconsolidated alluvial, eolian, lacustrine, or marine sediment.

Bedrock. The solid rock that underlies the soil and other unconsolidated material or that is exposed at the surface.

Bottom land. The normal flood plain of a stream, subject to flooding.

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 more or less cemented deposit of calcium carbonate in soils of warm-temperate, subhumid to arid areas. Caliche occurs as soft, thin layers in the soil or as hard, thick beds just beneath the solum, or it is exposed at the surface by erosion.

Cation. An ion carrying a positive charge of electricity. The common soil cations are calcium, potassium, magnesium, sodium, and hydrogen.

Cation-exchange capacity. The total amount of exchangeable cations that can be held by the soil, expressed in terms of milliequivalents per 100 grams of soil at neutrality (pH 7.0) or at some other stated pH value. The term, as applied to soils, is synonymous with base-exchange capacity but is more precise in meaning.

Chiseling. Tillage with an implement having one or more soil-penetrating points that shatter or loosen hard, compacted layers to a depth below normal plow depth.

Clay. As a soil separate, the mineral soil particles less than 0.002 millimeter in diameter. As a soil textural class, soil material that is 40 percent or more clay, less than 45 percent sand, and less than 40 percent silt.

Clay film. A thin coating of oriented clay on the surface of a soil aggregate or lining pores or root channels. Synonyms: clay coating, clay skin.

Claypan. A slowly permeable soil horizon that contains much more clay than the horizons above it. A claypan is commonly hard when dry and plastic or stiff when wet.

Climax plant community. The stabilized plant community on a particular site. The plant cover reproduces itself and does not change so long as the environment remains the same.

Coarse fragments. If round, mineral or rock particles 2 millimeters to 25 centimeters (10 inches) in diameter; if flat, mineral or rock particles (flagstone) 15 to 38 centimeters (6 to 15 inches) long.

Coarse textured soil. Sand or loamy sand.

Complex slope. Irregular or variable slope. Planning or establishing terraces, diversions, and other water-control structures on a complex slope is difficult.

Complex, soil. A map unit of two or more kinds of soil or miscellaneous areas in such an intricate pattern or so small in area that it is not practical to map them separately at the selected scale of mapping. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas.

Compressible (in tables). Excessive decrease in volume of soft soil under load.

Concretions. Cemented bodies with crude internal symmetry organized around a point, a line, or a plane. They typically take the form of concentric layers visible to the naked eye. Calcium carbonate, iron oxide, and manganese oxide are common compounds making up concretions. If formed in place, concretions of iron oxide or manganese oxide are generally considered a type of redoximorphic concentration.

Conservation tillage. A tillage system that does not invert the soil and that leaves a protective amount of crop residue on the surface throughout the year.

Consistence, soil. Refers to the degree of cohesion and adhesion of soil material and its resistance to deformation when ruptured. Consistence includes resistance of soil material to rupture and to penetration; plasticity, toughness, and stickiness of puddled soil material; and the manner in which the soil material behaves when subject to compression. Terms describing consistence are defined in the “Soil Survey Manual.”

Contour stripcropping. Growing crops in strips that follow the contour. Strips of grass or close-growing crops are alternated with strips of clean-tilled crops or summer fallow.

Control section. The part of the soil on which classification is based. The thickness varies among different kinds of soil, but for many it is that part of the soil profile between depths of 10 inches and 40 or 80 inches.

Corrosion. Soil-induced electrochemical or chemical action that dissolves or weakens concrete or uncoated steel.

Cover crop. A close-growing crop grown primarily to improve and protect the soil between periods of regular crop production, or a crop grown between trees and vines in orchards and vineyards.

Cutbanks cave (in tables). The walls of excavations tend to cave in or slough.

Decreasers. The most heavily grazed climax range plants. Because they are the most palatable, they are the first to be destroyed by overgrazing.

Deferred grazing. Postponing grazing or resting grazing land for a prescribed period.

Dense layer (in tables). A very firm, massive layer that has a bulk density of more than 1.8 grams per cubic centimeter. Such a layer affects the ease of digging and can affect filling and compacting.

Depth, soil. Generally, the thickness of the soil over bedrock. Very deep soils are more than 60 inches deep over bedrock; deep soils, 40 to 60 inches; moderately deep, 20 to 40 inches; shallow, 10 to 20 inches; and very shallow, less than 10 inches.

Depth to rock (in tables). Bedrock is too near the surface for the specified use.

Diversion (or diversion terrace). A ridge of earth, generally a terrace, built to protect downslope areas by diverting runoff from its natural course.

Drainage class (natural). Refers to the frequency and duration of wet periods under conditions similar to those under which the soil formed. Alterations of the water regime by human activities, either through drainage or irrigation, are not a consideration unless they have significantly changed the morphology of the soil. Seven classes of natural soil drainage are recognized—*excessively drained, somewhat excessively drained, well drained, moderately well drained, somewhat poorly drained, poorly drained,* and *very poorly drained*. These classes are defined in the “Soil Survey Manual.”

Drainage, surface. Runoff, or surface flow of water, from an area.

Eluviation. The movement of material in true solution or colloidal suspension from one place to another within the soil. Soil horizons that have lost material through eluviation are eluvial; those that have received material are illuvial.

Eolian soil material. Earthy parent material accumulated through wind action; commonly refers to sandy material in dunes or to loess in blankets on the surface.

Erosion. The wearing away of the land surface by water, wind, ice, or other geologic agents and by such processes as gravitational creep.

Erosion (geologic). Erosion caused by geologic processes acting over long geologic periods and resulting in the wearing away of mountains and the building up of such landscape features as flood plains and coastal plains. Synonym: natural erosion.

Erosion (accelerated). Erosion much more rapid than geologic erosion, mainly as a result of human or animal activities or of a catastrophe in nature, such as a fire, that exposes the surface.

Excess fines (in tables). Excess silt and clay in the soil. The soil does not provide a source of gravel or sand for construction purposes.

Excess lime (in tables). Excess carbonates in the soil restrict the growth of some plants.

Excess sodium (in tables). Excess exchangeable sodium in the soil. The resulting poor physical properties restrict the growth of plants.

Fast intake (in tables). The rapid movement of water into the soil.

Fertility, soil. The quality that enables a soil to provide plant nutrients, in adequate amounts and in proper balance, for the growth of specified plants when light, moisture, temperature, tilth, and other growth factors are favorable.

Field moisture capacity. The moisture content of a soil, expressed as a percentage of the ovendry weight, after the gravitational, or free, water has drained away; the field moisture content 2 or 3 days after a soaking rain; also called *normal field capacity, normal moisture capacity,* or *capillary capacity*.

Fine textured soil. Sandy clay, silty clay, or clay.

Flood plain. A nearly level alluvial plain that borders a stream and is subject to flooding unless protected artificially.

Fluvial. Of or pertaining to rivers; produced by river action, as a fluvial plain.

Foot slope. The inclined surface at the base of a hill.

Forb. Any herbaceous plant not a grass or a sedge.

Genesis, soil. The mode of origin of the soil. Refers especially to the processes or soil-forming factors responsible for the formation of the solum, or true soil, from the unconsolidated parent material.

Gilgai. Commonly, a succession of microbasins and microknolls in nearly level areas or of microvalleys and microridges parallel with the slope. Typically, the microrelief of clayey soils that shrink and swell considerably with changes in moisture content.

Gleyed soil. Soil that formed under poor drainage, resulting in the reduction of iron and other elements in the profile and in gray colors.

Grassed waterway. A natural or constructed waterway, typically broad and shallow, seeded to grass as protection against erosion. Conducts surface water away from cropland.

Gravel. Rounded or angular fragments of rock as much as 3 inches (2 millimeters to 7.6 centimeters) in diameter. An individual piece is a pebble.

Gully. A miniature valley with steep sides cut by running water and through which water ordinarily runs only after rainfall. The distinction between a gully and a rill is one of depth. A gully generally is an obstacle to farm machinery and is too deep to be obliterated by ordinary tillage; a rill is of lesser depth and can be smoothed over by ordinary tillage.

Horizon, soil. A layer of soil, approximately parallel to the surface, having distinct characteristics produced by soil-forming processes. In the identification of soil horizons, an uppercase letter represents the major horizons. Numbers or lowercase letters that follow represent subdivisions of the major horizons. An explanation of the subdivisions is given in the “Soil Survey Manual.” The major horizons of mineral soil are as follows:

O horizon.—An organic layer of fresh and decaying plant residue.

A horizon.—The mineral horizon at or near the surface in which an accumulation of humified organic matter is mixed with the mineral material. Also, a plowed surface horizon, most of which was originally part of a B horizon.

E horizon.—The mineral horizon in which the main feature is loss of silicate clay, iron, aluminum, or some combination of these.

B horizon.—The mineral horizon below an A horizon. The B horizon is in part a layer of transition from the overlying A to the underlying C horizon. The B horizon also has distinctive characteristics, such as (1) accumulation of clay, sesquioxides, humus, or a combination of these; (2) prismatic or blocky structure; (3) redder or browner colors than those in the A horizon; or (4) a combination of these.

C horizon.—The mineral horizon or layer, excluding indurated bedrock, that is little affected by soil-forming processes and does not have the properties typical of the overlying soil material. The material of a C horizon may be either like or unlike that in which the solum formed. If the material is known to differ from that in the solum, an Arabic numeral, commonly a 2, precedes the letter C.

Cr horizon.—Soft, consolidated bedrock beneath the soil.

R layer.—Consolidated bedrock beneath the soil. The bedrock commonly underlies a C horizon, but it can be directly below an A or a B horizon.

Hydrologic soil groups. Refers to soils grouped according to their runoff potential. The soil properties that influence this potential are those that affect the minimum rate of water infiltration on a bare soil during periods after prolonged wetting when the soil is not frozen. These properties are depth to a seasonal high water table, the infiltration rate and permeability after prolonged wetting, and depth to a very slowly permeable layer. The slope and the kind of plant cover are not considered but are separate factors in predicting runoff.

Illuviation. The movement of soil material from one horizon to another in the soil profile. Generally, material is removed from an upper horizon and deposited in a lower horizon.

Impervious soil. A soil through which water, air, or roots penetrate slowly or not at all. No soil is absolutely impervious to air and water all the time.

Increasers. Species in the climax vegetation that increase in amount as the more desirable plants are reduced by close grazing. Increasers commonly are the shorter plants and the less palatable to livestock.

Infiltration. The downward entry of water into the immediate surface of soil or other material, as contrasted with percolation, which is movement of water through soil layers or material.

Infiltration rate. The rate at which water penetrates the surface of the soil at any given instant, usually expressed in inches per hour. The rate can be limited by the infiltration capacity of the soil or the rate at which water is applied at the surface.

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

Intermittent stream. A stream, or reach of a stream, that flows for prolonged periods only when it receives ground-water discharge or long, continued contributions from melting snow or other surface and shallow subsurface sources.

Invaders. On range, plants that encroach into an area and grow after the climax vegetation has been reduced by grazing. Generally, plants invade following disturbance of the surface.

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.

Large stones (in tables). Rock fragments 3 inches (7.6 centimeters) or more across. Large stones adversely affect the specified use of the soil.

Leaching. The removal of soluble material from soil or other material by percolating water.

Liquid limit. The moisture content at which the soil passes from a plastic to a liquid state.

Loam. Soil material that is 7 to 27 percent clay particles, 28 to 50 percent silt particles, and less than 52 percent sand particles.

Low strength. The soil is not strong enough to support loads.

Masses. Concentrations of substances in the soil matrix that do not have a clearly defined boundary with the surrounding soil material and cannot be removed as a discrete unit. Common compounds making up masses are calcium carbonate, gypsum or other soluble salts, iron oxide, and manganese oxide. Masses consisting of iron oxide or manganese oxide generally are considered a type of redoximorphic concentration.

Medium textured soil. Very fine sandy loam, loam, silt loam, or silt.

Mineral soil. Soil that is mainly mineral material and low in organic material. Its bulk density is more than that of organic soil.

Minimum tillage. Only the tillage essential to crop production and prevention of soil damage.

Miscellaneous area. An area that has little or no natural soil and supports little or no vegetation.

Moderately coarse textured soil. Coarse sandy loam, sandy loam, or fine sandy loam.

Moderately fine textured soil. Clay loam, sandy clay loam, or silty clay loam.

Mollic epipedon. A thick, dark, humus-rich surface horizon (or horizons) that has high base saturation and pedogenic soil structure. It may include the upper part of the subsoil.

Morphology, soil. The physical makeup of the soil, including the texture, structure, porosity, consistence, color, and other physical, mineral, and biological properties of the various horizons, and the thickness and arrangement of those horizons in the soil profile.

Mottling, soil. Irregular spots of different colors that vary in number and size. Descriptive terms are as follows: abundance—*few, common,* and *many;* size—*fine, medium,* and *coarse;* and contrast—*faint, distinct,* and *prominent.* The size measurements are of the diameter along the greatest dimension. *Fine* indicates less than 5 millimeters (about 0.2 inch); *medium,* from 5 to 15 millimeters (about 0.2 to 0.6 inch); and *coarse,* more than 15 millimeters (about 0.6 inch).

Munsell notation. A designation of color by degrees of three simple variables—hue, value, and chroma. For example, a notation of 10YR 6/4 is a color with hue of 10YR, value of 6, and chroma of 4.

Neutral soil. A soil having a pH value of 6.6 to 7.3. (See Reaction, soil.)

Nutrient, plant. Any element taken in by a plant essential to its growth. Plant nutrients are mainly nitrogen, phosphorus, potassium, calcium, magnesium, sulfur, iron, manganese, copper, boron, and zinc obtained from the soil and carbon, hydrogen, and oxygen obtained from the air and water.

Organic matter. Plant and animal residue in the soil in various stages of decomposition. The content of organic matter in the surface layer is described as follows:

Very low	less than 0.5 percent
Low	0.5 to 1.0 percent
Moderately low	1.0 to 2.0 percent
Moderate	2.0 to 4.0 percent
High	4.0 to 8.0 percent
Very high	more than 8.0 percent

Pan. A compact, dense layer in a soil that impedes the movement of water and the growth of roots. For example, *hardpan, fragipan, claypan, plowpan,* and *traffic pan.*

Parent material. The unconsolidated organic and mineral material in which soil forms.

Ped. An individual natural soil aggregate, such as a granule, a prism, or a block.

Pedon. The smallest volume that can be called "a soil." A pedon is three dimensional and large enough to permit study of all horizons. Its area ranges from about 10 to 100 square feet (1 square meter to 10 square meters), depending on the variability of the soil.

Percolation. The downward movement of water through the soil.

Percs slowly (in tables). The slow movement of water through the soil adversely affects the specified use.

Permeability. The quality of the soil that enables water or air to move downward through the profile. The rate at which a saturated soil transmits water is accepted as a measure of this quality. In soil physics, the rate is referred to as "saturated hydraulic conductivity," which is defined in the "Soil Survey Manual." In line with conventional usage in the engineering profession and with traditional usage in published soil surveys, this rate of flow continues to be expressed as "permeability." Terms describing permeability, measured in inches per hour, are as follows:

Extremely slow	0.0 to 0.01 inch
Very slow	0.01 to 0.06 inch
Slow	0.06 to 0.2 inch
Moderately slow	0.2 to 0.6 inch
Moderate	0.6 inch to 2.0 inches
Moderately rapid	2.0 to 6.0 inches
Rapid	6.0 to 20 inches
Very rapid	more than 20 inches

Phase, soil. A subdivision of a soil series based on features that affect its use and management, such as slope, stoniness, and flooding.

pH value. A numerical designation of acidity and alkalinity in soil. (See Reaction, soil.)

Piping (in tables). Formation of subsurface tunnels or pipelike cavities by water moving through the soil.

Plasticity index. The numerical difference between the liquid limit and the plastic limit; the range of moisture content within which the soil remains plastic.

Plastic limit. The moisture content at which a soil changes from semisolid to plastic.

Plowpan. A compacted layer formed in the soil directly below the plowed layer.

Ponding. Standing water on soils in closed depressions. Unless the soils are artificially drained, the water can be removed only by percolation or evapotranspiration.

Poor filter (in tables). Because of rapid or very rapid permeability, the soil may not adequately filter effluent from a waste disposal system.

Poorly graded. Refers to a coarse grained soil or soil material consisting mainly of particles of nearly the same size. Because there is little difference in size of the particles, density can be increased only slightly by compaction.

Potential rooting depth (effective rooting depth). Depth to which roots could penetrate if the content of moisture in the soil were adequate. The soil has no properties restricting the penetration of roots to this depth.

Prescribed burning. Deliberately burning an area for specific management purposes, under the appropriate conditions of weather and soil moisture and at the proper time of day.

Productivity, soil. The capability of a soil for producing a specified plant or sequence of plants under specific management.

Profile, soil. A vertical section of the soil extending through all its horizons and into the parent material.

Proper grazing use. Grazing at an intensity that maintains enough cover to protect the soil and maintain or improve the quantity and quality of the desirable vegetation. This practice increases the vigor and reproduction capacity of the key plants and promotes the accumulation of litter and mulch necessary to conserve soil and water.

Range condition. The present composition of the plant community on a range site in relation to the potential natural plant community for that site. Range condition is expressed as excellent, good, fair, or poor on the basis of how much the present plant community has departed from the potential.

Rangeland. Land on which the potential natural vegetation is predominantly grasses, grasslike plants, forbs, or shrubs suitable for grazing or browsing. It includes natural grasslands, savannas, many wetlands, some deserts, tundras, and areas that support certain forb and shrub communities.

Range site. An area of rangeland where climate, soil, and relief are sufficiently uniform to produce a distinct natural plant community. A range site is the product of all the environmental factors responsible for its development. It is typified by an association of species that differ from those on other range sites in kind or proportion of species or total production.

Reaction, soil. A measure of acidity or alkalinity of a soil, expressed in pH values. A soil that tests to pH 7.0 is described as precisely neutral in reaction because it is neither acid nor alkaline. The degrees of acidity or alkalinity, expressed as pH values, are:

Ultra acid	less than 3.5
Extremely acid	3.5 to 4.4
Very strongly acid	4.5 to 5.0
Strongly acid	5.1 to 5.5
Moderately acid	5.6 to 6.0
Slightly acid	6.1 to 6.5
Neutral	6.6 to 7.3
Slightly alkaline	7.4 to 7.8
Moderately alkaline	7.9 to 8.4
Strongly alkaline	8.5 to 9.0
Very strongly alkaline	9.1 and higher

Relief. The elevations or inequalities of a land surface, considered collectively.

Rill. A steep-sided channel resulting from accelerated erosion. A rill generally is a few inches deep and not wide enough to be an obstacle to farm machinery.

Rock fragments. Rock or mineral fragments having a diameter of 2 millimeters or more; for example, pebbles, cobbles, stones, and boulders.

Rooting depth (in tables). Shallow root zone. The soil is shallow over a layer that greatly restricts roots.

Root zone. The part of the soil that can be penetrated by plant roots.

Runoff. The precipitation discharged into stream channels from an area. The water that flows off the surface of the land without sinking into the soil is called surface runoff. Water that enters the soil before reaching surface streams is called ground-water runoff or seepage flow from ground water.

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 millimeters in diameter. Most sand grains consist of quartz. As a soil textural class, a soil that is 85 percent or more sand and not more than 10 percent clay.

Sandstone. Sedimentary rock containing dominantly sand-sized particles.

Seepage (in tables). The movement of water through the soil. Seepage adversely affects the specified use.

Series, soil. A group of soils that have profiles that are almost alike, except for differences in texture of the surface layer. All the soils of a series have horizons that are similar in composition, thickness, and arrangement.

Shale. Sedimentary rock formed by induration of a clay, silty clay, or silty clay loam deposit and having the tendency to split into thin layers.

Sheet erosion. The removal of a fairly uniform layer of soil material from the land surface by the action of rainfall and surface runoff.

Shrink-swell (in tables). The shrinking of soil when dry and the swelling when wet. Shrinking and swelling can damage roads, dams, building foundations, and other structures. It can also damage plant roots.

Silt. As a soil separate, individual mineral particles that range in diameter from the upper limit of clay (0.002 millimeter) to the lower limit of very fine sand (0.05 millimeter). As a soil textural class, soil that is 80 percent or more silt and less than 12 percent clay.

Siltstone. Sedimentary rock made up of dominantly silt-sized particles.

Similar soils. Soils that share limits of diagnostic criteria, behave and perform in a similar manner, and have similar conservation needs or management requirements for the major land uses in the survey area.

Slickensides. Polished and grooved surfaces produced by one mass sliding past another. In soils, slickensides may occur at the bases of slip surfaces on the steeper slopes; on faces of blocks, prisms, and columns; and in swelling clayey soils, where there is marked change in moisture content.

Slope. The inclination of the land surface from the horizontal. Percentage of slope is the vertical distance divided by horizontal distance, then multiplied by 100. Thus, a slope of 20 percent is a drop of 20 feet in 100 feet of horizontal distance.

Slope (in tables). Slope is great enough that special practices are required to ensure satisfactory performance of the soil for a specific use.

Slow intake (in tables). The slow movement of water into the soil.

Small stones (in tables). Rock fragments less than 3 inches (7.6 centimeters) in diameter. Small stones adversely affect the specified use of the soil.

Soil. A natural, three-dimensional body at the earth's surface. It is capable of supporting plants and has properties resulting from the integrated effect of climate and living matter acting on earthy parent material, as conditioned by relief over periods of time.

Soil separates. Mineral particles less than 2 millimeters in equivalent diameter and ranging between specified size limits. The names and sizes, in millimeters, of separates recognized in the United States are as follows:

Very coarse sand	2.0 to 1.0
Coarse sand	1.0 to 0.5
Medium sand	0.5 to 0.25
Fine sand	0.25 to 0.10
Very fine sand	0.10 to 0.05
Silt	0.05 to 0.002
Clay	less than 0.002

Solum. The upper part of a soil profile, above the C horizon, in which the processes of soil formation are active. The solum in soil consists of the A, E, and B horizons. Generally, the characteristics of the material in these horizons are unlike those of the material below the solum. The living roots and plant and animal activities are largely confined to the solum.

Stony. Refers to a soil containing stones in numbers that interfere with or prevent tillage.

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. The part of the soil below the solum.

Subsurface layer. Technically, the E horizon. Generally refers to a leached horizon lighter in color and lower in content of organic matter than the overlying surface layer.

Surface layer. The soil ordinarily moved in tillage, or its equivalent in uncultivated soil, ranging in depth from 4 to 10 inches (10 to 25 centimeters). Frequently designated as the "plow layer," or the "Ap horizon."

Surface soil. The A, E, AB, and EB horizons, considered collectively. It includes all subdivisions of these horizons.

Terrace. An embankment, or ridge, constructed across sloping soils on the contour or at a slight angle to the contour. The terrace intercepts surface runoff so that water soaks into the soil or flows slowly to a prepared outlet. A terrace in a field generally is built so that the field can be farmed. A terrace intended mainly for drainage has a deep channel that is maintained in permanent sod.

Terrace (geologic). An old alluvial plain, ordinarily flat or undulating, bordering a river, a lake, or the sea.

Texture, soil. The relative proportions of sand, silt, and clay particles in a mass of soil. The basic textural classes, in order of increasing proportion of fine particles, are *sand, loamy sand, sandy loam, loam, silt loam, silt, sandy clay loam, clay loam, silty clay loam, sandy clay, silty clay, and clay*. The sand, loamy sand, and sandy loam classes may be further divided by specifying "coarse," "fine," or "very fine."

Thin layer (in tables). Otherwise suitable soil material that is too thin for the specified use.

Tilth, soil. The physical condition of the soil as related to tillage, seedbed preparation, seedling emergence, and root penetration.

Toe slope. The outermost inclined surface at the base of a hill; part of a foot slope.

Topsoil. The upper part of the soil, which is the most favorable material for plant growth. It is ordinarily rich in organic matter and is used to topdress roadbanks, lawns, and land affected by mining.

Unstable fill (in tables). Risk of caving or sloughing on banks of fill material.

Upland. Land at a higher elevation, in general, than the alluvial plain or stream terrace; land above the lowlands along streams.

Weathering. All physical and chemical changes produced in rocks or other deposits at or near the earth's surface by atmospheric agents. These changes result in disintegration and decomposition of the material.

Well graded. Refers to soil material consisting of coarse grained particles that are well distributed over a wide range in size or diameter. Such soil normally can be easily increased in density and bearing properties by compaction. Contrasts with poorly graded soil.

Wilting point (or permanent wilting point). The moisture content of soil, on an ovendry basis, at which a plant (specifically a sunflower) wilts so much that it does not recover when placed in a humid, dark chamber.

Tables

Table 1.--Temperature and Precipitation

(Recorded in the period 1961-90 at Floresville, Texas)

Month	Temperature: Average daily maximum	Temperature: Average daily minimum	Temperature: Average	Temperature: 2 years in 10 will have-- Maximum temperature higher than--	Temperature: 2 years in 10 will have-- Minimum temperature lower than--	Temperature: Average number of growing degree days*	Precipitation: Average	Precipitation: 2 years in 10 will have-- Less than--	Precipitation: 2 years in 10 will have-- More than--	Precipitation: Average number of days with 0.10 inch or more	Precipitation: Average snowfall
	°F	°F	°F	°F	°F	Units	In	In	In		In
January-----	63.7	37.2	50.5	85	15	134	1.80	0.63	3.02	3	0.4
February----	67.2	40.3	53.8	88	20	170	1.86	0.74	3.05	3	0.2
March-------	76.2	49.3	62.8	93	23	392	1.13	0.46	1.85	2	0.0
April-------	83.0	58.4	70.7	96	34	620	2.39	0.77	4.45	3	0.0
May---------	87.5	65.0	76.3	100	46	808	3.41	1.26	5.62	4	0.0
June--------	93.2	70.4	81.8	102	55	950	2.90	0.96	5.07	3	0.0
July--------	96.6	72.7	84.6	104	65	1070	1.90	0.47	3.55	2	0.0
August------	96.8	72.2	84.5	104	64	1056	2.33	0.78	4.10	3	0.0
September---	91.8	67.8	79.8	102	47	892	3.56	1.27	5.46	4	0.0
October-----	84.6	57.5	71.0	96	35	640	2.68	1.16	4.52	3	0.0
November----	75.3	48.4	61.8	90	26	374	1.97	1.09	3.34	3	0.0
December----	67.3	39.5	53.4	86	17	180	1.44	0.44	2.56	3	0.0
Yearly:											
Average---	81.9	56.6	69.2	---	---	---	---	---	---	---	---
Extreme---	---	---	---	106	12	---	---	---	---	---	---
Total-----	---	---	---	---	---	7284	27.37	16.60	34.26	36	0.6

* A growing degree day is a unit of heat available for plant growth. It can be calculated by adding the maximum and minumum daily temperatures, dividing the sum by 2, and subtracting the temperature below which growth is minimal for the principal crops in the area (50 degrees F).

Table 2.--Freeze Dates in Spring and Fall

(Recorded in the period 1961-90 at Floresville, Texas)

Probability	Temperature: 24 ^{o}F or lower	Temperature: 28 ^{o}F or lower	Temperature: 32 ^{o}F or lower
Last freezing temperature in spring:			
1 year in 10 later than--	February 22	March 14	April 5
2 years in 10 later than--	February 15	March 5	March 28
5 years in 10 later than--	January 31	February 18	March 11
First freezing temperature in fall:			
1 year in 10 earlier than--	November 23	November 13	November 1
2 years in 10 earlier than--	December 3	November 20	November 7
5 years in 10 earlier than--	December 21	December 4	November 20

Table 3.--Growing Season

(Recorded for the period 1961-90 at Floresville, Texas)

Probability	Daily minimum temperature during growing season: Higher than 24 ^{o}F	Higher than 28 ^{o}F	Higher than 32 ^{o}F
	Days	Days	Days
9 years in 10	288	260	222
8 years in 10	299	269	232
5 years in 10	319	287	253
2 years in 10	340	304	273
1 year in 10	351	313	283

Table 4.--Acreage and Proportionate Extent of the Soils

Map symbol	Soil name	Acres	Percent
BrB	Bryde fine sandy loam, 1 to 4 percent slopes	26,740	5.5
Bu	Buchel clay, occasionally flooded	13,540	2.8
Bw	Buchel clay, frequently flooded	5,520	1.1
CaA	Clareville clay loam, 0 to 1 percent slopes	16,650	3.5
CbC	Colibro sandy clay loam, 3 to 5 percent slopes	3,410	0.7
CbE	Colibro sandy clay loam, 5 to 12 percent slopes	680	0.1
CdA	Condido clay, 0 to 2 percent slopes	2,950	0.6
CnC	Conquista clay, 1 to 3 percent slopes	3,180	0.7
CnG	Conquista clay, 20 to 40 percent slopes	1,350	0.3
CoA	Coy clay loam, 0 to 1 percent slopes	4,300	0.9
CoB	Coy clay loam, 1 to 3 percent slopes	47,440	9.8
CoC	Coy clay loam, 3 to 5 percent slopes	8,510	1.8
DeB	Devine very gravelly fine sandy loam, 1 to 4 percent slopes	140	*
EcB	Ecleto sandy clay loam, 1 to 3 percent slopes	2,930	0.6
EcC	Ecleto sandy clay loam, 3 to 5 percent slopes	950	0.2
EdB	Elmendorf-Denhawken complex, 1 to 3 percent slopes	2,850	0.6
EsB	Eloso clay, 1 to 3 percent slopes	23,460	4.9
EsC	Eloso clay, 3 to 5 percent slopes	2,500	0.5
FaC	Fashing clay, 2 to 5 percent slopes	1,090	0.2
GtB	Gillett fine sandy loam, 1 to 4 percent slopes	23,130	4.8
Gu	Gullied land	1,120	0.2
Im	Imogene fine sandy loam, 0 to 1 percent slopes	1,710	0.4
MgB	Miguel fine sandy loam, 1 to 3 percent slopes	10,340	2.1
MgC	Miguel fine sandy loam, 3 to 5 percent slopes	1,500	0.3
MoA	Monteola clay, 0 to 1 percent slopes	930	0.2
MoB	Monteola clay, 1 to 3 percent slopes	16,280	3.4
MoC	Monteola clay, 3 to 5 percent slopes	5,040	1.0
MoD	Monteola clay, 5 to 8 percent slopes	190	*
NuC	Nusil fine sand, 1 to 5 percent slopes	8,610	1.8
Od	Odem fine sandy loam, occasionally flooded	1,180	0.2
OmD	Olmos very gravelly loam, 1 to 8 percent slopes	4,590	1.0
PaB	Papalote loamy coarse sand, 0 to 3 percent slopes	21,770	4.5
PbB	Papalote fine sandy loam, 1 to 3 percent slopes	14,610	3.0
PbC	Papalote fine sandy loam, 3 to 5 percent slopes	1,750	0.4
PcB	Parrita sandy clay loam, 1 to 3 percent slopes	1,210	0.3
PkB	Pavelek clay, 0 to 3 percent slopes	17,040	3.5
PkC	Pavelek clay, 3 to 5 percent slopes, severely eroded	6,730	1.4
PnC	Pernitas sandy clay loam, 2 to 5 percent slopes	46,330	9.6
PnD	Pernitas sandy clay loam, 5 to 8 percent slopes	1,600	0.3
PtC	Pettus loam, 2 to 5 percent slopes	3,230	0.7
Px	Pits and dumps	2,090	0.4
Qu	Quarry, sandstone	230	*
RhC	Rhymes fine sand, 1 to 5 percent slopes	2,110	0.4
RoA	Rosenbrock clay, 0 to 1 percent slopes	4,030	0.8
RoB	Rosenbrock clay, 1 to 3 percent slopes	12,110	2.5
Rr	Rosenbrock clay, 0 to 1 percent slopes, rarely flooded	530	0.1
SeC	Sarnosa fine sandy loam, 2 to 5 percent slopes	4,325	0.9
ShC	Schattel clay loam, 2 to 5 percent slopes	5,350	1.1
SrD	Shiner fine sandy loam, 1 to 8 percent slopes	2,510	0.5
St	Sinton sandy clay loam, occasionally flooded	11,640	2.4
Tc	Tiocano clay, 0 to 1 percent slopes	390	0.1
TrB	Tordia clay, 1 to 3 percent slopes	9,500	2.0
TrC	Tordia clay, 3 to 5 percent slopes	1,210	0.3
Us	Ustarents, loamy	2,050	0.4
WaC	Weesatche fine sandy loam, 2 to 5 percent slopes	34,463	7.1
WeB	Weesatche sandy clay loam, 1 to 3 percent slopes	20,540	4.3
WeC	Weesatche sandy clay loam, 3 to 5 percent slopes	2,060	0.4
WgC	Weigang fine sandy loam, 1 to 5 percent slopes	2,160	0.4
WtF	Weigang-Gillett complex, 3 to 25 percent slopes, very stony	4,030	0.8

See footnote at end of table.

Table 4.--Acreage and Proportionate Extent of the Soils--Continued

Map symbol	Soil name	Acres	Percent
Zu	Zunker fine sandy loam, occasionally flooded	3,640	0.8
W	Water (greater than 40 acres in size)	653	0.1
	Total	482,701	100.0

* Less than 0.05 percent. The combined extent of the soils assigned an asterisk in the “Percent” column is about 0.2 percent of the survey area.

Table 5.--Prime Farmland

(Only the soils considered prime farmland are listed. Urban or built-up areas of the soils listed are not considered prime farmland. If a soil is prime farmland only under certain conditions, the conditions are specified in parentheses after the soil name)

Map symbol	Soil name
BrB	Bryde fine sandy loam, 1 to 4 percent slopes (where irrigated)
Bu	Buchel clay, occasionally flooded
CaA	Clareville clay loam, 0 to 1 percent slopes
CbC	Colibro sandy clay loam, 3 to 5 percent slopes (where irrigated)
CoA	Coy clay loam, 0 to 1 percent slopes
CoB	Coy clay loam, 1 to 3 percent slopes
CoC	Coy clay loam, 3 to 5 percent slopes
EdB	Elmendorf-Denhawken complex, 1 to 3 percent slopes
EsB	Eloso clay, 1 to 3 percent slopes
EsC	Eloso clay, 3 to 5 percent slopes
MgB	Miguel fine sandy loam, 1 to 3 percent slopes (where irrigated)
MgC	Miguel fine sandy loam, 3 to 5 percent slopes (where irrigated)
MoA	Monteola clay, 0 to 1 percent slopes
MoB	Monteola clay, 1 to 3 percent slopes
MoC	Monteola clay, 3 to 5 percent slopes
Od	Odem fine sandy loam, occasionally flooded (where irrigated)
PaB	Papalote loamy coarse sand, 0 to 3 percent slopes (where irrigated)
PbB	Papalote fine sandy loam, 1 to 3 percent slopes
PbC	Papalote fine sandy loam, 3 to 5 percent slopes
PnC	Pernitas sandy clay loam, 2 to 5 percent slopes (where irrigated)
RoA	Rosenbrock clay, 0 to 1 percent slopes
RoB	Rosenbrock clay, 1 to 3 percent slopes
Rr	Rosenbrock clay, 0 to 1 percent slopes, rarely flooded
SeC	Sarnosa fine sandy loam, 2 to 5 percent slopes (where irrigated)
St	Sinton sandy clay loam, occasionally flooded
Tc	Tiocano clay, 0 to 1 percent slopes (where irrigated)
TrB	Tordia clay, 1 to 3 percent slopes
TrC	Tordia clay, 3 to 5 percent slopes
WaC	Weesatche fine sandy loam, 2 to 5 percent slopes
WeB	Weesatche sandy clay loam, 1 to 3 percent slopes
WeC	Weesatche sandy clay loam, 3 to 5 percent slopes
Zu	Zunker fine sandy loam, occasionally flooded (where irrigated)

Table 6.--Land Capability and Yields per Acre of Crops and Pasture

(Yields are those that can be expected under a high level of management. Absence of a yield indicates that the soil is not suited to the crop or the crop generally is not grown on the soil)

Soil name and map symbol	Land capability	Corn	Wheat	Grain sorghum	Cotton lint	Pasture
		Bu	Bu	Bu	Lbs	AUM*
BrB----------------------- Bryde	IIIe	30	25	40	325	3.0
Bu----------------------- Buchel	IIIw	45	30	55	450	5.5
Bw----------------------- Buchel	Vw	---	---	---	---	5.0
CaA----------------------- Clareville	IIc	40	35	55	450	5.0
CbC----------------------- Colibro	IIIe	30	20	40	250	4.0
CbE----------------------- Colibro	VIe	---	---	---	---	3.0
CdA----------------------- Condido	IIIe	20	20	30	---	2.5
CnC----------------------- Conquista	IVe	---	---	---	---	---
CnG----------------------- Conquista	VIIe	---	---	---	---	---
CoA----------------------- Coy	IIs	40	35	65	450	5.0
CoB----------------------- Coy	IIe	35	30	60	400	5.0
CoC----------------------- Coy	IIIe	30	25	55	350	4.5
DeB----------------------- Devine	VIs	---	---	---	---	2.5
EcB----------------------- Ecleto	IIIe	30	20	30	---	2.5
EcC----------------------- Ecleto	IVe	20	20	25	---	2.0
EdB:						
Elmendorf-----------------	IIe	40	35	50	400	3.0
Denhawken-----------------	IIIe	30	25	40	300	2.5
EsB----------------------- Eloso	IIIe	30	25	30	250	2.5
EsC----------------------- Eloso	IVe	30	20	25	200	2.0

See footnotes at end of table.

Table 6.--Land Capability and Yields per Acre of Crops and Pasture--Continued

Soil name and map symbol	Land capability	Corn	Wheat	Grain sorghum	Cotton lint	Pasture
		Bu	Bu	Bu	Lbs	AUM*
FaC----------------------- Fashing	IVe	---	20	30	250	2.5
GtB----------------------- Gillett	IIIe	30	20	35	---	2.5
Gu**---------------------- Gullied land	VIIe	---	---	---	---	---
Im------------------------ Imogene	IVs	---	---	25	---	3.0
MgB----------------------- Miguel	IIIe	30	22	30	200	3.0
MgC----------------------- Miguel	IVe	30	20	25	---	2.5
MoA----------------------- Monteola	IIs	40	35	55	400	3.5
MoB----------------------- Monteola	IIIe	35	30	50	350	3.0
MoC----------------------- Monteola	IIIe	30	25	40	300	3.0
MoD----------------------- Monteola	VIe	---	---	---	---	2.5
NuC----------------------- Nusil	IVe	---	---	---	---	3.0
Od------------------------ Odem	IIw	35	30	45	400	4.0
OmD----------------------- Olmos	VIIs	---	---	---	---	---
PaB----------------------- Papalote	IIIe	30	---	40	200	5.0
PbB----------------------- Papalote	IIe	30	---	40	200	5.0
PbC----------------------- Papalote	IIIe	---	---	30	150	4.5
PcB----------------------- Parrita	IIIe	---	---	25	---	2.0
PkB----------------------- Pavelek	IIIe	30	25	30	---	2.5
PkC----------------------- Pavelek	VIe	---	---	---	---	---
PnC----------------------- Pernitas	IIIe	---	---	25	200	2.5

See footnotes at end of table.

Table 6.--Land Capability and Yields per Acre of Crops and Pasture--Continued

Soil name and map symbol	Land capability	Corn	Wheat	Grain sorghum	Cotton lint	Pasture
		Bu	Bu	Bu	Lbs	AUM*
PnD----------------------- Pernitas	IVe	---	---	25	---	2.0
PtC----------------------- Pettus	IVe	---	---	25	---	1.5
Px**---------------------- Pits and dumps	VIIIs	---	---	---	---	---
Qu**---------------------- Quarry, sandstone	VIIIs	---	---	---	---	---
RhC----------------------- Rhymes	VIe	---	---	---	---	3.0
RoA----------------------- Rosenbrock	IIc	80	30	70	400	4.0
RoB----------------------- Rosenbrock	IIe	75	25	65	350	3.5
Rr------------------------ Rosenbrock	IIw	80	30	70	400	4.0
SeC----------------------- Sarnosa	IIIe	40	---	50	250	5.5
ShC----------------------- Schattel	IVe	---	---	---	---	1.5
SrD----------------------- Shiner	VIe	---	---	---	---	2.0
St------------------------ Sinton	IIw	40	35	70	350	6.0
Tc------------------------ Tiocano	IVw	20	---	25	---	4.0
TrB----------------------- Tordia	IIIe	30	30	60	300	6.0
TrC----------------------- Tordia	IIIe	30	25	55	275	6.0
Us**---------------------- Ustarents	IVe	---	---	---	---	---
WaC----------------------- Weesatche	IIIe	30	25	50	300	5.5
WeB----------------------- Weesatche	IIe	35	30	50	350	6.0
WeC----------------------- Weesatche	IIIe	30	25	50	300	5.5
WgC----------------------- Weigang	IVe	20	20	30	---	2.5

See footnotes at end of table.

Table 6.--Land Capability and Yields per Acre of Crops and Pasture--Continued

Soil name and map symbol	Land capability	Corn	Wheat	Grain sorghum	Cotton lint	Pasture
		Bu	Bu	Bu	Lbs	AUM*
WtF:						
Weigang	VIIs	---	---	---	---	---
Gillett	IIIe	30	20	35	---	2.5
Zu Zunker	IIw	35	20	45	---	3.5

* Animal-unit-month: The amount of forage or feed required to feed one animal unit (one cow, one horse, one mule, five sheep, or five goats) for 30 days.

** See description of the map unit for composition and behavior characteristics of the map unit.

Table 7.--Rangeland Productivity

(Only the soils that support rangeland vegetation suitable for grazing are listed)

Soil name and map symbol	Range site	Potential annual production for kind of growing season: Favorable	Average	Unfavorable
		Lb/acre	Lb/acre	Lb/acre
BrB-----Bryde	Tight Sandy Loam	4,800	3,000	2,000
Bu, Bw-----Buchel	Clayey Bottomland	7,500	6,500	5,000
CaA-----Clareville	Clay Loam	5,800	5,000	3,000
CbC, CbE-----Colibro	Gray Sandy Loam	4,000	3,500	2,000
CdA-----Condido	Shallow	3,000	2,000	1,200
CoA, CoB, CoC-----Coy	Rolling Blackland	4,000	3,500	2,500
DeB-----Devine	Gravelly Ridge	3,000	2,200	1,000
EcB, EcC-----Ecleto	Shallow	2,800	2,000	1,000
EdB*:				
Elmendorf	Blackland	4,000	3,500	2,500
Denhawken	Blackland	4,000	3,500	2,500
EsB, EsC-----Eloso	Rolling Blackland	4,200	3,200	2,000
FaC-----Fashing	Shallow	2,500	2,000	1,500
GtB-----Gillett	Tight Sandy Loam	4,800	3,000	2,000
Im-----Imogene	Tight Sandy Loam	4,000	3,200	1,800
MgB, MgC-----Miguel	Tight Sandy Loam	3,500	3,000	1,700
MoA, MoB, MoC, MoD-----Monteola	Rolling Blackland	4,000	3,500	2,500
NuC-----Nusil	Sandy	5,000	4,000	2,500
Od-----Odem	Loamy Bottomland	7,000	6,000	4,000
OmD-----Olmos	Shallow Ridge	2,700	1,800	1,000
PaB-----Papalote	Loamy Sand	4,500	3,900	2,000

See footnote at end of table.

Table 7.--Rangeland Productivity--Continued

Soil name and map symbol	Range site	Potential annual production for kind of growing season: Favorable	Average	Unfavorable
		Lb/acre	Lb/acre	Lb/acre
PbB, PbC: Papalote	Tight Sandy Loam	4,800	4,000	2,000
PcB: Parrita	Shallow Sandy Loam	3,700	3,000	1,200
PkB, PkC: Pavelek	Shallow Ridge	3,000	2,000	1,200
PnC, PnD: Pernitas	Gray Sandy Loam	4,500	3,500	2,500
PtC: Pettus	Shallow Ridge	3,200	2,700	1,500
RhC: Rhymes	Sandy	5,000	4,000	2,000
RoA, RoB, Rr: Rosenbrock	Rolling Blackland	4,200	3,200	2,000
SeC: Sarnosa	Gray Sandy Loam	4,500	3,500	2,500
ShC: Schattel	Sloping Clay Loam	3,500	2,500	2,000
SrD: Shiner	Chalky Ridge	3,000	2,000	1,000
St: Sinton	Loamy Bottomland	7,000	6,000	4,000
Tc: Tiocano	Lakebed	5,000	4,000	3,000
TrB, TrC: Tordia	Rolling Blackland	4,000	3,500	2,500
WaC: Weesatche	Sandy Loam	5,600	4,400	3,000
WeB, WeC: Weesatche	Clay Loam	5,800	4,400	3,000
WgC: Weigang	Shallow	2,500	2,000	1,500
WtF*:				
Weigang	Sandstone Hill	2,500	2,000	1,500
Gillett	Tight Sandy Loam	4,800	3,000	2,000
Zu: Zunker	Loamy Bottomland	7,000	5,000	2,000

* See description of the map unit for composition and behavior characteristics of the map unit.

Table 8.--Recreational Development

(Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," and "severe." Absence of an entry indicates that the soil was not rated)

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails
BrB: Bryde	Slight	Slight	Moderate: slope.	Slight.
Bu: Buchel	Severe: flooding.	Moderate: too clayey, percs slowly.	Moderate: too clayey, flooding, percs slowly.	Moderate: too clayey.
Bw: Buchel	Severe: flooding.	Moderate: flooding, too clayey, percs slowly.	Severe: flooding.	Moderate: too clayey, flooding.
CaA: Clareville	Slight	Slight	Slight	Slight.
CbC: Colibro	Slight	Slight	Moderate: slope.	Slight.
CbE: Colibro	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight.
CdA: Condido	Severe: cemented pan.	Severe: cemented pan.	Severe: cemented pan.	Moderate: too clayey.
CnC: Conquista	Moderate: percs slowly, too clayey.	Moderate: too clayey, percs slowly.	Moderate: slope, too clayey, percs slowly.	Moderate: too clayey.
CnG: Conquista	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
CoA: Coy	Moderate: percs slowly.	Moderate: percs slowly.	Moderate: percs slowly.	Slight.
CoB, CoC: Coy	Moderate: percs slowly.	Moderate: percs slowly.	Moderate: slope, percs slowly.	Slight.
DeB: Devine	Severe: small stones.	Severe: small stones.	Severe: small stones.	Severe: small stones.
EcB, EcC: Ecleto	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Slight.
EdB*:				
Elmendorf	Moderate: percs slowly.	Moderate: percs slowly.	Moderate: slope, percs slowly.	Slight.
Denhawken	Moderate: percs slowly.	Moderate: percs slowly.	Moderate: slope, percs slowly.	Slight.

See footnote at end of table.

Table 8.--Recreational Development--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails
EsB, EsC: Eloso	Moderate: percs slowly, too clayey.	Moderate: too clayey, percs slowly.	Moderate: slope, too clayey, percs slowly.	Moderate: too clayey.
FaC: Fashing	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Moderate: too clayey.
GtB: Gillett	Slight	Slight	Moderate: slope.	Slight.
Gu*: Gullied land				
Im: Imogene	Severe: percs slowly, excess sodium.	Severe: excess sodium.	Severe: excess sodium.	Slight.
MgB, MgC: Miguel	Slight	Slight	Moderate: slope.	Slight.
MoA: Monteola	Moderate: percs slowly, too clayey.	Moderate: too clayey, percs slowly.	Moderate: too clayey.	Moderate: too clayey.
MoB, MoC: Monteola	Moderate: percs slowly, too clayey.	Moderate: too clayey, percs slowly.	Moderate: slope, too clayey.	Moderate: too clayey.
MoD: Monteola	Moderate: percs slowly, too clayey.	Moderate: too clayey, percs slowly.	Severe: slope.	Moderate: too clayey.
NuC: Nusil	Severe: too sandy.	Severe: too sandy.	Severe: too sandy.	Severe: too sandy.
Od: Odem	Severe: flooding.	Slight	Moderate: flooding.	Slight.
OmD: Olmos	Severe: small stones, cemented pan.	Severe: small stones, cemented pan.	Severe: small stones, cemented pan.	Severe: small stones.
PaB: Papalote	Moderate: too sandy.	Moderate: too sandy.	Moderate: too sandy.	Moderate: too sandy.
PbB, PbC: Papalote	Slight	Slight	Moderate: slope.	Slight.
PcB: Parrita	Severe: cemented pan.	Severe: cemented pan.	Severe: cemented pan.	Slight.
PkB, PkC: Pavelek	Severe: cemented pan.	Severe: cemented pan.	Severe: cemented pan.	Moderate: too clayey.
PnC: Pernitas	Slight	Slight	Moderate: slope.	Slight.
PnD: Pernitas	Slight	Slight	Severe: slope.	Slight.

See footnote at end of table.

Table 8.--Recreational Development--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails
PtC: Pettus	Slight	Slight	Moderate: slope, small stones.	Slight.
Px*: Pits and dumps				
Qu*: Quarry, sandstone				
RhC: Rhymes	Severe: too sandy.	Severe: too sandy.	Severe: too sandy.	Severe: too sandy.
RoA: Rosenbrock	Moderate: percs slowly, too clayey.	Moderate: too clayey, percs slowly.	Moderate: too clayey, percs slowly.	Moderate: too clayey.
RoB: Rosenbrock	Moderate: percs slowly, too clayey.	Moderate: too clayey, percs slowly.	Moderate: slope, too clayey, percs slowly.	Moderate: too clayey.
Rr: Rosenbrock	Severe: flooding.	Moderate: too clayey, percs slowly.	Moderate: too clayey, percs slowly.	Moderate: too clayey.
SeC: Sarnosa	Slight	Slight	Moderate: slope.	Slight.
ShC: Schattel	Slight	Slight	Moderate: slope.	Slight.
SrD: Shiner	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Slight.
St: Sinton	Severe: flooding.	Slight	Moderate: flooding.	Slight.
Tc: Tiocano	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.
TrB, TrC: Tordia	Moderate: percs slowly, too clayey.	Moderate: too clayey, percs slowly.	Moderate: slope, too clayey, percs slowly.	Moderate: too clayey.
Us*: Ustarents				
WaC, WeB, WeC: Weesatche	Slight	Slight	Moderate: slope.	Slight.
WgC: Weigang	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Slight.
WtF*:				
Weigang	Severe: depth to rock.	Severe: depth to rock.	Severe: large stones, slope, small stones.	Slight.

See footnote at end of table.

Table 8.--Recreational Development--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails
WtF*:				
Gillett	Slight	Slight	Moderate: slope.	Slight.
Zu Zunker	Severe: flooding.	Slight	Moderate: flooding.	Slight.

* See description of the map unit for composition and behavior characteristics of the map unit.

Table 9.--Wildlife Habitat

(See text for definitions of "good," "fair," "poor," and "very poor." Absence of an entry indicates that the soil was not rated)

Soil name and map symbol	Potential for habitat elements				Potential as habitat for--	
	Grain and seed crops	Grasses and legumes	Wild herba- ceous plants	Shrubs	Openland wildlife	Rangeland wildlife
BrB----------------Bryde	Fair	Good	Good	Good	Good	Good.
Bu-----------------Buchel	Fair	Fair	Poor	Fair	Fair	Poor.
Bw-----------------Buchel	Very poor	Poor	Poor	Fair	Poor	Poor.
CaA----------------Clareville	Good	Good	Fair	Good	Good	Fair.
CbC----------------Colibro	Fair	Good	Fair	Good	Fair	Fair.
CbE----------------Colibro	Poor	Fair	Fair	Fair	Fair	Fair.
CdA----------------Condido	Fair	Good	Fair	Fair	Fair	Fair.
CnC----------------Conquista	Poor	Fair	Fair	Fair	Poor	Fair.
CnG----------------Conquista	Very poor	Very poor	Fair	Fair	Poor	Fair.
CoA, CoB-----------Coy	Good	Good	Fair	Good	Good	Fair.
CoC----------------Coy	Fair	Good	Fair	Good	Fair	Fair.
DeB----------------Devine	Poor	Poor	Fair	Fair	Poor	Fair.
EcB, EcC-----------Ecleto	Fair	Good	Good	Good	Good	Good.
EdB*:						
Elmendorf---------	Good	Good	Fair	Good	Good	Fair.
Denhawken---------	Fair	Good	Fair	Fair	Fair	Fair.
EsB, EsC-----------Eloso	Fair	Fair	Fair	Fair	Fair	Fair.
FaC----------------Fashing	Fair	Good	Fair	Fair	Fair	Fair.
GtB----------------Gillett	Fair	Good	Good	Good	Good	Good.
Gu*----------------Gullied land	Poor	Fair	Poor	Poor	Poor	Poor.

See footnote at end of table.

Table 9.--Wildlife Habitat--Continued

Soil name and map symbol	Potential for habitat elements				Potential as habitat for--	
	Grain and seed crops	Grasses and legumes	Wild herba- ceous plants	Shrubs	Openland wildlife	Rangeland wildlife
Im----------------- Imogene	Poor	Poor	Poor	Poor	Poor	Poor.
MgB, MgC----------- Miguel	Fair	Fair	Good	Good	Fair	Good.
MoA, MoB, MoC------ Monteola	Fair	Good	Fair	Fair	Fair	Fair.
MoD---------------- Monteola	Poor	Fair	Fair	Fair	Fair	Fair.
NuC---------------- Nusil	Fair	Fair	Good	Fair	Fair	Fair.
Od----------------- Odem	Good	Good	Good	Good	Good	Good.
OmD---------------- Olmos	Very poor	Very poor	Poor	Fair	Very poor	Poor.
PaB, PbB, PbC------ Papalote	Good	Good	Good	Good	Good	Good.
PcB---------------- Parrita	Fair	Good	Fair	Good	Fair	Fair.
PkB, PkC----------- Pavelek	Fair	Fair	Fair	Fair	Fair	Fair.
PnC, PnD----------- Pernitas	Fair	Good	Fair	Good	Fair	Fair.
PtC---------------- Pettus	Fair	Fair	Fair	Fair	Fair	Fair.
Px*---------------- Pits and dumps	Very poor	Very poor	Very poor	Very poor	Very poor	Very poor.
Qu*---------------- Quarry, sandstone	Very poor	Very poor	Very poor	Very poor	Very poor	Very poor.
RhC---------------- Rhymes	Fair	Fair	Fair	Fair	Fair	Fair.
RoA, RoB, Rr------- Rosenbrock	Fair	Good	Fair	Fair	Fair	Fair.
SeC---------------- Sarnosa	Fair	Good	Good	Good	Good	Good.
ShC---------------- Schattel	Poor	Fair	Fair	Fair	Fair	Fair.
SrD---------------- Shiner	Fair	Good	Fair	Fair	Fair	Fair.
St----------------- Sinton	Good	Good	Good	Good	Good	Good.

See footnote at end of table.

Table 9.--Wildlife Habitat--Continued

Soil name and map symbol	Potential for habitat elements: Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Shrubs	Potential as habitat for--: Openland wildlife	Rangeland wildlife
Tc: Tiocano	Poor	Fair	Poor	Fair	Poor	Poor.
TrB, TrC: Tordia	Fair	Good	Poor	Fair	Fair	Poor.
Us*: Ustarents	Good	Good	Good	Good	Good	Good.
WaC: Weesatche	Fair	Good	Fair	Fair	Fair	Fair.
WeB: Weesatche	Good	Good	Fair	Fair	Good	Fair.
WeC: Weesatche	Fair	Good	Fair	Fair	Fair	Fair.
WgC: Weigang	Fair	Fair	Fair	Fair	Fair	Fair.
WtF*:						
Weigang	Very poor	Very poor	Very poor	Fair	Very poor	Very poor.
Gillett	Fair	Good	Good	Good	Good	Good.
Zu: Zunker	Good	Good	Good	Good	Good	Good.

* See description of the map unit for composition and behavior characteristics of the map unit.

Table 10.--Building Site Development

(Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," and "severe." Absence of an entry indicates that the soil was not rated. The information in this table indicates the dominant soil condition but does not eliminate the need for onsite investigation)

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
BrB Bryde	Moderate: too clayey.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell, low strength.	Slight.
Bu Buchel	Severe: cutbanks cave.	Severe: flooding, shrink-swell.	Severe: flooding, shrink-swell.	Severe: flooding, shrink-swell.	Severe: shrink-swell, low strength, flooding.	Severe: too clayey.
Bw Buchel	Severe: cutbanks cave.	Severe: flooding, shrink-swell.	Severe: flooding, shrink-swell.	Severe: flooding, shrink-swell.	Severe: shrink-swell, low strength, flooding.	Severe: flooding, too clayey.
CaA Clareville	Moderate: too clayey.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell, low strength.	Slight.
CbC Colibro	Severe: cutbanks cave.	Slight	Slight	Moderate: slope.	Slight	Slight.
CbE Colibro	Severe: cutbanks cave.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope.	Moderate: slope.
CdA Condido	Severe: cemented pan.	Moderate: cemented pan.	Severe: cemented pan.	Moderate: cemented pan.	Moderate: cemented pan.	Severe: cemented pan, too clayey.
CnC Conquista	Slight	Slight	Slight	Slight	Slight	Severe: too clayey.
CnG Conquista	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope, too clayey.
CoA, CoB, CoC Coy	Moderate: too clayey.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell, low strength.	Slight.
DeB Devine	Moderate: too clayey.	Slight	Slight	Slight	Slight	Severe: small stones, droughty.
EcB, EcC Ecleto	Severe: depth to rock.	Severe: shrink-swell.	Severe: depth to rock, shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell, low strength.	Severe: depth to rock.
EdB*:						
Elmendorf	Moderate: too clayey.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell, low strength.	Slight.
Denhawken	Moderate: too clayey.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell, low strength.	Slight.

See footnote at end of table.

Table 10.--Building Site Development--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
EsB, EsC---------- Eloso	Moderate: too clayey.	Severe: shrink-swell.	Slight---------	Severe: shrink-swell.	Severe: shrink-swell, low strength.	Severe: too clayey.
FaC--------------- Fashing	Severe: depth to rock.	Severe: shrink-swell.	Severe: depth to rock, shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell, low strength.	Severe: depth to rock, too clayey.
GtB--------------- Gillett	Moderate: too clayey.	Severe: shrink-swell.	Slight---------	Severe: shrink-swell.	Severe: shrink-swell, low strength.	Moderate: droughty.
Gu*--------------- Gullied land						
Im---------------- Imogene	Slight---------	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, low strength.	Severe: excess sodium.
MgB--------------- Miguel	Moderate: too clayey.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Severe: low strength.	Moderate: droughty.
MgC--------------- Miguel	Moderate: too clayey.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, slope.	Severe: low strength.	Moderate: droughty.
MoA, MoB, MoC, MoD-------------- Monteola	Severe: cutbanks cave.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell, low strength.	Severe: too clayey.
NuC--------------- Nusil	Severe: cutbanks cave.	Slight---------	Slight---------	Slight---------	Slight---------	Moderate: droughty.
Od---------------- Odem	Moderate: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Moderate: flooding.
OmD--------------- Olmos	Severe: cemented pan.	Moderate: cemented pan, large stones.	Severe: cemented pan.	Moderate: slope, cemented pan, large stones.	Moderate: cemented pan, large stones.	Severe: small stones, droughty, cemented pan.
PaB--------------- Papalote	Moderate: too clayey.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Severe: low strength.	Moderate: droughty, too sandy.
PbB--------------- Papalote	Moderate: too clayey.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Severe: low strength.	Slight.
PbC--------------- Papalote	Moderate: too clayey.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, slope.	Severe: low strength.	Slight.
PcB--------------- Parrita	Severe: cemented pan.	Moderate: cemented pan.	Severe: cemented pan.	Moderate: cemented pan.	Moderate: cemented pan.	Severe: cemented pan.
PkB--------------- Pavelek	Severe: cemented pan.	Moderate: cemented pan.	Severe: cemented pan.	Moderate: cemented pan.	Moderate: cemented pan.	Severe: cemented pan, too clayey.

See footnote at end of table.

Table 10.--Building Site Development--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
PkC: Pavelek	Severe: cemented pan.	Moderate: cemented pan.	Severe: cemented pan.	Moderate: slope, cemented pan.	Moderate: cemented pan.	Severe: cemented pan, too clayey.
PnC: Pernitas	Slight	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Severe: low strength.	Slight.
PnD: Pernitas	Slight	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, slope.	Severe: low strength.	Slight.
PtC: Pettus	Slight	Slight	Slight	Slight	Slight	Moderate: droughty.
Px*: Pits and dumps						
Qu*: Quarry, sandstone						
RhC: Rhymes	Severe: cutbanks cave.	Slight	Slight	Slight	Slight	Moderate: droughty.
RoA, RoB: Rosenbrock	Moderate: too clayey.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell, low strength.	Severe: too clayey.
Rr: Rosenbrock	Moderate: too clayey.	Severe: flooding, shrink-swell.	Severe: flooding, shrink-swell.	Severe: flooding, shrink-swell.	Severe: shrink-swell, low strength.	Severe: too clayey.
SeC: Sarnosa	Slight	Slight	Slight	Slight	Slight	Slight.
ShC: Schattel	Moderate: too clayey.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell, low strength.	Moderate: droughty.
SrD: Shiner	Severe: depth to rock.	Moderate: depth to rock.	Severe: depth to rock.	Moderate: depth to rock.	Moderate: depth to rock.	Severe: depth to rock.
St: Sinton	Severe: cutbanks cave.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Moderate: flooding.
Tc: Tiocano	Severe: cutbanks cave, ponding.	Severe: ponding, shrink-swell.	Severe: ponding, shrink-swell.	Severe: ponding, shrink-swell.	Severe: shrink-swell, low strength, ponding.	Severe: ponding, too clayey.
TrB, TrC: Tordia	Moderate: too clayey.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell, low strength.	Severe: too clayey.
Us*: Ustarents						
WaC, WeB: Weesatche	Slight	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, low strength.	Slight.

See footnote at end of table.

Table 10.--Building Site Development--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
WeC: Weesatche	Slight	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, slope.	Moderate: shrink-swell, low strength.	Slight.
WgC: Weigang	Severe: depth to rock.	Moderate: shrink-swell, depth to rock.	Severe: depth to rock.	Moderate: shrink-swell, depth to rock.	Moderate: depth to rock, shrink-swell.	Severe: depth to rock.
WtF*:						
Weigang	Severe: depth to rock.	Moderate: shrink-swell, slope, depth to rock.	Severe: depth to rock.	Severe: slope.	Moderate: depth to rock, shrink-swell, slope.	Severe: depth to rock.
Gillett	Moderate: too clayey.	Severe: shrink-swell.	Slight	Severe: shrink-swell.	Severe: shrink-swell, low strength.	Moderate: droughty.
Zu: Zunker	Severe: cutbanks cave.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Moderate: droughty, flooding.

* See description of the map unit for composition and behavior characteristics of the map unit.

Table 11.--Sanitary Facilities

(Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "good," and other terms. Absence of an entry indicates that the soil was not rated. The information in this table indicates the dominant soil condition but does not eliminate the need for onsite investigation)

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
BrB----------------- Bryde	Severe: percs slowly.	Moderate: slope.	Severe: too clayey.	Slight-----------	Poor: too clayey, hard to pack.
Bu, Bw-------------- Buchel	Severe: flooding, percs slowly.	Severe: flooding.	Severe: flooding, too clayey.	Severe: flooding.	Poor: too clayey, hard to pack.
CaA----------------- Clareville	Severe: percs slowly.	Moderate: seepage.	Severe: too clayey.	Slight-----------	Poor: too clayey, hard to pack.
CbC----------------- Colibro	Slight-----------	Severe: seepage.	Severe: seepage.	Severe: seepage.	Good.
CbE----------------- Colibro	Moderate: slope.	Severe: seepage, slope.	Severe: seepage.	Severe: seepage.	Fair: slope.
CdA----------------- Condido	Severe: cemented pan.	Severe: cemented pan.	Moderate: cemented pan.	Severe: cemented pan.	Poor: cemented pan.
CnC----------------- Conquista	Severe: percs slowly.	Moderate: slope.	Slight-----------	Slight-----------	Poor: small stones.
CnG----------------- Conquista	Severe: percs slowly, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: small stones, slope.
CoA----------------- Coy	Severe: percs slowly.	Slight-----------	Severe: too clayey.	Slight-----------	Poor: too clayey, hard to pack.
CoB, CoC------------ Coy	Severe: percs slowly.	Moderate: slope.	Severe: too clayey.	Slight-----------	Poor: too clayey, hard to pack.
DeB----------------- Devine	Severe: percs slowly, poor filter.	Severe: seepage.	Slight-----------	Severe: seepage.	Poor: seepage, small stones.
EcB, EcC------------ Ecleto	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock, too clayey.	Severe: depth to rock.	Poor: depth to rock, too clayey, hard to pack.
EdB*:					
Elmendorf----------	Severe: percs slowly.	Moderate: slope.	Severe: too clayey.	Slight-----------	Poor: too clayey, hard to pack.
Denhawken----------	Severe: percs slowly.	Moderate: slope.	Severe: too clayey.	Slight-----------	Poor: too clayey, hard to pack.

See footnote at end of table.

Table 11.--Sanitary Facilities--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
EsB, EsC: Eloso	Severe: percs slowly.	Moderate: seepage, slope.	Slight	Slight	Good.
FaC: Fashing	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock, too clayey.	Severe: depth to rock.	Poor: depth to rock, too clayey, hard to pack.
GtB: Gillett	Severe: percs slowly.	Moderate: slope.	Slight	Slight	Good.
Gu*: Gullied land					
Im: Imogene	Severe: percs slowly.	Slight	Severe: excess sodium, excess salt.	Slight	Poor: excess salt, excess sodium.
MgB, MgC: Miguel	Severe: percs slowly.	Moderate: slope.	Moderate: too clayey.	Slight	Fair: too clayey.
MoA: Monteola	Severe: percs slowly.	Slight	Severe: too clayey.	Slight	Poor: too clayey, hard to pack.
MoB, MoC, MoD: Monteola	Severe: percs slowly.	Moderate: slope.	Severe: too clayey.	Slight	Poor: too clayey, hard to pack.
NuC: Nusil	Severe: percs slowly, poor filter.	Severe: seepage.	Severe: too sandy.	Severe: seepage.	Poor: too sandy.
Od: Odem	Severe: flooding.	Severe: seepage, flooding.	Severe: flooding, seepage.	Severe: flooding, seepage.	Good.
OmD: Olmos	Severe: cemented pan.	Severe: cemented pan.	Moderate: cemented pan, large stones.	Severe: cemented pan.	Poor: cemented pan, small stones.
PaB, PbB, PbC: Papalote	Severe: percs slowly.	Severe: seepage.	Severe: too clayey.	Slight	Poor: too clayey, hard to pack.
PcB: Parrita	Severe: cemented pan.	Severe: cemented pan.	Moderate: cemented pan.	Severe: cemented pan.	Poor: cemented pan.
PkB, PkC: Pavelek	Severe: cemented pan.	Severe: cemented pan.	Moderate: cemented pan.	Severe: cemented pan.	Poor: cemented pan.
PnC, PnD: Pernitas	Moderate: percs slowly.	Moderate: seepage, slope.	Moderate: too clayey.	Slight	Fair: too clayey, small stones.
PtC: Pettus	Moderate: percs slowly.	Severe: seepage.	Severe: seepage.	Severe: seepage.	Poor: small stones.
Px*: Pits and dumps					

See footnote at end of table.

Table 11.--Sanitary Facilities--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
Qu*. Quarry, sandstone					
RhC. Rhymes	Severe: percs slowly, poor filter.	Severe: seepage.	Severe: too sandy.	Severe: seepage.	Poor: too sandy.
RoA. Rosenbrock	Severe: percs slowly.	Slight	Severe: too clayey.	Slight	Poor: too clayey, hard to pack.
RoB. Rosenbrock	Severe: percs slowly.	Moderate: slope.	Severe: too clayey.	Slight	Poor: too clayey, hard to pack.
Rr. Rosenbrock	Severe: percs slowly.	Slight	Severe: too clayey.	Moderate: flooding.	Poor: too clayey, hard to pack.
SeC. Sarnosa	Moderate: percs slowly.	Severe: seepage.	Severe: seepage.	Slight	Good.
ShC. Schattel	Severe: percs slowly.	Moderate: slope.	Severe: too clayey.	Slight	Poor: too clayey, hard to pack.
SrD. Shiner	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Poor: depth to rock.
St. Sinton	Severe: flooding.	Severe: seepage, flooding.	Severe: flooding, seepage.	Severe: flooding, seepage.	Fair: too sandy.
Tc. Tiocano	Severe: ponding, percs slowly.	Severe: ponding.	Severe: ponding, too clayey.	Severe: ponding.	Poor: too clayey, hard to pack, ponding.
TrB, TrC. Tordia	Severe: percs slowly.	Moderate: slope.	Severe: too clayey.	Slight	Poor: too clayey, hard to pack.
Us*. Ustarents					
WaC, WeB, WeC. Weesatche	Moderate: percs slowly.	Moderate: seepage, slope.	Slight	Slight	Good.
WgC. Weigang	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Poor: depth to rock.
WtF*:					
Weigang	Severe: depth to rock.	Severe: depth to rock, slope.	Severe: depth to rock.	Severe: depth to rock.	Poor: depth to rock, small stones.
Gillett	Severe: percs slowly.	Moderate: slope.	Slight	Slight	Good.

See footnote at end of table.

Table 11.--Sanitary Facilities--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
Zu------------------- Zunker	Severe: flooding.	Severe: seepage, flooding.	Severe: flooding, seepage.	Severe: flooding, seepage.	Fair: too sandy.

* See description of the map unit for composition and behavior characteristics of the map unit.

Table 12.--Construction Materials

(Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "good," "fair," and other terms. Absence of an entry indicates that the soil was not rated. The information in this table indicates the dominant soil condition but does not eliminate the need for onsite investigation)

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
BrB------------------- Bryde	Good	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
Bu, Bw---------------- Buchel	Poor: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
CaA------------------- Clareville	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey.
CbC, CbE-------------- Colibro	Good	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey, area reclaim.
CdA------------------- Condido	Good	Improbable: excess fines.	Improbable: excess fines.	Poor: cemented pan.
CnC------------------- Conquista	Good	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, area reclaim.
CnG------------------- Conquista	Poor: slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, area reclaim, slope.
CoA, CoB, CoC--------- Coy	Poor: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
DeB------------------- Devine	Good	Improbable: thin layer.	Probable	Poor: small stones, area reclaim.
EcB, EcC-------------- Ecleto	Poor: depth to rock, shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: depth to rock, too clayey, small stones.
EdB*:				
Elmendorf------------	Poor: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
Denhawken------------	Poor: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
EsB, EsC-------------- Eloso	Good	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
FaC------------------- Fashing	Poor: depth to rock, shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: depth to rock, area reclaim, too clayey.

See footnote at end of table.

Table 12.--Construction Materials--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
GtB------------------- Gillett	Good-----------------	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
Gu*------------------- Gullied land				
Im-------------------- Imogene	Fair: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: excess salt, excess sodium.
MgB, MgC-------------- Miguel	Fair: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
MoA, MoB, MoC, MoD---- Monteola	Poor: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
NuC------------------- Nusil	Good-----------------	Improbable: excess fines.	Improbable: excess fines.	Poor: too sandy.
Od-------------------- Odem	Good-----------------	Improbable: excess fines.	Improbable: excess fines.	Good.
OmD------------------- Olmos	Fair: large stones.	Improbable: excess fines.	Improbable: excess fines.	Poor: cemented pan, small stones, area reclaim.
PaB, PbB, PbC--------- Papalote	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
PcB------------------- Parrita	Good-----------------	Improbable: excess fines.	Improbable: excess fines.	Poor: cemented pan.
PkB, PkC-------------- Pavelek	Good-----------------	Improbable: excess fines.	Improbable: excess fines.	Poor: cemented pan.
PnC, PnD-------------- Pernitas	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey, small stones, area reclaim.
PtC------------------- Pettus	Good-----------------	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, area reclaim.
Px*------------------- Pits and dumps				
Qu*------------------- Quarry, sandstone				
RhC------------------- Rhymes	Good-----------------	Improbable: excess fines.	Improbable: excess fines.	Poor: too sandy.
RoA, RoB, Rr---------- Rosenbrock	Good-----------------	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
SeC------------------- Sarnosa	Good-----------------	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey.

See footnote at end of table.

Table 12.--Construction Materials--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
ShC: Schattel	Poor: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
SrD: Shiner	Poor: depth to rock.	Improbable: excess fines.	Improbable: excess fines.	Poor: depth to rock, area reclaim, small stones.
St: Sinton	Good	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey.
Tc: Tiocano	Poor: shrink-swell, low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, wetness.
TrB, TrC: Tordia	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
Us*: Ustarents				
WaC, WeB, WeC: Weesatche	Fair: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey.
WgC: Weigang	Poor: depth to rock.	Improbable: excess fines.	Improbable: excess fines.	Poor: depth to rock.
WtF*:				
Weigang	Poor: depth to rock.	Improbable: excess fines.	Improbable: excess fines.	Poor: depth to rock, small stones.
Gillett	Good	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
Zu: Zunker	Good	Improbable: excess fines.	Improbable: excess fines.	Fair: too sandy.

* See description of the map unit for composition and behavior characteristics of the map unit.

Table 13.--Water Managemnent

(Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," and "severe." Absence of an entry indicates that the soil was not evaluated. The information in this table indicates the dominant soil condition but does not eliminate the need for onsite investigation)

Soil name and map symbol	Limitations for-- Pond reservoir areas	Embankments, dikes, and levees	Features affecting-- Drainage	Irrigation	Terraces and diversions	Grassed waterways
BrB--------------- Bryde	Severe: seepage.	Severe: hard to pack.	Deep to water	Soil blowing, percs slowly.	Erodes easily, soil blowing, percs slowly.	Erodes easily, percs slowly.
Bu, Bw------------ Buchel	Slight---------	Severe: hard to pack.	Deep to water	Slow intake, percs slowly, flooding.	Percs slowly---	Percs slowly.
CaA--------------- Clareville	Moderate: seepage.	Moderate: hard to pack.	Deep to water	Favorable------	Favorable------	Favorable.
CbC--------------- Colibro	Severe: seepage.	Moderate: thin layer, piping.	Deep to water	Slope----------	Favorable------	Favorable.
CbE--------------- Colibro	Severe: seepage.	Moderate: thin layer, piping.	Deep to water	Slope----------	Slope----------	Slope.
CdA--------------- Condido	Severe: cemented pan.	Severe: piping.	Deep to water	Droughty, slow intake, percs slowly.	Cemented pan, erodes easily.	Erodes easily, droughty, cemented pan.
CnC--------------- Conquista	Slight---------	Severe: piping.	Deep to water	Droughty, slow intake.	Favorable------	Droughty, rooting depth.
CnG--------------- Conquista	Severe: slope.	Severe: piping.	Deep to water	Slope, droughty, slow intake.	Slope----------	Slope, droughty, rooting depth.
CoA, CoB---------- Coy	Slight---------	Severe: hard to pack.	Deep to water	Percs slowly---	Percs slowly---	Percs slowly.
CoC--------------- Coy	Slight---------	Severe: hard to pack.	Deep to water	Slope, percs slowly.	Percs slowly---	Percs slowly.
DeB--------------- Devine	Severe: seepage.	Severe: seepage.	Deep to water	Droughty-------	Favorable------	Droughty.
EcB--------------- Ecleto	Severe: depth to rock.	Severe: hard to pack.	Deep to water	Percs slowly, depth to rock.	Depth to rock, erodes easily, percs slowly.	Erodes easily, depth to rock, percs slowly.
EcC--------------- Ecleto	Severe: depth to rock.	Severe: hard to pack.	Deep to water	Slope, percs slowly, depth to rock.	Depth to rock, erodes easily, percs slowly.	Erodes easily, depth to rock, percs slowly.
EdB*:						
Elmendorf--------	Slight---------	Moderate: hard to pack, excess salt.	Deep to water	Percs slowly, excess salt.	Percs slowly---	Percs slowly.
Denhawken--------	Slight---------	Severe: hard to pack.	Deep to water	Percs slowly---	Percs slowly---	Percs slowly.

See footnote at end of table.

Table 13.--Water Managemnent--Continued

Soil name and map symbol	Limitations for-- Pond reservoir areas	Embankments, dikes, and levees	Features affecting-- Drainage	Irrigation	Terraces and diversions	Grassed waterways
EsB--------------- Eloso	Moderate: seepage, depth to rock.	Severe: piping.	Deep to water	Slow intake, percs slowly.	Favorable------	Percs slowly.
EsC--------------- Eloso	Moderate: seepage, depth to rock.	Severe: piping.	Deep to water	Slope, slow intake, percs slowly.	Favorable------	Percs slowly.
FaC--------------- Fashing	Severe: depth to rock.	Severe: hard to pack.	Deep to water	Slope, droughty, slow intake.	Depth to rock, percs slowly.	Droughty, depth to rock, rooting depth.
GtB--------------- Gillett	Slight---------	Severe: piping.	Deep to water	Droughty, soil blowing.	Erodes easily, soil blowing, percs slowly.	Erodes easily, droughty, rooting depth.
Gu*--------------- Gullied land						
Im---------------- Imogene	Slight---------	Severe: excess sodium, excess salt.	Deep to water	Droughty, soil blowing, percs slowly.	Erodes easily, soil blowing, percs slowly.	Excess sodium, erodes easily, droughty.
MgB--------------- Miguel	Slight---------	Slight---------	Deep to water	Droughty, soil blowing.	Soil blowing, percs slowly.	Percs slowly.
MgC--------------- Miguel	Moderate: slope.	Slight---------	Deep to water	Slope, droughty, soil blowing.	Soil blowing, percs slowly.	Percs slowly.
MoA, MoB---------- Monteola	Slight---------	Severe: hard to pack.	Deep to water	Slow intake, percs slowly.	Erodes easily, percs slowly.	Erodes easily, percs slowly.
MoC, MoD---------- Monteola	Moderate: slope.	Severe: hard to pack.	Deep to water	Slope, slow intake, percs slowly.	Erodes easily, percs slowly.	Erodes easily, percs slowly.
NuC--------------- Nusil	Severe: seepage.	Severe: seepage, piping.	Deep to water	Slope, droughty, fast intake.	Too sandy, soil blowing.	Droughty, rooting depth, percs slowly.
Od---------------- Odem	Severe: seepage.	Severe: piping.	Deep to water	Soil blowing, flooding.	Soil blowing---	Favorable.
OmD--------------- Olmos	Severe: cemented pan.	Moderate: large stones.	Deep to water	Slope, large stones, droughty.	Large stones, cemented pan.	Large stones, droughty, cemented pan.
PaB--------------- Papalote	Slight---------	Moderate: hard to pack.	Deep to water	Droughty, soil blowing.	Soil blowing, percs slowly.	Droughty, percs slowly.
PbB--------------- Papalote	Slight---------	Moderate: hard to pack.	Deep to water	Soil blowing---	Soil blowing, percs slowly.	Percs slowly.
PbC--------------- Papalote	Slight---------	Moderate: hard to pack.	Deep to water	Slope, soil blowing.	Soil blowing, percs slowly.	Percs slowly.
PcB--------------- Parrita	Severe: cemented pan.	Slight---------	Deep to water	Droughty-------	Cemented pan---	Droughty, cemented pan.

See footnote at end of table.

Table 13.--Water Managemnent--Continued

Soil name and map symbol	Limitations for-- Pond reservoir areas	Embankments, dikes, and levees	Features affecting-- Drainage	Irrigation	Terraces and diversions	Grassed waterways
PkB: Pavelek	Severe: cemented pan.	Severe: piping.	Deep to water	Droughty, slow intake.	Cemented pan, erodes easily.	Erodes easily, droughty, cemented pan.
PkC: Pavelek	Severe: cemented pan.	Severe: piping.	Deep to water	Slope, droughty, slow intake.	Cemented pan, erodes easily.	Erodes easily, droughty, cemented pan.
PnC, PnD: Pernitas	Moderate: seepage.	Slight	Deep to water	Slope	Favorable	Favorable.
PtC: Pettus	Severe: seepage.	Moderate: piping.	Deep to water	Slope, droughty.	Favorable	Droughty.
Px*: Pits and dumps						
Qu*: Quarry, sandstone						
RhC: Rhymes	Severe: seepage.	Severe: seepage, piping.	Deep to water	Slope, droughty, fast intake.	Too sandy, soil blowing.	Droughty.
RoA, RoB, Rr: Rosenbrock	Slight	Severe: hard to pack.	Deep to water	Slow intake, percs slowly.	Percs slowly	Percs slowly.
SeC: Sarnosa	Severe: seepage.	Slight	Deep to water	Slope	Favorable	Favorable.
ShC: Schattel	Moderate: depth to rock.	Moderate: thin layer, hard to pack, excess salt.	Deep to water	Slope, droughty.	Favorable	Droughty.
SrD: Shiner	Severe: depth to rock.	Slight	Deep to water	Slope, droughty, soil blowing.	Depth to rock, soil blowing.	Droughty, depth to rock.
St: Sinton	Severe: seepage.	Severe: piping.	Deep to water	Flooding	Favorable	Favorable.
Tc: Tiocano	Slight	Severe: hard to pack, ponding.	Ponding, percs slowly.	Ponding, slow intake, percs slowly.	Ponding, percs slowly.	Wetness, percs slowly.
TrB: Tordia	Moderate: depth to rock.	Severe: hard to pack.	Deep to water	Slow intake, percs slowly.	Percs slowly	Percs slowly.
TrC: Tordia	Moderate: depth to rock.	Severe: hard to pack.	Deep to water	Slope, slow intake, percs slowly.	Percs slowly	Percs slowly.
Us*: Ustarents						
WaC: Weesatche	Moderate: seepage.	Moderate: piping.	Deep to water	Slope, soil blowing.	Soil blowing	Favorable.

See footnote at end of table.

Table 13.--Water Managemnent--Continued

Soil name and map symbol	Limitations for-- Pond reservoir areas	Embankments, dikes, and levees	Features affecting-- Drainage	Irrigation	Terraces and diversions	Grassed waterways
WeB: Weesatche	Moderate: seepage.	Moderate: piping.	Deep to water	Favorable	Favorable	Favorable.
WeC: Weesatche	Moderate: seepage.	Moderate: piping.	Deep to water	Slope	Favorable	Favorable.
WgC: Weigang	Severe: depth to rock.	Severe: thin layer.	Deep to water	Slope, soil blowing, depth to rock.	Depth to rock, soil blowing.	Depth to rock, rooting depth.
WtF*:						
Weigang	Severe: depth to rock, slope.	Severe: thin layer.	Deep to water	Slope, droughty, depth to rock.	Slope, large stones, depth to rock.	Large stones, slope, droughty.
Gillett	Slight	Severe: piping.	Deep to water	Slope, droughty, soil blowing.	Erodes easily, soil blowing, percs slowly.	Erodes easily, droughty, rooting depth.
Zu: Zunker	Severe: seepage.	Severe: piping.	Deep to water	Droughty, soil blowing.	Soil blowing	Droughty.

* See description of the map unit for composition and behavior characteristics of the map unit.

Table 14.--Engineering Index Properties

(The symbol < means less than; > means more than. Absence of an entry indicates that data were not estimated)

Soil name and map symbol	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Fragments 3-10 inches	Percentage passing sieve number--: 4	10	40	200	Liquid limit	Plasticity index
	In				Pct					Pct	
BrB-------------- Bryde	0-9	Fine sandy loam	SC	A-4, A-6	0-5	95-100	95-100	90-100	40-50	24-34	7-15
	9-25	Clay, sandy clay	CH	A-7-6	0-5	100	98-100	95-100	60-70	53-71	30-45
	25-41	Clay, sandy clay, clay loam.	CH	A-7-6	0-5	95-100	95-100	90-100	55-70	51-66	29-41
	41-47	Clay, sandy clay, clay loam.	CH, CL	A-7-6	0-5	95-100	95-100	95-100	60-70	41-61	21-37
	47-80	Very fine sandy loam, fine sandy loam.	SM, SC, SC-SM	A-4	0-5	95-100	95-100	90-100	35-45	16-23	NP-10
Bu--------------- Buchel	0-16	Clay-------------	CH	A-7-6	0	95-100	95-100	90-100	75-95	55-75	32-48
	16-42	Clay, silty clay	CH	A-7-6	0	95-100	95-100	90-100	75-95	55-75	32-48
	42-80	Clay, silty clay	CH	A-7-6	0	95-100	95-100	90-100	75-95	55-75	32-48
Bw--------------- Buchel	0-14	Clay-------------	CH	A-7-6	0	95-100	95-100	90-100	75-95	55-75	32-48
	14-54	Clay, silty clay	CH	A-7-6	0	95-100	95-100	90-100	75-95	55-75	32-48
	54-80	Clay, silty clay	CH	A-7-6	0	95-100	95-100	90-100	75-95	55-75	32-48
CaA-------------- Clareville	0-10	Clay loam--------	CL, SC	A-6, A-7-6	0	98-100	95-100	90-100	45-70	32-48	15-27
	10-33	Clay loam, clay, sandy clay.	CL, CH	A-7	0	98-100	95-100	90-100	51-80	46-60	25-37
	33-56	Clay loam, clay, sandy clay.	CL, CH	A-7	0	98-100	95-100	90-100	51-80	46-60	25-37
	56-80	Clay loam, loam, sandy clay loam.	CL, CH	A-6, A-7-6	0	95-100	85-100	85-100	51-75	36-52	17-30
CbC-------------- Colibro	0-17	Sandy clay loam	CL	A-4, A-6	0-5	95-100	95-100	85-100	60-90	29-40	9-20
	17-56	Loam, sandy clay loam, fine sandy loam.	CL, SC	A-4, A-6	0-5	95-100	95-100	85-95	40-70	28-39	9-19
	56-80	Loam, sandy loam, loamy sand.	SM	A-2-4, A-4	0-5	90-100	65-95	60-95	15-45	16-30	NP-7
CbE-------------- Colibro	0-8	Sandy clay loam	CL	A-4, A-6	0-5	95-100	95-100	85-100	60-90	29-40	9-20
	8-45	Loam, sandy clay loam, fine sandy loam.	CL, SC	A-4, A-6	0-5	95-100	95-100	85-95	40-70	28-39	9-19
	45-80	Loam, sandy loam, loamy sand.	SM	A-2-4, A-4	0-5	90-100	65-95	60-95	15-45	16-30	NP-7
CdA-------------- Condido	0-15	Clay-------------	CH	A-7-6	0	100	100	95-100	80-90	56-71	33-45
	15-18	Gravelly clay----	CH	A-7-6	0	70-80	65-75	60-70	55-65	56-71	33-45
	18-24	Cemented---------	---	---	---	---	---	---	---	---	---
	24-40	Silt loam, loam	CL, CL-ML	A-4, A-6	0	100	98-100	85-95	70-80	20-30	5-12
	40-80	Silt loam, loam	CL, CL-ML	A-4, A-6	0	100	98-100	85-95	70-80	20-30	5-12
CnC-------------- Conquista	0-11	Clay-------------	CH	A-7-6	0	95-100	95-100	85-100	65-85	56-71	33-45
	11-80	Stratified fine sandy loam to gravelly sandy clay loam.	CL-ML, CL, SC-SM, GC	A-4, A-6, A-2-4	0-2	70-95	50-90	40-80	30-70	21-32	6-12
CnG-------------- Conquista	0-12	Clay-------------	CH	A-7-6	0	95-100	95-100	85-100	65-85	56-71	33-45
	12-80	Stratified fine sandy loam to gravelly sandy clay loam.	CL-ML, CL, SC-SM, GC	A-4, A-6, A-2-4	0-2	70-95	50-90	40-80	30-70	21-32	6-12

See footnote at end of table.

Table 14.--Engineering Index Properties--Continued

Soil name and map symbol	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Frag- ments 3-10 inches	Percentage passing sieve number-- 4	10	40	200	Liquid limit	Plas- ticity index
	In				Pct					Pct	
CoA-------------- Coy	0-6	Clay loam--------	CL, CH	A-6, A-7-6	0	98-100	97-100	95-100	70-85	35-55	18-30
	6-50	Clay, clay loam, sandy clay.	CH, CL	A-7-6	0	98-100	97-100	95-100	70-90	42-62	27-42
	50-80	Clay, silty clay	CH, CL	A-7-6	0	98-100	97-100	95-100	70-90	40-60	25-40
CoB-------------- Coy	0-6	Clay loam--------	CL, CH	A-6, A-7-6	0	98-100	97-100	95-100	70-85	35-55	18-30
	6-47	Clay, clay loam, sandy clay.	CH, CL	A-7-6	0	98-100	97-100	95-100	70-90	42-62	27-42
	47-80	Clay, silty clay	CH, CL	A-7-6	0	98-100	97-100	95-100	70-90	40-60	25-40
CoC-------------- Coy	0-5	Clay loam--------	CL, CH	A-6, A-7-6	0	98-100	97-100	95-100	70-85	35-55	18-30
	5-54	Clay, clay loam, sandy clay.	CH, CL	A-7-6	0	98-100	97-100	95-100	70-90	42-62	27-42
	54-80	Clay, silty clay	CH, CL	A-7-6	0	98-100	97-100	95-100	70-90	40-60	25-40
DeB-------------- Devine	0-13	Very gravelly fine sandy loam.	GM, GP-GM, GM-GC	A-1, A-2-4	0-5	20-55	10-50	10-40	8-25	16-25	NP-7
	13-22	Very gravelly fine sandy loam, extremely gravelly sandy loam, extremely gravelly loam.	GM, GP-GM, GC, GM-GC	A-1, A-2-4	0-5	20-55	10-50	10-40	8-25	16-25	NP-9
	22-80	Extremely gravelly sandy clay, extremely gravelly clay, extremely gravelly clay loam.	GC	A-2	5-10	20-55	15-45	15-40	15-35	35-50	16-24
EcB-------------- Ecleto	0-3	Sandy clay loam	SC, CL, CH	A-7-6, A-6	0	100	85-100	85-100	35-55	34-55	15-32
	3-14	Clay, sandy clay, clay loam.	CH	A-7-6	0	100	75-100	75-100	55-65	52-69	30-43
	14-18	Gravelly clay, gravelly clay loam, gravelly sandy clay.	SC, GC	A-7-6	0-2	55-78	50-75	50-70	40-50	51-66	29-41
	18-60	Stratified weathered bedrock.	---	---	---	---	---	---	---	---	---
EcC-------------- Ecleto	0-6	Sandy clay loam	SC, CL, CH	A-7-6, A-6	0	100	85-100	85-100	35-55	34-55	15-32
	6-14	Clay, sandy clay, clay loam.	CH	A-7-6	0	100	75-100	75-100	55-65	52-69	30-43
	14-80	Stratified weathered bedrock.	---	---	---	---	---	---	---	---	---
EdB*:											
Elmendorf-------	0-7	Sandy clay loam	CL	A-6, A-7	0-2	95-100	90-100	90-100	60-90	30-50	15-28
	7-59	Clay loam, clay	CH, CL	A-7	0-2	95-100	90-100	90-100	75-95	45-65	25-40
	59-80	Clay loam, sandy clay loam, clay.	CH, CL	A-7	0-2	95-100	90-100	90-100	70-95	45-60	25-36

See footnote at end of table.

Table 14.--Engineering Index Properties--Continued

Soil name and map symbol	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Frag- ments 3-10 inches	Percentage passing sieve number--: 4	10	40	200	Liquid limit	Plas- ticity index
	In				Pct					Pct	
EdB*:											
Denhawken	0-7	Sandy clay loam	CL, CH	A-6, A-7	0-2	95-100	90-100	90-100	60-90	35-55	16-33
	7-54	Clay loam, clay, sandy clay loam.	CH, CL	A-6, A-7	0-2	95-100	90-100	85-100	75-95	35-60	20-38
	54-80	Clay loam, clay	CH, CL	A-7	0-2	95-100	90-100	85-100	70-95	48-68	25-43
EsB Eloso	0-12	Clay	CH	A-7-6	0	100	100	95-100	75-85	56-66	33-41
	12-28	Clay	CH	A-7-6	0	100	95-100	95-100	75-95	56-66	33-41
	28-37	Clay loam, clay, silty clay.	CH	A-7-6	0	100	95-100	90-100	80-95	51-66	29-41
	37-80	Silt loam, loam	CL, CL-ML	A-4, A-6	0	100	98-100	85-95	70-80	20-30	5-12
EsC Eloso	0-7	Clay	CH	A-7-6	0	100	100	95-100	75-85	56-66	33-41
	7-26	Clay	CH	A-7-6	0	100	95-100	95-100	75-95	56-66	33-41
	26-34	Clay loam, clay, silty clay.	CH	A-7-6	0	100	95-100	90-100	80-95	51-66	29-41
	34-80	Silt loam, loam	CL, CL-ML	A-4, A-6	0	100	98-100	85-95	70-80	20-30	5-12
FaC Fashing	0-18	Clay	CH	A-7-6	0	98-100	96-100	95-100	80-100	50-66	29-41
	18-80	Stratified weathered bedrock.	---	---	---	---	---	---	---	---	---
GtB Gillett	0-7	Fine sandy loam	SC, SM, SC-SM	A-4	0-2	95-100	95-100	90-100	40-50	16-25	3-10
	7-19	Clay loam, sandy clay, clay.	CH	A-7-6	0	100	100	95-100	60-70	56-71	33-45
	19-27	Clay loam, sandy clay, clay.	CH	A-7-6	0	100	100	95-100	60-70	56-71	33-45
	27-34	Sandy clay loam, gravelly clay loam, gravelly sandy clay loam.	GC, SC	A-7-6	0-2	55-85	55-80	50-80	40-50	41-66	21-41
	34-80	Fine sandy loam, very fine sandy loam.	SM, SC, SC-SM	A-4	0-5	95-100	95-100	90-100	35-45	16-26	NP-9
Gu* Gullied land											
Im Imogene	0-8	Fine sandy loam	SC-SM, SC, CL-ML, CL	A-4, A-6	0	100	95-100	70-95	40-70	16-30	NP-15
	8-17	Sandy clay loam, clay loam, sandy clay.	SC, CL	A-6, A-7-6	0	100	95-100	80-100	45-75	26-48	11-24
	17-80	Sandy clay loam, clay loam.	SC, CL	A-6, A-7-6	0	95-100	90-100	75-95	40-70	26-43	11-25
MgB Miguel	0-8	Fine sandy loam	SM, SC-SM, SC	A-2-4, A-4	0	95-100	95-100	90-100	15-45	16-28	NP-10
	8-28	Sandy clay, clay	CL, SC, CH	A-7-6	0	95-100	95-100	90-100	45-70	41-55	20-32
	28-80	Sandy clay loam, sandy clay.	CL, SC	A-6, A-7-6	0	95-100	90-100	90-100	36-70	30-50	15-28
MgC Miguel	0-10	Fine sandy loam	SM, SC-SM, SC	A-2-4, A-4	0	95-100	95-100	90-100	15-45	16-28	NP-10
	10-31	Sandy clay, clay	CL, SC, CH	A-7-6	0	95-100	95-100	90-100	45-70	41-55	20-32
	31-60	Sandy clay loam, sandy clay.	CL, SC	A-6, A-7-6	0	95-100	90-100	90-100	36-70	30-50	15-28

See footnote at end of table.

Table 14.--Engineering Index Properties--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag- ments 3-10 inches	Percentage passing sieve number--				Liquid limit	Plas- ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
MoA-------------- Monteola	0-6	Clay-------------	CH	A-7-6	0-3	98-100	95-100	80-100	75-90	51-75	30-50
	6-44	Clay-------------	CH	A-7-6	0-3	90-100	80-100	75-100	75-96	56-80	33-54
	44-54	Clay-------------	CH	A-7-6	0-3	90-100	80-100	75-100	75-96	56-80	33-54
	54-80	Clay-------------	CH	A-7-6	0-3	90-100	80-100	75-100	75-96	56-80	33-54
MoB-------------- Monteola	0-5	Clay-------------	CH	A-7-6	0-3	98-100	95-100	80-100	75-90	51-75	30-50
	5-37	Clay-------------	CH	A-7-6	0-3	90-100	80-100	75-100	75-96	56-80	33-54
	37-50	Clay-------------	CH	A-7-6	0-3	90-100	80-100	75-100	75-96	56-80	33-54
	50-80	Clay-------------	CH	A-7-6	0-3	90-100	80-100	75-100	75-96	56-80	33-54
MoC-------------- Monteola	0-13	Clay-------------	CH	A-7-6	0-3	98-100	95-100	80-100	75-90	51-75	30-50
	13-22	Clay-------------	CH	A-7-6	0-3	90-100	80-100	75-100	75-96	56-80	33-54
	22-48	Clay-------------	CH	A-7-6	0-3	90-100	80-100	75-100	75-96	56-80	33-54
	48-80	Clay-------------	CH	A-7-6	0-3	90-100	80-100	75-100	75-96	56-80	33-54
MoD-------------- Monteola	0-10	Clay-------------	CH	A-7-6	0-3	98-100	95-100	80-100	75-90	51-75	30-50
	10-29	Clay-------------	CH	A-7-6	0-3	90-100	80-100	75-100	75-96	56-80	33-54
	29-43	Clay-------------	CH	A-7-6	0-3	90-100	80-100	75-100	75-96	56-80	33-54
	43-80	Clay-------------	CH	A-7-6	0-3	90-100	80-100	75-100	75-96	56-80	33-54
NuC-------------- Nusil	0-10	Fine sand--------	SM	A-2-4	0	100	100	50-80	15-35	16-20	NP-3
	10-36	Fine sand, loamy fine sand.	SM	A-2-4	0	100	100	50-80	15-35	16-22	NP-3
	36-44	Sandy clay loam, fine sandy loam.	SC, CL	A-4, A-6	0	100	100	80-90	35-55	25-38	8-15
	44-72	Sandy clay loam, fine sandy loam.	SC, CL	A-4, A-6	0	100	100	80-90	35-55	25-38	8-15
	72-80	Sandy clay loam, fine sandy loam.	SC, CL	A-2, A-4, A-6	0	100	100	70-90	30-55	20-35	8-15
Od--------------- Odem	0-27	Fine sandy loam	SC-SM, SM	A-2-4	0	100	100	90-100	20-30	16-25	NP-7
	27-80	Fine sandy loam, loam.	SC-SM, SM	A-2-4	0	100	98-100	90-100	20-30	16-25	NP-7
OmD-------------- Olmos	0-11	Very gravelly loam.	GC, GM-GC, SC, SC-SM	A-2-4, A-2-6, A-4	0-30	35-75	25-55	25-55	20-50	18-43	4-18
	11-24	Indurated--------	---	---	---	---	---	---	---	---	---
	24-80	Gravelly loam, very gravelly loam, extremely gravelly loam.	GC, GM-GC, GP-GC	A-4, A-2-4, A-2-6	0-30	25-60	15-55	15-55	10-50	16-30	NP-11
PaB-------------- Papalote	0-19	Loamy coarse sand	SM, SC-SM	A-2-4, A-1-B	0	95-100	90-100	40-80	20-35	16-25	NP-6
	19-33	Sandy clay, clay, clay loam.	CL, SC, CH	A-7-6	0	95-100	90-100	85-100	43-70	41-61	21-36
	33-80	Sandy clay loam, clay loam, sandy clay.	CL, SC	A-6, A-7-6	0	95-100	80-100	75-96	36-70	35-49	18-31
PbB-------------- Papalote	0-8	Fine sandy loam	SM, SC-SM, SC, CL-ML	A-4	0	95-100	95-100	90-100	40-60	16-25	NP-8
	8-35	Sandy clay, clay, clay loam.	CL, SC, CH	A-7-6	0	95-100	90-100	85-100	43-70	41-61	21-36
	35-60	Sandy clay loam, clay loam, sandy clay.	CL, SC	A-6, A-7-6	0	95-100	80-100	75-96	36-70	35-49	18-31

See footnote at end of table.

Table 14.--Engineering Index Properties--Continued

Soil name and map symbol	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Frag- ments 3-10 inches	Percentage passing sieve number--: 4	10	40	200	Liquid limit	Plas- ticity index
	In				Pct					Pct	
PbC-------------- Papalote	0-5	Fine sandy loam	SM, SC-SM, SC, CL-ML	A-4	0	95-100	95-100	90-100	40-60	16-25	NP-8
	5-40	Sandy clay, clay, clay loam.	CL, SC, CH	A-7-6	0	95-100	90-100	85-100	43-70	41-61	21-36
	40-60	Sandy clay loam, clay loam, sandy clay.	CL, SC	A-6, A-7-6	0	95-100	80-100	75-96	36-70	35-49	18-31
PcB-------------- Parrita	0-4	Sandy clay loam	SC, CL, SC-SM, CL-ML	A-2, A-4, A-6	0	100	100	80-100	31-55	26-35	7-15
	4-10	Sandy clay loam, sandy clay, clay.	CL, CH	A-6, A-7-6	0	100	100	80-100	51-60	38-55	17-30
	10-19	Sandy clay, clay	CL, CH	A-7-6	0	100	100	80-100	52-75	41-59	22-34
	19-24	Cemented---------	---	---	---	---	---	---	---	---	---
	24-80	Gravelly sandy clay loam, sandy clay loam, gravelly loam.	SC	A-2-6, A-6	0-2	75-98	70-95	60-85	20-40	25-35	10-18
PkB-------------- Pavelek	0-7	Clay-------------	CH	A-7-6	0	95-100	75-100	75-100	70-80	56-66	33-41
	7-14	Gravelly clay loam, gravelly clay.	CH, GC, SC	A-7-6	0	65-75	60-70	55-65	45-55	51-66	29-41
	14-20	Cemented---------	---	---	0	---	---	---	---	---	---
	20-46	Silt loam, loam	CL, CL-ML	A-4, A-6	0	100	98-100	85-95	70-80	20-30	5-12
	46-80	Silt loam, loam	CL, CL-ML	A-4, A-6	0	100	98-100	85-95	70-80	20-30	5-12
PkC-------------- Pavelek	0-4	Clay-------------	CH	A-7-6	0	95-100	75-100	75-100	70-80	56-66	33-41
	4-10	Gravelly clay loam, gravelly clay.	CH, GC, SC	A-7-6	0	65-75	60-70	55-65	45-55	51-66	29-41
	10-16	Cemented---------	---	---	0	---	---	---	---	---	---
	16-36	Silt loam, loam	CL, CL-ML	A-4, A-6	0	100	98-100	85-95	70-80	20-30	5-12
	36-80	Silt loam, loam	CL, CL-ML	A-4, A-6	0	100	98-100	85-95	70-80	20-30	5-12
PnC-------------- Pernitas	0-7	Sandy clay loam	SC, CL	A-4, A-6	0	100	100	95-100	36-55	24-37	9-20
	7-33	Clay loam, sandy clay loam.	CL, CH	A-6, A-7-6	0	98-100	96-100	90-98	53-75	33-57	16-33
	33-80	Sandy clay, sandy clay loam.	SC, CL	A-7-6, A-6	0	75-100	70-99	60-98	40-67	35-50	17-27
PnD-------------- Pernitas	0-7	Sandy clay loam	SC, CL	A-4, A-6	0	100	100	95-100	36-55	24-37	9-20
	7-26	Clay loam, sandy clay loam.	CL, CH	A-6, A-7-6	0	98-100	96-100	90-98	53-75	33-57	16-33
	26-80	Sandy clay, sandy clay loam.	SC, CL	A-7-6, A-6	0	75-100	70-99	60-98	40-67	35-50	17-27

See footnote at end of table.

Table 14.--Engineering Index Properties--Continued

Soil name and map symbol	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Frag- ments 3-10 inches	Percentage passing sieve number-- 4	10	40	200	Liquid limit	Plas- ticity index
	In				Pct					Pct	
PtC-------------- Pettus	0-10	Loam-------------	CL, SC	A-6, A-7-6	0	80-100	75-95	55-92	40-65	27-43	11-21
	10-18	Gravelly loam, gravelly sandy clay loam, very gravelly sandy clay loam.	CL, SC, GC	A-6, A-7-6, A-2-6	0-10	35-85	25-75	20-60	15-55	27-43	11-21
	18-28	Very gravelly loam, very gravelly sandy clay loam, cobbly sandy clay loam.	SC, GC, CL	A-2-6, A-6	0-20	30-80	20-75	15-70	15-60	25-35	10-18
	28-80	Very gravelly loam, very gravelly sandy clay loam.	SC, GC, CL	A-2-6, A-6	0-10	50-95	35-80	30-70	26-56	25-35	10-18
Px*-------------- Pits and dumps											
Qu*-------------- Quarry, sandstone											
RhC-------------- Rhymes	0-10	Fine sand--------	SM	A-2-4	0	100	100	50-80	15-35	16-20	NP-3
	10-56	Fine sand, loamy sand, loamy fine sand.	SM	A-2-4	0	100	100	50-80	15-35	16-20	NP-3
	56-80	Fine sandy loam, sandy clay loam.	SC, CL	A-4, A-6	0	100	100	80-90	35-55	25-38	8-15
RoA-------------- Rosenbrock	0-11	Clay-------------	CH	A-7-6	0	100	100	95-100	80-90	56-66	33-41
	11-45	Clay, silty clay	CH	A-7-6	0	100	100	95-100	85-95	61-76	36-49
	45-80	Silt loam, loam	CL, CL-ML	A-4, A-6	0	100	98-100	85-95	70-80	20-30	5-12
RoB, Rr---------- Rosenbrock	0-8	Clay-------------	CH	A-7-6	0	100	100	95-100	80-90	56-66	33-41
	8-43	Clay, silty clay	CH	A-7-6	0	100	100	95-100	85-95	61-76	36-49
	43-62	Loam, clay loam	CL, CH	A-6, A-7-6	0	100	100	90-100	85-95	36-51	17-28
	62-80	Silt loam, loam	CL, CL-ML	A-4, A-6	0	100	98-100	85-95	70-80	20-30	5-12
SeC-------------- Sarnosa	0-18	Fine sandy loam	SC	A-2-6, A-2-7, A-6	0	95-100	95-100	70-95	20-45	30-45	11-25
	18-45	Fine sandy loam, loam, sandy clay loam.	SC	A-2-6, A-2-7, A-6	0	95-100	95-100	70-90	20-45	30-45	11-25
	45-80	Fine sandy loam, loam, sandy clay loam.	SC, SC-SM	A-2-4, A-4	0	80-100	80-100	60-85	20-40	20-30	4-10
ShC-------------- Schattel	0-5	Clay loam--------	CL	A-6, A-7-6	0-1	96-100	96-100	70-100	55-80	36-48	16-25
	5-55	Clay, clay loam	CL, CH	A-7-6	0	96-100	96-100	70-100	65-95	43-62	21-36
	55-80	Clay, silty clay, clay loam.	CL, CH	A-7-6	0	96-100	96-100	65-100	60-95	48-70	27-48

See footnote at end of table.

Table 14.--Engineering Index Properties--Continued

Soil name and map symbol	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Frag-ments 3-10 inches	Percentage passing sieve number--: 4	10	40	200	Liquid limit	Plas-ticity index
	In				Pct					Pct	
SrD-------------- Shiner	0-9	Fine sandy loam	SC, SC-SM	A-2-4, A-2-6, A-4	0-5	75-100	75-100	45-75	20-50	20-30	6-15
	9-14	Fine sandy loam, sandy clay loam, gravelly fine sandy loam.	GC, GM-GC, GP-GC, SC	A-2-4, A-2-6, A-4	0-10	50-85	50-85	30-70	10-40	20-30	6-15
	14-31	Stratified weathered bedrock to fine sandy loam.	---	---	---	---	---	---	---	16-19	NP-4
	31-80	Fine sandy loam	SC-SM, SC	A-2-4, A-2-6, A-4	0-2	80-100	75-100	45-75	20-50	20-30	6-15
St--------------- Sinton	0-43	Sandy clay loam	CL, SC	A-6	0	100	96-100	80-100	45-55	28-40	11-23
	43-80	Stratified loamy fine sand to sandy clay loam.	CL-ML, SC-SM, SM, SC	A-2-4, A-2-6, A-4	0	100	96-100	50-100	20-52	16-30	NP-14
Tc--------------- Tiocano	0-18	Clay-------------	CH	A-7-6	0	100	100	90-100	75-95	56-76	33-49
	18-80	Clay-------------	CH	A-7-6	0	100	100	90-100	75-95	56-76	33-49
TrB-------------- Tordia	0-16	Clay-------------	CH	A-7-6	0-2	95-100	95-100	90-100	75-90	55-75	31-48
	16-37	Clay-------------	CH	A-7-6	0-2	95-100	95-100	90-100	75-95	55-75	31-48
	37-43	Clay-------------	CH	A-7-6	0-2	95-100	95-100	90-100	85-95	55-75	31-48
	43-80	Clay, silty clay, shaly clay.	CH	A-7-6	0-5	95-100	95-100	90-100	85-95	55-75	31-48
TrC-------------- Tordia	0-20	Clay-------------	CH	A-7-6	0-2	95-100	95-100	90-100	75-90	55-75	31-48
	20-34	Clay-------------	CH	A-7-6	0-2	95-100	95-100	90-100	75-95	55-75	31-48
	34-40	Clay-------------	CH	A-7-6	0-2	95-100	95-100	90-100	85-95	55-75	31-48
	40-60	Clay, silty clay, shaly clay.	CH	A-7-6	0-5	95-100	95-100	90-100	85-95	55-75	31-48
Us*-------------- Ustarents											
WaC-------------- Weesatche	0-5	Fine sandy loam	SC, CL	A-2-4, A-2-6, A-6	0	95-100	95-100	65-98	28-65	20-30	8-15
	5-65	Sandy clay loam, clay loam.	SC, CL	A-6, A-7, A-2-6	0	95-100	95-100	65-98	28-75	30-42	15-26
	65-80	Sandy clay loam, fine sandy loam, loam.	SC, CL	A-6, A-2-6	0	95-100	95-100	55-100	28-80	25-40	11-24
WeB-------------- Weesatche	0-8	Sandy clay loam	SC, CL	A-6, A-2-6	0	95-100	95-100	65-98	28-65	25-35	11-20
	8-51	Sandy clay loam, clay loam.	SC, CL	A-6, A-7, A-2-6	0	95-100	95-100	65-98	28-75	30-42	15-26
	51-80	Sandy clay loam, fine sandy loam, loam.	SC, CL	A-6, A-2-6	0	95-100	95-100	55-100	28-80	25-40	11-24

See footnote at end of table.

Table 14.--Engineering Index Properties--Continued

Soil name and map symbol	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Frag- ments 3-10 inches	Percentage passing sieve number-- 4	10	40	200	Liquid limit	Plas- ticity index
	In				Pct					Pct	
WeC-------------- Weesatche	0-10	Sandy clay loam	SC, CL	A-6, A-2-6	0	95-100	95-100	65-98	28-65	25-35	11-20
	10-45	Sandy clay loam, clay loam.	SC, CL	A-6, A-7, A-2-6	0	95-100	95-100	65-98	28-75	30-42	15-26
	45-60	Sandy clay loam, fine sandy loam, loam.	SC, CL	A-6, A-2-6	0	95-100	95-100	55-100	28-80	25-40	11-24
WgC-------------- Weigang	0-5	Fine sandy loam	SC, CL, CL-ML, SC-SM	A-4, A-6	0-5	96-100	90-100	70-85	40-55	23-30	6-11
	5-18	Sandy clay loam, clay loam.	CL, SC	A-6, A-7-6	0-5	90-100	85-100	80-100	40-75	35-43	15-21
	18-80	Stratified weathered bedrock.	---	---	---	---	---	---	---	---	---
WtF*:											
Weigang---------	0-5	Very stony fine sandy loam.	SC-SM, SC	A-2-4, A-2-6	5-20	75-85	65-75	60-70	20-30	20-30	5-15
	5-19	Very stony sandy clay loam, very stony clay loam.	CL, SC	A-6	5-20	75-85	65-75	65-75	45-75	25-40	12-25
	19-80	Stratified weathered bedrock.	---	---	---	---	---	---	---	---	---
Gillett---------	0-5	Fine sandy loam	SC, SM, SC-SM	A-4	0-2	95-100	95-100	90-100	40-50	16-25	3-10
	5-19	Clay loam, sandy clay, clay.	CH	A-7-6	0	100	100	95-100	60-70	56-71	33-45
	19-36	Clay loam, sandy clay, clay.	CH	A-7-6	0	100	100	95-100	60-70	56-71	33-45
	36-80	Fine sandy loam, very fine sandy loam.	SM, SC, SC-SM	A-4	0-5	95-100	95-100	90-100	35-45	16-26	NP-9
Zu--------------- Zunker	0-18	Fine sandy loam	SM, SC-SM, ML, CL-ML	A-4	0	100	95-100	70-85	40-55	16-23	NP-7
	18-60	Fine sandy loam, loamy fine sand.	SM, SC-SM, ML, CL-ML	A-4, A-2-4	0	100	95-100	70-90	25-55	12-23	NP-7
	60-80	Fine sandy loam, loamy fine sand.	SM, SC-SM, ML, CL-ML	A-4	0	100	95-100	85-95	40-75	16-23	NP-7

* See description of the map unit for composition and behavior characteristics of the map unit.

Table 15.--Physical and Chemical Properties of the Soils

(The symbol < means less than; > means more than. Entries under "Erosion factors--T" apply to the entire profile. Entries under "Wind erodibility group" and "Organic matter" apply only to the surface layer. Absence of an entry indicates that data were not available or were not estimated)

Soil name and map symbol	Depth	Clay	Moist bulk density	Permeability	Available water capacity	Soil reaction	Salinity	Shrink-swell potential	Erosion factors K	Erosion factors T	Wind erodibility group	Organic matter
	In	Pct	G/cc	In/hr	In/in	pH	mmhos/cm					Pct
BrB--------------	0-9	5-15	1.40-1.60	0.6-2.0	0.10-0.15	6.1-7.3	<2	Low--------	0.43	4	3	.5-1
Bryde	9-25	35-50	1.35-1.60	0.06-0.2	0.12-0.18	6.6-7.8	2-4	Very high	0.32			
	25-41	35-50	1.40-1.60	0.06-0.2	0.12-0.18	7.4-8.4	2-4	High------	0.32			
	41-47	25-45	1.40-1.70	0.06-0.2	0.14-0.18	7.4-8.4	2-4	Moderate	0.32			
	47-80	5-18	1.35-1.55	0.06-0.2	0.05-0.09	6.6-8.4	2-4	Low--------	0.43			
Bu---------------	0-16	40-60	1.25-1.55	<0.06	0.12-0.20	7.9-8.4	0-4	Very high	0.32	5	4	2-5
Buchel	16-42	40-60	1.25-1.60	<0.06	0.12-0.20	7.9-8.4	0-4	Very high	0.32			
	42-80	40-60	1.30-1.60	<0.06	0.12-0.20	7.9-8.4	0-8	Very high	0.32			
Bw---------------	0-14	40-60	1.25-1.55	<0.06	0.12-0.20	7.9-8.4	0-4	Very high	0.32	5	4	2-5
Buchel	14-54	40-60	1.25-1.60	<0.06	0.12-0.20	7.9-8.4	0-4	Very high	0.32			
	54-80	40-60	1.30-1.60	<0.06	0.12-0.20	7.9-8.4	0-8	Very high	0.32			
CaA--------------	0-10	25-35	1.35-1.55	0.6-2.0	0.12-0.20	6.6-7.8	0-0	Moderate	0.32	4	6	1-3
Clareville	10-33	35-45	1.35-1.55	0.2-0.6	0.15-0.20	6.6-7.8	0-0	High------	0.32			
	33-56	35-45	1.40-1.60	0.2-0.6	0.15-0.20	7.9-8.4	0-0	High------	0.32			
	56-80	25-40	1.40-1.60	0.6-2.0	0.12-0.16	7.9-8.4	0-4	Moderate	0.32			
CbC--------------	0-17	20-35	1.40-1.60	2.0-6.0	0.10-0.15	7.9-8.4	<2	Low--------	0.28	5	4L	<1
Colibro	17-56	19-40	1.50-1.70	2.0-6.0	0.10-0.15	7.9-8.4	<2	Low--------	0.28			
	56-80	10-22	1.50-1.70	2.0-6.0	0.09-0.14	7.9-8.4	<2	Low--------	0.28			
CbE--------------	0-8	20-35	1.40-1.60	2.0-6.0	0.10-0.15	7.9-8.4	<2	Low--------	0.28	5	4L	<1
Colibro	8-45	19-40	1.50-1.70	2.0-6.0	0.10-0.15	7.9-8.4	<2	Low--------	0.28			
	45-80	10-22	1.50-1.70	2.0-6.0	0.09-0.14	7.9-8.4	<2	Low--------	0.28			
CdA--------------	0-15	40-55	1.35-1.55	<0.06	0.10-0.20	6.6-7.8	0-2	High------	0.28	2	4	1-3
Condido	15-18	40-55	1.35-1.55	<0.06	0.08-0.18	7.4-8.4	0-2	High------	0.17			
	18-24	---	---	0.01-2.0	---	---	0-2	-----------	----			
	24-40	14-26	1.20-1.35	0.6-2.0	0.05-0.10	7.4-8.4	0-2	Low--------	0.37			
	40-80	14-26	1.20-1.35	0.6-2.0	0.02-0.08	7.4-8.4	0-2	Low--------	0.37			
CnC--------------	0-11	40-55	1.40-1.60	<0.06	0.14-0.20	7.4-8.4	0-2	High------	0.32	2	4	1-3
Conquista	11-80	18-35	1.60-1.80	0.2-0.6	0.07-0.11	7.4-8.4	2-8	Low--------	0.24			
CnG--------------	0-12	40-55	1.40-1.60	<0.06	0.14-0.20	7.4-8.4	0-2	High------	0.32	2	4	1-3
Conquista	12-80	18-35	1.60-1.80	0.2-0.6	0.07-0.11	7.4-8.4	2-8	Low--------	0.24			
CoA--------------	0-6	27-45	1.35-1.55	0.2-0.6	0.15-0.20	7.9-8.4	0-2	Moderate	0.32	5	4	1-3
Coy	6-50	35-60	1.40-1.60	<0.06	0.14-0.18	7.9-8.4	0-2	High------	0.32			
	50-80	40-55	1.40-1.60	<0.06	0.10-0.18	7.9-8.4	2-8	High------	0.32			
CoB--------------	0-6	27-45	1.35-1.55	0.2-0.6	0.15-0.20	7.9-8.4	0-2	Moderate	0.32	5	4	1-3
Coy	6-47	35-60	1.40-1.60	<0.06	0.14-0.18	7.9-8.4	0-2	High------	0.32			
	47-80	40-55	1.40-1.60	<0.06	0.10-0.18	7.9-8.4	2-8	High------	0.32			
CoC--------------	0-5	27-45	1.35-1.55	0.2-0.6	0.15-0.20	7.9-8.4	0-2	Moderate	0.32	5	4	1-3
Coy	5-54	35-60	1.40-1.60	<0.06	0.14-0.18	7.9-8.4	0-2	High------	0.32			
	54-80	40-55	1.40-1.60	<0.06	0.10-0.18	7.9-8.4	2-8	High------	0.32			
DeB--------------	0-13	10-20	1.40-1.65	6.0-20	0.03-0.11	5.6-7.3	0-2	Low--------	0.10	4	8	.5-2
Devine	13-22	10-25	1.40-1.65	6.0-20	0.03-0.11	5.6-7.3	0-2	Low--------	0.10			
	22-80	35-50	1.35-1.60	0.2-0.6	0.03-0.12	5.6-7.8	0-2	Low--------	0.10			

See footnote at end of table.

Table 15.--Physical and Chemical Properties of the Soils**--Continued**

Soil name and map symbol	Depth	Clay	Moist bulk density	Permea- bility	Available water capacity	Soil reaction	Salinity	Shrink- swell potential	Erosion factors K	Erosion factors T	Wind erodi- bility group	Organic matter
	In	Pct	G/cc	In/hr	In/in	pH	mmhos/cm					Pct
EcB-------------- Ecleto	0-3	15-30	1.40-1.55	0.2-0.6	0.10-0.20	6.6-7.3	0-2	Moderate	0.37	2	5	1-3
	3-14	35-45	1.35-1.55	0.06-0.2	0.14-0.20	6.6-7.8	0-2	High------	0.32			
	14-18	35-42	1.25-1.55	0.06-0.2	0.08-0.12	7.9-8.4	0-2	High------	0.20			
	18-60	---	---	0.2-2.0	---	---	---	----------	----			
EcC-------------- Ecleto	0-6	15-30	1.40-1.55	0.2-0.6	0.10-0.20	6.6-7.3	0-2	Moderate	0.37	2	5	1-3
	6-14	35-45	1.35-1.55	0.06-0.2	0.14-0.20	6.6-7.8	0-2	High------	0.32			
	14-80	---	---	0.2-2.0	---	---	---	----------	----			
EdB*:												
Elmendorf-------	0-7	20-34	1.35-1.55	0.2-0.6	0.15-0.20	6.1-8.4	<2	Moderate	0.32	5	6	1-3
	7-59	35-50	1.30-1.60	<0.06	0.15-0.20	6.6-8.4	0-6	High------	0.32			
	59-80	30-45	1.25-1.60	<0.06	0.04-0.18	7.4-8.4	2-16	High------	0.32			
Denhawken-------	0-7	30-45	1.20-1.50	0.2-0.6	0.13-0.18	7.4-8.4	0-2	Moderate	0.32	5	6	1-4
	7-54	30-50	1.25-1.50	<0.06	0.14-0.18	7.4-8.4	0-2	High------	0.32			
	54-80	35-50	1.35-1.60	<0.06	0.04-0.15	7.4-8.4	2-16	High------	0.32			
EsB-------------- Eloso	0-12	40-50	1.15-1.50	<0.06	0.14-0.20	6.6-7.8	0-2	High------	0.28	3	4	1-3
	12-28	40-55	1.20-1.50	<0.06	0.14-0.20	7.4-8.4	0-2	High------	0.28			
	28-37	35-50	1.20-1.50	0.06-0.2	0.08-0.18	7.4-8.4	0-2	High------	0.28			
	37-80	15-27	1.20-1.35	0.6-2.0	0.08-0.18	7.4-8.4	0-2	Low-------	0.32			
EsC-------------- Eloso	0-7	40-50	1.15-1.50	<0.06	0.14-0.20	6.6-7.8	0-2	High------	0.28	3	4	1-3
	7-26	40-55	1.20-1.50	<0.06	0.14-0.20	7.4-8.4	0-2	High------	0.28			
	26-34	35-50	1.20-1.50	0.06-0.2	0.08-0.18	7.4-8.4	0-2	High------	0.28			
	34-80	15-27	1.20-1.35	0.6-2.0	0.08-0.18	7.4-8.4	0-2	Low-------	0.32			
FaC-------------- Fashing	0-18	35-50	1.30-1.45	<0.06	0.10-0.18	7.4-8.4	0-4	High------	0.32	2	4	1-2
	18-80	---	1.70-1.90	0.01-0.6	0.02-0.06	7.4-8.4	<2	Low-------	0.32			
GtB-------------- Gillett	0-7	8-19	1.70-1.80	0.6-2.0	0.08-0.12	6.1-7.3	0-2	Low-------	0.32	3	3	.5-1
	7-19	35-55	1.35-1.55	0.06-0.2	0.11-0.15	6.1-7.8	0-4	High------	0.37			
	19-27	35-55	1.35-1.55	0.06-0.2	0.11-0.15	6.6-8.4	0-4	High------	0.37			
	27-34	25-50	1.40-1.60	0.06-0.2	0.05-0.10	6.6-8.4	0-4	Moderate	0.24			
	34-80	5-18	1.35-1.55	0.06-0.2	0.01-0.04	6.6-8.4	0-4	Low-------	0.43			
Gu*-------------- Gullied land												
Im--------------- Imogene	0-8	10-18	1.40-1.70	0.6-2.0	0.10-0.20	6.1-7.8	0-4	Low-------	0.43	2	3	1-3
	8-17	20-40	1.50-1.75	<0.06	0.05-0.12	6.6-8.4	4-20	Moderate	0.43			
	17-80	20-34	1.40-1.65	0.06-0.2	0.05-0.11	7.4-9.0	4-16	Moderate	0.43			
MgB-------------- Miguel	0-8	10-20	1.50-1.70	0.6-2.0	0.09-0.13	6.1-7.3	0-2	Low-------	0.32	5	3	.3-1
	8-28	35-50	1.35-1.65	0.06-0.2	0.10-0.16	6.6-8.4	0-2	Moderate	0.32			
	28-80	30-45	1.35-1.65	0.06-0.2	0.10-0.16	7.4-8.4	0-2	Moderate	0.32			
MgC-------------- Miguel	0-10	10-20	1.50-1.70	0.6-2.0	0.09-0.13	6.1-7.3	0-2	Low-------	0.32	5	3	.3-1
	10-31	35-50	1.35-1.65	0.06-0.2	0.10-0.16	6.6-8.4	0-2	Moderate	0.32			
	31-60	30-45	1.35-1.65	0.06-0.2	0.10-0.16	7.4-8.4	0-2	Moderate	0.32			
MoA-------------- Monteola	0-6	40-55	1.20-1.45	0.00-0.06	0.13-0.18	7.4-8.4	0-4	Very high	0.32	5	4	1-4
	6-44	40-60	1.20-1.55	0.00-0.06	0.13-0.18	7.4-8.4	2-4	Very high	0.37			
	44-54	40-60	1.30-1.60	0.00-0.06	0.13-0.17	7.4-8.4	2-4	Very high	0.37			
	54-80	40-60	1.40-1.65	0.00-0.06	0.06-0.13	7.4-9.0	4-16	High------	0.37			
MoB-------------- Monteola	0-5	40-55	1.20-1.45	0.00-0.06	0.13-0.18	7.4-8.4	0-4	Very high	0.32	5	4	1-4
	5-37	40-60	1.20-1.55	0.00-0.06	0.13-0.18	7.4-8.4	2-4	Very high	0.37			
	37-50	40-60	1.30-1.60	0.00-0.06	0.13-0.17	7.4-8.4	2-4	Very high	0.37			
	50-80	40-60	1.40-1.65	0.00-0.06	0.06-0.13	7.4-9.0	4-16	High------	0.37			

See footnote at end of table.

Table 15.--Physical and Chemical Properties of the Soils--**Continued**

Soil name and map symbol	Depth	Clay	Moist bulk density	Permea- bility	Available water capacity	Soil reaction	Salinity	Shrink- swell potential	Erosion factors K	Erosion factors T	Wind erodi- bility group	Organic matter
	In	Pct	G/cc	In/hr	In/in	pH	mmhos/cm					Pct
MoC-------------- Monteola	0-13	40-55	1.20-1.45	0.00-0.06	0.13-0.18	7.4-8.4	0-4	Very high	0.32	5	4	1-4
	13-22	40-60	1.20-1.55	0.00-0.06	0.13-0.18	7.4-8.4	2-4	Very high	0.37			
	22-48	40-60	1.30-1.60	0.00-0.06	0.13-0.17	7.4-8.4	2-4	Very high	0.37			
	48-80	40-60	1.40-1.65	0.00-0.06	0.06-0.13	7.4-9.0	4-16	High------	0.37			
MoD-------------- Monteola	0-10	40-55	1.20-1.45	0.00-0.06	0.13-0.18	7.4-8.4	0-4	Very high	0.32	5	4	1-4
	10-29	40-60	1.20-1.55	0.00-0.06	0.13-0.18	7.4-8.4	2-4	Very high	0.37			
	29-43	40-60	1.30-1.60	0.00-0.06	0.13-0.17	7.4-8.4	2-4	Very high	0.37			
	43-80	40-60	1.40-1.65	0.00-0.06	0.06-0.13	7.4-9.0	4-16	High------	0.37			
NuC-------------- Nusil	0-10	1-10	1.35-1.50	6.0-20	0.05-0.08	6.1-7.8	0-0	Low-------	0.17	5	1	.5-1
	10-36	1-13	1.35-1.65	2.0-20	0.05-0.11	6.1-7.8	0-0	Low-------	0.17			
	36-44	18-35	1.65-1.75	0.06-0.2	0.12-0.17	6.1-7.8	0-2	Moderate	0.24			
	44-72	18-35	1.60-1.70	0.2-0.6	0.08-0.12	6.1-8.4	0-2	Moderate	0.24			
	72-80	15-30	1.50-1.65	0.6-2.0	0.11-0.17	6.1-8.4	0-2	Moderate	0.24			
Od--------------- Odem	0-27	7-18	1.40-1.65	2.0-6.0	0.10-0.16	6.1-8.4	0-2	Low-------	0.24	5	3	1-3
	27-80	7-18	1.40-1.65	2.0-6.0	0.10-0.16	6.6-8.4	0-2	Low-------	0.24			
OmD-------------- Olmos	0-11	12-40	1.00-1.55	0.6-2.0	0.05-0.10	7.4-8.4	0-2	Low-------	0.10	2	8	1-5
	11-24	---	---	<0.06	---	7.9-8.4	0-2	----------	----			
	24-80	5-26	1.35-1.80	0.6-2.0	0.02-0.05	7.9-8.4	0-4	Low-------	0.10			
PaB-------------- Papalote	0-19	2-10	1.55-1.70	6.0-20	0.05-0.10	5.6-7.8	0-2	Low-------	0.17	5	2	.5-1
	19-33	35-55	1.35-1.60	0.06-0.2	0.13-0.18	6.1-8.4	0-2	Moderate	0.32			
	33-80	30-40	1.45-1.70	0.06-0.2	0.12-0.17	6.6-8.4	0-2	Moderate	0.32			
PbB-------------- Papalote	0-8	6-17	1.45-1.70	2.0-6.0	0.11-0.16	5.1-7.8	0-2	Low-------	0.32	5	3	.5-1
	8-35	35-55	1.35-1.60	0.06-0.2	0.13-0.18	6.1-8.4	0-2	Moderate	0.32			
	35-60	30-40	1.45-1.70	0.06-0.2	0.12-0.17	6.6-8.4	0-2	Moderate	0.32			
PbC-------------- Papalote	0-5	6-17	1.45-1.70	2.0-6.0	0.11-0.16	5.1-7.8	0-2	Low-------	0.32	5	3	.5-1
	5-40	35-55	1.35-1.60	0.06-0.2	0.13-0.18	6.1-8.4	0-2	Moderate	0.32			
	40-60	30-40	1.45-1.70	0.06-0.2	0.12-0.17	6.6-8.4	0-2	Moderate	0.32			
PcB-------------- Parrita	0-4	16-30	1.35-1.55	0.6-2.0	0.11-0.16	6.6-8.4	0-2	Low-------	0.24	2	5	1-3
	4-10	30-48	1.35-1.55	0.6-2.0	0.12-0.17	6.6-8.4	0-2	Moderate	0.24			
	10-19	37-52	1.35-1.55	0.2-0.6	0.12-0.18	7.4-8.4	0-2	Moderate	0.24			
	19-24	---	---	0.01-0.6	---	7.9-8.4	0-2	----------	----			
	24-80	15-26	1.35-1.65	0.6-2.0	0.06-0.08	7.9-8.4	0-2	Low-------	----			
PkB-------------- Pavelek	0-7	35-50	1.10-1.47	0.06-0.2	0.14-0.20	7.4-8.4	0-2	High------	0.37	2-1	4	1-3
	7-14	35-55	1.10-1.47	0.06-0.2	0.12-0.18	7.4-8.4	0-2	Moderate	0.15			
	14-20	---	---	0.01-0.2	---	---	0-2	----------	----			
	20-46	14-26	1.20-1.35	0.6-2.0	0.02-0.05	7.9-8.4	0-2	Low-------	0.37			
	46-80	14-26	1.20-1.35	0.6-2.0	0.02-0.05	7.9-8.4	0-2	Low-------	0.37			
PkC-------------- Pavelek	0-4	35-50	1.10-1.47	0.06-0.2	0.14-0.20	7.4-8.4	0-2	High------	0.37	2-1	4	1-3
	4-10	35-55	1.10-1.47	0.06-0.2	0.12-0.18	7.4-8.4	0-2	Moderate	0.15			
	10-16	---	---	0.01-0.2	---	---	0-2	----------	----			
	16-36	14-26	1.20-1.35	0.6-2.0	0.02-0.05	7.9-8.4	0-2	Low-------	0.37			
	36-80	14-26	1.20-1.35	0.6-2.0	0.02-0.05	7.9-8.4	0-2	Low-------	0.37			
PnC-------------- Pernitas	0-7	20-32	1.35-1.60	0.6-2.0	0.11-0.16	7.4-8.4	0-2	Low-------	0.32	5	5	1-3
	7-33	21-35	1.30-1.55	0.6-2.0	0.13-0.18	7.4-8.4	0-2	Moderate	0.32			
	33-80	21-35	1.35-1.60	0.6-2.0	0.10-0.15	7.9-8.4	0-2	Moderate	0.32			
PnD-------------- Pernitas	0-7	20-32	1.35-1.60	0.6-2.0	0.11-0.16	7.4-8.4	0-2	Low-------	0.32	5	5	1-3
	7-26	21-35	1.30-1.55	0.6-2.0	0.13-0.18	7.4-8.4	0-2	Moderate	0.32			
	26-80	21-35	1.35-1.60	0.6-2.0	0.10-0.15	7.9-8.4	0-2	Moderate	0.32			

See footnote at end of table.

Table 15.--Physical and Chemical Properties of the Soils--**Continued**

Soil name and map symbol	Depth	Clay	Moist bulk density	Permea-bility	Available water capacity	Soil reaction	Salinity	Shrink-swell potential	Erosion factors K	Erosion factors T	Wind erodi-bility group	Organic matter
	In	Pct	G/cc	In/hr	In/in	pH	mmhos/cm					Pct
PtC-------------- Pettus	0-10	20-35	1.45-1.60	0.6-2.0	0.10-0.15	7.9-8.4	0-2	Low-------	0.24	3-2	4L	1-3
	10-18	20-35	1.45-1.65	0.6-2.0	0.08-0.12	7.9-8.4	0-2	Low-------	0.24			
	18-28	18-26	1.45-1.60	0.6-2.0	0.02-0.05	7.9-8.4	0-2	Low-------	0.10			
	28-80	15-26	1.50-1.65	0.6-6.0	0.03-0.08	7.9-8.4	0-2	Low-------	0.24			
Px*-------------- Pits and dumps												
Qu*-------------- Quarry, sandstone												
RhC-------------- Rhymes	0-10	1-10	1.35-1.50	6.0-20	0.05-0.08	5.6-7.8	0-2	Low-------	0.17	5	1	.5-1
	10-56	1-13	1.35-1.50	2.0-20	0.05-0.11	5.6-7.8	0-2	Low-------	0.17			
	56-80	18-35	1.50-1.65	0.2-0.6	0.12-0.17	5.6-8.4	0-2	Moderate	0.24			
RoA-------------- Rosenbrock	0-11	40-50	1.10-1.35	<0.06	0.14-0.20	7.4-8.4	0-2	High------	0.24	5	4	2-5
	11-45	45-60	1.10-1.35	<0.06	0.14-0.20	7.4-8.4	0-4	High------	0.24			
	45-80	10-26	1.10-1.35	0.6-2.0	0.07-0.11	7.4-8.4	2-8	Low-------	0.37			
RoB, Rr---------- Rosenbrock	0-8	40-50	1.10-1.35	<0.06	0.14-0.20	7.4-8.4	0-2	High------	0.24	5	4	2-5
	8-43	45-60	1.10-1.35	<0.06	0.14-0.20	7.4-8.4	0-4	High------	0.24			
	43-62	20-35	1.10-1.35	0.2-0.6	0.13-0.19	7.4-8.4	2-8	Moderate	0.28			
	62-80	10-26	1.10-1.35	0.6-2.0	0.07-0.11	7.4-8.4	2-8	Low-------	0.37			
SeC-------------- Sarnosa	0-18	8-25	1.35-1.55	0.6-2.0	0.10-0.15	7.9-8.4	0-0	Low-------	0.24	5	4	1-3
	18-45	8-25	1.40-1.60	0.6-2.0	0.10-0.15	7.9-8.4	0-0	Low-------	0.24			
	45-80	8-25	1.40-1.65	2.0-6.0	0.06-0.12	7.9-8.4	0-0	Low-------	0.24			
ShC-------------- Schattel	0-5	27-45	1.15-1.35	0.6-2.0	0.11-0.18	7.4-8.4	0-4	Moderate	0.32	3	6	.5-2
	5-55	35-55	1.20-1.45	0.2-0.6	0.08-0.15	7.4-8.4	2-8	High------	0.32			
	55-80	35-60	1.65-1.80	0.06-0.2	0.03-0.08	7.4-8.4	4-16	High------	0.37			
SrD-------------- Shiner	0-9	10-20	1.40-1.60	0.6-2.0	0.10-0.15	7.9-8.4	0-2	Low-------	0.24	2	3	.5-2
	9-14	10-20	1.40-1.60	0.6-2.0	0.06-0.12	7.9-8.4	0-2	Low-------	0.24			
	14-31	0-0	1.80-1.90	0.6-2.0	0.03-0.10	7.9-8.4	0-2	Low-------	----			
	31-80	10-20	1.40-1.65	0.6-2.0	0.05-0.10	7.9-8.4	0-2	Low-------	0.24			
St--------------- Sinton	0-43	20-35	1.35-1.60	0.6-2.0	0.15-0.20	7.4-8.4	<2	Low-------	0.28	5	5	1-3
	43-80	10-35	1.40-1.65	2.0-6.0	0.07-0.15	7.4-8.4	<2	Low-------	0.20			
Tc--------------- Tiocano	0-18	40-60	1.25-1.50	<0.06	0.12-0.18	6.6-7.8	0-2	Very high	0.32	5	4	1-4
	18-80	40-60	1.25-1.50	<0.06	0.12-0.17	7.4-8.4	0-2	Very high	0.32			
TrB-------------- Tordia	0-16	40-60	1.25-1.45	<0.06	0.12-0.18	6.6-8.4	0-2	High------	0.32	4	4	1-4
	16-37	40-60	1.25-1.45	<0.06	0.12-0.18	6.6-8.4	<2	High------	0.32			
	37-43	40-60	1.25-1.45	<0.06	0.12-0.18	6.6-8.4	<2	High------	0.32			
	43-80	40-60	1.45-1.65	<0.06	0.10-0.15	6.6-8.4	<4	Moderate	0.32			
TrC-------------- Tordia	0-20	40-60	1.25-1.45	<0.06	0.12-0.18	6.6-8.4	0-2	High------	0.32	4	4	1-4
	20-34	40-60	1.25-1.45	<0.06	0.12-0.18	6.6-8.4	<2	High------	0.32			
	34-40	40-60	1.25-1.45	<0.06	0.12-0.18	6.6-8.4	<2	High------	0.32			
	40-60	40-60	1.45-1.65	<0.06	0.10-0.15	6.6-8.4	<4	Moderate	0.32			
Us*-------------- Ustarents												
WaC-------------- Weesatche	0-5	14-20	1.35-1.55	0.6-2.0	0.11-0.15	6.6-7.8	0-2	Low-------	0.32	5	3	1-4
	5-65	20-35	1.30-1.50	0.6-2.0	0.15-0.20	7.4-8.4	0-2	Moderate	0.32			
	65-80	16-33	1.30-1.55	0.6-2.0	0.10-0.15	7.9-8.4	0-2	Moderate	0.32			

See footnote at end of table.

Table 15.--Physical and Chemical Properties of the Soils--Continued

Soil name and map symbol	Depth	Clay	Moist bulk density	Permea- bility	Available water capacity	Soil reaction	Salinity	Shrink- swell potential	Erosion factors K	Erosion factors T	Wind erodi- bility group	Organic matter
	In	Pct	G/cc	In/hr	In/in	pH	mmhos/cm					Pct
WeB-------------- Weesatche	0-8	16-27	1.30-1.50	0.6-2.0	0.12-0.17	6.6-7.8	0-2	Moderate	0.32	5	5	1-4
	8-51	20-35	1.30-1.50	0.6-2.0	0.15-0.20	7.4-8.4	0-2	Moderate	0.32			
	51-80	16-33	1.30-1.55	0.6-2.0	0.10-0.15	7.9-8.4	0-2	Moderate	0.32			
WeC-------------- Weesatche	0-10	16-27	1.30-1.50	0.6-2.0	0.12-0.17	6.6-7.8	0-2	Moderate	0.32	5	5	1-4
	10-45	20-35	1.30-1.50	0.6-2.0	0.15-0.20	7.4-8.4	0-2	Moderate	0.32			
	45-60	16-33	1.30-1.55	0.6-2.0	0.10-0.15	7.9-8.4	0-2	Moderate	0.32			
WgC-------------- Weigang	0-5	12-20	1.40-1.60	0.6-2.0	0.11-0.15	6.1-7.8	0-2	Low-------	0.28	2	3	1-3
	5-18	27-35	1.40-1.55	0.6-2.0	0.13-0.17	6.1-7.8	0-2	Moderate	0.28			
	18-80	12-20	1.55-1.75	0.01-0.6	0.04-0.08	6.1-8.4	0-2	Low-------	----			
WtF*:												
Weigang---------	0-5	9-18	1.40-1.60	0.6-2.0	0.07-0.13	6.1-7.3	0-0	Low-------	0.17	2	8	1-3
	5-19	20-35	1.40-1.55	0.6-2.0	0.12-0.18	6.1-7.8	0-0	Moderate	0.17			
	19-80	12-20	1.40-1.75	0.01-0.6	0.04-0.08	6.1-8.4	0-0	----------	----			
Gillett---------	0-5	8-19	1.70-1.80	0.6-2.0	0.08-0.12	6.1-7.3	0-2	Low-------	0.32	3	3	.5-1
	5-19	35-55	1.35-1.55	0.06-0.2	0.11-0.15	6.1-7.8	0-4	High------	0.37			
	19-36	35-55	1.35-1.55	0.06-0.2	0.11-0.15	6.6-8.4	0-4	High------	0.37			
	36-80	5-18	1.35-1.55	0.06-0.2	0.01-0.04	6.6-8.4	0-4	Low-------	0.43			
Zu--------------- Zunker	0-18	8-20	1.50-1.65	2.0-6.0	0.11-0.15	7.4-8.4	0-2	Low-------	0.24	5	3	1-2
	18-60	7-18	1.60-1.70	2.0-6.0	0.07-0.15	7.4-8.4	0-2	Low-------	0.24			
	60-80	10-20	1.70-1.80	2.0-6.0	0.10-0.16	7.4-8.4	0-2	Low-------	0.24			

* See description of the map unit for composition and behavior characteristics of the map unit.

Table 16.--Soil and Water Features

("Flooding" and "water table" and terms such as "rare," "brief," "apparent," and "perched" are explained in the text. The symbol < means less than; > means more than. Absence of an entry indicates that the feature is not a concern or that data were not estimated)

Soil name and map symbol	Hydro-logic group	Flooding			High water table			Bedrock		Cemented pan		Risk of corrosion	
		Frequency	Duration	Months	Depth	Kind	Months	Depth	Hard-ness	Depth	Thick-ness	Uncoated steel	Concrete
					Ft			In		In			
BrB: Bryde	C	None	---	---	>6.0	---	---	>60	---	---	---	High	Low.
Bu: Buchel	D	Occasional	Very brief	Jan-Dec	>6.0	---	---	>60	---	---	---	High	Low.
Bw: Buchel	D	Frequent	Very brief	Jan-Dec	>6.0	---	---	>60	---	---	---	High	Low.
CaA: Clareville	C	None	---	---	>6.0	---	---	>60	---	---	---	High	Low.
CbC, CbE: Colibro	B	None	---	---	>6.0	---	---	>60	---	---	---	Moderate	Low.
CdA: Condido	D	None	---	---	>6.0	---	---	>60	---	10-20	Thin	High	Low.
CnC, CnG: Conquista	D	None	---	---	>6.0	---	---	>60	---	---	---	High	Low.
CoA, CoB, CoC: Coy	D	None	---	---	>6.0	---	---	>60	---	---	---	High	Low.
DeB: Devine	C	None	---	---	>6.0	---	---	>60	---	---	---	Moderate	Low.
EcB, EcC: Ecleto	D	None	---	---	>6.0	---	---	10-20	Soft	---	---	High	Low.
EdB*:													
Elmendorf	D	None	---	---	>6.0	---	---	>60	---	---	---	High	Low.
Denhawken	D	None	---	---	>6.0	---	---	>60	---	---	---	High	Low.

See footnote at end of table.

Table 16.--Soil and Water Features--Continued

Soil name and map symbol	Hydrologic group	Flooding: Frequency	Flooding: Duration	Flooding: Months	High water table: Depth	High water table: Kind	High water table: Months	Bedrock: Depth	Bedrock: Hardness	Cemented pan: Depth	Cemented pan: Thickness	Risk of corrosion: Uncoated steel	Risk of corrosion: Concrete
					Ft			In		In			
EsB, EsC---------- Eloso	D	None--------	---	---	>6.0	---	---	>60	---	---	---	High-----	Low.
FaC--------------- Fashing	D	None--------	---	---	>6.0	---	---	10-20	Soft	---	---	High-----	Low.
GtB--------------- Gillett	D	None--------	---	---	>6.0	---	---	>60	---	---	---	High-----	Low.
Gu*--------------- Gullied land													
Im---------------- Imogene	C	None--------	---	---	>6.0	---	---	>60	---	---	---	High-----	Moderate.
MgB, MgC---------- Miguel	D	None--------	---	---	>6.0	---	---	>60	---	---	---	High-----	Low.
MoA, MoB, MoC, MoD-------------- Monteola	D	None--------	---	---	>6.0	---	---	>60	---	---	---	High-----	Low.
NuC--------------- Nusil	A	None--------	---	---	>6.0	---	---	>60	---	---	---	Low------	Moderate.
Od---------------- Odem	B	Occasional	Very brief	Sep-May	>6.0	---	---	>60	---	---	---	Moderate	Low.
OmD--------------- Olmos	C	None--------	---	---	>6.0	---	---	>60	---	10-20	Thin	High-----	Low.
PaB, PbB, PbC----- Papalote	C	None--------	---	---	>6.0	---	---	>60	---	---	---	High-----	Low.
PcB--------------- Parrita	C	None--------	---	---	>6.0	---	---	>60	---	12-20	Thin	High-----	Low.
PkB, PkC---------- Pavelek	D	None--------	---	---	>6.0	---	---	>60	---	10-20	Thin	High-----	Low.

See footnote at end of table.

Table 16.--Soil and Water Features--**Continued**

Soil name and map symbol	Hydro-logic group	Flooding: Frequency	Flooding: Duration	Flooding: Months	High water table: Depth	High water table: Kind	High water table: Months	Bedrock: Depth	Bedrock: Hard-ness	Cemented pan: Depth	Cemented pan: Thick-ness	Risk of corrosion: Uncoated steel	Risk of corrosion: Concrete
					Ft			In		In			
PnC, PnD---------- Pernitas	C	None--------	---	---	>6.0	---	---	>60	---	---	---	High-----	Low.
PtC--------------- Pettus	C	None--------	---	---	>6.0	---	---	>60	---	---	---	Moderate	Low.
Px*--------------- Pits and dumps													
Qu*--------------- Quarry, sandstone													
RhC--------------- Rhymes	A	None--------	---	---	>6.0	---	---	>60	---	---	---	Low------	Moderate.
RoA, RoB---------- Rosenbrock	D	None--------	---	---	>6.0	---	---	>60	---	---	---	High-----	Low.
Rr---------------- Rosenbrock	D	Rare--------	---	---	>6.0	---	---	>60	---	---	---	High-----	Low.
SeC--------------- Sarnosa	B	None--------	---	---	>6.0	---	---	>60	---	---	---	Moderate	Low.
ShC--------------- Schattel	C	None--------	---	---	>6.0	---	---	>60	---	---	---	High-----	Low.
SrD--------------- Shiner	C	None--------	---	---	>6.0	---	---	10-20	Soft	---	---	Moderate	Low.
St---------------- Sinton	B	Occasional	Brief-----	Sep-May	>6.0	---	---	>60	---	---	---	Moderate	Low.
Tc---------------- Tiocano	D	None--------	---	---	+1-2.0	Perched	Sep-May	>60	---	---	---	High-----	Low.
TrB, TrC---------- Tordia	D	None--------	---	---	>6.0	---	---	>60	---	---	---	High-----	Low.

See footnote at end of table.

Table 16.--Soil and Water Features--**Continued**

Soil name and map symbol	Hydro-logic group	Flooding			High water table			Bedrock		Cemented pan		Risk of corrosion	
		Frequency	Duration	Months	Depth	Kind	Months	Depth	Hard-ness	Depth	Thick-ness	Uncoated steel	Concrete
					Ft			In		In			
Us*: Ustarents													
WaC, WeB, WeC: Weesatche	B	None	---	---	>6.0	---	---	>60	---	---	---	High	Low.
WgC: Weigang	C	None	---	---	>6.0	---	---	8-20	Soft	---	---	Moderate	Low.
WtF*:													
Weigang	C	None	---	---	>6.0	---	---	8-20	Soft	---	---	Moderate	Low.
Gillett	D	None	---	---	>6.0	---	---	>60	---	---	---	High	Low.
Zu: Zunker	B	Occasional	Very brief to brief.	Jan-Dec	>6.0	---	---	>60	---	---	---	Moderate	Low.

* See description of the map unit for composition and behavior characteristics of the map unit.

Table 17.--Physical Analyses of Selected Soils

[Dashes indicate data were not available]

Soil name and sample number	Depth	Horizon	Particle-size Distribution (Percentage by Weight): Sand: Very coarse (2-1 mm)	Sand: Coarse (1-0.5 mm)	Sand: Medium (0.5-0.25 mm)	Sand: Fine (0.25-0.10 mm)	Sand: Very fine (0.10-0.05 mm)	Sand: Total (2.0-0.05 mm)	Silt: Total (0.05-0.002 mm)	Clay: Total (<0.002 mm)	COLE	Bulk density: 1/3 bar	Bulk density: Air dry	Water content: 1/3 bar
	In		Pct.	Pct.	Pct.	Pct.	Pct.	Pct.	Pct.	Pct.	Cm/cm	G/cc	G/cc	Pct(wt)
Bryde [1,2]														
(S88TX-255-005)	0-9	A	0.3	1.1	6.9	34.1	26.3	68.7	21.0	10.3	0.019	1.53	1.62	22.1
	9-17	Bt1	0.4	0.8	4.3	21.9	17.5	44.9	14.4	40.7	0.133	1.32	1.92	35.8
	17-25	Bt2	0.4	0.8	4.2	21.4	17.3	44.1	14.3	41.6	0.125	1.35	1.92	33.4
	25-35	Bt3	0.8	1.0	4.7	21.8	17.3	45.6	14.7	39.7	0.123	1.34	1.90	34.1
	35-41	Btk	0.6	1.0	4.3	20.4	18.1	44.4	16.4	39.2	--	-	-	--
	41-47	Bt/2Cr	0.3	0.8	4.0	17.7	25.0	47.8	23.9	28.3	--	-	-	--
	47-74	2Cr[6]	0.2	0.3	4.4	25.3	32.9	63.1	26.0	10.9	--	-	-	--
	74-80	2Cr[6]	0.1	0.6	5.9	40.9	23.7	71.2	21.8	7.0	--	-	-	--
Buchel [1,2]														
(S90TX-255-001)	0-6	Ap	0.2	0.5	0.8	2.8	3.5	7.8	40.2	53.1	0.091	1.30	1.69	26.9
	6-16	A	0.1	0.5	0.7	2.8	3.5	7.6	30.5	61.9	0.107	1.37	1.86	27.7
	16-29	Bss1[6]	0.1	0.4	0.5	2.6	3.2	6.8	35.5	57.7	0.125	1.35	1.92	32.4
	29-42	Bss1[6]	0.2	0.3	0.4	2.3	3.3	6.5	32.3	61.2	0.123	1.39	1.97	29.5
	42-60	Bss2	0.1	0.2	0.3	2.7	3.9	7.2	28.1	64.7	0.130	1.38	1.99	30.9
	60-77	Bkss	0.1	0.2	0.3	3.3	4.2	8.1	33.0	58.9	0.139	1.32	1.95	35.7
	77-80	B'ss	0.2	0.3	0.4	4.3	4.7	9.9	30.4	59.7	0.124	1.36	1.93	31.5
Condido [1,2]														
(S88TX-255-003)	0-6	A1	0.0	0.2	1.9	8.5	8.8	19.4	33.5	47.1	0.130	1.20	1.73	37.4
	6-15	A2	0.1	0.4	1.7	7.4	8.1	17.7	29.8	52.2	0.149	1.18	1.79	36.2
	15-18	A3	1.9	2.8	2.9	6.6	7.3	21.5	37.0	41.5	--	-	-	--
	18-24	Bkm	2.5	5.1	5.9	8.4	8.6	30.5	57.3	12.2	--	-	-	--
	24-80	BCk,2Cr[7]	2.9	4.5	5.1	7.5	9.7	29.7	50.1	20.2	0.000	1.60	1.61	23.3
Ecleto [1,2]														
(S88TX-255-001)	0-3	A	0.4	0.7	4.1	42.7	19.6	67.5	14.7	17.8	0.059	1.45	1.72	26.7
	3-14	Bt1	0.2	0.4	3.5	31.7	12.4	48.2	10.6	41.2	0.168	1.18	1.88	43.5
	14-18	Bt2	0.4	0.8	4.2	34.1	12.8	52.3	11.9	35.8	0.119	1.07	1.50	48.7
	18-60	Cr	0.3	0.4	1.5	62.0	13.0	77.2	16.1	6.7	0.015	1.29	1.35	27.4

See footnotes at end of table.

Table 17.--Physical Analyses of Selected Soils--Continued

Soil name and sample number	Depth	Horizon	Particle-size Distribution (Percentage by Weight): Sand: Very coarse (2-1 mm)	Sand: Coarse (1-0.5 mm)	Sand: Medium (0.5-0.25 mm)	Sand: Fine (0.25-0.10 mm)	Sand: Very fine (0.10-0.05 mm)	Sand: Total (2.0-0.05 mm)	Silt: Total (0.05-0.002 mm)	Clay: Total (<0.002 mm)	COLE	Bulk density: 1/3 bar	Bulk density: Air dry	Water content: 1/3 bar
	In		Pct.	Pct.	Pct.	Pct.	Pct.	Pct.	Pct.	Pct.	Cm/cm	G/cc	G/cc	Pct(wt)
Eloso [1,2]														
(S88TX-255-007)	0-5	Ap	0.1	0.4	2.5	11.3	9.9	24.2	35.5	40.3	0.094	1.17	1.53	40.0
	5-12	A	0.1	0.4	2.3	10.3	8.6	21.7	31.9	46.4	0.086	1.24	1.59	36.0
	12-28	Bk	0.4	0.5	1.2	5.8	6.3	14.2	35.2	50.6	0.105	1.29	1.74	33.7
	28-37	BCk	0.6	0.7	1.3	4.6	5.5	12.7	41.7	45.6	0.130	1.20	1.73	38.6
	37-80	2C	0.6	1.3	1.5	7.2	13.5	24.1	53.7	22.2	0.030	1.22	1.33	32.7
Gillett [4,2]														
(S88TX-255-004)	0-4	A	0.3	0.7	9.3	46.2	22.7	79.2	14.7	6.1	0.017	1.55	1.63	20.1
	4-9	Bt1	0.3	0.6	6.0	29.7	14.4	51.0	13.0	36.0	0.155	1.32	1.83	33.0
	9-16	Bt2	0.1	0.5	6.1	27.2	14.0	47.9	12.5	39.6	0.125	1.30	1.85	35.2
	16-24	Bt3	0.3	0.6	6.1	29.1	15.4	51.5	14.9	33.6	0.085	1.47	1.88	26.7
	24-31	Btk	0.9	1.0	6.3	30.4	16.5	55.1	16.0	28.9	0.089	1.44	1.86	28.2
	31-44	Btkz	0.3	0.4	2.8	25.1	20.8	49.4	17.6	33.0	0.070	1.34	1.64	30.7
	44-56	Btk'	0.2	0.4	2.8	29.9	20.3	53.6	14.8	31.6	0.060	1.26	1.50	35.1
	56-89	Bk/Ck	0.2	0.3	3.6	35.8	19.4	59.3	14.7	26.0	0.040	1.29	1.45	32.6
	56-89	Ck/Bk	0.1	0.2	1.0	21.3	29.0	51.6	16.2	32.2	--	-	-	--
	89-102	2C	0.0	0.1	20.4	60.1	3.1	83.7	3.0	13.3	--	-	-	--
Gillett [1,2]														
(S89TX-255-001)	0-7	A	--	--	--	--	--	78.5	9.2	12.3	0.006	1.64	-	14.5
	7-13	Bt1	--	--	--	--	--	45.6	5.6	48.8	0.108	1.34	-	30.0
	13-19	Bt2	--	--	--	--	--	42.9	7.2	49.9	0.156	1.19	-	44.0
	19-27	Btk	--	--	--	--	--	42.0	14.3	43.7	0.101	1.32	-	34.1
	27-34	2BCtk	--	--	--	--	--	67.2	9.8	23.0	0.25	1.44	-	27.7
Nusil [1,2]														
(S92TX-255-001)	0-10	A1	0.5	3.7	26.7	50.4	13.2	94.5	3.1	2.4	--	-	-	--
	10-30	A2	0.7	4.8	22.9	45.5	16.0	91.0	5.0	4.0	--	-	-	--
	30-36	E	0.3	3.5	19.0	53.9	17.3	94.0	3.3	2.7	--	-	-	--
	36-44	Bt1	1.1	5.0	16.3	31.0	11.0	64.4	3.8	31.8	--	-	-	--
	44-54	Bt2	1.6	5.6	18.4	24.3	8.2	56.5	7.9	35.6	--	-	-	--
	54-72	Bt3	1.0	5.6	21.5	27.9	9.0	65.0	6.9	28.1	--	-	-	--
	72-80	BC	0.7	4.0	18.5	32.9	11.6	67.7	6.6	25.7	--	-	-	--

See footnotes at end of table.

TABLE 17.--PHYSICAL ANALYSES OF SELECTED SOILS--Continued

Soil name and sample number	Depth	Horizon	Particle-size Distribution (Percentage by Weight): Sand: Very coarse (2-1 mm)	Sand: Coarse (1-0.5 mm)	Sand: Medium (0.5-0.25 mm)	Sand: Fine (0.25-0.10 mm)	Sand: Very fine (0.10-0.05 mm)	Sand: Total (2.0-0.05 mm)	Silt: Total (0.05-0.002 mm)	Clay: Total (<0.002 mm)	COLE	Bulk density: 1/3 bar	Bulk density: Air dry	Water content: 1/3 bar
	In		Pct.	Pct.	Pct.	Pct.	Pct.	Pct.	Pct.	Pct.	Cm/cm	G/cc	G/cc	Pct(wt)
Pavelek [1,3]														
(S86TX-255-001)	0-7	A	0.7	1.1	4.1	14.3	9.6	29.8	25.8	44.4	--	-	-	--
	7-14	Bk	3.5	2.8	3.5	10.0	7.8	27.6	27.3	45.1	0.10	1.10	-	38.7
	14-80	Bkm,BCk[7]	0.4	1.2	4.5	13.6	16.0	35.7	46.3	18.0	--	-	-	--
	14-80	2Cr[7]	0.4	0.4	4.5	13.6	16.0	35.7	46.3	18.0	--	-	-	--
Pernitas [1,3]														
(S89TX-255-002)	21-33	Btk	0.7	1.5	7.6	19.7	8.6	38.1	23.4	38.5	0.065	1.53		22.3
Rhymes [1,2]														
(S92TX-255-002)	0-10	A1	0.6	4.1	27.9	49.3	12.8	94.7	3.1	2.2	--	-	-	--
	10-36	A2	0.1	1.4	16.6	54.5	20.5	93.1	4.6	2.3	--	-	-	--
	36-56	E	0.1	2.8	22.9	30.0	32.0	87.8	8.8	3.4	--	-	-	--
	56-68	Bt1	0.0	1.3	13.3	40.8	17.6	71.5	9.7	18.8	--	-	-	--
	68-80	Bt2	0.0	0.6	9.2	40.0	19.9	69.7	7.5	22.8	--	-	-	--
Rosenbrock [1,2]														
(S88TX-255-006)	0-8	Ap	0.1	0.4	2.6	8.3	4.8	16.2	35.6	48.2	0.122	1.09	1.49	46.9
	8-18	Bw	0.1	0.2	2.4	7.7	4.6	15.0	28.3	56.7	0.118	1.11	1.55	46.2
	18-31	Bk1	0.2	0.4	2.3	7.2	4.6	14.7	27.7	57.6	0.118	1.13	1.58	43.8
	31-43	Bk2	0.1	0.4	2.3	7.4	5.3	15.5	28.9	55.6	0.115	1.14	1.58	42.8
	43-62	2Cr/Bk	0.9	2.8	5.0	10.0	10.2	28.9	46.5	24.6	--	-	-	--
	62-80	2Cr	0.5	1.8	5.1	12.5	12.7	32.6	53.0	14.4	--	-	-	--

See footnotes at end of table.

Table 17.--Physical Analyses of Selected Soils--Continued

Soil name and sample number	Depth	Horizon	Particle-size Distribution (Percentage by Weight): Sand: Very coarse (2-1 mm)	Sand: Coarse (1-0.5 mm)	Sand: Medium (0.5-0.25 mm)	Sand: Fine (0.25-0.10 mm)	Sand: Very fine (0.10-0.05 mm)	Sand: Total (2.0-0.05 mm)	Silt: Total (0.05-0.002 mm)	Clay: Total (<0.002 mm)	COLE	Bulk density: 1/3 bar	Bulk density: Air dry	Water content: 1/3 bar
	In		Pct.	Pct.	Pct.	Pct.	Pct.	Pct.	Pct.	Pct.	Cm/cm	G/cc	G/cc	Pct(wt)
Weesatche [5,2]														
(S88TX-255-002)	0-5	A1	0.0	0.6	12.0	45.3	13.4	71.3	12.5	16.2	0.061	1.13	1.59	32.2
	5-12	A2	0.0	0.7	11.8	43.6	11.7	67.8	11.0	21.2	0.042	1.36	1.54	26.2
	12-17	Bt1	0.0	0.7	10.3	38.2	10.0	59.2	8.9	31.9	0.130	1.24	1.79	49.0
	17-29	Bt2	0.1	1.0	10.8	38.1	10.2	60.2	8.6	31.2	0.143	1.20	1.79	52.9
	29-52	Bt3	0.0	0.7	11.1	38.8	11.0	61.6	8.4	30.0	0.122	1.31	1.85	40.5
	52-64	Bk	0.1	0.8	12.7	45.1	11.7	70.4	8.2	21.4	0.039	1.41	1.58	28.8
	64-80	C	0.0	0.7	17.0	50.2	10.7	78.6	6.4	15.0	0.041	1.39	1.57	27.4

[1] Location of pedon sample is the same as the pedon given as typical of series in "Soil Series and Their Morphology."

[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 outside the range for Gillett series. Depth of solum is more than 40 inches.

Location of this pedon: From the intersection of Texas Highway 119 and Texas Highway 80 in Gillett, 4.4 miles southeast on Texas Highway 119, 1.75 miles northeast and north on unpaved county road, 800 feet west in rangeland.

[5] Location of Weesatche pedon: From the intersection of U. S. Highway 181 and Texas Highway 72 in Kenedy, 4.6 miles south on U.S. Highway 181, 1.85 miles southeast on unpaved county road, 100 feet northeast of unpaved county road in abandoned cropland.

[6] The horizon was subdivided for sampling purposes.

[7] Horizons were mixed in sampling.

Table 18.--Chemical Analyses of Selected Soils

(Dash indicates the determination was not made. TR means trace.)

Soil name and sample number	Depth	Horizon	Extractable bases Ca	Mg	K	Na	CEC (NH_4OAc)	Base Saturation	Organic carbon	pH 1:1 soil:water	Elec. Conductivity	SAR	Exchange-able sodium percentage	Calcium Carbonate Equivalent
	In		Meq/100g					Pct	Pct	pH	mmhos/CM			Pct
Bryde:[1]	0-9	A	6.2	1.5	0.2	0.2	7.3	100	0.71	6.3	0.4	2	2	---
(S88TX-255-005)	9-17	Bt1	25.7	5.5	0.3	3.2	34.0	100	0.82	6.8	1.1	7	8	---
	17-25	Bt2	27.8	5.8	0.3	4.3	35.2	100	0.71	7.4	2.8	9	8	---
	25-35	Bt3	25.9	5.5	0.2	4.7	33.8	100	0.64	7.5	3.5	8	9	0.4
	35-41	Btk	35.8	5.5	0.3	4.6	32.9	100	0.40	7.5	3.4	9	9	1.3
	41-47	Bt/2Cr	45.6	5.5	0.3	4.8	34.8	100	0.36	7.5	3.5	9	9	2.2
	47-74	2Cr[7]	20.7	4.0	0.3	4.5	27.6	100	0.12	7.1	2.6	9	11	---
	74-80	2Cr[7]	20.1	3.6	0.2	4.1	24.2	100	0.06	7.4	3.2	10	12	---
Buchel:[1,2]	0-6	Ap	66.7	3.7	2.4	0.5	38.5	100	1.62	8.0	0.7	1	1	28.0
(S88TX-255-001)	6-16	A	66.4	5.7	1.0	1.9	38.8	100	1.18	8.2	0.7	5	4	29.4
	16-29	Bss1[7]	61.4	5.2	0.8	4.5	35.8	100	0.72	8.4	1.0	11	11	28.5
	29-42	Bss1[7]	56.6	6.3	0.9	7.5	36.2	100	0.75	8.4	1.9	19	17	27.4
	42-60	Bss2	61.9	5.8	1.0	11.8	38.9	100	0.99	8.4	3.4	18	24	26.9
	60-77	Bkss	72.8	5.3	1.0	11.1	33.3	100	0.49	8.0	7.9	16	19	30.1
	77-86	B’ss	56.0	5.3	1.0	11.5	34.5	100	0.31	8.3	5.0	21	24	30.7
Condido:[1,2]	0-6	A1	32.5	3.8	1.5	0.3	35.6	100	1.55	6.9	0.3	0	1	---
(S88TX-255-003)	6-15	A2	38.4	3.6	1.3	0.3	39.6	100	1.42	7.2	0.5	0	1	---
	15-18	A3	64.6	3.5	1.3	0.3	36.8	100	1.46	7.9	0.6	0	1	14.3
	18-24	Bkm	47.8	1.3	0.6	0.3	11.7	100	0.34	8.4	0.5	1	2	46.6
	24-80	Bck,2Cr[8]	62.6	2.3	1.1	0.4	26.5	100	0.66	8.3	0.6	1	1	26.2
Ecleto:[1,2]	0-3	A	10.2	2.2	0.5	0.3	12.8	100	1.19	6.9	0.4	1	2	---
(S88TX-255-001)	3-14	Bt1	14.4	6.6	0.7	1.6	31.6	74	0.81	6.9	0.6	3	4	---
	14-18	Bt2	21.6	6.6	0.5	3.5	32.2	100	0.75	8.0	1.5	6	9	0.4
	18-60	Cr	9.9	3.2	0.6	3.5	21.9	78	0.06	7.9	2.6	7	12	---
Eloso:1,2	0-5	Ap	41.4	2.4	1.1	0.2	34.4	100	1.65	7.4	0.5	0	1	0.6
(S88TX-255-007)	5-12	A	58.2	2.1	1.1	0.2	35.6	100	1.01	7.7	0.5	0	1	4.5
	12-28	Bk	62.9	2.1	0.4	0.3	34.7	100	0.55	7.8	0.4	0	1	14.6
	28-37	BCk	58.9	2.2	0.5	0.4	33.4	100	0.42	7.8	0.4	1	1	14.8
	37-80	2Cr	52.0	2.4	0.6	0.5	34.6	100	0.19	7.7	0.4	1	1	12.8

See footnotes at end of table.

Table 18.--Chemical Analyses of Selected Soils--Continued

Soil name and sample number	Depth	Horizon	Extractable bases Ca	Extractable bases Mg	Extractable bases K	Extractable bases Na	CEC (NH_4OAc)	Base Saturation	Organic carbon	pH 1:1 soil:water	Elec. Conductivity	SAR	Exchangeable sodium percentage	Calcium Carbonate Equivalent
	In		Meq/100g					Pct	Pct	pH	mmhos/CM			Pct
Gillette:[4,2]	0-4	A	3.2	1.0	0.3	0.2	5.0	94	0.42	5.8	0.2	2	4	---
(S88TX-255-004)	4-9	Bt1	18.8	5.0	0.4	3.1	28.5	96	0.85	6.2	1.0	9	9	---
	9-16	Bt2	23.3	6.1	0.3	5.0	32.2	100	0.77	6.8	2.6	11	11	---
	16-24	Bt3	21.5	5.8	0.3	5.6	29.5	100	0.61	7.5	4.5	12	13	---
	24-31	Btk	25.8	4.4	0.3	5.4	24.6	100	0.27	8.0	4.9	14	13	2.5
	31-44	Btkz	48.8	5.5	0.6	8.3	30.5	100	0.18	7.9	8.1	11	19	2.8
	44-56	Btk′	30.6	5.2	0.5	7.5	28.7	100	0.10	7.9	5.0	14	18	0.7
	56-89	Bk/Ck	43.9	4.1	0.4	5.4	19.9	100	0.07	8.1	5.2	11	16	5.0
	56-89	Ck/Bk	43.6	5.0	0.6	8.2	27.6	100	0.10	7.9	5.9	16	18	2.4
	89-102	2C	9.1	2.0	0.2	3.0	11.6	100	0.06	8.0	3.5	14	16	---
Gillette:[1,2]	0-7	A	---	---	---	---	---	---	1.02	6.2	---	--	--	0
(S89TX-255-001)	7-13	Bt1	---	---	---	---	---	---	0.95	6.6	---	--	--	0
	13-19	Bt2	---	---	---	---	---	---	0.68	7.5	---	--	--	0.6
	19-27	Bt3	---	---	---	---	---	---	0.47	8.2	---	--	--	6.4
	27-34	Btk	---	---	---	---	---	---	0.26	8.2	---	--	--	0.9
	27-34	Bt/2Cr[8]	---	---	---	---	---	---	0.26	8.2	---	--	--	0.9
Imogene:[5,2]	13-17	A	5.2	2.2	0.1	2.6	9.0	---	---	7.1	1.3	21	24	---
(S86TX-255-001)	17-24	Bt1	10.3	4.2	0.1	5.5	18.7	---	---	7.4	1.7	30	24	---
	24-33	Bt2	32.3	4.6	0.3	7.8	16.8	---	---	7.6	9.6	19	23	---
	33-44	Bt3	9.4	3.9	0.1	6.8	14.4	---	---	7.8	7.6	20	22	---
Nusil:[1,2]	0-10	A	1.9	0.2	0.1	0.0	2.4	---	---	---	---	0	--	---
(S92TX-255-001)	10-30	Bt1	2.4	0.2	0.1	0.1	2.8	---	---	---	---	0	--	---
	30-36	Bt2	1.4	0.2	0.0	0.1	1.7	---	---	---	---	0	--	---
	36-44	Bt3	13.6	4.2	0.4	0.3	18.6	---	---	---	---	0	--	---
	44-54	Btk	15.1	5.1	0.4	0.3	21.8	---	---	---	---	0	--	---
	54-72	Bt/2Cr	14.5	4.8	0.2	0.3	19.0	---	---	---	---	0	--	---
	72-80	2Cr	12.4	4.6	0.3	0.4	18.9	---	---	---	---	0	--	---
Pavelek:[1,3]	0-7	A	---	1.7	1.4	0.2	37.8	---	2.01	7.9	0.63	TR	1	7
(S86TX-255-001)	7-14	Bk	---	1.1	0.9	TR	34.5	---	1.81	7.7	0.62	TR	TR	22
	14-80	Bkm[8]	---	1.9	1.2	0.4	43.7	---	0.05	8.2	0.17	--	1	2
	14-80	BCk[8]	---	1.9	1.2	0.4	43.7	---	0.05	8.2	0.17	--	1	2
	14-80	2Cr[8]	---	1.9	1.2	0.4	43.7	---	0.05	8.2	0.17	--	1	2

See footnotes at end of table.

Table 18.--Chemical Analyses of Selected SoilsTable 18.--Chemical Analyses of Selected Soils--Continued

Soil name and sample number	Depth	Horizon	Extractable bases: Ca	Mg	K	Na	CEC (NH_4OAc)	Base Saturation	Organic carbon	pH 1:1 soil:water	Elec. Conductivity	SAR	Exchangeable sodium percentage	Calcium Carbonate Equivalent
	In		Meq/100g					Pct	Pct	pH	mmhos/CM			Pct
Pernitas:[1,3] (S89TX-255-02)	21-33	Btk	---	1.2	0.5	0.2	25.7	100	0.67	8.1	---	3	1	20
Rhymes:[1,2] (S92TX-255-002)	0-10	A1	2.0	0.2	0.1	0.1	2.4	---	---	---	---	0	--	---
	10-36	A2	1.0	0.3	0.2	0.1	1.9	---	---	---	---	0	--	---
	36-56	E	0.6	0.1	0.1	0.2	1.5	---	---	---	---	0	--	---
	56-68	Bt1	5.2	1.3	0.2	0.3	8.7	---	---	---	---	0	--	---
	68-80	Bt2	9.3	2.5	0.3	0.6	---	---	---	---	---	0	--	---
Rosenbrock:[1,2] (S88TX-255-006)	0-8	Ap	54.1	3.5	3.2	0.2	42.9	100	2.59	7.6	0.6	0	0	0.5
	8-18	Bw	70.6	3.7	2.1	0.2	40.0	100	1.37	7.7	0.5	0	0	5.8
	18-31	Bk1	54.5	4.3	1.5	0.4	39.0	100	1.07	7.8	0.5	1	1	9.9
	31-43	Bk2	62.4	4.7	1.3	1.7	34.4	100	0.69	7.7	2.8	2	3	16.5
	43-62	2Cr/Bk	53.0	4.5	1.2	3.0	31.5	100	0.20	7.7	4.5	5	6	29.2
	62-86	2Cr	49.5	5.1	1.1	4.8	31.4	100	0.15	7.8	5.8	10	9	26.2
Weesatche:[6,2] (S88TX-255-002)	0-5	A1	15.3	1.8	0.7	0.2	15.7	100	1.20	7.5	---	--	1	---
	5-12	A2	17.0	2.0	0.4	0.2	18.7	100	0.99	7.3	---	--	1	---
	12-17	Bt1	22.5	3.8	0.5	0.3	26.8	100	0.82	7.6	---	--	1	---
	17-29	Bt2	20.0	3.9	0.4	0.4	23.2	100	0.44	7.5	---	--	2	---
	29-52	Bt3	17.6	4.1	0.4	0.4	22.2	100	0.33	7.7	---	--	2	---
	52-64	Bk	32.2	3.1	0.3	0.4	14.8	100	0.15	8.5	---	--	3	1.7
	64-80	C	23.4	2.2	0.2	0.3	10.4	100	0.17	8.6	---	--	3	1.5

[1] Location of pedon sample is the same as the pedon given as typical of series in “Soil Series and Their Morphology.”

[2] Analysis by Soil Characterization Laboratory, Texas Agricultural Experiment Station, College Station, Texas.

[3] Analysis by National Soil Survey Laboratory, Soil Conservation Service, Lincoln, Nebraska.

[4] This pedon is outside the range for the Gillett series. Location of this pedon: From the intersection of Texas Highway 119 and Texas Highway 80 in Gillett, 4.4 miles southeast on Texas Highway 119, 1.75 miles northeast and north on unpaved county road, 800 feet west in rangeland.

[5] Location of Imogene pedon: From the intersection of Texas Highway 123 and Farm Road 887 in Pawelekville, 5.7 miles east on Farm Road 887, and 600 feet south in pastureland.

[6] Location of Weesatche pedon: From the intersection of U.S. Highway 181 and Texas Highway 72 in Kenedy, 4.6 miles south on U.S. Highway 181 to unpaved county road, 1.85 miles southeast on unpaved county road, 100 feet northeast of unpaved county road in abandoned cropland.

[7] The horizon was subdivided for sampling purposes.

[8] Horizons were mixed in sampling.

Table 19.--Clay Mineralogy of Selected Soils

(Analysis by the Soil Characterization Laboratory, Texas Agricultural Experiment Station, College Station, Texas)
(Dashes indicate none was detected, TR means trace)

Soil Series and sample number	Depth	Horizon	Percentage of clay minerals[7] (x-ray diffraction)				
			Mica	Smectite	Kaolinite	Quartz	Calcite
	In						
Bryde:[1,2]							
(S88TX-255-005)	9-17	Bt1	--	>50	0-10	0-10	---
	35-41	Btk	--	>50	0-10	0-10	---
	41-47	Bt/2Cr	--	--	---	--	---
	74-80	2Cr	--	>50	0-10	0-10	---
Buchel:[1,2]							
S90TX-255-001)	16-29	Bss1	10-50	>50	10-50	10-50	---
	77-86	B'ss	10-50	>50	10-50	10-50	---
Condido:[1,2]							
(S88TX-255-003)	15-18	A3	TR	>50	0-10	0-10	---
	18-24	Bkm	--	10-50	0-10	0-10	---
	24-80	BCk,2Cr[6]	TR	10-50	0-10	0-10	10-50
Ecleto:[1,2]							
(S88TX-255-001)	3-14	Bt1	TR	>50	0-10	0-10	---
	14-18	Bt2	TR	>50	0-10	0-10	---
	18-60	Cr	-	>50	0-10	0-10	---
Eloso:[1,2]							
(S88TX-255-007)	5-12	A	-	>50	TR	0-10	0-10
	12-28	Bk	-	>50	TR	0-10	0-10
	37-80	2C	-	>50	TR	0-10	0-10
Gillett:[4,2]							
(S88TX-255-004)	4-9	Bt1	--	>50	0-10	0-10	---
	9-16	Bt2	--	>50	0-10	0-10	---
	44-56	Btk'	--	>50	0-10	0-10	---
	89-102	2C	--	>50	0-10	0-10	---
Rosenbrock:1,2							
(S88TX-255-006)	8-18	Bw	--	>50	0-10	0-10	---
	18-31	Bk1	--	>50	0-10	0-10	---
	62-86	2Cr	--	>50	0-10	0-10	---

See footnotes at end of table.

Table 19.--Clay Mineralogy of Selected Soils--Continued

Soil Series and sample number	Depth	Horizon	Percentage of clay minerals[7] (x-ray diffraction)				
			Mica	Smectite	Kaolinite	Quartz	Calcite
	In						
Pavelek:[1,3,7]							
(S86TX-255-001)	0-7	A	2	3	1	---	2
Weesatche:[5,2]							
(S88TX-255-002)	17-29	Bt2	0-10	>50	10-50	0-10	---
	29-52	Bt3	0-10	>50	10-50	0-10	---
	64-80	C	0-10	>50	10-50	0-10	---

[1] Location of Pedon samples is the same as the pedon given as typical of series in "Soil Series and Their Morphology."

[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 outside the range for the Gillett Series. Depth of solum is more than 40 inches. Location of this pedon: From the intersection of Texas Highway 119 and Texas Highway 80 in Gillett, 4.4 miles southeast on Texas Highway 119, 1.75 miles northeast and north on unpaved county road, 800 feet west in rangeland.

[5] Location of Weesatche pedon: From the intersection of U.S. Highway 181 and Texas Highway 72 in Kenedy, 4.6 miles south on U.S. Highway 181, 1.85 miles southeast on unpaved county road, 100 feet northeast of unpaved county road in abandoned cropland.

[6] Horizons were mixed in sampling.

[7] Clay minerals for Pavelek soils are given as relative amounts, as follows: 1--trace; 2--small; 3--moderate; 4--abundant; 5--dominant.

Table 20.--Classification of the Soils

Soil name	Family or higher taxonomic class
Bryde	Fine, montmorillonitic, hyperthermic Vertic Paleustalfs
Buchel	Fine, montmorillonitic, hyperthermic Typic Haplusterts
Clareville	Fine, montmorillonitic, hyperthermic Pachic Argiustolls
Colibro	Fine-loamy, carbonatic, hyperthermic Typic Ustochrepts
Condido	Clayey, montmorillonitic, hyperthermic, shallow Petrocalcic Paleustolls
Conquista	Fine-loamy, mixed, hyperthermic Entic Haplustolls
Coy	Fine, montmorillonitic, hyperthermic Vertic Argiustolls
Denhawken	Fine, montmorillonitic, hyperthermic Vertic Ustochrepts
Devine	Clayey-skeletal, mixed, hyperthermic Typic Paleustalfs
Ecleto	Clayey, montmorillonitic, hyperthermic, shallow Typic Argiustolls
Elmendorf	Fine, montmorillonitic, hyperthermic Vertic Argiustolls
Eloso	Fine, montmorillonitic, hyperthermic Vertic Haplustolls
Fashing	Clayey, montmorillonitic, hyperthermic, shallow Entic Haplustolls
Gillett	Fine, montmorillonitic, hyperthermic Typic Paleustalfs
Imogene	Fine-loamy, mixed, hyperthermic Mollic Natrustalfs
Miguel	Fine, mixed, hyperthermic Typic Paleustalfs
Monteola	Fine, montmorillonitic, hyperthermic Typic Haplusterts
Nusil	Loamy, siliceous, hyperthermic Arenic Paleustalfs
Odem	Coarse-loamy, mixed, hyperthermic Cumulic Haplustolls
Olmos	Loamy-skeletal, carbonatic, hyperthermic, shallow Petrocalcic Calciustolls
Papalote	Fine, mixed, hyperthermic Typic Paleustalfs
Parrita	Clayey, mixed, hyperthermic, shallow Petrocalcic Paleustolls
Pavelek	Clayey, montmorillonitic, hyperthermic, shallow Petrocalcic Calciustolls
Pernitas	Fine-loamy, mixed, hyperthermic Typic Argiustolls
Pettus	Loamy-skeletal, carbonatic, hyperthermic Typic Calciustolls
Rhymes	Loamy, siliceous, hyperthermic Grossarenic Paleustalfs
Rosenbrock	Fine, montmorillonitic, hyperthermic Vertic Haplustolls
Sarnosa	Coarse-loamy, mixed, hyperthermic Typic Calciustolls
Schattel	Fine, montmorillonitic, hyperthermic Vertic Ustochrepts
Shiner	Loamy, carbonatic, hyperthermic, shallow Calcic Udic Ustochrepts
Sinton	Fine-loamy, mixed, hyperthermic Cumulic Haplustolls
Tiocano	Fine, montmorillonitic, hyperthermic Udic Haplusterts
Tordia	Fine, montmorillonitic, hyperthermic Vertic Haplustolls
Weesatche	Fine-loamy, mixed, hyperthermic Typic Argiustolls
Weigang	Loamy, mixed, hyperthermic, shallow Typic Argiustolls
Zunker	Coarse-loamy, siliceous, hyperthermic Fluventic Ustochrepts

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