United States Department of Agriculture

Natural Resources Conservation Service

In cooperation with the Texas Agricultural Experiment Station

Soil Survey of Crockett County, Texas

How To Use This Soil Survey

General Soil Map

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

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

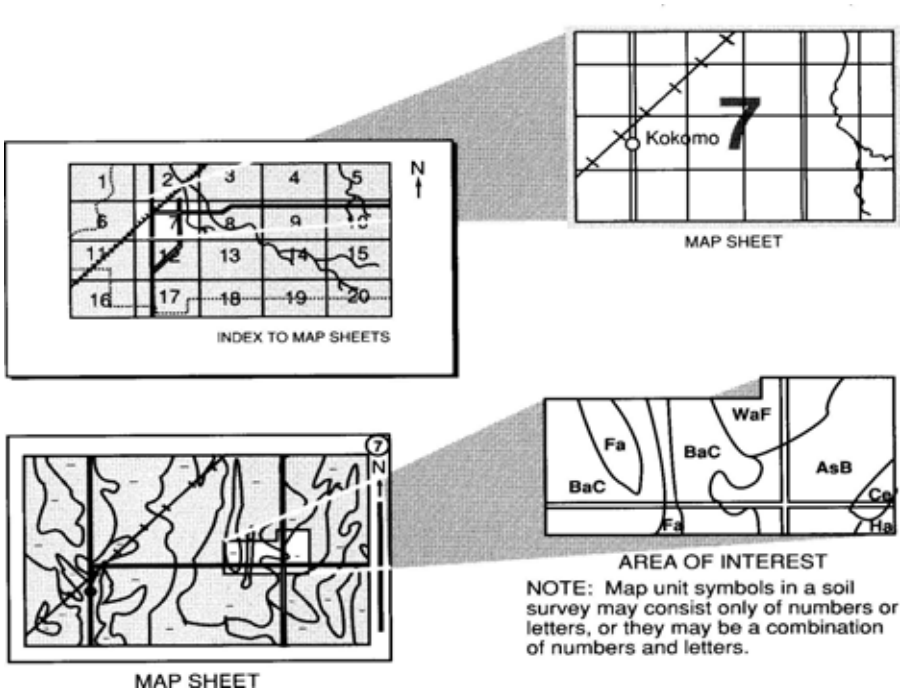
Detailed Soil Maps

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

To find information about your area of interest, locate that area on the **Index to Map Sheets**.

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

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



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

Major fieldwork for this soil survey was completed in 1998. Soil names and descriptions were approved in 2002. Unless otherwise indicated, statements in this publication refer to conditions in the survey area in 1998. 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 Crockett 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: Landscapes in an area of Lozier-Rock outcrop complex, 15 to 55 percent slopes, very stony.

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

Contents

September 2007

Foreword

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

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

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

Great differences in soil properties can occur within short distances. Some soils are seasonally wet or subject to flooding. Some are 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 Texas Cooperative Extension.

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Soil Survey of Crockett County, Texas

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General Nature of the Survey Area

Crockett County is the southwestern part of Texas (fig. 1). It is bounded on the west by the Pecos River, which separates it from Terrell and Pecos counties. On the north, it borders Crane, Upton, Reagan, and Irion counties, Schleicher and Sutton counties to the east, and Val Verde County borders on the south. It is semi-rectangular and measures about 85 miles from west to east and about 54 miles from north to south. It has an area of 2,808 square miles or about 1,795,859 acres.

Crockett County is on the western edge of the Edwards Plateau Major Land Resource Area. The land surface consists of deep, narrow, steep-walled, canyons and flat mesas in the southern and western areas and broad valleys and flat divides in the northern part. The northeastern part is a large flat divide separating the Colorado and Rio Grande River Basins. Elevations range from 1,824 to 3,958 feet above sea level.

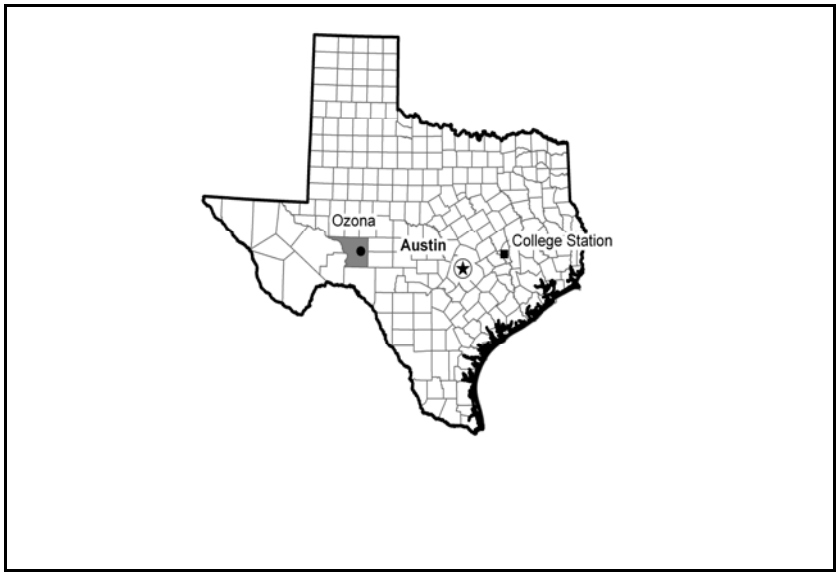

Figure 1.—Location of Crockett County, Texas.

The major drainage system of Crockett County is the Pecos River forming the western boundary. Johnson's Run and Howard Draw bisect the central part of the county before reaching the Devils River and Pecos River in Val Verde County to the south. Live Oak Creek, in the western part of the county, reaches the Pecos River at Ft. Lancaster. Buckhorn Draw in the northeastern part, flows into Sutton County and enters the Devils River.

The major land use in Crockett County is rangeland. Sheep, Angora goats, and cattle are the majority of the range economy supplemented by the oil and gas industry and hunting leases.

History

Prehistoric Indians lived in the area many years before the Spanish explorers traveled through Crockett County. Live Oak Draw (fig. 2) and Cedar Springs provided sources of water, caves, and the limestone ledges provided shelter.

The first Spaniard to pass through the area was Gaspar Castano de Sousa in 1590. He led a mining expedition from Monclova, Chihuahua, Mexico and traveled through northern New Mexico. He is believed to have traveled up through Johnson's Run and crossed the Pecos River (fig. 3) as he traveled north.

In December 1683, Juan Dominguez de Mendoza and his men traveled from Paso del Norte (El Paso) to probably north of Uvalde with the intent of establishing missions among the Indians. Detailed diaries indicate that he camped on the west side of the Pecos River northeast of Girvin about one month after leaving El Paso. Encounters with hostile Indians probably caused the expedition to turn around north of Uvalde and head back. The return trip brought them through Crockett County.

Figure 2.—Area of Iraan silty clay loam, 0 to 2 percent slopes, occasionally flooded, along Live Oak Draw. Live oak trees with an understory of small mesquite are common in these deep soils.

Figure 3.—The Pecos River in Crockett County. The soils along the river include Harkey and Patrole association, 0 to 1 percent slopes, rarely flooded. Lozier-Rock outcrop complex, 15 to 55 percent slopes, very stony, is in the background.

They traveled up Live Oak Creek indicating it to be "a beautiful river." The Pecos was crossed again northwest of Iraan near the site of Pontoon Bridge built by the military in 1872.

In 1848, the Treaty of Guadalupe Hidalgo ended the Mexican war. San Antonio merchants were now interested in trading with the Mexican state of Chihuahua with its rich silver and copper mines. The old Indian and Spanish trails became known as the Chihuahua Trail. In Crockett County, important water sources were Howard's Well and Escondido (hidden) Water Hole which was located in a canyon near Live Oak Creek and was known only to Indians and guides.

In 1849, John Coffee Hays lead an expedition through the county charting water sources for the freight and stagecoach line from San Antonio to El Paso. The military determined that more military protection was needed and established several forts along the trail. In 1855, Ft. Lancaster was established on the east bank of Live Oak Creek just above the junction with the Pecos River. It was abandoned 6 years later when Texas joined the Confederacy. Traffic on the trail almost came to a standstill without the Union troops along the way for protection. With all the forts along the trail, the Chihuahua Trail also became known as Government Road, Lower Road, Military Road, and The Southern Route.

In 1875, Crockett County, named for Davy Crockett, was formed from Bexar County. It included the future Sutton, Schleicher, and parts of Val Verde, Kinney, and Edwards counties. In 1887, the county was reduced to its present size as Sutton and Schleicher counties were created.

Several short-lived towns sprang up on the county in the 1880's and 1890's. Emerald, 8 miles east of present day Ozona, opened a post office in 1890 and had the first school in 1891. An election was held to determine the county seat and the

results were inconclusive. E. M. Powell had drilled a good well and donated land for a town site back to the west. Some accounts say there was sulfur in the well at Emerald and others say it was because of the railroad bypassing the town, but for whatever reason, the town site of Emerald was moved west to the present site of Ozona. In 1900, stagecoach service began connecting Ozona with the railroad at San Angelo and Comstock.

In 1925, oil was discovered in the north central part of the county, but because of the distance to the railroad and lack of roads, it was slow in developing. It was not until the middle 1930's and 1940's that oil and gas production became important to the economy of the county.

In 2000, the U.S. Census reported the population of Crockett County at 4,099. Ozona, the county seat had a population of 3,436.

Climate

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

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

In winter, the average temperature is 46.2 degrees F and the average daily minimum temperature is 31.6 degrees. The lowest temperature on record, which occurred at Ozona on February 2, 1951, was -8 degrees. In summer, the average temperature is 79.6 degrees and the average daily maximum temperature is 91.8 degrees. The highest temperature, which occurred at Ozona on August 18, 1969, was 109 degrees.

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

The average annual total precipitation is about 19.11 inches. Of this, about 14.76 inches, or 77 percent, usually falls in April through October. The growing season for most crops falls within this period. The heaviest 1-day rainfall during the period of record was 5.80 inches at Ozona on October 4, 1959. Thunderstorms occur on about 37 days each year, and most occur between May and August.

The average seasonal snowfall is 0.5 inches. The greatest snow depth at any one time during the period of record was 3 inches recorded on November 28, 2001. On an average, less than one day each year has at least 1 inch of snow on the ground. The heaviest 1-day snowfall on record was 4.0 inches recorded on November 16, 1980.

The average relative humidity in mid-afternoon ranges from about 25 percent in March and April to about 45 percent in the fall and winter. Humidity is higher at night, and the average at dawn ranges from about 65 percent in the spring to about 80 percent in the early fall. The sun shines about 77 percent of the time in summer and 68 percent in winter. The prevailing wind is from the south. Average wind speed is highest, around 13 miles per hour, in March and April.

How This Survey Was Made

This survey was made to provide information about the soils and miscellaneous areas in the survey area. The information includes a description of the soils and miscellaneous areas and their location and a discussion of their suitability, limitations,

and management for specified uses. Soil scientists observed the steepness, length, and shape of the slopes; the general pattern of drainage; the kinds of crops and native plants; and the kinds of bedrock. They dug many holes to study the soil profile, which is the sequence of natural layers, or horizons, in a soil. The profile extends from the surface down into the unconsolidated material in which the soil formed. The unconsolidated material is devoid of roots and other living organisms and has not been changed by other biological activity.

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

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

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

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

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

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

General Soil Map Units

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

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

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

1. Ector-Rock outcrop

Very shallow to shallow, gently sloping to very steep, cobbly loamy soils; Rock outcrop on uplands (fig. 4)

Setting

General location: MLRA 81A—Edwards Plateau, western part
Landscape: Dissected plateau
Slope: 1 to 60 percent

Composition

Extent of the survey area: 46 percent
Ector soils: 49 percent
Rock outcrop: 16 percent
Minor soils: 35 percent (including Angelo, Mailtrail, Noelke, Rio Diablo, Sanderson and Upton soils)

Typical Profile

Ector soils

Surface layer: Dark grayish brown, moderately alkaline cobbly clay loam
Subsoil: 85 percent cobbles and stones, 15 percent dark grayish brown, moderately alkaline extremely cobbly clay loam
Underlying layer: Fractured, indurated limestone bedrock

Rock outcrop

Limestone bedrock

Soil Characteristics

Depth: Very shallow and shallow
Drainage class: Well drained
Landform: Crest footslope and crest backslope on ridge
Slope: Very gently sloping to very steep
Parent material: Loamy residuum weathered from limestone

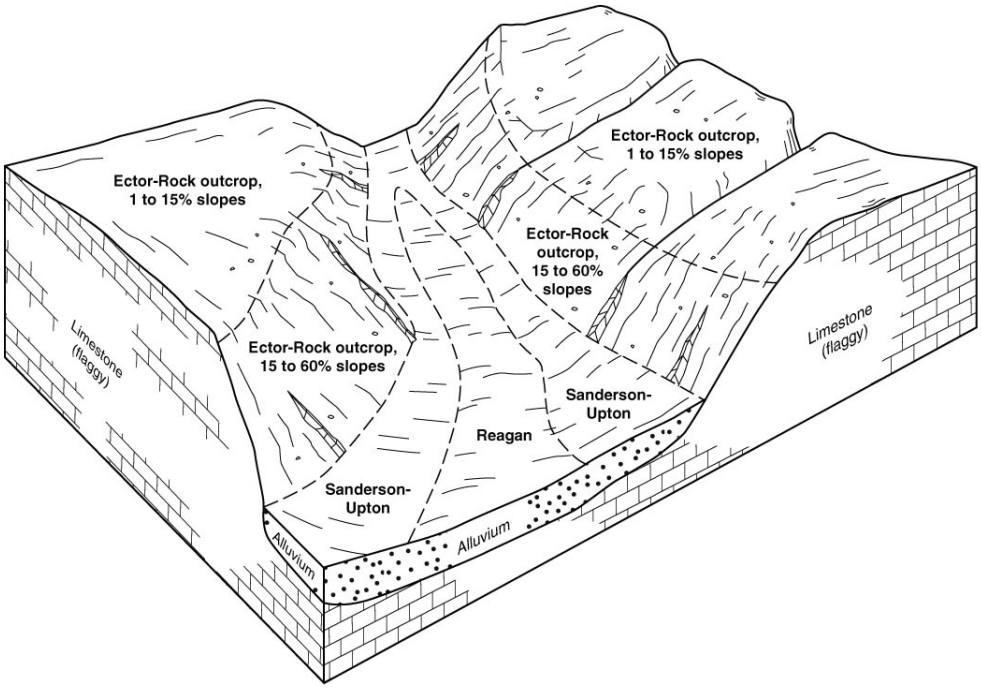

Figure 4.—Pattern of soils and underlying material in the Ector-Rock outcrop general soil map unit.

Use and Management

Uses: Rangeland and wildlife habitat

Rangeland

Suitability: These soils are suited to this use.
Management concerns: Slope and very low available water capacity

Urban Development

Suitability: These soils are not suited to this use.
Management concerns: Slope, very low available water capacity, depth to limestone bedrock, and surface fragments

2. Noelke-Texon-Ector

Very shallow, shallow, and deep, nearly level and gently sloping, very gravelly and cobbly, loamy soils on uplands (fig. 5)

Setting

General location: MLRA 81A—Edwards Plateau, western part
Landscape: Noelke and Ector—Dissected plateau; Texon—Plateau
Slope: 0 to 5 percent

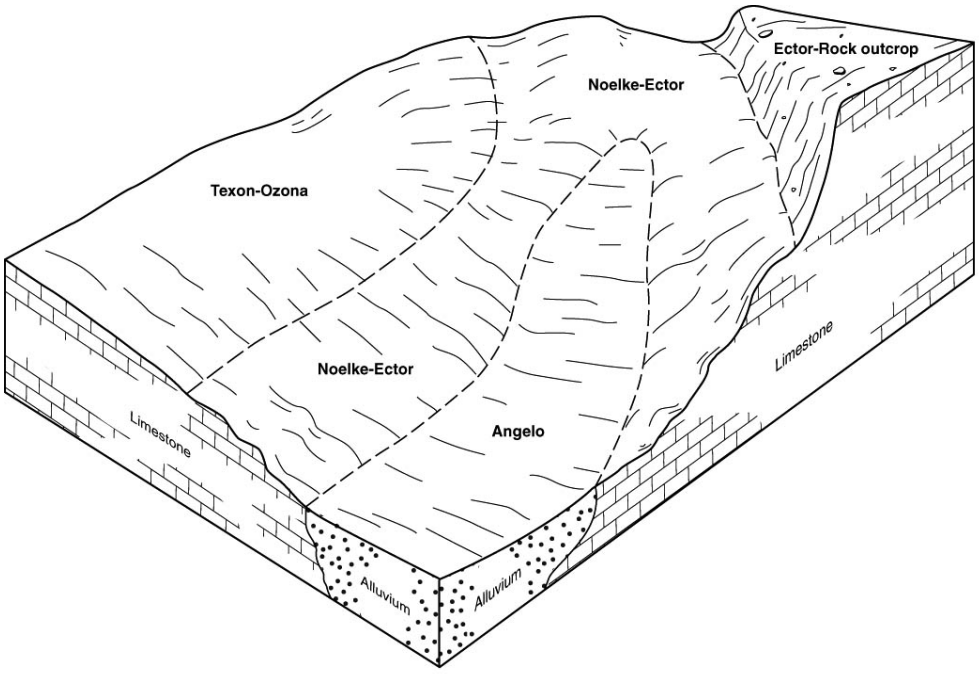

Figure 5.—Pattern of soils and underlying material in the Noelke-Texon-Ector general soil map unit.

Composition

Extent of the survey area: 27 percent
Noelke soils: 24 percent
Texon soils: 19 percent
Ector soils: 16 percent
Minor soils: 41 percent (including Angelo, Ozona, Pandale, Tobosa and Upton soils)

Typical Profile

Noelke soils

Surface layer: Brown, moderately alkaline very gravelly clay loam
Subsoil: Very pale brown, cemented material
Underlying layer: Indurated limestone bedrock

Texon soils

Surface layer: Grayish brown, moderately alkaline silt loam
Subsoil: Brown silty clay in the upper part, light brown silty clay in the middle part, pink and white clay in the lower part, moderately alkaline

Ector soils

Surface layer: Very dark grayish brown, moderately alkaline very cobbly clay loam
Underlying layer: Indurated, fractured limestone bedrock

Soil Characteristics

Depth: Noelke and Ector soils—very shallow and shallow; Texon soils—very deep
Drainage class: Well drained

Landform: Noelke and Ector soils—backslope, summit or shoulder on low hill; Texon soils—plain
Slope: Nearly level and gently sloping
Parent material: Noelke soils—gravelly loamy residuum weathered from limestone; Texon soils—silty and clayey alluvium derived from limestone; Ector soils—loamy residuum weathered from limestone

Use and Management

Uses: Rangeland and wildlife habitat

Rangeland

Suitability: These soils are not suited to this use.
Management concerns: Noelke and Ector soils—very low available water capacity; Texon soils—none

Urban Development

Suitability: These soils are poorly suited to this use.
Management concerns: Noelke and Texon soils—high shrink-swell potential; Ector soils—large stones, shallow to cemented material, and bedrock

3. Reagan-Pandale-Upton

Very shallow, shallow, and very deep, nearly level to gently sloping, loamy soils on uplands (fig. 6)

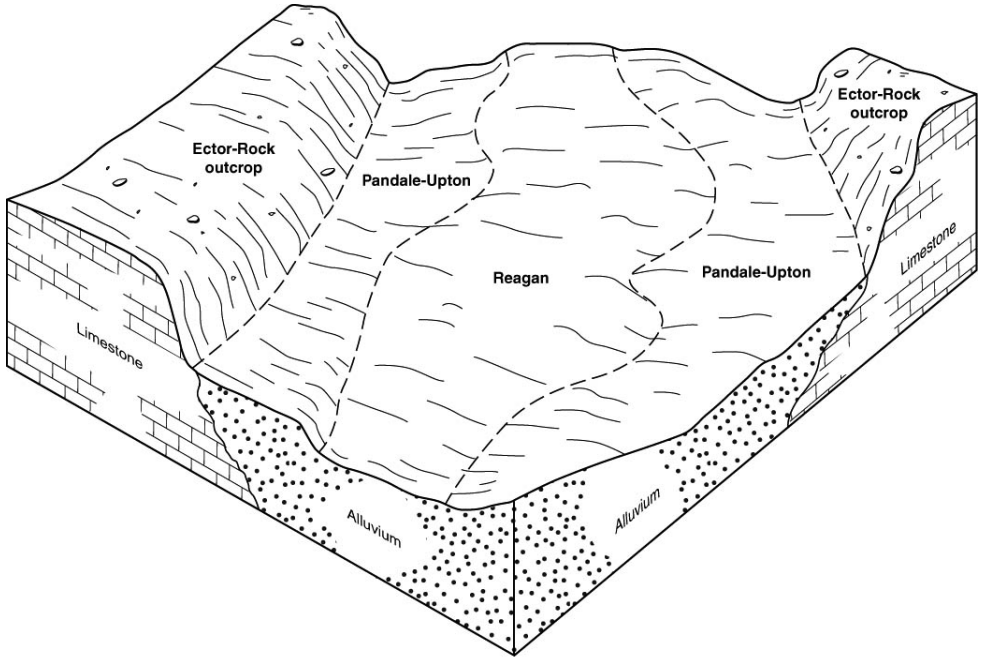

Figure 6.—Pattern of soil and underlying materials in the Reagan-Pandale-Upton general soil map unit.

Setting

General location: MLRA 81A—Edwards Plateau, western part
Landscape: Reagan soils—plateau; Pandale and Upton soils—dissected plateau
Slope: 0 to 8 percent

Composition

Extent of the survey area: 13 percent
Reagan soils: 15 percent
Pandale soils: 14 percent
Upton soils: 9 percent
Minor soils: 62 percent (including Angelo, Dev, Ector, Iraan, Rio Diablo and Sanderson soils)

Typical Profile

Reagan soils

Surface layer: Yellowish brown, moderately alkaline silty clay loam
Subsoil: Pale brown, moderately alkaline silty clay loam in the upper part, light gray and pinkish white, moderately alkaline silty clay loam in the middle part, pinkish white and pink moderately alkaline silt loam in the lower part

Pandale soils

Surface layer: Brown, moderately alkaline gravelly loam
Subsurface layer: Brown, moderately alkaline gravelly clay loam
Subsoil: Pale brown in the upper part, light brown in the middle part, pink in the lower part, moderately alkaline gravelly loam

Upton soils

Surface layer: Brown, moderately alkaline gravelly loam
Subsoil: Pale brown, moderately alkaline gravelly loam in the upper part, very pale brown indurated caliche in the middle part, and very pale brown, weakly cemented loamy caliche and marl interbedded with caliche gravels in the lower part

Soil Characteristics

Depth: Reagan and Pandale soils—very deep; Upton soils—very shallow and shallow
Drainage class: Well drained
Landform: Reagan soils—plains; Pandale soils—alluvial fan; Upton soils—incised valley or piedmont valley slopes
Slope: Nearly level to moderately sloping
Parent material: Reagan soils—loamy alluvium derived from limestone; Pandale soils—loamy alluvium derived from limestone; Upton soils—loamy alluvium derived from limestone

Use and Management

Uses: Rangeland and wildlife habitat

Rangeland

Suitability: Reagan and Pandale soils are suited to this use. Upton soils are poorly suited to this use.
Management concerns: Reagan and Pandale soils—none; Upton soils—very low available water capacity

Urban Development

Suitability: These soils are suited to this use.
Management concerns: Reagan soils—shrink-swell potential; Pandale—none; Upton soils—shallow depth to cemented pan

4. Angelo-Mailtrail

Very shallow, shallow, deep and very deep, nearly level to moderately sloping, loamy and very gravelly loamy soils on stream terraces (fig. 7)

Setting

General location: Angelo soils—MLRA 81A—Edwards Plateau, western part; Mailtrail soils—MLRA 81B—Edwards Plateau, central part
Landscape: Angelo soils—alluvial plain; Mailtrail soils—limestone plateau
Slope: 0 to 8 percent

Composition

Extent of the survey area: 5 percent
Angelo soils: 40 percent
Mailtrail soils: 14 percent
Minor soils: 46 percent (including Dev, Ector, Iraan, Pandale, and Rio Diablo soils)

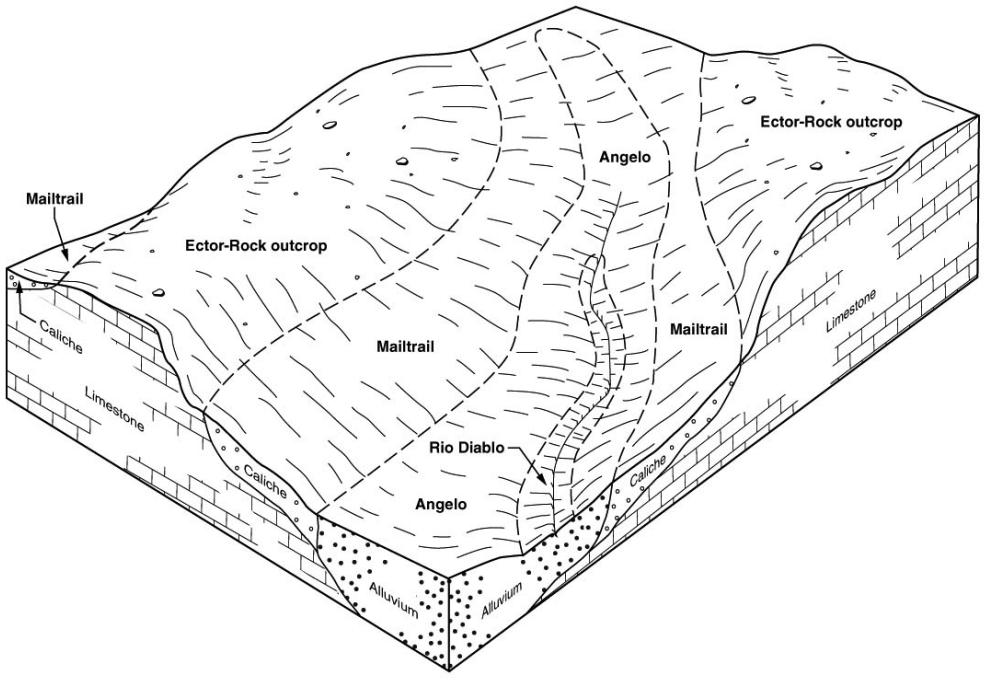

Figure 7.—Pattern of soil and underlying material in the Angelo-Mailtrail general soil map unit.

Typical Profile

Angelo soils

Surface layer: Brown, moderately alkaline silty clay loam
Subsurface layer: Brown, moderately alkaline silty clay loam
Subsoil: Brown, moderately alkaline silty clay loam in the upper part, light brown, moderately alkaline silty clay loam in the middle part, and reddish yellow, moderately alkaline silty clay loam in the lower part

Mailtrail soils

Surface layer: Dark grayish brown, moderately alkaline very gravelly clay loam
Subsurface layer: Brown, moderately alkaline extremely cobbly clay loam
Subsoil: Very pale brown indurated caliche in the upper part, and pink, moderately alkaline caliche in the lower part

Soil Characteristics

Depth: Angelo soils—very deep or deep; Mailtrail soils—very shallow or shallow
Drainage class: Well drained
Landform: Angelo soils—plain; Mailtrail soils—fan or footslopes below limestone hills
Slope: Angelo soils—nearly level and very gently sloping; Mailtrail soils—very gently sloping to moderately sloping
Parent material: Angelo soils—loamy alluvium derived from limestone; Mailtrail soils—gravelly loamy alluvium

Use and Management

Uses: Rangeland and wildlife habitat

Rangeland

Suitability: Angelo soils are well suited to this use; Mailtrail soils are suited to this use.
Management concerns: Angelo soils—none; Mailtrail soils—very low available water capacity

Urban Development

Suitability: Angelo soils are suited to this use; Mailtrail soils are not suited to this use.
Management concerns: Angelo soils—shrink-swell potential; Mailtrail soils—large stones, depth to cemented pan

5. Tarrant-Rock outcrop

Very shallow to shallow, very gently sloping to steep, very cobbly, clayey soils; Rock outcrop on uplands

Setting

General location: 81B—Edwards Plateau, central part
Landscape: Dissected plateau
Slope: 1 to 40 percent

Composition

Extent of the survey area: 4 percent
Tarrant soils: 35 percent
Rock outcrop: 24 percent
Minor soils: 41 percent (including Angelo, Ector, Mailtrail, Noelke, Ozona, and Rio Diablo soils)

Typical Profile

Tarrant soils

Surface layer: Very dark gray, moderately alkaline very cobbly silty clay
Underlying layer: Fractured, indurated limestone bedrock

Rock outcrop

Limestone bedrock

Soil Characteristics

Depth: Very shallow and shallow
Drainage class: Well drained
Landform: Side slopes, shoulder slopes, backslopes, or base slopes on ridges
Slope: 1 to 15 percent
Parent material: Residuum weathered from limestone

Use and Management

Uses: Rangeland and wildlife habitat

Rangeland

Suitability: These soils are suited to this use
Management concerns: Slope and very low available water capacity

Urban Development

Suitability: These soils are not suited to this use.
Management concerns: Depth to hard bedrock, large stones, and shrink-swell potential

6. Rio Diablo-Dev-Iraan

Very deep, nearly level and very gently sloping, loamy soils on stream terraces and flood plains

Setting

General location: 81A—Edwards Plateau, western part
Landscape: Dissected plateau
Slope: 0 to 3 percent

Composition

Extent of the survey area: 2 percent
Rio Diablo soils: 30 percent
Dev soils: 18 percent
Iraan soils: 7 percent
Minor soils: 45 percent (including Angelo, Ector, Mailtrail, Reagan, Sanderson, and Upton soils)

Typical Profile

Rio Diablo soils

Surface layer: Grayish brown, moderately alkaline silty clay loam
Subsurface layer: Grayish brown, moderately alkaline silty clay loam
Subsoil: Light brown, moderately alkaline silty clay loam

Dev soils

Surface layer: Dark grayish brown, moderately alkaline very gravelly loam
Subsurface layer: Dark grayish brown, moderately alkaline extremely gravelly loam
Subsoil: Brown, moderately alkaline extremely gravelly loam in the upper part, and yellowish brown, moderately alkaline very gravelly loam in the lower part

Iraan soils

Surface layer: Dark grayish brown, moderately alkaline silty clay loam
Subsurface layer: Brown, moderately alkaline silty clay loam
Subsoil: Brown, moderately alkaline silty clay loam in the upper part, yellowish brown, moderately alkaline clay loam in the middle part, and pale brown, moderately alkaline clay loam in the lower part

Soil Characteristics

Depth: Very deep
Drainage class: Well drained
Landform: Rio Diablo soils—draw or step flood plain; Dev soils—draw or flood plain; Iraan soils—broad channels or draw
Slope: Rio Diablo soils—0 to 2 percent; Dev soils—0 to 3 percent; Iraan soils—0 to 2 percent
Parent material: Rio Diablo soils—clayey alluvium derived from limestone; Dev soils—gravelly loamy alluvium derived from limestone; Iraan soils—calcareous loamy alluvium

Use and Management

Uses: Rangeland and wildlife habitat

Rangeland

Suitability: These soils are suited to this use.
Management concerns: Flooding

Urban Development

Suitability: These soils are not suited to this use.
Management concerns: Rio Diablo and Iraan soils—hazard of flooding and shrink-swell potential; Dev soils—hazard of flooding

7. Paisano-Kinco-Ima

Very shallow, shallow, deep and very deep, nearly level to moderately sloping, very gravelly loamy and loamy soils on uplands and stream terraces

Setting

General location: MLRA 42—Southern Desertic Basins, Plains, and Mountains
Landscape: Paisano soils—limestone plateau; Kinco and Ima soils—valley
Slope: 0 to 8 percent

Composition

Extent of the survey area: 1 percent
Paisano soils: 35 percent
Kinco soils: 10 percent
Ima soils: 6 percent
Minor soils: 49 percent (including Blakeney, Conger, Lozier, Reagan, and Wickett soils)

Typical Profile

Paisano soils

Surface layer: Brown, moderately alkaline very gravelly loam
Subsoil: Pale brown, moderately alkaline extremely gravelly loam in the upper part, very pale brown indurated caliche in the middle part, and very pale brown weakly cemented gravelly loam in the lower part

Kinco soils

Surface layer: Brown, moderately alkaline fine sandy loam
Subsoil: Light brown, moderately alkaline fine sandy loam in the upper part, and pink, moderately alkaline fine sandy loam in the lower part

Ima soils

Surface layer: Brown, moderately alkaline fine sandy loam
Subsurface layer: Reddish brown, moderately alkaline fine sandy loam
Subsoil: Reddish yellow, moderately alkaline fine sandy loam in the upper part, and light brown, moderately alkaline fine sandy loam in the lower part

Soil Characteristics

Depth: Paisano soils—very shallow and shallow to a petrocalcic layer; Kinco and Ima soils—very deep
Drainage class: Well drained
Landform: Paisano soils—fan remnant; Kinco soils—eolian plains; Ima soils—high terrace
Slope: Paisano soils—1 to 8 percent; Kinco and Ima soils—0 to 2 percent
Parent material: Paisano soils—gravelly alluvium; Kinco soils—loamy eolian deposits; Ima soils—loamy alluvium

Use and Management

Uses: Rangeland and wildlife habitat

Rangeland

Suitability: Paisano soils are suited to this use; Kinco and Ima soils are well suited to this use
Management concerns: Paisano soils—very low available water capacity; Kinco and Ima soils—none

Urban Development

Suitability: These soils are suited to this use.
Management concerns: Paisano soils—depth to cemented pan; Kinco and Ima soils—none

8. Lozier-Rock outcrop

Very shallow and shallow, very gently sloping to very steep, very gravelly loamy soils; Rock outcrop on uplands

Setting

General location: MLRA 42—Southern Desertic Basins, Plains, and Mountains
Landscape: Hills and steep hills
Slope: 2 to 55 percent

Composition

Extent of the survey area: 1 percent
Lozier soils: 25 percent
Rock outcrop: 14 percent
Minor soils: 61 percent (including Pandale, Sanderson, and Upton soils)

Typical Profile

Lozier soils

Surface layer: Brown, moderately alkaline very gravelly loam
Subsoil: Brown, moderately alkaline very gravelly loam
Underlying layer: Fractured platy limestone bedrock

Rock outcrop

Limestone bedrock

Soil Characteristics

Depth: Very shallow and shallow
Drainage class: Well drained
Landform: Divide
Slope: 2 to 55 percent
Parent material: Loamy residuum weathered from limestone

Use and Management

Uses: Rangeland and wildlife habitat

Rangeland

Suitability: These soils are suited to this use.
Management concerns: Very low available water capacity and slope

Urban Development

Suitability: These soils are not suited to this use.
Management concerns: Depth to hard bedrock, slope, and large stones

9. Harkey-Patrole-Kinco

Very deep, nearly level and very gently sloping, loamy soils on flood plains and stream terraces

Setting

General location: MLRA 42—Desertic Basins, Plains, and Mountains
Landscape: Harkey and Patrole soils—alluvial plain; Kinco soils—valley
Slope: 0 to 2 percent

Composition

Extent of the survey area: 1 percent
Harkey soils: 35 percent
Patrole soils: 11 percent
Kinco soils: 9 percent
Minor soils: 45 percent (including Paisano, Pandale, Sanderson, and Upton soils)

Typical Profile

Harkey soils

Surface layer: Brown, moderately alkaline very fine sandy loam

Underlying layer: Pale brown, moderately alkaline very fine sandy loam in the upper part, brown, moderately alkaline very fine sandy loam in the middle part, and pale brown, moderately alkaline very fine sandy loam in the lower part

Patrole soils

Surface layer: Brown, moderately alkaline silt loam
Subsoil: Brown, moderately alkaline silt loam in the upper part, pinkish gray, moderately alkaline silty clay loam in the middle part, brown, moderately alkaline clay and silty clay in the lower part

Kinco soils

Surface layer: Brown, moderately alkaline fine sandy loam
Subsoil: Light brown, moderately alkaline fine sandy loam in the upper part, and pink, moderately alkaline fine sandy loam in the lower part

Soil Characteristics

Depth: Very deep
Drainage class: Well drained
Landform: Harkey soils—flood plains; Patrole soils—high flood plains; Kinco soils—broad flats and terraces of the Pecos River
Slope: Harkey and Patrole soils—0 to 1 percent; Kinco soils—0 to 2 percent
Parent material: Harkey soils—loamy alluvium derived from sedimentary rock; Patrole soils—silty and clayey alluvium; Kinco soils—loamy eolian deposits

Use and Management

Uses: Rangeland and wildlife habitat

Rangeland

Suitability: These soils are well suited to this use.
Management concerns: Hazard of flooding

Urban Development

Suitability: Harkey and Patrole soils are not suited to this use; Kinco soils are suited to this use
Management concerns: Harkey and Patrole soils—hazard of flooding; Kinco soils—none

Detailed Soil Map Units

The map units delineated on the detailed soil maps in this survey represent the soils or miscellaneous areas in the survey area. The map unit descriptions in this section, along with the maps, can be used to determine the suitability and potential of a unit for specific uses. They also can be used to plan the management needed for those uses.

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

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

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

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

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

Soils of one series can differ in texture of the surface layer, slope, stoniness, salinity, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Harkey very fine sandy loam, 0 to 2 percent slopes is a phase of the Harkey 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. Sanderson-Upton complex, 1 to 8 percent slopes is an example.

An *association* is made up of two or more geographically associated soils or miscellaneous areas that are shown as one unit on the maps. Because of present or anticipated uses of the map units in the survey area, it was not considered practical or necessary to map the soils or miscellaneous areas separately. The pattern and relative proportion of the soils or miscellaneous areas are somewhat similar. Riverwash and Dev soils, 0 to 3 percent slopes, is an example.

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

Table 4 lists the map units in this survey area. Other tables give properties of the soils and the limitations, capabilities, and potentials for many uses. The “Glossary” defines many of the terms used in describing the soils.

AnB—Angelo silty clay loam, 0 to 2 percent slopes

Setting

General location: Edwards Plateau of west central Texas
Major land resource area: 81A—Edwards Plateau, Western Part
Landscape: Alluvial plain
Elevation: 1,495 to 2,745 feet (457 to 838 meters)
Mean annual precipitation: 15 to 21 inches (381 to 533 millimeters)
Mean annual air temperature: 61 to 70 degrees F (16 to 21 degrees C)
Frost-free period: 210 to 240 days

Composition

Angelo and similar soils: 80 percent
Contrasting soils: 20 percent

Based on transect data and other field observations of the map unit during the survey, the best estimate is that the Angelo soils and similar soils make up about 80 percent of the map unit, and contrasting soils make up 20 percent. Similar soils include those soils that have loamy subsoils. Contrasting soils are small areas of Tobosa soils and small areas of soil with limestone at depths greater than 30 inches. Small areas of Dev and Rioconcho soils may also be included near stream channels.

Soil Description

Angelo

Position on landform: Plain
Parent material: Loamy alluvium derived from limestone

Typical Profile

Surface layer:
0 to 9 inches—brown, moderately alkaline silty clay loam
Subsurface layer:
9 to 16 inches—brown, moderately alkaline silty clay loam
Subsoil:
16 to 25 inches—brown, moderately alkaline silty clay loam
25 to 36 inches—light brown, moderately alkaline silty clay loam
36 to 80 inches—reddish yellow, moderately alkaline silty clay loam

Note: A complete soil description with range in characteristics is included, in alphabetical order, in the "Soil Series and Morphology" section.

Properties and Qualities

Slope: 0 to 2 percent
Percent of area covered by surface fragments: Unspecified
Depth to first restrictive layer: Not present
Slowest soil permeability to 60 inches, above first cemented restrictive layer: 0.2 to 0.6 in/hr (Moderately slow)
Slowest permeability to 60 inches, within and below first cemented restrictive layer: No restrictive layer
Salinity, representative within 40 inches: Not saline
Salinity, maximum within 40 inches: Not saline
Sodicity, representative within 40 inches: Not sodic
Sodicity, maximum within 40 inches: Not sodic
Representative total available water capacity to 60 inches: About 10.2 inches (High)
Natural drainage class: Well drained
Runoff: Low
Flooding frequency: None

Interpretive Groups

Land capability nonirrigated: 3e
Land capability irrigated: 2e
Ecological site name: Clay Loam PE 19-25
Ecological site number: R081AY291TX
Typical vegetation: The natural plant community for this site is short and mid grasses, forbs, and woody vegetation. Dominate grasses include sideoats grama, cane bluestem, buffalograss, and curly mesquite grass. Woody vegetation includes mesquite, redberry juniper, cacti, and algerita.

Note: Additional information specific to the components of this map unit is available in the “Tables” section.

Use and Management

Major land uses: Rangeland, a few areas may be used as cropland and planted to small grains.

Rangeland
Major limitations:

- There are no major limitations that affect this use.

Wildlife habitat
Major limitations:

- There are no major limitations that affect this use.

Urban development
Major limitations:
- The low strength limits use for roads and streets.

Minor limitations:
- The shrink-swell potential limits use for dwellings, buildings, and local roads and streets.
- The moderate permeability limits use for septic tank absorption fields.
- Seepage limits use for sewage lagoons.

Note: For more information about managing this map unit, see the section on "Soil Properties," and the section on "Use and Management" which includes subsections on "Engineering," "Rangeland," "Recreation," and "Wildlife Habitat."

ANS—Area not surveyed, access denied

The soil survey information in these areas is not available.

BkB—Blakeney fine sandy loam, 1 to 3 percent slopes

Setting

General location: Southern part of High Plains and adjacent margins of Edwards Plateau and Trans-Pecos areas of west Texas and adjoining areas in New Mexico and Arizona
Major land resource area: 42—Southern Desertic Basins, Plains, and Mountains
Landscape: Plains
Elevation: 2,000 to 3,595 feet (610 to 1,097 meters)
Mean annual precipitation: 10 to 17 inches (254 to 432 millimeters)
Mean annual air temperature: 63 to 68 degrees F (17 to 20 degrees C)
Frost-free period: 210 to 240 days

Composition

Blakeney and similar soils: 85 percent
Contrasting soils: 15 percent

Based on transect data and other field observations of the map unit during the survey, the best estimate is that Blakeney soils and similar soils make up 85 percent of the map unit and contrasting soils make up 15 percent. Similar soils include Conger and Upton soils, which are loamier and have more gravel. Another similar soil is deeper than 20 inches to an indurated caliche layer. Contrasting soils are small areas of Kinco, Ima, and Wickett soils which are deep, sandy soils without an indurated caliche layer and occur on lower landscape positions.

Soil Description

Blakeney

Position on landform: Terrace fan
Parent material: Loamy, calcareous materials

Typical Profile

Surface layer:
0 to 6 inches—brown, moderately alkaline fine sandy loam
Subsoil:
6 to 16 inches—strong brown, moderately alkaline fine sandy loam
16 to 24 inches—very pale brown, moderately alkaline caliche

24 to 80 inches—pinkish white, moderately alkaline loam, weakly cemented by calcium carbonate

Note: A complete soil description with range in characteristics is included, in alphabetical order, in the "Soil Series and Morphology" section.

Properties and Qualities

Slope: 1 to 3 percent
Percent of area covered by surface fragments: Unspecified
Depth to first restrictive layer: Petrocalcic: 6 to 20 inches
Slowest soil permeability to 60 inches, above first cemented restrictive layer: 2.0 to 6.0 in/hr (Moderately rapid)
Slowest permeability to 60 inches, within and below first cemented restrictive layer: 0.06 to 0.2 in/hr (Slow)
Salinity, representative within 40 inches: Not saline
Salinity, maximum within 40 inches: Not saline
Sodicity, representative within 40 inches: Not sodic
Sodicity, maximum within 40 inches: Not sodic
Representative total available water capacity to 60 inches: About 1.8 inches (Very low)
Natural drainage class: Well drained
Runoff: Very low
Flooding frequency: None

Interpretive Groups

Land capability nonirrigated: 6e
Land capability irrigated: None specified
Ecological site name: Shallow Sandy Loam (desert Grassland)
Ecological site number: R042XY257TX
Typical vegetation: The natural plant community for this site is short and mid grasses and forbs. Black grama, side oats grama, and plains bristlegrass are the dominate grasses. Woody plants include mesquite, acacia, creosote, cacti, and yucca.

Note: Additional information specific to the components of this map unit is available in the “Tables” section.

Use and Management

Major land uses: Rangeland

Rangeland
Major limitations:
- The very shallow or shallow rooting depth and very low available water capacity limit the amount of forage produced.

Wildlife habitat
Major limitations:
- The very low available water capacity limits production of wild herbaceous plants and shrubs.

Minor limitations:
- The very shallow or shallow rooting zone limits production of wild herbaceous plants and shrubs.

Urban development
Major limitations:
- The shallow depth to a cemented pan limits use for dwellings, buildings, roads

and streets, shallow excavations, lawns and landscaping, septic absorption fields, and sewage lagoons.
- The calcium carbonate amount and droughtiness limit use for lawns and landscaping.

Minor limitations:
- The shallow depth to a cemented pan and seepage limit use for landfills.

Note: For more information about managing this map unit, see the section on "Soil Properties," and the section on "Use and Management" which includes subsections on "Engineering," “Rangeland,” "Recreation," and "Wildlife Habitat."

CoC—Conger loam, 0 to 3 percent slopes

Setting

General location: Southern parts of the High Plains, western Edwards Plateau, and Trans-Pecos areas in far west Texas and in New Mexico
Major land resource area: 81A—Edwards Plateau, Western Part
Landscape: Plateau
Elevation: 1,495 to 3,595 feet (457 to 1,097 meters)
Mean annual precipitation: 10 to 17 inches (254 to 432 millimeters)
Mean annual air temperature: 63 to 68 degrees F (17 to 20 degrees C)
Frost-free period: 210 to 240 days

Composition

Conger and similar soils: 80 percent
Contrasting soils: 20 percent

Based on transect data and other field observations of the map unit during the survey, the best estimate is that the Conger soils and similar soils make up 80 percent of the map unit, and contrasting soils make up 20 percent. Similar soils include Upton soils, and soils that have hard caliche layers greater than 20 inches deep. Contrasting soils are Reagan and Pandale soils that occur on lower positions on the landscape.

Soil Description

Conger

Position on landform: Plain
Parent material: Loamy alluvium derived from limestone

Typical Profile

Surface layer:
0 to 6 inches—brown, moderately alkaline loam
Subsoil:
6 to 13 inches—pale brown, moderately alkaline very cobbly loam
13 to 21 inches—very pale brown, moderately alkaline indurated caliche
21 to 80 inches—very pale brown, moderately alkaline weakly cemented, loamy caliche materials

Note: A complete soil description with range in characteristics is included, in alphabetical order, in the "Soil Series and Morphology" section.

Properties and Qualities

Slope: 0 to 3 percent
Percent of area covered by surface fragments: About 10 percent subrounded gravel
Depth to first restrictive layer: Petrocalcic: 8 to 20 inches

Slowest soil permeability to 60 inches, above first cemented restrictive layer: 0.6 to 2.0 in/hr (Moderate)
Slowest permeability to 60 inches, within and below first cemented restrictive layer: 0.06 to 0.2 in/hr (Slow)
Salinity, representative within 40 inches: Not saline
Salinity, maximum within 40 inches: Not saline
Sodicity, representative within 40 inches: Not sodic
Sodicity, maximum within 40 inches: Not sodic
Representative total available water capacity to 60 inches: About 1.8 inches (Very low)
Natural drainage class: Well drained
Runoff: 0 to 1 percent slopes—negligible; 1 to 3 percent slopes—very low
Flooding frequency: None

Interpretive Groups

Land capability nonirrigated: 6e
Land capability irrigated: None specified
Ecological site name: Shallow PE 19-25
Ecological site number: R081AY311TX
Typical vegetation: The natural plant community for this site is blue grama, black grama, and sideoats grama. Woody vegetation includes juniper, mesquite, algerita, and cacti.

Note: Additional information specific to the components of this map unit is available in the “Tables” section.

Use and Management

Major land uses: Rangeland

Rangeland
Major limitations:
- The very shallow or shallow rooting depth and very low available water capacity limit the amount of forage produced.

Minor limitations:
- Stones on the surface limit some types of mechanical range improvements.

Wildlife habitat
Major limitations:
- The very shallow or shallow rooting zone and very low available water capacity limits production of wild herbaceous plants and shrubs.

Urban development
Major limitations:
- The depth to a cemented pan limits use for dwellings, commercial buildings, shallow excavations, lawns and landscaping, and septic tank absorption fields.
- The high carbonate content limits use for daily cover for landfills.

Minor limitations:
- The depth to a cemented pan limits use for local roads and streets, and trench-type landfills.

Note: For more information about managing this map unit, see the section on "Soil Properties,” and the section on "Use and Management" which includes subsections on "Engineering,” "Rangeland,” "Recreation,” and "Wildlife Habitat.”

DAM—Dams

These areas consist of barriers built across a waterway to control the flow or raise the level of surface water.

DvB—Dev very gravelly loam, 0 to 3 percent slopes, frequently flooded

Setting

General location: Western and central parts of the Edwards Plateau and southeastern New Mexico
Major land resource area: 81A—Edwards Plateau, Western Part
Landscape: Dissected plateau; dissected river valley
Elevation: 600 to 3,145 feet (183 to 960 meters)
Mean annual precipitation: 8 to 25 inches (203 to 635 millimeters)
Mean annual air temperature: 61 to 70 degrees F (16 to 21 degrees C)
Frost-free period: 210 to 290 days

Composition

Dev and similar soils: 80 percent
Contrasting soils: 20 percent

Based on transect data and other field observations of the map unit during the survey, the best estimate is that the Dev soils and similar soils make up 80 percent of the map unit, and contrasting soils make up 20 percent. Similar soils include those that may not be as gravelly or have a thicker nongravelly surface. Contrasting soils include Rioconcho, Iraan, and soils higher on the landscape that may be occasionally flooded. Also included is the stream channel or riverwash consisting of limestone gravels, cobbles, and a few stones.

Soil Description

Dev

Position on landform: Draw or flood plain (fig. 8)
Parent material: Gravelly loamy alluvium derived from limestone

Typical Profile

Surface layer:
5 to 8 inches—dark grayish brown, moderately alkaline very gravelly loam
Subsurface layer:
8 to 25 inches—dark grayish brown, moderately alkaline extremely gravelly loam
Subsoil:
25 to 38 inches—brown, moderately alkaline extremely gravelly loam
38 to 80 inches—yellowish brown, moderately alkaline very gravelly loam

Note: A complete soil description with range in characteristics is included, in alphabetical order, in the "Soil Series and Morphology" section.

Properties and Qualities

Slope: 0 to 3 percent
Percent of area covered by surface fragments: Unspecified
Depth to first restrictive layer: Not present
Slowest soil permeability to 60 inches, above first cemented restrictive layer: 2.0 to 6.0 in/hr (Moderately rapid)

Figure 8.—The foreground is an area of Dev very gravelly loam, 0 to 3 percent slopes, frequently flooded. Ector-Rock outcrop complex, 15 to 60 percent slopes, is in the background.

Slowest permeability to 60 inches, within and below first cemented restrictive layer: No restrictive layer
Salinity, representative within 40 inches: Not saline
Salinity, maximum within 40 inches: Not saline
Sodicity, representative within 40 inches: Not sodic
Sodicity, maximum within 40 inches: Not sodic
Representative total available water capacity to 60 inches: About 4.8 inches (Low)
Natural drainage class: Well drained
Runoff: 0 to 1 percent slopes—negligible; 1 to 3 percent slopes—very low
Flooding frequency: Frequent

Interpretive Groups

Land capability nonirrigated: 6w
Land capability irrigated: None specified
Ecological site name: Draw PE 19-25
Ecological site number: R081AY292TX
Typical vegetation: The natural plant community on this site is short and mid grasses with woody vegetation along the stream channel. Grasses include sideoats grama, cane bluestem, vine mesquite, and buffalograss. Woody vegetation included juniper, mesquite, hackberry, Texas persimmon, Arizona black walnut, cacti, and sachuawista.

Note: Additional information specific to the components of this map unit is available in the “Tables” section.

Use and Management

Major land uses: Rangeland and wildlife

Rangeland
Major limitations:
- There are no major limitations that affect this use.

Wildlife habitat
Major limitations:
- There are no major limitations that affect this use.

Urban development
Major limitations:
- The severe hazard of flooding limits use for homesites, building sites, shallow excavations, local roads and streets, septic tank absorption fields, sewage lagoons, and landfills.
- The severe hazard of flooding and high content of calcium carbonate limits use for lawns.
- The moderately rapid permeability limits use for septic tank absorption fields and landfills.

Minor limitations:
- The gravel content limits use for lawns and landscaping.

Note: For more information about managing this map unit, see the section on "Soil Properties," and the section on "Use and Management" which includes subsections on "Engineering," “Rangeland,” "Recreation," and "Wildlife Habitat."

ERD—Ector-Rock outcrop complex, 1 to 15 percent slopes

Setting

General location: Limestone areas of West Texas and southern New Mexico
Major land resource area: 81A—Edwards Plateau, Western Part
Landscape: Dissected plateau
Elevation: 1,600 to 2,745 feet (488 to 838 meters)
Mean annual precipitation: 10 to 35 inches (254 to 889 millimeters)
Mean annual air temperature: 52 to 73 degrees F (11 to 23 degrees C)
Frost-free period: 120 to 320 days

Composition

Ector and similar soils: 60 percent
Rock outcrop: 30 percent
Contrasting soils: 10 percent

Based on transect data and other field observations of the map unit during the survey, the best estimate is that the Ector soils and similar soils make up 60 percent of the map unit. Thirty percent of the map unit is nearly level to vertical rock outcrops occurring throughout the map unit, but are most prominent near the top of the slope. Contrasting soils include Dev soils in small drains and Reagan soils on lower positions on the landscape.

Soil Description

Ector

Position on landform: Crest footslope on ridge; Crest backslope on ridge
Parent material: Loamy residuum weathered from limestone

Typical Profile

Surface layer:
0 to 5 inches—dark grayish brown, moderately alkaline very cobbly clay loam
Underlying material:
5 to 8 inches—dark grayish brown, moderately alkaline extremely cobbly clay loam
8 to 30 inches—indurated, fractured limestone bedrock

Note: A complete soil description with range in characteristics is included, in alphabetical order, in the "Soil Series and Morphology" section.

Properties and Qualities

Slope: 1 to 15 percent
Percent of area covered by surface fragments: About 25 percent subrounded cobbles, about 5 percent fine subrounded gravel, about 15 percent subrounded medium gravels, about 25 percent subrounded medium cobbles.
Depth to first restrictive layer: Lithic bedrock: 6 to 20 inches
Slowest soil permeability to 60 inches, above first cemented restrictive layer: 0.6 to 2.0 in/hr (Moderate)
Slowest permeability to 60 inches, within and below first cemented restrictive layer: 0.00 to 00.06 in/hr (very slow)
Salinity, representative within 40 inches: Not saline
Salinity, maximum within 40 inches: Not saline
Sodicity, representative within 40 inches: Not sodic
Sodicity, maximum within 40 inches: Not sodic
Representative total available water capacity to 60 inches: About 0.6 inches (Very low)
Natural drainage class: Well drained
Runoff: 1 to 5 percent slopes—low; 5 to 15 percent slopes—medium
Flooding frequency: None

Interpretive Groups

Land capability nonirrigated: 7s
Land capability irrigated: None specified
Ecological site name: Limestone Hill PE 19-25
Ecological site number: R081AY566TX
Typical vegetation: The natural plant community for this site is short and mid grasses and low desert shrubs. Grasses include sideoats grama, cane bluestem, green sprangletop, and yellow indiangrass. Woody vegetation includes juniper, mesquite, sotol, agarito, and lechuguilla.

Rock outcrop

Position on landform: Side slope on hillslope
Parent material: Limestone

Properties and Qualities

Slope: 1 to 15 percent
Percent of area covered by surface fragments: Unspecified
Depth to first restrictive layer: Lithic bedrock: 0 to 2 inches
Slowest soil permeability to 60 inches, above first cemented restrictive layer: Not specified
Slowest permeability to 60 inches, within and below first cemented restrictive layer: 0.06 to 0.2 in/hr (Slow)

Salinity, representative within 40 inches: Not saline
Salinity, maximum within 40 inches: Not saline
Sodicity, representative within 40 inches: Not sodic
Sodicity, maximum within 40 inches: Not sodic
Representative total available water capacity to 60 inches: About 0.0 (Very low)
Natural drainage class: Not specified
Runoff: Not specified
Flooding frequency: None

Interpretive Groups

Land capability nonirrigated: 8s
Land capability irrigated: None specified
Ecological site name: Not specified
Ecological site number: Not specified
Typical vegetation: Not specified

Note: Additional information specific to the components of this map unit is available in the “Tables” section.

Use and Management

Major land uses: Rangeland and wildlife

Rangeland
Major limitations:
- The very low available water capacity limits the amount of forage produced.
- The large amount of rock outcrop limits the amount of forage produced.

Minor limitations:
- The very shallow or shallow depth to bedrock limits some types of mechanical range improvements.

Wildlife habitat
Major limitations:
- The very low available water capacity limits production of wild herbaceous plants and shrubs.
- The very shallow or shallow rooting zone limits production of wild herbaceous plants and shrubs.

Urban development
Major limitations:
- The depth to hard bedrock limits use for dwellings, commercial buildings, shallow excavations, lawns and landscaping, septic tank absorption fields, and landfills.
- Droughtiness and high carbonate content limit use for lawns and landscaping.
- The slope limits sites for small commercial buildings and sewage lagoons.

Minor limitations:
- The high content of stones on the surface and amount of rock outcrop limit use for homesites, building sites, and local roads and streets.

Note: For more information about managing this map unit, see the section on "Soil Properties,” and the section on "Use and Management" which includes subsections on "Engineering,” “Rangeland,” "Recreation,” and "Wildlife Habitat.”

ERG—Ector-Rock outcrop complex, 15 to 60 percent slopes

Setting

General location: Limestone areas of West Texas and southern New Mexico
Major land resource area: 81A—Edwards Plateau, Western Part
Landscape: Dissected plateau
Elevation: 1,600 to 2,745 feet (488 to 838 meters)
Mean annual precipitation: 10 to 35 inches (254 to 889 millimeters)
Mean annual air temperature: 52 to 73 degrees F (11 to 23 degrees C)
Frost-free period: 120 to 320 days

Composition

Ector and similar soils: 55 percent
Rock outcrop: 35 percent
Contrasting soils: 10 percent

Based on transect data and other field observations of the map unit during the survey, the best estimate is that the Ector soils and similar soils make up 55 percent of the map unit. Nearly level to vertical rock outcrops occur throughout the map unit, but are most prominent near the top of the slope. Contrasting soils include Dev soils in small drains and Reagan soils on lower positions.

Soil Description

Ector

Position on landform: Crest footslope on ridge; Crest backslope on ridge
Parent material: Loamy residuum weathered from limestone

Typical Profile

Surface layer:
0 to 18 inches—brown, moderately alkaline extremely cobbly loam
Underlying material:
18 to 30 inches—indurated, fractured limestone bedrock

Note: A complete soil description with range in characteristics is included, in alphabetical order, in the "Soil Series and Morphology" section.

Properties and Qualities

Slope: 15 to 40 percent
Percent of area covered by surface fragments: About 10 percent subrounded gravel, about 10 percent subrounded cobbles, about 20 percent subrounded stones, about 10 percent subrounded boulders
Depth to first restrictive layer: Lithic bedrock: 6 to 20 inches
Slowest soil permeability to 60 inches, above first cemented restrictive layer: 0.6 to 2.0 in/hr (Moderate)
Slowest permeability to 60 inches, within and below first cemented restrictive layer: 0.00 to 00.06 in/hr (Very slow)
Salinity, representative within 40 inches: Not saline
Salinity, maximum within 40 inches: Not saline
Sodicity, representative within 40 inches: Not sodic
Sodicity, maximum within 40 inches: Not sodic
Representative total available water capacity to 60 inches: About 0.7 inches (Very low)

Natural drainage class: Well drained
Runoff: 15 to 20 percent—medium; 20 to 40 percent—high
Flooding frequency: None

Interpretive Groups

Land capability nonirrigated: 7s
Land capability irrigated: None specified
Ecological site name: Steep Rocky PE 19-25
Ecological site number: R081AY319TX
Typical vegetation: The natural plant community for this site is short and mid grasses and low desert shrubs. Grasses include sideoats grama, cane bluestem, green sprangletop, and little bluestem. Woody vegetation includes juniper, mesquite, sotol, agarito, and lechuguilla.

Rock outcrop

Position on landform: Crest footslope on ridge, crest backslope on ridge
Parent material: Limestone

Properties and Qualities

Slope: 15 to 60 percent
Percent of area covered by surface fragments: Unspecified
Depth to first restrictive layer: Lithic bedrock: 0 to 2 inches
Slowest soil permeability to 60 inches, above first cemented restrictive layer: Not specified
Slowest permeability to 60 inches, within and below first cemented restrictive layer: 0.06 to 0.2 in/hr (Slow)
Salinity, representative within 40 inches: Not saline
Salinity, maximum within 40 inches: Not saline
Sodicity, representative within 40 inches: Not sodic
Sodicity, maximum within 40 inches: Not sodic
Representative total available water capacity to 60 inches: About (Very low)
Natural drainage class: Not specified
Runoff: Not specified
Flooding frequency: None

Interpretive Groups

Land capability nonirrigated: 8s
Land capability irrigated: None specified
Ecological site name: Not specified
Ecological site number: Not specified
Typical vegetation: Not specified

Note: Additional information specific to the components of this map unit is available in the “Tables” section.

Use and Management

Major land uses: Rangeland and wildlife

Rangeland
Major limitations:

- The very shallow or shallow rooting zone and very low available water capacity limit the amount of forage produced.
- Slope may limit livestock access to some areas (fig. 9).

Figure 9.—Horses grazing on an area of Ector-Rock outcrop complex, 15 to 60 percent slopes. Some areas may be unaccessable to certain types of livestock.

Wildlife habitat
Major limitations:

The very shallow or shallow rooting depth and very low available water capacity limit the amount of wild herbaceous plants and shrubs.

Urban development
Major limitations:

- The depth to hard bedrock, slope, and content of large stones severely limit use for dwellings, commercial buildings, shallow excavations, local roads and streets, lawns, landscaping, septic tank absorption fields, sewage lagoons, and landfills.
- Droughtiness and carbonate content limit use for lawns and landscaping.

Note: For more information about managing this map unit, see the section on "Soil Properties," and the section on "Use and Management" which includes subsections on "Engineering," “Rangeland,” "Recreation," and "Wildlife Habitat."

HaB—Harkey very fine sandy loam, 0 to 2 percent slopes, rarely flooded

Setting

General location: Rio Grande and Pecos River Valleys in southeastern New Mexico and western Texas
Major land resource area: 42—Southern Desertic Basins, Plains, and Mountains
Landscape: Alluvial plain
Elevation: 2,495 to 4,500 feet (762 to 1,372 meters)
Mean annual precipitation: 8 to 12 inches (203 to 305 millimeters)

Mean annual air temperature: 61 to 64 degrees F (16 to 18 degrees C)
Frost-free period: 180 to 220 days

Composition

Harkey and similar soils: 85 percent
Contrasting soils: 15 percent

Based on transect data and other field observations of the map unit during the survey, the best estimate is that the Harkey soils and similar soils make up 85 percent of the map unit. Contrasting soils make up 15 percent of the map unit. Similar soils include Patrole. Patrole soils are slightly lower on the landscape and contain gypsum and other salts. Contrasting soils are found higher on the landscape and include Kinco, Ima, Sanderson, Upton, Pandale, and Paisano. Kinco and Ima are deep sandy soils, Sanderson and Pandale are deep gravelly loams, and Upton and Paisano have indurated caliche layers at 20 inches or less.

Soil Description

Harkey

Position on landform: High stream terrace
Parent material: Loamy alluvium derived from sedimentary rock

Typical Profile

Surface layer:
0 to 6 inches—brown, moderately alkaline very fine sandy loam
Underlying material:
6 to 80 inches—pale brown, brown, and pale brown, moderately alkaline very fine sandy loam

Note: A complete soil description with range in characteristics is included, in alphabetical order, in the "Soil Series and Morphology" section.

Properties and Qualities

Slope: 0 to 2 percent
Percent of area covered by surface fragments: Unspecified
Depth to first restrictive layer: Not present
Slowest soil permeability to 60 inches, above first cemented restrictive layer: 0.6 to 2.0 in/hr (Moderate)
Slowest permeability to 60 inches, within and below first cemented restrictive layer: No restrictive layer
Salinity, representative within 40 inches: Not saline
Salinity, maximum within 40 inches: Not saline
Sodicity, representative within 40 inches: Not sodic
Sodicity, maximum within 40 inches: Not sodic
Representative total available water capacity to 60 inches: About 9.6 inches (High)
Natural drainage class: Well drained
Runoff: 0 to 1 percent slopes—negligible; 1 to 2 percent slopes—low
Flooding frequency: Rare

Interpretive Groups

Land capability nonirrigated: 7s
Land capability irrigated: 3s
Ecological site name: Salty Bottomland (desert Grassland)
Ecological site number: R042XY253TX
Typical vegetation: The natural plant community for this site is tobosagrass, black grama, and blue grama.

Note: Additional information specific to the components of this map unit is available in the “Tables” section.

Use and Management

Major land uses: Primarily used for rangeland and wildlife habitat, but some areas are cropped to alfalfa.

Rangeland
Major limitations:
- There are no major limitations that affect this use.

Wildlife habitat
Major limitations:
- There are no major limitations that affect this use.

Urban development
Major limitations:
- The hazard of flooding limits use for homesites, building sites, and shallow excavations.

Minor limitations:
- The hazard of flooding limits use for local roads and streets, septic tank absorption fields, and landfills.
- Shallow excavations should be shored to prevent cave-ins.
- Seepage and the moderate permeability limit use for septic tank absorption fields and sewage lagoons.

Note: For more information about managing this map unit, see the section on "Soil Properties,” and the section on "Use and Management" which includes subsections on "Engineering,” “Rangeland,” "Recreation,” and "Wildlife Habitat.”

HRA—Harkey-Patrole association, 0 to 1 percent slopes, rarely flooded

Setting

General location: Rio Grande and Pecos River Valleys in southeastern New Mexico and western Texas
Major land resource area: 42—Southern Desertic Basins, Plains, and Mountains
Landscape: Alluvial plain
Elevation: 2,250 to 2,995 feet (686 to 914 meters)
Mean annual precipitation: 10 to 16 inches (254 to 406 millimeters)
Mean annual air temperature: 57 to 68 degrees F (14 to 20 degrees C)
Frost-free period: 210 to 240 days

Composition

Harkey and similar soils: 45 percent
Patrole and similar soils: 45 percent
Contrasting soils: 10 percent

Based on transect data and other field observations of the map unit during the survey, the best estimate is that the Harkey and Patrole soils and similar soils make up 90 percent of the map unit, and contrasting soils make up 10 percent. Contrasting soils are higher on the landscape and above the flood plain. Kinco and Ima soils are deep sandy soils, Pandale and Sanderson are deep, gravelly loams, Upton and Paisano have gravels and indurated caliche layers at 20 inches or less, Lozier has limestone bedrock at 20 inches or less.

Soil Description

Harkey

Position on landform: Flood plain
Parent material: Loamy alluvium derived from sedimentary rock

Typical Profile

Surface layer:
0 to 14 inches—brown, moderately alkaline silt loam
Subsoil:
14 to 80 inches—brown, moderately alkaline silt loam

Note: A complete soil description with range in characteristics is included, in alphabetical order, in the "Soil Series and Morphology" section.

Properties and Qualities

Slope: 0 to 1 percent
Percent of area covered by surface fragments: Unspecified
Depth to first restrictive layer: Not present
Slowest soil permeability to 60 inches, above first cemented restrictive layer: 0.6 to 2.0 in/hr (Moderate)
Slowest permeability to 60 inches, within and below first cemented restrictive layer: No restrictive layer
Salinity, representative within 40 inches: Saline
Salinity, maximum within 40 inches: Saline
Sodicity, representative within 40 inches: Not sodic
Sodicity, maximum within 40 inches: Not sodic
Representative total available water capacity to 60 inches: About 6.0 inches (Moderate)
Natural drainage class: Well drained
Runoff: Negligible
Flooding frequency: Rare

Interpretive Groups

Land capability nonirrigated: 7s
Land capability irrigated: 3s
Ecological site name: Salty Bottomland (desert Grassland)
Ecological site number: R042XY253TX
Typical vegetation: The natural plant community for this site is alkali sacaton, giant sacaton, false rhodesgrass, and inland saltgrass. Woody vegetation includes fourwing saltbush, mesquite, salt cedar, tasajillo, and prickly pear.

Patrole

Position on landform: High flood plain
Parent material: Stratified silty over clayey alluvium

Typical Profile

Surface layer:
0 to 9 inches—brown, moderately alkaline silt loam
Subsoil:
9 to 28 inches—brown, moderately alkaline silt loam
28 to 33 inches—pinkish gray, moderately alkaline silty clay loam
33 to 50 inches—brown, moderately alkaline clay
50 to 80 inches—brown, moderately alkaline silty clay loam

Note: A complete soil description with range in characteristics is included, in alphabetical order, in the "Soil Series and Morphology" section.

Properties and Qualities

Slope: 0 to 1 percent
Percent of area covered by surface fragments: Unspecified
Depth to first restrictive layer: Not present
Slowest soil permeability to 60 inches, above first cemented restrictive layer: 0.001 to 0.06 in/hr (Very slow)
Slowest permeability to 60 inches, within and below first cemented restrictive layer: No restrictive layer
Salinity, representative within 40 inches: Saline
Salinity, maximum within 40 inches: Saline
Sodicity, representative within 40 inches: Not sodic
Sodicity, maximum within 40 inches: Not sodic
Representative total available water capacity to 60 inches: About 6.0 inches (Moderate)
Natural drainage class: Well drained
Runoff: High
Flooding frequency: Rare

Interpretive Groups

Land capability nonirrigated: 7s
Land capability irrigated: 3s
Ecological site name: Salty Bottomland (desert Grassland)
Ecological site number: R042XY253TX
Typical vegetation: The natural plant community for this site is alkali sacaton, false rhodesgrass, giant sacaton, vine mesquite, and white tridens. Woody vegetation includes fourwing saltbush, mesquite, salt cedar, tasajillo, and prickly pear.

Note: Additional information specific to the components of this map unit is available in the “Tables” section.

Use and Management

Major land uses: Rangeland and wildlife habitat

Rangeland
Major limitations:
- There are no major limitations that affect this use.

Wildlife habitat
Major limitations:
- There are no major limitations that affect this use.

Urban development
Major limitations:
- The hazard of flooding limits use for homesites, building sites, and shallow excavations.
- The shrink-swell potential and low strength in the Patrole soils limit use for homesites.
- The salinity levels in the soils limit the use for lawns and landscaping.
- The very slow permeability limits use for septic tank absorption fields on Patrole soils.

Minor limitations:
- The hazard of flooding limits use for local roads and streets, septic tank absorption fields, and landfills.

- Seepage limits use for sewage lagoons on Harkey soils.
- Shallow excavations should be shored to prevent cave-ins.

Note: For more information about managing this map unit, see the section on "Soil Properties," and the section on "Use and Management" which includes subsections on "Engineering," “Rangeland,” "Recreation," and "Wildlife Habitat."

IDB—Iraan and Dev soils, 0 to 2 percent slopes, occasionally flooded

Setting

General location: Western part of the Edwards Plateau in western Texas
Major land resource area: 81A—Edwards Plateau, Western Part
Landscape: Dissected plateau
Elevation: 600 to 3,300 feet (183 to 1,006 meters)
Mean annual precipitation: 8 to 25 inches (203 to 635 millimeters)
Mean annual air temperature: 61 to 70 degrees F (16 to 21 degrees C)
Frost-free period: 210 to 290 days

Composition

Iraan, Dev, and similar soils: 85 percent
Contrasting soils: 15 percent

Based on transect data and other field observations of the map unit during the survey, the best estimate is that the Iraan and Dev soils and similar soils make up 85 percent of the map unit, and contrasting soils make up 15 percent. Soils similar to Iraan and Dev soils include Reagan, Pandale, and Sanderson soils. These soils are on higher positions. Similar soils on similar positions include Harkey, Patrole, Rioconcho, and Rio Diablo soils which are occasionally or rarely flooded. Contrasting soils include small areas of Upton, Ector, Lozier, and other soils on higher positions.

Soil Description

Iraan

Position on landform: Broad channel, draw
Parent material: Loamy alluvium derived from limestone

Typical Profile

Surface layer:
0 to 10 inches—dark brown, moderately alkaline clay loam
Subsurface layer:
10 to 24 inches—dark brown, moderately alkaline clay loam
Subsoil:
24 to 80 inches—brown, moderately alkaline clay loam

Note: A complete soil description with range in characteristics is included, in alphabetical order, in the "Soil Series and Morphology" section.

Properties and Qualities

Slope: 0 to 2 percent
Percent of area covered by surface fragments: Unspecified
Depth to first restrictive layer: Not present
Slowest soil permeability to 60 inches, above first cemented restrictive layer: 0.2 to 0.6 in/hr (Moderately slow)

Slowest permeability to 60 inches, within and below first cemented restrictive layer: No restrictive layer
Salinity, representative within 40 inches: Not saline
Salinity, maximum within 40 inches: Not saline
Sodicity, representative within 40 inches: Not sodic
Sodicity, maximum within 40 inches: Not sodic
Representative total available water capacity to 60 inches: About 10.8 inches (High)
Natural drainage class: Well drained
Runoff: 0 to 1 percent slopes—negligible; 1 to 2 percent slopes—low
Flooding frequency: Occasional

Interpretive Groups

Land capability nonirrigated: 6w
Land capability irrigated: 2w
Ecological site name: Draw PE 19-25
Ecological site number: R081AY292TX
Typical vegetation: The natural plant community for this site is cane bluestem, sideoats grama, vine mesquite, Arizona cottontop, and tobosagrass.

Dev

Position on landform: Draw or flood plain
Parent material: Gravelly loamy alluvium derived from limestone

Typical Profile

Surface layer:
0 to 8 inches—dark grayish brown, moderately alkaline very gravelly loam
Subsurface layer:
8 to 25 inches—dark grayish brown, moderately alkaline extremely gravelly loam
Subsoil:
25 to 38 inches—brown, moderately alkaline extremely gravelly loam
38 to 80 inches—yellowish brown, moderately alkaline very gravelly loam

Note: A complete soil description with range in characteristics is included, in alphabetical order, in the "Soil Series and Morphology" section.

Properties and Qualities

Slope: 0 to 2 percent
Percent of area covered by surface fragments: Unspecified
Depth to first restrictive layer: Not present
Slowest soil permeability to 60 inches, above first cemented restrictive layer: 2.0 to 6.0 in/hr (Moderately rapid)
Slowest permeability to 60 inches, within and below first cemented restrictive layer: No restrictive layer
Salinity, representative within 40 inches: Not saline
Salinity, maximum within 40 inches: Not saline
Sodicity, representative within 40 inches: Not sodic
Sodicity, maximum within 40 inches: Not sodic
Representative total available water capacity to 60 inches: About 4.8 inches (Low)
Natural drainage class: Well drained
Runoff: 0 to 1 percent slopes—negligible; 1 to 2 percent slopes—very low
Flooding frequency: Frequent

Interpretive Groups

Land capability nonirrigated: 6w
Land capability irrigated: None specified

Ecological site name: Draw PE 19-25
Ecological site number: R081AY292TX
Typical vegetation: The natural plant community on this site is short and mid grasses with woody vegetation along the stream channel. Grasses include sideoats grama, cane bluestem, vine mesquite, and buffalograss. Woody vegetation included juniper, mesquite, hackberry, Texas persimmon, Arizona black walnut, cacti, and sachuawista.

Note: Additional information specific to the components of this map unit is available in the “Tables” section.

Use and Management

Major land uses: Rangeland and wildlife habitat

Rangeland
Major limitations:
- The low available water capacity limits the amount of forage produced.

Wildlife habitat
Major limitations:
- The low available water capacity limits production of wild herbaceous plants and shrubs.

Urban development
Major limitations:
- The severe hazard of flooding limits use for homesites, building sites, shallow excavations, local roads and streets, septic tank absorption fields, and landfills.
- The low strength limits use for local roads and streets.

Minor limitations:
- The shrink-swell potential limits use for homesites, building sites, and local roads and streets.
- The moderate permeability limits use for septic tank absorption fields in Iraan soils.
- Seepage and clayey textures limit use for septic tank absorption fields, sewage lagoons, and landfills.

Note: For more information about managing this map unit, see the section on "Soil Properties,” and the section on "Use and Management" which includes subsections on "Engineering,” “Rangeland,” "Recreation,” and "Wildlife Habitat."

InB—Iraan silty clay loam, 0 to 2 percent slopes, occasionally flooded

Setting

General location: Western part of the Edwards Plateau in western Texas
Major land resource area: 81A—Edwards Plateau, Western Part
Landscape: Dissected plateau
Elevation: 1,495 to 3,300 feet (457 to 1,006 meters)
Mean annual precipitation: 12 to 20 inches (305 to 508 millimeters)
Mean annual air temperature: 61 to 70 degrees F (16 to 21 degrees C)
Frost-free period: 210 to 240 days

Composition

Iraan and similar soils: 85 percent
Contrasting soils: 15 percent

Based on transect data and other field observations of the map unit during the survey, the best estimate is that the Iraan soils and similar soils make up 85 percent of the map unit, and contrasting soils make up 15 percent. Similar soils include Reagan, Pandale, and Sanderson soils which are on higher positions. Similar soils on similar positions include Harkey, Patrole, Rioconcho, and Rio Diablo soils that are occasionally or rarely flooded. Contrasting soils include small areas of Upton, Ector, Lozier, and other soils on higher positions.

Soil Description

Iraan

Position on landform: Broad channel or draw
Parent material: Calcareous loamy alluvium

Typical Profile

Surface layer:
0 to 6 inches—dark grayish brown, moderately alkaline silty clay loam
Subsurface layer:
6 to 25 inches—brown, moderately alkaline silty clay loam
Subsoil:
25 to 42 inches—brown, moderately alkaline silty clay loam
42 to 51 inches—yellowish brown, moderately alkaline clay loam
51 to 80 inches—pale brown, moderately alkaline clay loam

Note: A complete soil description with range in characteristics is included, in alphabetical order, in the "Soil Series and Morphology" section.

Properties and Qualities

Slope: 0 to 2 percent
Percent of area covered by surface fragments: Unspecified
Depth to first restrictive layer: Not present
Slowest soil permeability to 60 inches, above first cemented restrictive layer: 0.2 to 0.6 in/hr (Moderately slow)
Slowest permeability to 60 inches, within and below first cemented restrictive layer: No restrictive layer
Salinity, representative within 40 inches: Not saline
Salinity, maximum within 40 inches: Not saline
Sodicity, representative within 40 inches: Not sodic
Sodicity, maximum within 40 inches: Not sodic
Representative total available water capacity to 60 inches: About 11.2 inches (High)
Natural drainage class: Well drained
Runoff: 0 to 1 percent slopes—negligible; 1 to 2 percent slopes—low
Flooding frequency: Occasional

Interpretive Groups

Land capability nonirrigated: 6w
Land capability irrigated: 2w
Ecological site name: Draw PE 19-25
Ecological site number: R081AY292TX
Typical vegetation: The natural plant community for this site is cane bluestem, sideoats grama, vine mesquite, Arizona cottontop, and tobosagrass.

Note: Additional information specific to the components of this map unit is available in the “Tables” section.

Use and Management

Major land uses: Rangeland and wildlife habitat

Rangeland
Major limitations:
- There are no major limitations that affect this use.

Wildlife habitat
Major limitations:
- There are no major limitations that affect this use.

Urban development
Major limitations:
- The severe hazard of flooding limits use for homesites, building sites, shallow excavations, local roads and streets, septic tank absorption fields, sewage lagoons, and landfills.
- The low strength limits use for local roads and streets.
- The moderately slow permeability limits use for septic tank absorption fields.

Minor limitations:
- The shrink-swell potential limits use for homesites, building sites, and local roads and streets.

Note: For more information about managing this map unit, see the section on "Soil Properties," and the section on "Use and Management" which includes subsections on "Engineering," “Rangeland,” "Recreation," and "Wildlife Habitat."

IrA—Irion clay, 0 to 1 percent slopes

Setting

General location: Central and western part of the Edwards Plateau in western Texas
Major land resource area: 81A—Edwards Plateau, Western Part
Landscape: Dissected plateau
Elevation: 2,280 to 2,735 feet (695 to 835 meters)
Mean annual precipitation: 14 to 22 inches (356 to 559 millimeters)
Mean annual air temperature: 64 to 70 degrees F (18 to 21 degrees C)
Frost-free period: 220 to 240 days

Composition

Irion and similar soils: 90 percent
Contrasting soils: 10 percent

Based on transect data and other field observations of the map unit during the survey, the best estimate is that the Irion soils and similar soils make up 90 percent of the map unit, and contrasting soils make up 10 percent. Similar soils include Tobosa on slightly higher positions. Also included are soils that have limestone bedrock at depths less than 60 inches or greater than 80 inches. Contrasting soils include Noelke and Ector soils, which are shallow to limestone bedrock and on higher positions.

Soil Description

Irion

Position on landform: Depression
Parent material: Alluvium derived from limestone

Typical Profile

Surface layer:
0 to 4 inches—very dark grayish brown, moderately alkaline clay
Subsurface layer:
4 to 14 inches—dark grayish brown, moderately alkaline clay
Subsoil:
14 to 54 inches—dark grayish brown, moderately alkaline clay
54 to 72 inches—grayish brown, moderately alkaline clay
Underlying material:
72 to 80 inches—indurated platy limestone interbedded with thin layers of marl

Note: A complete soil description with range in characteristics is included, in alphabetical order, in the "Soil Series and Morphology" section.

Properties and Qualities

Slope: 0 to 1 percent
Percent of area covered by surface fragments: Unspecified
Depth to first restrictive layer: Lithic bedrock: 60 to 80 inches
Slowest soil permeability to 60 inches, above first cemented restrictive layer: 0.001 to 0.06 in/hr (Very slow)
Slowest permeability to 60 inches, within and below first cemented restrictive layer: No restrictive layer
Salinity, representative within 40 inches: Not saline
Salinity, maximum within 40 inches: Not saline
Sodicity, representative within 40 inches: Not sodic
Sodicity, maximum within 40 inches: Not sodic
Representative total available water capacity to 60 inches: About 9.0 inches (High)
Natural drainage class: Well drained
Runoff: Negligible
Flooding frequency: None
Ponding: From the surface to a depth of 6 feet during May through November for long duration

Interpretive Groups

Land capability nonirrigated: 2s
Land capability irrigated: None specified
Ecological site name: Clay Flat PE 19-25
Ecological site number: R081AY290TX
Typical vegetation: The natural plant community for this site is short and mid grasses including tobosagrass, vine mesquite, buffalograss, and white tridens.

Note: Additional information specific to the components of this map unit is available in the “Tables” section.

Use and Management

Major land uses: Rangeland and wildlife habitat

Rangeland
Major limitations:

- There are no major limitations that affect this use.

Wildlife habitat
Major limitations:

- There are no major limitations that affect this use.

Urban development
Major limitations:

- Ponding and the high shrink-swell potential severely limit use for homesites, small commercial buildings, local road and streets, shallow excavations, lawns, septic tank absorption fields, and landfills.
- The clayey nature of the soil limits use for lawns and landscaping.
- Low strength limits use for local roads and streets.
- Shallow excavations should be shored to prevent cave-ins.
- The very slow permeability limits use for septic tank absorption fields.

Note: For more information about managing this map unit, see the section on "Soil Properties," and the section on "Use and Management" which includes subsections on "Engineering," “Rangeland,” "Recreation," and "Wildlife Habitat."

IsA—Irion clay, 0 to 1 percent slopes, stony

Setting

General location: Central and western part of the Edwards Plateau in western Texas
Major land resource area: 81A—Edwards Plateau, Western Part
Landscape: Dissected plateau
Elevation: 2,280 to 2,735 feet (695 to 835 meters)
Mean annual precipitation: 14 to 22 inches (356 to 559 millimeters)
Mean annual air temperature: 64 to 70 degrees F (18 to 21 degrees C)
Frost-free period: 220 to 240 days

Composition

Irion and similar soils: 90 percent
Contrasting soils: 10 percent

Based on transect data and other field observations of the map unit during the survey, the best estimate is that the Irion soils and similar soils make up 90 percent of the map unit, and contrasting soils make up 10 percent. Similar soils include Tobosa soils on slightly higher positions. Also included are soils that have limestone bedrock at depths less than 60 inches or greater than 80 inches. Contrasting soils include Noelke and Ector soils which are shallow to limestone bedrock and on higher positions.

Soil Description

Irion

Position on landform: Depression
Parent material: Alluvium derived from limestone

Typical Profile

Surface layer:
0 to 4 inches—very dark grayish brown, moderately alkaline clay
Subsurface layer:
4 to 14 inches—dark grayish brown, moderately alkaline clay
Subsoil:
14 to 72 inches—dark grayish brown, moderately alkaline clay
Underlying material:
72 to 80 inches—indurated platy limestone interbedded with thin layers of marl

Note: A complete soil description with range in characteristics is included, in alphabetical order, in the "Soil Series and Morphology" section.

Properties and Qualities

Slope: 0 to 1 percent
Percent of area covered by surface fragments: About 1 percent subangular cobbles, about 1 percent subangular stones, about 4 percent subangular boulders
Depth to first restrictive layer: Lithic bedrock: 60 to 80 inches
Slowest soil permeability to 60 inches, above first cemented restrictive layer: 0.001 to 0.06 in/hr (Very slow)
Slowest permeability to 60 inches, within and below first cemented restrictive layer: No restrictive layer
Salinity, representative within 40 inches: Not saline
Salinity, maximum within 40 inches: Not saline
Sodicity, representative within 40 inches: Not sodic
Sodicity, maximum within 40 inches: Not sodic
Representative total available water capacity to 60 inches: About 7.8 inches (Moderate)
Natural drainage class: Well drained
Runoff: Negligible
Flooding frequency: None
Ponding: From the surface to a depth of 6 feet during May through November for long duration

Interpretive Groups

Land capability nonirrigated: 4s
Land capability irrigated: None specified
Ecological site name: Clay Flat PE 19-25
Ecological site number: R081AY290TX
Typical vegetation: The natural plant community for this site is short and mid grasses including tobosagrass, vine mesquite, buffalograss, and white tridens.

Note: Additional information specific to the components of this map unit is available in the “Tables” section.

Use and Management

Major land uses: Rangeland and wildlife habitat

Rangeland
Major limitations:
- There are no major limitations that affect this use.

Wildlife habitat
Major limitations:
- There are no major limitations that affect this use.

Urban development
Major limitations:
- Ponding and the high shrink-swell potential severely limit use for homesites, small commercial buildings, local roads and streets, shallow excavations, and lawns.
- The clayey nature of the soil limits use for lawns, landscaping, and daily cover for landfills.
- Low strength limits use for local roads and streets.
- Shallow excavations should be shored to prevent cave-ins.
- Ponding limits use for septic tank absorption fields, sewage lagoons, and landfills.

Note: For more information about managing this map unit, see the section on "Soil Properties,” and the section on "Use and Management" which includes subsections on "Engineering,” “Rangeland,” "Recreation,” and "Wildlife Habitat.”

KiB—Kinco-Ima complex, 0 to 2 percent slopes

Setting

General location: Western Texas and possibly southeastern New Mexico
Major land resource area: 42—Southern Desertic Basins, Plains, and Mountains
Landscape: Valley
Elevation: 1,495 to 3,500 feet (457 to 1,067 meters)
Mean annual precipitation: 10 to 16 inches (254 to 406 millimeters)
Mean annual air temperature: 63 to 70 degrees F (17 to 21 degrees C)
Frost-free period: 210 to 240 days

Composition

Kinco and similar soils: 50 percent
Ima and similar soils: 35 percent
Contrasting soils: 15 percent

Based on transect data and other field observations of the map unit during the survey, the best estimate is that the Kinco soils, Ima soils, and similar soils make up 85 percent of the map unit, and contrasting soils make up 15 percent. Contrasting soils include Reagan, Upton, and Wickett soils. Reagan soils have silty clay loam textures and are on similar positions. Upton soils have loamy textures and hardened caliche layers at less than 20 inches. Wickett soils have sandy surfaces and hardened caliche layers deeper than 20 inches.

Soil Description

Kinco

Position on landform: Eolian plain
Parent material: Loamy alluvium and eolian sediments

Typical Profile

Surface layer:
0 to 10 inches—brown, moderately alkaline fine sandy loam
Subsoil:
10 to 29 inches—light brown, moderately alkaline fine sandy loam
29 to 80 inches—light brown and pink, moderately alkaline fine sandy loam

Note: A complete soil description with range in characteristics is included, in alphabetical order, in the "Soil Series and Morphology" section.

Properties and Qualities

Slope: 0 to 2 percent
Percent of area covered by surface fragments: Unspecified
Depth to first restrictive layer: Not present
Slowest soil permeability to 60 inches, above first cemented restrictive layer: 2.0 to 6.0 in/hr (Moderately rapid)
Slowest permeability to 60 inches, within and below first cemented restrictive layer: No restrictive layer
Salinity, representative within 40 inches: Not saline
Salinity, maximum within 40 inches: Not saline
Sodicity, representative within 40 inches: Not sodic
Sodicity, maximum within 40 inches: Not sodic
Representative total available water capacity to 60 inches: About 6.5 inches (Moderate)
Natural drainage class: Well drained

Runoff: 0 to 1 percent slopes—negligible; 1 to 2 percent slopes—very low
Flooding frequency: None

Interpretive Groups

Land capability nonirrigated: 6e
Land capability irrigated: None specified
Ecological site name: Sandy Loam (desert Grassland)
Ecological site number: R042XY256TX
Typical vegetation: The natural plant community for this site is short and mid grasses including black grama, blue grama, sideoats grama, and mesa dropseed.

Ima

Position on landform: High terrace
Parent material: Loamy alluvium

Typical Profile

Surface layer:
0 to 5 inches—brown, moderately alkaline fine sandy loam
Subsurface layer:
5 to 18 inches—reddish brown, moderately alkaline fine sandy loam
Subsoil:
18 to 26 inches—reddish yellow, moderately alkaline fine sandy loam
26 to 80 inches—light brown, moderately alkaline fine sandy loam

Note: A complete soil description with range in characteristics is included, in alphabetical order, in the "Soil Series and Morphology" section.

Properties and Qualities

Slope: 0 to 2 percent
Percent of area covered by surface fragments: Unspecified
Depth to first restrictive layer: Not present
Slowest soil permeability to 60 inches, above first cemented restrictive layer: 0.6 to 2.0 in/hr (Moderate)
Slowest permeability to 60 inches, within and below first cemented restrictive layer: No restrictive layer
Salinity, representative within 40 inches: Not saline
Salinity, maximum within 40 inches: Not saline
Sodicity, representative within 40 inches: Not sodic
Sodicity, maximum within 40 inches: Not sodic
Representative total available water capacity to 60 inches: About 7.9 inches (Moderate)
Natural drainage class: Well drained
Runoff: 0 to 1 percent slopes—low; 1 to 2 percent slopes—medium
Flooding frequency: Not flooded

Interpretive Groups

Land capability nonirrigated: 6e
Land capability irrigated: None specified
Ecological site name: Sandy Loam (desert Grassland)
Ecological site number: R042XY256TX
Typical vegetation: The natural plant community for this site is short and mid grasses including sideoats grama, cane bluestem, tanglehead, and black grama.

Note: Additional information specific to the components of this map unit is available in the “Tables” section.

Use and Management

Major land uses: Rangeland and wildlife habitat

Rangeland
Major limitations:
- There are no major limitations that affect this use.

Wildlife habitat
Major limitations:
- There are no major limitations that affect this use.

Urban development
Major limitations:
- Seepage limits use for sewage lagoons.

Minor limitations:
- Shallow excavations should be shored to prevent cave-ins.
- The moderate permeability limits use for septic tank absorption fields on Ima soils.

Note: For more information about managing this map unit, see the section on "Soil Properties," and the section on "Use and Management" which includes subsections on "Engineering," "Rangeland," "Recreation," and "Wildlife Habitat."

LRD—Lozier-Rock outcrop complex, 2 to 15 percent slopes

Setting

General location: Southwestern Texas and possibly southern New Mexico
Major land resource area: 42—Southern Desertic Basins, Plains, and Mountains
Landscape: Hills
Elevation: 1,095 to 3,745 feet (335 to 1,143 meters)
Mean annual precipitation: 10 to 15 inches (254 to 381 millimeters)
Mean annual air temperature: 52 to 73 degrees F (11 to 23 degrees C)
Frost-free period: 210 to 240 days

Composition

Lozier and similar soils: 70 percent
Rock outcrop: 20 percent
Contrasting soils: 10 percent

Based on transect data and other field observations of the map unit during the survey, the best estimate is that the Lozier soils and similar soils make up 70 percent, Rock outcrop is 20 percent, and contrasting soils comprise 10 percent of the map unit. Similar soils include soils that have somewhat sandier textures. Contrasting soils are small areas of Pandale soils and shallow soils with weakly cemented sandstone.

Soil Description

Lozier

Position on landform: Divide
Parent material: Residuum weathered from limestone

Typical Profile

Surface layer:
0 to 3 inches—brown, moderately alkaline very gravelly loam

Subsoil:
3 to 9 inches—brown, moderately alkaline very gravelly loam
Underlying material:
9 to 30 inches—indurated, fractured platy limestone bedrock

Note: A complete soil description with range in characteristics is included, in alphabetical order, in the "Soil Series and Morphology" section.

Properties and Qualities

Slope: 2 to 15 percent
Percent of area covered by surface fragments: About 10 percent subrounded cobbles, about 50 percent subrounded gravel
Depth to first restrictive layer: Lithic bedrock: 4 to 20 inches
Slowest soil permeability to 60 inches, above first cemented restrictive layer: 0.6 to 2.0 in/hr (Moderate)
Slowest permeability to 60 inches, within and below first cemented restrictive layer: 0.06 to 0.2 in/hr (Slow)
Salinity, representative within 40 inches: Not saline
Salinity, maximum within 40 inches: Not saline
Sodicity, representative within 40 inches: Not sodic
Sodicity, maximum within 40 inches: Not sodic
Representative total available water capacity to 60 inches: About 0.7 inches (Very low)
Natural drainage class: Well drained
Runoff: 2 to 5 percent slopes—low; 5 to 15 percent slopes—medium
Flooding frequency: None

Interpretive Groups

Land capability nonirrigated: 7s
Land capability irrigated: None specified
Ecological site name: Limestone Hill and Mountain (desert Grassland)
Ecological site number: R042XY249TX
Typical vegetation: The natural plant community for this site is short and mid grasses including sideoats grama, cane bluestem, tanglehead, and black grama. Woody vegetation includes creosotebush, lechuguilla, sotol, Spanish dagger, and tasajillo.

Rock outcrop

Position on landform: None assigned
Parent material: Limestone

Properties and Qualities

Slope: 2 to 15 percent
Percent of area covered by surface fragments: Unspecified
Depth to first restrictive layer: Lithic bedrock: 0 to 2 inches
Slowest soil permeability to 60 inches, above first cemented restrictive layer: Not specified
Slowest permeability to 60 inches, within and below first cemented restrictive layer: 0.00 to 0.06 in/hr (Very slow)
Salinity, representative within 40 inches: Not saline
Salinity, maximum within 40 inches: Not saline
Sodicity, representative within 40 inches: Not sodic
Sodicity, maximum within 40 inches: Not sodic

Representative total available water capacity to 60 inches: About 0.0 (Very low)
Natural drainage class: Not specified
Runoff: Not specified
Flooding frequency: None

Interpretive Groups

Land capability nonirrigated: 8s
Land capability irrigated: None specified
Ecological site name: Not specified
Ecological site number: Not specified
Typical vegetation: Not specified

Note: Additional information specific to the components of this map unit is available in the “Tables” section.

Use and Management

Major land uses: Rangeland and wildlife habitat

Rangeland
Major limitations:
- The amount of rock outcrop, very shallow or shallow rooting depth, and very low available water capacity limit the amount of forage produced.

Minor limitations:
- The very shallow or shallow depth to bedrock limits some types of mechanical range improvements.

Wildlife habitat
Major limitations:
- The very shallow or shallow rooting depth and very low available water capacity limit the amount of wild herbaceous plants and shrubs.

Urban development
Major limitations:
- The depth to hard bedrock limits use for dwellings, commercial buildings, shallow excavations, lawns, landscaping, septic tank absorption fields, sewage lagoons, and landfills.
- Slope limits use for small commercial buildings and sewage lagoons.
- The gravel content and droughtiness limit use for lawns and landscaping.

Minor limitations:
- Slope limits use for homesites, local road and streets, and shallow excavations.

Note: For more information about managing this map unit, see the section on "Soil Properties,” and the section on "Use and Management" which includes subsections on "Engineering,” “Rangeland,” "Recreation,” and "Wildlife Habitat.”

LRG—Lozier-Rock outcrop complex, 15 to 55 percent slopes, very stony

Setting

General location: Southwestern Texas and possibly southern New Mexico
Major land resource area: 42—Southern Desertic Basins, Plains, and Mountains
Landscape: Steep hills
Elevation: 1,095 to 3,745 feet (335 to 1,143 meters)
Mean annual precipitation: 10 to 35 inches (254 to 889 millimeters)
Mean annual air temperature: 52 to 73 degrees F (11 to 23 degrees C)
Frost-free period: 120 to 320 days

Composition

Lozier and similar soils: 60 percent
Rock outcrop: 30 percent
Contrasting soils: 10 percent

Based on transect data and other field observations of the map unit during the survey, the best estimate is that the Lozier soils and similar soils make up 60 percent, Rock outcrop makes up 30 percent, and contrasting soils comprise 10 percent of the map unit. Similar soils include soils that have somewhat sandier textures or have limestone bedrock at depths greater than 20 inches. The majority of the Rock outcrop occurs near the top of the slope as vertical faces and bluffs. Contrasting soils are Pandale, Sanderson, and Upton soils on lower positions.

Soil Description

Lozier

Position on landform: Divide (fig. 10)
Parent material: Residuum weathered from limestone

Typical Profile

Surface layer:
0 to 4 inches—grayish brown, moderately alkaline very gravelly loam
Subsoil:
4 to 13 inches—light brownish gray, moderately alkaline very gravelly loam
Underlying material:
13 to 35 inches—indurated, fractured platy limestone bedrock

Note: A complete soil description with range in characteristics is included, in alphabetical order, in the "Soil Series and Morphology" section.

Figure 10.—Landscape of Lozier-Rock outcrop complex, 15 to 55 percent slopes, very stony. The valley in the background is comprised mainly of Pandale soils.

Properties and Qualities

Slope: 15 to 40 percent
Percent of area covered by surface fragments: About 10 percent subrounded stones, about 35 percent subrounded gravel, about 15 percent subrounded cobbles
Depth to first restrictive layer: Lithic bedrock: 4 to 20 inches
Slowest soil permeability to 60 inches, above first cemented restrictive layer: 0.6 to 2.0 in/hr (Moderate)
Slowest permeability to 60 inches, within and below first cemented restrictive layer: 0.00 to 0.06 in/hr (Very slow)
Salinity, representative within 40 inches: Not saline
Salinity, maximum within 40 inches: Not saline
Sodicity, representative within 40 inches: Not sodic
Sodicity, maximum within 40 inches: Not sodic
Representative total available water capacity to 60 inches: About 1.0 inches (Very low)
Natural drainage class: Well drained
Runoff: 15 to 20 percent—medium; 20 to 40 percent—high
Flooding frequency: None

Interpretive Groups

Land capability nonirrigated: 7s
Land capability irrigated: None specified
Ecological site name: Limestone Hill and Mountain (desert Grassland)
Ecological site number: R042XY249TX
Typical vegetation: The natural plant community for this site is short and mid grasses including sideoats grama, cane bluestem, tanglehead, and black grama. Woody vegetation includes creosotebush, lechuguilla, sotol, Spanish dagger, and tasajillo.

Rock outcrop

Position on landform: None assigned
Parent material: Limestone

Properties and Qualities

Slope: 15 to 55 percent
Percent of area covered by surface fragments: Unspecified
Depth to first restrictive layer: Lithic bedrock: 0 to 2 inches
Slowest soil permeability to 60 inches, above first cemented restrictive layer: Not specified
Slowest permeability to 60 inches, within and below first cemented restrictive layer: 0.06 to 0.2 in/hr (Slow)
Salinity, representative within 40 inches: Not saline
Salinity, maximum within 40 inches: Not saline
Sodicity, representative within 40 inches: Not sodic
Sodicity, maximum within 40 inches: Not sodic
Representative total available water capacity to 60 inches: About 0.0 (Very low)
Natural drainage class: Not specified
Runoff: Not specified
Flooding frequency: None

Interpretive Groups

Land capability nonirrigated: 8s
Land capability irrigated: None specified
Ecological site name: Not specified

Ecological site number: Not specified
Typical vegetation: Not specified

Note: Additional information specific to the components of this map unit is available in the “Tables” section.

Use and Management

Major land uses: Rangeland and wildlife habitat

Rangeland
Major limitations:
- The amount of Rock outcrop, very shallow or shallow rooting depth, and very low available water capacity limit the amount of forage produced.
- The very shallow or shallow depth to bedrock, and slope limit some types of mechanical range improvements.

Minor limitations:
- Slope limits livestock access in some areas.

Wildlife habitat
Major limitations:
- The very shallow or shallow rooting depth and very low available water capacity limit the amount of wild herbaceous plants and shrubs.

Urban development
Major limitations:
- The slope and depth to hard bedrock limit use for dwellings, commercial buildings, shallow excavations, lawns, landscaping, septic tank absorption fields, sewage lagoons, and landfills.
- Slope limits use for small commercial buildings.
- The droughtiness limits use for lawns and landscaping.

Minor limitations:
- The large stone content limits use for homesites, building sites, local roads and streets, and shallow excavations.

Note: For more information about managing this map unit, see the section on "Soil Properties,” and the section on "Use and Management" which includes subsections on "Engineering,” “Rangeland,” "Recreation,” and "Wildlife Habitat."

M-W—Miscellaneous water

Small, constructed water area that is used for industrial, sanitary, or mining applications and contains water most of the year.

MaD—Mailtrail very gravelly clay loam, 1 to 8 percent slopes

Setting

General location: Western and Central Edwards Plateau in Texas
Major land resource area: 81B—Edwards Plateau, Central Part
Landscape: Limestone plateau
Elevation: 1,495 to 2,495 feet (457 to 762 meters)
Mean annual precipitation: 16 to 26 inches (406 to 660 millimeters)
Mean annual air temperature: 64 to 70 degrees F (18 to 21 degrees C)
Frost-free period: 210 to 240 days

Composition

Mailtrail and similar soils: 90 percent

Contrasting soils: 10 percent

Based on transect data and other field observations of the map unit during the survey, the best estimate is that the Mailtrail soils and similar soils make up 90 percent and contrasting soils comprise 10 percent of the map unit. Similar soils include Ozona soils that have more rock fragments, are slightly higher on the landscape, and soils having hard caliche at depths greater than 20 inches. Contrasting soils include Ector soils that are shallow to hard limestone bedrock and higher on the landscape, Texon soils which are slightly higher on the landscape and are deep clayey soils, and Angelo soils which are deep clay loams and slightly lower on the landscape.

Soil Description

Mailtrail

Position on landform: Fan
Parent material: Gravelly loamy alluvium

Typical Profile

Surface layer:
0 to 5 inches—dark grayish brown, moderately alkaline very gravelly clay loam
Subsurface layer:
5 to 12 inches—brown, moderately alkaline extremely cobbly clay loam
Subsoil:
12 to 16 inches—very pale brown, moderately alkaline indurated caliche
16 to 80 inches—pink, moderately alkaline, moderately cemented caliche, with gravelly loam texture

Note: A complete soil description with range in characteristics is included, in alphabetical order, in the "Soil Series and Morphology" section.

Properties and Qualities

Slope: 1 to 8 percent
Percent of area covered by surface fragments: Unspecified
Depth to first restrictive layer: Petrocalcic: 4 to 20 inches
Slowest soil permeability to 60 inches, above first cemented restrictive layer: 0.6 to 2.0 in/hr (Moderate)
Slowest permeability to 60 inches, within and below first cemented restrictive layer: 0.06 to 0.2 in/hr (Slow)
Salinity, representative within 40 inches: Not saline
Salinity, maximum within 40 inches: Not saline
Sodicity, representative within 40 inches: Not sodic
Sodicity, maximum within 40 inches: Not sodic
Representative total available water capacity to 60 inches: About 0.8 inches (Very low)
Natural drainage class: Well drained
Runoff: 1 to 5 percent slopes—low; 5 to 8 percent slopes—medium
Flooding frequency: None

Interpretive Groups

Land capability nonirrigated: 7s
Land capability irrigated: None specified
Ecological site name: Very Shallow PE 25-31
Ecological site number: R081BY353TX

Typical vegetation: The natural plant community for this site is short and mid grasses including sideoats grama, sliver bluestem, and little bluestem. Woody vegetation includes live oak, mesquite, juniper, agarito, and prickly pear.

Note: Additional information specific to the components of this map unit is available in the “Tables” section.

Use and Management

Major land uses: Rangeland and wildlife habitat

Rangeland
Major limitations:
- The very shallow or shallow rooting depth and very low available water capacity limit the amount of forage produced.

Minor limitations:
- The very shallow or shallow depth to bedrock limits some types of mechanical range improvements.

Wildlife habitat
Major limitations:
- The very shallow or shallow rooting depth and very low available water capacity limit the amount of wild herbaceous plants and shrubs.

Urban development
Major limitations:
- The depth to a cemented pan and large stones limit use for dwellings, commercial buildings, shallow excavations, lawns, landscaping, septic tank absorption fields, sewage lagoons, and landfills.
- Shallow excavations should be shored to prevent cave-ins.
- The high carbonate content and droughtiness limit use for lawns.

Note: For more information about managing this map unit, see the section on "Soil Properties,” and the section on "Use and Management" which includes subsections on "Engineering,” “Rangeland,” "Recreation,” and "Wildlife Habitat.”

NoD—Noelke-Ector complex, 0 to 5 percent slopes

Setting

General location: Western Edwards Plateau and Rolling Plains of west central Texas
Major land resource area: 81A—Edwards Plateau, Western Part
Landscape: Dissected plateau
Elevation: 1,600 to 3,500 feet (488 to 1,067 meters)
Mean annual precipitation: 13 to 20 inches (330 to 508 millimeters)
Mean annual air temperature: 64 to 68 degrees F (18 to 20 degrees C)
Frost-free period: 210 to 240 days

Composition

Noelke and similar soils: 60 percent
Ector and similar soils: 30 percent
Contrasting soils: 10 percent

Based on transect data and other field observations of the map unit during the survey, the best estimate is that the Noelke soils and similar soils make up 60 percent of the map unit, 30 percent of the map unit is Ector and similar soils, and contrasting soils comprise 10 percent of the map unit. The soils similar to Noelke and Ector soils include Tarrant soils which are on more sloping areas, soils that

are heavier textured and on flatter areas. Contrasting soils are small areas of loamy or clayey textured soils with limestone at 20 to 40 inches. Tobosa and Angelo soils are lower on the landscape and have clay and clay loam textures. Texon and Ozona soils are slightly higher on the landscape. Texon soils are deep clayey soils, and Ozona soils are shallow to indurated caliche layers.

Soil Description

Noelke

Position on landform: Interfluve backslope on low hill, interfluve summit on low hill, interfluve shoulder on low hill
Parent material: Gravelly loamy residuum weathered from limestone

Typical Profile

Surface layer:
0 to 10 inches—brown, moderately alkaline very gravelly clay loam
Subsoil:
10 to 16 inches—very pale brown, moderately alkaline strongly cemented material
Underlying material:
16 to 30 inches—indurated limestone bedrock

Note: A complete soil description with range in characteristics is included, in alphabetical order, in the "Soil Series and Morphology" section.

Properties and Qualities

Slope: 0 to 5 percent
Percent of area covered by surface fragments: About 19 percent subrounded gravel, about 1 percent cobbles
Depth to first restrictive layer: Petrocalcic: 6 to 20 inches
Lithic bedrock: 12 to 20 inches
Slowest soil permeability to 60 inches, above first cemented restrictive layer: 0.6 to 2.0 in/hr (Moderate)
Slowest permeability to 60 inches, within and below first cemented restrictive layer: 0.06 to 0.2 in/hr (Slow)
Salinity, representative within 40 inches: Not saline
Salinity, maximum within 40 inches: Not saline
Sodicity, representative within 40 inches: Not sodic
Sodicity, maximum within 40 inches: Not sodic
Representative total available water capacity to 60 inches: About 0.9 inches (Very low)
Natural drainage class: Well drained
Runoff: 0 to 1 percent slopes—negligible; 1 to 5 percent slopes—low
Flooding frequency: None

Interpretive Groups

Land capability nonirrigated: 7s
Land capability irrigated: None specified
Ecological site name: Limestone Hill PE 19-25
Ecological site number: R081AY566TX
Typical vegetation: The natural plant community for this site is short and mid grasses including sideoats grama, rough tridens, Texas wintergrass, and cane bluestem.

Ector

Position on landform: Interfluve backslope on low hill, interfluve shoulder on low hill, interfluve summit on low hill

Parent material: Loamy residuum weathered from limestone

Typical Profile

Surface layer:
0 to 11 inches—very dark grayish brown, moderately alkaline very cobbly clay loam
Underlying material:
11 to 30 inches—fractured limestone bedrock

Note: A complete soil description with range in characteristics is included, in alphabetical order, in the "Soil Series and Morphology" section.

Properties and Qualities

Slope: 0 to 5 percent
Percent of area covered by surface fragments: About 5 percent subrounded cobbles, about 30 percent subrounded gravel
Depth to first restrictive layer: Lithic bedrock: 4 to 20 inches
Slowest soil permeability to 60 inches, above first cemented restrictive layer: 0.6 to 2.0 in/hr (Moderate)
Slowest permeability to 60 inches, within and below first cemented restrictive layer: 0.06 to 0.2 in/hr (Slow)
Salinity, representative within 40 inches: Not saline
Salinity, maximum within 40 inches: Not saline
Sodicity, representative within 40 inches: Not sodic
Sodicity, maximum within 40 inches: Not sodic
Representative total available water capacity to 60 inches: About 0.7 inches (Very low)
Natural drainage class: Well drained
Runoff: 0 to 1 percent slopes—negligible; 1 to 5 percent slopes—low
Flooding frequency: None

Interpretive Groups

Land capability nonirrigated: 7s
Land capability irrigated: None specified
Ecological site name: Limestone Hill PE 19-25
Ecological site number: R081AY566TX
Typical vegetation: The natural plant community for this site is short and mid grasses including sideoats grama, cane bluestem, green sprangletop, little bluestem, and yellow indiangrass.

Note: Additional information specific to the components of this map unit is available in the “Tables” section.

Use and Management

Major land uses: Rangeland and wildlife

Rangeland
Major limitations:
- The very shallow or shallow rooting depth and very low available water capacity limit the amount of forage produced.

Minor limitations:
- The very shallow or shallow depth to bedrock limits some types of mechanical range improvements.

Wildlife habitat
Major limitations:
- The very shallow or shallow rooting depth and very low available water capacity limit the amount of wild herbaceous plants and shrubs.

Urban development
Major limitations:
- The depth to a cemented pan and hard bedrock limit use for dwellings, commercial buildings, shallow excavations, lawns, landscaping, septic tank absorption fields, sewage lagoons, and landfills.
- The high carbonate content, large stones, and droughtiness limit use for lawns.
- The high gravel content limits use for daily cover for landfills.

Minor limitations:
- Large stones limit use for homesites, building sites, local roads and streets, shallow excavations, septic tank absorption fields, and landfills.

Note: For more information about managing this map unit, see the section on "Soil Properties," and the section on "Use and Management" which includes subsections on "Engineering," “Rangeland,” "Recreation," and "Wildlife Habitat."

OaC—Ozona-Tarrant complex, 0 to 5 percent slopes

Setting

General location: Western and Central Edwards Plateau of Texas
Major land resource area: 81A—Edwards Plateau, Western Part
Landscape: Limestone plateau
Elevation: 800 to 3,100 feet (244 to 945 meters)
Mean annual precipitation: 15 to 34 inches (381 to 864 millimeters)
Mean annual air temperature: 63 to 70 degrees F (17 to 21 degrees C)
Frost-free period: 210 to 280 days

Composition

Ozona and similar soils: 60 percent
Tarrant and similar soils: 30 Percent
Contrasting soils: 10 percent

Based on transect data and other field observations of the map unit during the survey, the best estimate is that the Ozona soils and similar soils make up 60 percent of the map unit, Tarrant soil and similar soils make up 30 percent, and contrasting soils make up 10 percent of the map unit. Similar soils to Ozona soils include soils deeper than 20 inches to hard caliche. Similar soils to Tarrant soils include soils with less than 15 percent rock fragments. Contrasting soils include clayey soils with limestone bedrock at more than 20 inches. Angelo soils are lower on the landscape and are deep soils. Dev soils are lower on the landscape in drainageways and are gravelly soils.

Soil Description

Ozona

Position on landform: Plain
Parent material: Loamy eolian materials overlying marl and limestone

Typical Profile

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

Subsurface layer:
5 to 18 inches—dark brown, moderately alkaline clay loam
Subsoil:
18 to 25 inches—very pale brown, moderately alkaline indurated caliche
25 to 80 inches—white, moderately alkaline gravelly loam and weakly cemented caliche materials

Note: A complete soil description with range in characteristics is included, in alphabetical order, in the "Soil Series and Morphology" section.

Properties and Qualities

Slope: 0 to 3 percent
Percent of area covered by surface fragments: Unspecified
Depth to first restrictive layer: Petrocalcic: 4 to 20 inches
Slowest soil permeability to 60 inches, above first cemented restrictive layer: 0.6 to 2.0 in/hr (Moderate)
Slowest permeability to 60 inches, within and below first cemented restrictive layer: 0.2 to 0.6 in/hr (Moderately Slow)
Salinity, representative within 40 inches: Not saline
Salinity, maximum within 40 inches: Not saline
Sodicity, representative within 40 inches: Not sodic
Sodicity, maximum within 40 inches: Not sodic
Representative total available water capacity to 60 inches: About 3.3 inches (Low)
Natural drainage class: Well drained
Runoff: 0 to 1 percent slopes—low; 1 to 5 percent slopes—medium
Flooding frequency: None

Interpretive Groups

Land capability nonirrigated: 6s
Land capability irrigated: None specified
Ecological site name: Shallow PE 19-25
Ecological site number: R081AY311TX
Typical vegetation: The natural plant community for this site is short and mid grasses including sideoats grama, little bluestem, Texas wintergrass, and cane bluestem.

Tarrant

Position on landform: Interfluve summit on hill
Parent material: Residuum weathered from limestone

Typical Profile

Surface layer:
0 to 9 inches—very dark gray, moderately alkaline cobbly clay
Subsurface layer:
9 to 16 inches—very dark grayish brown, moderately alkaline cobbly clay
Underlying material:
16 to 24 inches—fractured, indurated limestone bedrock

Note: A complete soil description with range in characteristics is included, in alphabetical order, in the "Soil Series and Morphology" section.

Properties and Qualities

Slope: 1 to 5 percent
Percent of area covered by surface fragments: About 5 percent subangular (shape or size unspecified), about 15 percent subangular cobbles, about 10 percent subangular gravel

Depth to first restrictive layer: Lithic bedrock: 6 to 20 inches
Slowest soil permeability to 60 inches, above first cemented restrictive layer: 0.2 to 0.6 in/hr (Moderately slow)
Slowest permeability to 60 inches, within and below first cemented restrictive layer: 0.06 to 0.2 in/hr (Slow)
Salinity, representative within 40 inches: Not saline
Salinity, maximum within 40 inches: Not saline
Sodicity, representative within 40 inches: Not sodic
Sodicity, maximum within 40 inches: Not sodic
Representative total available water capacity to 60 inches: About 1.3 inches (Very low)
Natural drainage class: Well drained
Runoff: 0 to 1 percent slopes—low; 1 to 5 percent slopes—medium
Flooding frequency: None

Interpretive Groups

Land capability nonirrigated: 7s
Land capability irrigated: None specified
Ecological site name: Low Stony Hill PE 25-31
Ecological site number: R081BY336TX
Typical vegetation: The natural plant community for this site is short and mid grasses including sideoats grama, little bluestem, Texas cupgrass, Texas wintergrass, buffalograss, and yellow indiangrass.

Note: Additional information specific to the components of this map unit is available in the “Tables” section.

Use and Management

Major land uses: Rangeland and wildlife habitat

Rangeland
Major limitations:
- The very low and low available water capacity limit the amount of forage produced.

Minor limitations:
- The very shallow or shallow depth to bedrock in Tarrant soils limits some types of mechanical range improvements.
- The depth to a cemented pan limits some type of mechanical range improvements.

Wildlife habitat
Major limitations:
- The very shallow or shallow rooting depth and very low available water capacity limit the amount of wild herbaceous plants and shrubs on Tarrant soils.
- The very shallow or shallow rooting depth and low available water capacity limit the amount of wild herbaceous plants and shrubs on Ozona soils.

Urban development
Major limitations:
- The depth to a cemented pan limits use for dwellings, commercial buildings, shallow excavations, lawns, landscaping, septic tank absorption fields, sewage lagoons, and landfills on Ozona soils.
- The depth to hard bedrock and large stones limits use for dwellings, commercial buildings, shallow excavations, lawns, landscaping, septic tank absorption fields, sewage lagoons, and landfills on Tarrant soils.
- Low strength limits use for local roads and streets on Ozona soils.

- Droughtiness limits use for lawns on Tarrant soils.
- The high carbonate content limits use for lawns on Ozona soils.
- The clayey textures limit use for landfills and cover for landfill on Tarrant soils.

Minor limitations:

- Shrink-swell potential limits use for homesites, building sites, and local roads and streets on Ozona soils.
- Seepage limits use for sewage lagoons.

Note: For more information about managing this map unit, see the section on "Soil Properties," and the section on "Use and Management" which includes subsections on "Engineering," "Rangeland," "Recreation," and "Wildlife Habitat."

PaD—Paisano very gravelly loam, 1 to 8 percent slopes

Setting

General location: Trans Pecos and western Edwards Plateau of West Texas
Major land resource area: 42—Southern Desertic Basins, Plains, and Mountains
Landscape: Limestone plateau
Elevation: 2,900 to 3,995 feet (884 to 1,219 meters)
Mean annual precipitation: 8 to 14 inches (203 to 356 millimeters)
Mean annual air temperature: 63 to 66 degrees F (17 to 19 degrees C)
Frost-free period: 210 to 260 days

Composition

Paisano and similar soils: 80 percent
Contrasting soils: 20 percent

Based on transect data and other field observations of the map unit during the survey, the best estimate is that the Paisano soils and similar soils make up 80 percent of the map unit, and contrasting soils make up 20 percent. Similar soils include Upton and Conger soils that have less rock fragments and those that have indurated caliche layers at depths greater than 20 inches. Contrasting soils such as Reagan, Rio Diablo, Sanderson, Harkey, and Patrole are lower on the landscape. Reagan soils are loamy soils and are on broad flats. Rio Diablo soils are deep, clayey soils on stream terraces. Harkey and Patrole soils are deep, loamy soils along the Pecos River.

Soil Description

Paisano

Position on landform: Fan remnant
Parent material: Gravelly alluvium

Typical Profile

Surface layer:
0 to 3 inches—brown, moderately alkaline very gravelly loam
Subsoil:
3 to 8 inches—pale brown, moderately alkaline extremely gravelly loam
8 to 17 inches—very pale brown, moderately alkaline indurated caliche
17 to 80 inches—very pale brown, moderately alkaline weakly cemented gravelly loam

Note: A complete soil description with range in characteristics is included, in alphabetical order, in the "Soil Series and Morphology" section.

Properties and Qualities

Slope: 1 to 8 percent
Percent of area covered by surface fragments: Unspecified
Depth to first restrictive layer: Petrocalcic: 7 to 14 inches
Slowest soil permeability to 60 inches, above first cemented restrictive layer: 2.0 to 6.0 in/hr (Moderately rapid)
Slowest permeability to 60 inches, within and below first cemented restrictive layer: 0.00 to 0.06 in/hr (Very slow)
Salinity, representative within 40 inches: Not saline
Salinity, maximum within 40 inches: Not saline
Sodicity, representative within 40 inches: Not sodic
Sodicity, maximum within 40 inches: Not sodic
Representative total available water capacity to 60 inches: About 0.6 inches (Very low)
Natural drainage class: Well drained
Runoff: 1 to 5 percent—very low; 5 to 8 percent—low
Flooding frequency: None

Interpretive Groups

Land capability nonirrigated: 7s
Land capability irrigated: None specified
Ecological site name: Gravelly (desert Grassland)
Ecological site number: R042XY244TX
Typical vegetation: The natural plant community for this site includes black grama, bush muhly, Arizona cottontop, blue grama, and cane bluestem.

Note: Additional information specific to the components of this map unit is available in the “Tables” section.

Use and Management

Major land uses: Rangeland and wildlife habitat

Rangeland
Major limitations:
- The very shallow or shallow rooting depth and very low available water capacity limit the amount of forage produced.

Minor limitations:
- The very shallow or shallow depth to bedrock limits some types of mechanical range improvements.

Wildlife habitat
Major limitations:
- The very shallow or shallow rooting depth and very low available water capacity limit the amount of wild herbaceous plants and shrubs.

Urban development
Major limitations:
- The depth to a cemented pan limits use for dwellings, commercial buildings, shallow excavations, lawns, landscaping, septic tank absorption fields, sewage lagoons, and landfills.
- Shallow excavations should be shored to prevent cave-ins.
- Droughtiness and the high content of gravel limits use for lawns.
- Seepage limits use for sewage lagoons.
- Gravel content and high carbonate content limit use for daily cover for landfills.

Note: For more information about managing this map unit, see the section on "Soil Properties," and the section on "Use and Management" which includes subsections on "Engineering," "Rangeland," "Recreation," and "Wildlife Habitat."

PdB—Pandale gravelly loam, 0 to 3 percent slopes

Setting

General location: Western Edwards Plateau of West Texas
Major land resource area: 81A—Edwards Plateau, Western Part
Landscape: Dissected plateau
Elevation: 1,200 to 2,295 feet (366 to 701 meters)
Mean annual precipitation: 21 to 34 inches (533 to 864 millimeters)
Mean annual air temperature: 64 to 70 degrees F (18 to 21 degrees C)
Frost-free period: 210 to 230 days

Composition

Pandale and similar soils: 80 percent
Contrasting soils: 20 percent

Based on transect data and other field observations of the map unit during the survey, the best estimate is that the Pandale soils and similar soils make up 80 percent of the map unit, and contrasting soils make up 20 percent. Similar soils include Reagan soils on somewhat lower positions and Sanderson soils on higher positions. Another similar soil has hard caliche at more than 40 inches. Contrasting soils include Upton soils on narrow ridges, and Rio Diablo soils on lower positions along drainageways.

Soil Description

Pandale

Position on landform: Alluvial fan, broad alluvial flat
Parent material: Loamy alluvium and reworked eolian sediments

Typical Profile

Surface layer:
0 to 6 inches—brown, moderately alkaline gravelly loam
Subsurface layer:
6 to 16 inches—brown, moderately alkaline gravelly clay loam
Subsoil:
16 to 45 inches—brown, moderately alkaline gravelly clay loam
45 to 61 inches—light brown, moderately alkaline gravelly clay loam
61 to 80 inches—pink, moderately alkaline gravelly clay loam

Note: A complete soil description with range in characteristics is included, in alphabetical order, in the "Soil Series and Morphology" section.

Properties and Qualities

Slope: 0 to 3 percent
Percent of area covered by surface fragments: About 15 percent rounded gravel
Depth to first restrictive layer: Not present
Slowest soil permeability to 60 inches, above first cemented restrictive layer: 0.6 to 2.0 in/hr (Moderate)
Slowest permeability to 60 inches, within and below first cemented restrictive layer: No restrictive layer
Salinity, representative within 40 inches: Not saline

Salinity, maximum within 40 inches: Not saline
Sodicity, representative within 40 inches: Not sodic
Sodicity, maximum within 40 inches: Not sodic
Representative total available water capacity to 60 inches: About 6.0 inches (Moderate)
Natural drainage class: Well drained
Runoff: 0 to 1 percent slopes—negligible; 1 to 3 percent slopes—low
Flooding frequency: None

Interpretive Groups

Land capability nonirrigated: 3e
Land capability irrigated: None specified
Ecological site name: Loamy PE 19-25
Ecological site number: R081AY303TX
Typical vegetation: The natural plant community for this site includes tobosagrass, buffalograss, burrograss, and sideoats grama.

Note: Additional information specific to the components of this map unit is available in the “Tables” section.

Use and Management

Major land uses: Rangeland (fig. 11) and wildlife habitat

Rangeland
Major limitations:

- There are no major limitations that affect this use.

Figure 11.—The foreground depicts Pandale gravelly loam, 0 to 3 percent slopes. The background is Lozier-Rock outcrop complex, 15 to 55 percent slopes, very stony.

Wildlife habitat
Major limitations:
- There are no major limitations that affect this use.

Urban development
Major limitations:
- Shallow excavations should be shored to prevent cave-ins.
- The carbonate content limits use for lawns and daily cover for landfills.

Minor limitations:

The moderate permeability and seepage limit use for septic tank absorption fields and sewage lagoons.

Note: For more information about managing this map unit, see the section on "Soil Properties," and the section on "Use and Management" which includes subsections on "Engineering," “Rangeland,” "Recreation," and "Wildlife Habitat."

PoC—Pandale-Upton complex, 0 to 5 percent slopes

Setting

General location: Western Edwards Plateau of West Texas
Major land resource area: 81A—Edwards Plateau, Western Part
Landscape: Dissected plateau
Elevation: 1,095 to 3,995 feet (335 to 1,219 meters)
Mean annual precipitation: 7 to 17 inches (178 to 432 millimeters)
Mean annual air temperature: 61 to 70 degrees F (16 to 21 degrees C)
Frost-free period: 210 to 240 days

Composition

Pandale and similar soils: 80 percent
Contrasting soils: 20 percent

Based on transect data and other field observations of the map unit during the survey, the best estimate is that the Pandale soils and similar soils make up 80 percent of the map unit, and contrasting soils make up 20 percent. Similar soils include Reagan soils on lower positions and Sanderson on higher positions. Another similar soil has hard caliche at more than 40 inches. Contrasting soils include Upton soils on narrow ridges, and Rio Diablo lower on the landscape along drainageways.

Soil Description

Pandale

Position on landform: Alluvial fan, broad alluvial flat
Parent material: Loamy alluvium and reworked eolian sediments

Typical Profile

Surface layer:
0 to 6 inches—brown, moderately alkaline gravelly loam
Subsurface layer:
6 to 16 inches—brown, moderately alkaline gravelly clay loam
Subsoil:
16 to 45 inches—brown, moderately alkaline gravelly clay loam
45 to 61 inches—light brown, moderately alkaline gravelly clay loam
61 to 80 inches—pink, moderately alkaline gravelly clay loam

Note: A complete soil description with range in characteristics is included, in alphabetical order, in the "Soil Series and Morphology" section.

Properties and Qualities

Slope: 0 to 3 percent
Percent of area covered by surface fragments: About 30 percent subrounded gravels
Depth to first restrictive layer: Not present
Slowest soil permeability to 60 inches, above first cemented restrictive layer: 0.6 to 2.0 in/hr (Moderate)
Slowest permeability to 60 inches, within and below first cemented restrictive layer: No restrictive layer
Salinity, representative within 40 inches: Not saline
Salinity, maximum within 40 inches: Not saline
Sodicity, representative within 40 inches: Not sodic
Sodicity, maximum within 40 inches: Not sodic
Representative total available water capacity to 60 inches: About 6.0 inches (Moderate)
Natural drainage class: Well drained
Runoff: 0 to 1 percent slopes—negligible; 1 to 3 percent slopes—low
Flooding frequency: None

Interpretive Groups

Land capability nonirrigated: 6e
Land capability irrigated: 2e
Ecological site name: Loamy PE 19-25
Ecological site number: R081AY303TX
Typical vegetation: The natural plant community for this site includes tobosagrass, buffalograss, burrograss, and sideoats grama.

Upton

Position on landform: Incised valley, piedmont slopes valley
Parent material: Loamy alluvium derived from limestone

Typical Profile

Surface layer:
0 to 8 inches—grayish brown, moderately alkaline gravelly loam
Subsoil:
8 to 14 inches—pinkish white, moderately alkaline strongly cemented caliche
14 to 80 inches—very pale brown, moderately alkaline very gravelly loam

Note: A complete soil description with range in characteristics is included, in alphabetical order, in the "Soil Series and Morphology" section.

Properties and Qualities

Slope: 1 to 5 percent
Percent of area covered by surface fragments: About 15 percent (shape or size unspecified), about 8 percent (shape or size unspecified), about 5 percent (shape or size unspecified), about 2 percent (shape or size unspecified)
Depth to first restrictive layer: Petrocalcic: 7 to 20 inches
Slowest soil permeability to 60 inches, above first cemented restrictive layer: 0.6 to 2.0 in/hr (Moderate)
Slowest permeability to 60 inches, within and below first cemented restrictive layer: 0.06 to 0.2 in/hr (Slow)
Salinity, representative within 40 inches: Not saline
Salinity, maximum within 40 inches: Not saline

Sodicity, representative within 40 inches: Not sodic
Sodicity, maximum within 40 inches: Not sodic
Representative total available water capacity to 60 inches: About 0.9 inches (Very low)
Natural drainage class: Well drained
Runoff: 0 to 1 percent slopes—negligible; 1 to 3 percent slopes—low
Flooding frequency: None

Interpretive Groups

Land capability nonirrigated: 7s
Land capability irrigated: None specified
Ecological site name: Gravelly PE 19-25
Ecological site number: R081AY296TX
Typical vegetation: The natural plant community for this site includes black grama, bush muhly, blue grama, burrograss, and sideoats grama.

Note: Additional information specific to the components of this map unit is available in the “Tables” section.

Use and Management

Major land uses: Rangeland and wildlife habitat

Rangeland
Major limitations:
- The very shallow or shallow rooting depth and very low available water capacity limit the amount of forage produced on Upton soils.

Wildlife habitat
Major limitations:
- The very shallow or shallow rooting depth and very low available water capacity limit the amount of wild herbaceous plants and shrubs on Upton soils.

Urban development
Major limitations:
- The depth to a cemented pan limits use for dwellings, commercial buildings, shallow excavations, lawns, landscaping, septic tank absorption fields, sewage lagoons, and landfills on Upton soils.
- Shallow excavations should be shored to prevent cave-ins.
- Droughtiness and carbonate content limit use for lawns on Upton soils.
- The carbonate content limits use for lawns and daily cover for landfills on Pandale soils.

Minor limitations:
- Seepage limits use for sewage lagoons.
- The moderate permeability limits use for septic tank absorption fields on Pandale soils.

Note: For more information about managing this map unit, see the section on "Soil Properties,” and the section on "Use and Management" which includes subsections on "Engineering,” “Rangeland,” "Recreation,” and "Wildlife Habitat.”

RaB—Reagan silty clay loam, 0 to 2 percent slopes

Setting

General location: Western Edwards Plateau of West Texas
Major land resource area: 81A—Edwards Plateau, Western Part
Landscape: Plateau

Elevation: 1,495 to 3,995 feet (457 to 1,219 meters)
Mean annual precipitation: 13 to 17 inches (330 to 432 millimeters)
Mean annual air temperature: 61 to 70 degrees F (16 to 21 degrees C)
Frost-free period: 210 to 240 days

Composition

Reagan and similar soils: 85 percent
Contrasting soils: 15 percent

Based on transect data and other field observations of the map unit during the survey, the best estimate is that the Reagan soils and similar soils make up 85 percent of the map unit, and contrasting soils make up 15 percent. Similar soils include Pandale soils on somewhat higher positions and Sanderson soils on higher positions. Another similar soil has hard caliche at more than 40 inches. Contrasting soils include Upton soils on narrow ridges, and Rio Diablo soils on lower positions along drainageways.

Soil Description

Reagan

Position on landform: Plain
Parent material: Loamy alluvium

Typical Profile

Surface layer:
0 to 8 inches—brown, moderately alkaline silty clay loam
Subsoil:
8 to 20 inches—brown, moderately alkaline silty clay loam
20 to 30 inches—light brown, moderately alkaline silty clay loam
30 to 41 inches—light brown, moderately alkaline silty clay loam
41 to 80 inches—yellowish red, moderately alkaline silty clay loam

Note: A complete soil description with range in characteristics is included, in alphabetical order, in the "Soil Series and Morphology" section.

Properties and Qualities

Slope: 0 to 2 percent
Percent of area covered by surface fragments: Unspecified
Depth to first restrictive layer: Not present
Slowest soil permeability to 60 inches, above first cemented restrictive layer: 0.6 to 2.0 in/hr (Moderate)
Slowest permeability to 60 inches, within and below first cemented restrictive layer: No restrictive layer
Salinity, representative within 40 inches: Not saline
Salinity, maximum within 40 inches: Not saline
Sodicity, representative within 40 inches: Not sodic
Sodicity, maximum within 40 inches: Sodic
Representative total available water capacity to 60 inches: About 7.9 inches (Moderate)
Natural drainage class: Well drained
Runoff: 0 to 1 percent slopes—negligible; 1 to 2 percent slopes—low
Flooding frequency: None

Interpretive Groups

Land capability nonirrigated: 6e
Land capability irrigated: 2e

Ecological site name: Loamy PE 19-25
Ecological site number: R081AY303TX
Typical vegetation: The natural plant community for this site includes tobosagrass, buffalograss, burrograss, and sideoats grama.

Note: Additional information specific to the components of this map unit is available in the “Tables” section.

Use and Management

Major land uses: Rangeland and wildlife habitat

Rangeland
Major limitations:
- There are no major limitations that affect this use.

Wildlife habitat
Major limitations:
- There are no major limitations that affect this use.

Urban development
Major limitations:
- Low strength limits use for roads and streets.

Minor limitations:
- Shrink-swell potential limits use for homesites, building sites, and local roads and streets.
- Seepage and moderate permeability limit use for septic tank absorption fields and sewage lagoons.

Note: For more information about managing this map unit, see the section on "Soil Properties,” and the section on "Use and Management" which includes subsections on "Engineering,” “Rangeland,” "Recreation,” and "Wildlife Habitat.”

RdB—Rio Diablo silty clay loam, 0 to 2 percent slopes, rarely flooded

Setting

General location: Western Edwards Plateau of West Texas
Major land resource area: 81A—Edwards Plateau, Western Part
Landscape: Dissected plateau
Dissected river valley
Elevation: 1,495 to 2,295 feet (457 to 701 meters)
Mean annual precipitation: 15 to 22 inches (381 to 559 millimeters)
Mean annual air temperature: 66 to 70 degrees F (19 to 21 degrees C)
Frost-free period: 230 to 260 days

Composition

Rio Diablo and similar soils: 80 percent
Contrasting soils: 20 percent

Based on transect data and other field observations of the map unit during the survey, the best estimate is that the Rio Diablo soils and similar soils make up 80 percent of the map unit, and contrasting soils make up 20 percent. Similar soils include Reagan soils on somewhat lower positions and Sanderson soils on higher positions. Another similar soil has hard caliche at more than 40 inches. Contrasting soils include Upton soils on narrow ridges, and Rio Diablo soils on lower positions along drainageways.

Soil Description

Rio Diablo

Position on landform: Draw, step flood plain
Parent material: Calcareous alluvium derived from limestone

Typical Profile

Surface layer:
0 to 3 inches—grayish brown, moderately alkaline silty clay loam
Subsurface layer:
3 to 10 inches—grayish brown, moderately alkaline silty clay loam
Subsoil:
10 to 80 inches—light brown, moderately alkaline silty clay loam

Note: A complete soil description with range in characteristics is included, in alphabetical order, in the "Soil Series and Morphology" section.

Properties and Qualities

Slope: 0 to 2 percent
Percent of area covered by surface fragments: Unspecified
Depth to first restrictive layer: Not present
Slowest soil permeability to 60 inches, above first cemented restrictive layer: 0.02 to 0.06 in/hr (Moderately slow)
Slowest permeability to 60 inches, within and below first cemented restrictive layer: No restrictive layer
Salinity, representative within 40 inches: Not saline
Salinity, maximum within 40 inches: Not saline
Sodicity, representative within 40 inches: Not sodic
Sodicity, maximum within 40 inches: Not sodic
Representative total available water capacity to 60 inches: About 10.5 inches (High)
Natural drainage class: Well drained
Runoff: 0 to 1 percent—medium; 1 to 2 percent—high
Flooding frequency: Rare

Interpretive Groups

Land capability nonirrigated: 3c
Land capability irrigated: 2e
Ecological site name: Clay Loam PE 19-25
Ecological site number: R081AY291TX
Typical vegetation: The natural plant community for this site includes sideoats grama, vine mesquite, yellow indiangrass, Arizona cottontop, and silver bluestem.

Note: Additional information specific to the components of this map unit is available in the “Tables” section.

Use and Management

Major land uses: Rangeland and wildlife habitat

Rangeland
Major limitations:
- There are no major limitations that affect this use.

Wildlife habitat
Major limitations:
- There are no major limitations that affect this use.

Urban development
Major limitations:
- The severe hazard of flooding limits use for homesites, building sites, and shallow excavations.
- Shrink-swell potential limits use for homesites, building sites, and local roads and streets.
- The slow permeability limits use for septic tank absorption fields.

Minor limitations:
- The hazard of flooding limits use for local roads and streets, septic tank absorption fields, and landfills.

Note: For more information about managing this map unit, see the section on "Soil Properties," and the section on "Use and Management" which includes subsections on "Engineering," “Rangeland,” "Recreation," and "Wildlife Habitat."

RoB—Rioconcho silty clay, 0 to 2 percent slopes, occasionally flooded

Setting

General location: Rolling Plains and Edwards Plateau of Texas
Major land resource area: 81A—Edwards Plateau, Western Part
Landscape: Dissected plateau; dissected river valley
Elevation: 1,400 to 2,495 feet (427 to 762 meters)
Mean annual precipitation: 15 to 26 inches (381 to 660 millimeters)
Mean annual air temperature: 57 to 68 degrees F (14 to 20 degrees C)
Frost-free period: 210 to 240 days

Composition

Rioconcho and similar soils: 80 percent
Contrasting soils: 20 percent

Based on transect data and other field observations of the map unit during the survey, the best estimate is that the Rioconcho soils and similar soils make up 80 percent of the map unit, and contrasting soils make up 20 percent. Similar soils include Reagan soils on somewhat lower positions and Sanderson soils on higher positions. Another similar soil has hard caliche at more than 40 inches. Contrasting soils include Upton soils on narrow ridges, and Rio Diablo on lower positions along drainageways.

Soil Description

Rioconcho

Position on landform: Draw or step flood plain
Parent material: Silty or clayey alluvium

Typical Profile

Surface layer:
0 to 24 inches—very dark grayish brown, moderately alkaline silty clay
Subsoil:
24 to 42 inches—brown, moderately alkaline silty clay loam
42 to 80 inches—light brown, moderately alkaline clay loam

Note: A complete soil description with range in characteristics is included, in alphabetical order, in the "Soil Series and Morphology" section.

Properties and Qualities

Slope: 0 to 2 percent
Percent of area covered by surface fragments: Unspecified
Depth to first restrictive layer: Not present
Slowest soil permeability to 60 inches, above first cemented restrictive layer: 0.06 to 0.2 in/hr (Slow)
Slowest permeability to 60 inches, within and below first cemented restrictive layer: No restrictive layer
Salinity, representative within 40 inches: Saline
Salinity, maximum within 40 inches: Saline
Sodicity, representative within 40 inches: Not sodic
Sodicity, maximum within 40 inches: Not sodic
Representative total available water capacity to 60 inches: About 8.9 inches (Moderate)
Natural drainage class: Moderately well drained
Runoff: 0 to 1 percent—high; 1 to 2 percent—very high
Flooding frequency: Occasional

Interpretive Groups

Land capability nonirrigated: 2w
Land capability irrigated: 2w
Ecological site name: Loamy Bottomland PE 19-25
Ecological site number: R081AY306TX
Typical vegetation: The natural plant community for this site includes sideoats grama, Canada wildrye, silver bluestem, vine mesquite, yellow indiangrass, and Texas wintergrass.

Note: Additional information specific to the components of this map unit is available in the “Tables” section.

Use and Management

Major land uses: Rangeland and wildlife habitat

Rangeland
Major limitations:
- There are no major limitations that affect this use.

Wildlife habitat
Major limitations:
- There are no major limitations that affect this use.

Urban development
Major limitations:
- The severe hazard of flooding and shrink-swell potential limits use for homesites, building sites, local roads and streets, septic tank absorption fields, sewage lagoons, and landfills.
- Low strength limits use for roads and streets.
- The salinity content and clayey nature of the soil limit use for lawns and landscaping.
- The very slow permeability limits use for septic tank absorption fields.

Minor limitations:
- The hazard of flooding and the clayey nature of the soil limits use for shallow excavations.
- The hazard of flooding limits use for lawns and landscaping.

Note: For more information about managing this map unit, see the section on "Soil Properties," and the section on "Use and Management" which includes subsections on "Engineering," "Rangeland," "Recreation," and "Wildlife Habitat."

RVB—Riverwash and Dev soils, 0 to 3 percent slopes, frequently flooded

Setting

General location: Western and central parts of the Edwards Plateau and southeastern New Mexico
Major land resource area: 81A—Edwards Plateau, Western Part
Landscape: Dissected river valley
Elevation: 600 to 3,145 feet (183 to 960 meters)
Mean annual precipitation: 8 to 35 inches (203 to 889 millimeters)
Mean annual air temperature: 61 to 70 degrees F (16 to 21 degrees C)
Frost-free period: 210 to 300 days

Composition

Riverwash: 60 percent
Dev and similar soils: 30 percent
Contrasting soils: 10 percent

Based on transect data and other field observations of the map unit during the survey, the best estimate is that Riverwash soils make up about 60 percent, Dev soils and similar soils make up 30 percent of the map unit, and contrasting soils make up 10 percent of the map unit. Similar soils to Dev soils include those that may not be as gravelly or have thicker nongravelly surfaces. Contrasting soils include Rioconcho, Iraan, and soils on higher positions that are occasionally flooded.

Soil Description

Riverwash

Position on landform: Channel
Parent material: Gravelly alluvium derived from limestone

Properties and Qualities

Slope: 0 to 2 percent
Percent of area covered by surface fragments: Unspecified
Depth to first restrictive layer: Not present
Slowest soil permeability to 60 inches, above first cemented restrictive layer: 6.0 to 20 in/hr (Rapid)
Slowest permeability to 60 inches, within and below first cemented restrictive layer: No restrictive layer
Salinity, representative within 40 inches: Not saline
Salinity, maximum within 40 inches: Not saline
Sodicity, representative within 40 inches: Not sodic
Sodicity, maximum within 40 inches: Not sodic
Representative total available water capacity to 60 inches: About 1.8 inches (Very low)
Natural drainage class: Excessively drained
Runoff: Negligible
Flooding frequency: Frequent

Interpretive Groups

Land capability nonirrigated: 8w
Land capability irrigated: None specified
Ecological site name: Not specified
Ecological site number: Not specified
Typical vegetation: Not specified

Dev

Position on landform: Draw, flood plain
Parent material: Gravelly loamy alluvium derived from limestone

Typical Profile

Surface layer:
0 to 7 inches—very dark grayish brown, moderately alkaline very gravelly loam
Subsurface layer:
7 to 18 inches—very dark grayish brown, moderately alkaline extremely gravelly loam
Subsoil:
18 to 28 inches—dark brown, moderately alkaline very gravelly loam
28 to 65 inches—brown, moderately alkaline very gravelly loam
Underlying material:
65 to 80 inches—dark yellowish brown, moderately alkaline extremely gravelly loam

Note: A complete soil description with range in characteristics is included, in alphabetical order, in the "Soil Series and Morphology" section.

Properties and Qualities

Slope: 0 to 3 percent
Percent of area covered by surface fragments: Unspecified
Depth to first restrictive layer: Not present
Slowest soil permeability to 60 inches, above first cemented restrictive layer: 2.0 to 6.0 in/hr (Moderately rapid)
Slowest permeability to 60 inches, within and below first cemented restrictive layer: No restrictive layer
Salinity, representative within 40 inches: Not saline
Salinity, maximum within 40 inches: Not saline
Sodicity, representative within 40 inches: Not sodic
Sodicity, maximum within 40 inches: Not sodic
Representative total available water capacity to 60 inches: About 4.6 inches (Low)
Natural drainage class: Well drained
Runoff: 0 to 1 percent slopes—negligible; 1 to 3 percent slopes—very low
Flooding frequency: Frequent

Interpretive Groups

Land capability nonirrigated: 6w
Land capability irrigated: None specified
Ecological site name: Draw PE 19-25
Ecological site number: R081AY292TX
Typical vegetation: The natural plant community on this site is short and mid grasses with woody vegetation along the stream channel. Grasses include sideoats grama, cane bluestem, vine mesquite and buffalograss. Woody vegetation included juniper, mesquite, hackberry, Texas persimmon, Arizona black walnut, cacti, and sachuawista.

Note: Additional information specific to the components of this map unit is available in the “Tables” section.

Use and Management

Major land uses: Rangeland and wildlife habitat

Rangeland
Major limitations:
- The very low and low available water capacity limits the amount of forage produced.

Wildlife habitat
Major limitations:
- The very low and low available water capacity limits production of wild herbaceous plants and shrubs.

Urban development
Major limitations:
- The severe hazard of flooding limits use for homesites, building sites, shallow excavations, local roads and streets, lawns, septic tank absorption fields, sewage lagoons, and landfills.
- Shallow excavations should be shored to prevent cave-ins.
- Droughtiness, carbonate content, gravel content, and large stones limit use for lawns.
- Seepage and poor filtering capacity limit use for septic tank absorption fields.

Note: For more information about managing this map unit, see the section on "Soil Properties," and the section on "Use and Management" which includes subsections on "Engineering," “Rangeland,” "Recreation," and "Wildlife Habitat.'"

SuD—Sanderson-Upton complex, 1 to 8 percent slopes

Setting

General location: West Texas (MLRA 81 and 42) and southern New Mexico
Major land resource area: 81A—Edwards Plateau, Western Part
Landscape: Dissected plateau
Elevation: 1,095 to 3,995 feet (335 to 1,219 meters)
Mean annual precipitation: 7 to 20 inches (178 to 508 millimeters)
Mean annual air temperature: 61 to 70 degrees F (16 to 21 degrees C)
Frost-free period: 210 to 260 days

Composition

Sanderson and similar soils: 60 percent
Upton and similar soils: 30 percent
Contrasting soils: 10 percent

Based on transect data and other field observations of the map unit during the survey, the best estimate is that Sanderson soils make up about 60 percent, Upton soils and similar soils make up 30 percent, and contrasting soils make up 10 percent of the map unit. Soils similar to Upton are Paisano soils which contain more gravels and soils similar to Sanderson having a darker surface. Contrasting soils include Reagan, Dev, and Iraan soils. These soils are lower on the landscape. Reagan is a silty soil on broad flats, Dev is a gravelly soil along major drainageways. Iraan is a deep, clayey soil on flood plains.

Soil Description

Sanderson

Position on landform: Incised valley, piedmont slopes valley

Parent material: Loamy alluvium derived from limestone

Typical Profile

Surface layer:
0 to 7 inches—pale brown, moderately alkaline gravelly loam
Subsoil:
7 to 21 inches—light yellowish brown, moderately alkaline very gravelly clay loam
21 to 31 inches—brownish yellow, moderately alkaline very gravelly clay loam
31 to 53 inches—light brown, moderately alkaline very gravelly clay loam
Underlying material:
53 to 80 inches—light brown, moderately alkaline very gravelly loam

Note: A complete soil description with range in characteristics is included, in alphabetical order, in the "Soil Series and Morphology" section.

Properties and Qualities

Slope: 1 to 8 percent
Percent of area covered by surface fragments: About 54 percent subrounded gravel, about 1 percent subrounded cobbles
Depth to first restrictive layer: Not present
Slowest soil permeability to 60 inches, above first cemented restrictive layer: 0.6 to 2.0 in/hr (Moderate)
Slowest permeability to 60 inches, within and below first cemented restrictive layer: No restrictive layer
Salinity, representative within 40 inches: Not saline
Salinity, maximum within 40 inches: Not saline
Sodicity, representative within 40 inches: Not sodic
Sodicity, maximum within 40 inches: Not sodic
Representative total available water capacity to 60 inches: About 4.9 inches (Low)
Natural drainage class: Well drained
Runoff: 1 to 5 percent slopes—low; 5 to 8 percent slopes—medium
Flooding frequency: None

Interpretive Groups

Land capability nonirrigated: 6s
Land capability irrigated: None specified
Ecological site name: Gravelly PE 19-25
Ecological site number: R081AY296TX
Typical vegetation: Not specified

Upton

Position on landform: Incised valley or piedmont valley plains
Parent material: Loamy alluvium derived from limestone

Typical Profile

Surface layer:
0 to 7 inches—brown, moderately alkaline gravelly loam
Subsoil:
7 to 14 inches—pale brown, moderately alkaline gravelly loam
14 to 20 inches—very pale brown, moderately alkaline indurated caliche
20 to 80 inches—very pale brown, moderately alkaline weakly cemented loamy caliche and marl

Note: A complete soil description with range in characteristics is included, in alphabetical order, in the "Soil Series and Morphology" section.

Properties and Qualities

Slope: 1 to 8 percent
Percent of area covered by surface fragments: About 20 percent (shape or size unspecified), about 20 percent (shape or size unspecified), about 5 percent (shape or size unspecified), about 1 percent (shape or size unspecified)
Depth to first restrictive layer: Petrocalcic: 7 to 20 inches
Slowest soil permeability to 60 inches, above first cemented restrictive layer: 0.6 to 2.0 in/hr (Moderate)
Slowest permeability to 60 inches, within and below first cemented restrictive layer: 0.06 to 0.2 in/hr (Slow)
Salinity, representative within 40 inches: Not saline
Salinity, maximum within 40 inches: Not saline
Sodicity, representative within 40 inches: Not sodic
Sodicity, maximum within 40 inches: Not sodic
Representative total available water capacity to 60 inches: About 0.9 inches (Very low)
Natural drainage class: Well drained
Runoff: 1 to 5 percent slopes—low; 5 to 8 percent slopes—medium
Flooding frequency: None

Interpretive Groups

Land capability nonirrigated: 7s
Land capability irrigated: None specified
Ecological site name: Gravelly PE 19-25
Ecological site number: R081AY296TX
Typical vegetation: The natural plant community on this site is short and mid grasses. Grasses include black grama, bush muhly, blue grama, burrograss, and sideoats grama.

Note: Additional information specific to the components of this map unit is available in the “Tables” section.

Use and Management

Major land uses: Rangeland and wildlife habitat

Rangeland
Major limitations:
- The very low and low available water capacity limits the amount of forage produced.

Wildlife habitat
Major limitations:
- The very low and low available water capacity limits production of wild herbaceous plants and shrubs.

Urban development
Major limitations:
- The depth to a cemented pan limits use for dwellings, commercial buildings, shallow excavations, lawns, landscaping, septic tank absorption fields, sewage lagoons, and landfills on Upton soils.
- Shallow excavations should be shored to prevent cave-ins.
- Droughtiness, gravel content, and the carbonate content limit use for lawns.
- Seepage limits use for sewage lagoons on Sanderson soils.
- The gravel content and carbonate content limit use for daily cover for landfills.

Minor limitations:

- Slope limits use for sewage lagoons.
- Seepage limits use for sewage lagoons on Upton soils.

Note: For more information about managing this map unit, see the section on "Soil Properties," and the section on "Use and Management" which includes subsections on "Engineering," “Rangeland,” "Recreation," and "Wildlife Habitat."

ToB—Texon-Ozona complex, 0 to 3 percent slopes

Setting

General location: Western and Central Edwards Plateau of Texas
Major land resource area: 81A—Edwards Plateau, Western Part
Landscape: Plateau
Elevation: 1,000 to 2,495 feet (305 to 762 meters)
Mean annual precipitation: 16 to 28 inches (406 to 711 millimeters)
Mean annual air temperature: 64 to 70 degrees F (18 to 21 degrees C)
Frost-free period: 220 to 240 days

Composition

Texon and similar soils: 60 percent
Ozona and similar soils: 30 percent
Contrasting soils: 10 percent

Based on transect data and other field observations of the map unit during the survey, the best estimate is that Texon soils make up about 60 percent, Ozona soils and similar soils make up 30 percent, and contrasting soils make up 10 percent of the map unit. Soils similar to Texon include Angelo, Irion, and Tobosa soils. Angelo soils are deep clay loam soils and lower on the landscape. Irion soils are underlain by limestone at depths greater than 60 inches and Tobosa soils are similar, but are not underlain by limestone. Contrasting soils are Noelke and Ector soils which are underlain by limestone at depths less than 20 inches and generally lower on the landscape.

Soil Description

Texon

Position on landform: Plain
Parent material: Eolian sediments overlying marl and limestone

Typical Profile

Surface layer:
0 to 2 inches—grayish brown, moderately alkaline silt loam
Subsoil:
2 to 18 inches—brown, moderately alkaline silty clay
18 to 34 inches—light brown, moderately alkaline clay
34 to 46 inches—pink, moderately alkaline clay
46 to 80 inches—white, moderately alkaline clay

Note: A complete soil description with range in characteristics is included, in alphabetical order, in the "Soil Series and Morphology" section.

Properties and Qualities

Slope: 0 to 3 percent
Percent of area covered by surface fragments: Unspecified
Depth to first restrictive layer: Not present

Slowest soil permeability to 60 inches, above first cemented restrictive layer: 0.001 to 0.06 in/hr (Very slow)
Slowest permeability to 60 inches, within and below first cemented restrictive layer: No restrictive layer
Salinity, representative within 40 inches: Saline
Salinity, maximum within 40 inches: Saline
Sodicity, representative within 40 inches: Not sodic
Sodicity, maximum within 40 inches: Not sodic
Representative total available water capacity to 60 inches: About 9.9 inches (High)
Natural drainage class: Well drained
Runoff: 0 to 1 percent—high; 1 to 3 percent—very high
Flooding frequency: None

Interpretive Groups

Land capability nonirrigated: 2e
Land capability irrigated: None specified
Ecological site name: Clay Loam PE 19-25
Ecological site number: R081AY291TX
Typical vegetation: The natural plant community on this site is short and mid grasses. Grasses include Texas wintergrass, buffalograss, dropseed, sideoats grama, silver bluestem, vine mesquite, white tridens, and yellow indiangrass.

Ozona

Position on landform: Plain
Parent material: Marl derived from limestone

Typical Profile

Surface layer:
0 to 10 inches—brown, moderately alkaline silty clay loam
Subsoil:
10 to 16 inches—brown, moderately alkaline silty clay loam
16 to 24 inches—very pale brown, moderately alkaline indurated caliche
24 to 80 inches—very pale brown, moderately alkaline weakly cemented calcareous loamy materials

Note: A complete soil description with range in characteristics is included, in alphabetical order, in the "Soil Series and Morphology" section.

Properties and Qualities

Slope: 0 to 3 percent
Percent of area covered by surface fragments: Unspecified
Depth to first restrictive layer: Petrocalcic: 6 to 20 inches
Slowest soil permeability to 60 inches, above first cemented restrictive layer: 0.2 to 0.6 in/hr (Moderately slow)
Slowest permeability to 60 inches, within and below first cemented restrictive layer: 0.06 to 0.2 in/hr (Slow)
Salinity, representative within 40 inches: Not saline
Salinity, maximum within 40 inches: Not saline
Sodicity, representative within 40 inches: Not sodic
Sodicity, maximum within 40 inches: Not sodic
Representative total available water capacity to 60 inches: About 3.1 inches (Low)
Natural drainage class: Well drained
Runoff: 0 to 1 percent slopes—low; 1 to 3 percent slopes—medium
Flooding frequency: None

Interpretive Groups

Land capability nonirrigated: 3e
Land capability irrigated: None specified
Ecological site name: Shallow PE 19-25
Ecological site number: R081AY311TX
Typical vegetation: The natural plant community for this site is short and mid grasses including sideoats grama, little bluestem, Texas wintergrass, buffalograss, cane bluestem, and curly mesquite.

Note: Additional information specific to the components of this map unit is available in the “Tables” section.

Use and Management

Major land uses: Rangeland and wildlife habitat

Rangeland
Major limitations:
- There are no major limitations that affect this use on Texon soils.
- The low available water capacity limits the amount of forage produced on Ozona soils.

Wildlife habitat
Major limitations:
- There are no major limitations that affect this use on Texon soils.
- The very low available water capacity limits production of wild herbaceous plants and shrubs on Ozona soils.

Urban development
Major limitations:
- The shrink-swell potential limits use for homesites, building sites, and local roads and streets on Texon soils.
- Low strength limits use for local roads and streets.
- Salinity limits use for lawns on Texon soils.
- The very slow permeability limits use for septic tank absorption fields on Texon soils.
- The clayey textures and difficulty in compaction limit use for daily cover for landfills on Texon soils.
- The depth to a cemented pan limits use for dwellings, commercial buildings, shallow excavations, lawns, landscaping, septic tank absorption fields, sewage lagoons, and landfills on Ozona soils.
- The carbonate content limits use for lawns on Ozona soils.

Minor limitations:
- Shrink-swell potential limits use for homesites, building sites, local roads and streets on Ozona soils.
- Seepage and clayey textures limit use for landfills and daily cover for landfills on Ozona soils.

Note: For more information about managing this map unit, see the section on "Soil Properties,” and the section on "Use and Management" which includes subsections on "Engineering,” “Rangeland,” "Recreation,” and "Wildlife Habitat.”

TRD—Tarrant-Rock outcrop complex, 1 to 15 percent slopes

Setting

General location: West central Texas and Oklahoma, mostly in Central and West Texas Edwards Plateau
Major land resource area: 81B—Edwards Plateau, Central Part
Landscape: Dissected plateau
Elevation: 800 to 3,100 feet (244 to 945 meters)
Mean annual precipitation: 10 to 35 inches (254 to 889 millimeters)
Mean annual air temperature: 52 to 73 degrees F (11 to 23 degrees C)
Frost-free period: 120 to 320 days

Composition

Tarrant and similar soils: 60 percent
Rock outcrop: 30 percent
Contrasting soils: 10 percent

Based on transect data and other field observations of the map unit during the survey, the best estimate is that Tarrant soils and similar soils make up about 60 percent, Rock outcrop make up 30 percent, and contrasting soils make up 10 percent of the map unit. Similar soils include Noelke and Ector soils which are loamier and generally higher on the landscape. Other similar soils are noncalcareous above the limestone bedrock. Contrasting soils such as Mailtrail and Pandale soils are lower on the landscape. Mailtrail soils are loamy and underlain by indurated caliche layers at less than 20 inches and Pandale soils are deep, loamy and gravelly soils.

Soil Description

Tarrant

Position on landform: Side slope or shoulder on ridge
Parent material: Residuum weathered from limestone

Typical Profile

Surface layer:
0 to 8 inches—very dark gray, moderately alkaline very cobbly silty clay
Underlying material:
8 to 30 inches—fractured, indurated limestone bedrock

Note: A complete soil description with range in characteristics is included, in alphabetical order, in the "Soil Series and Morphology" section.

Properties and Qualities

Slope: 1 to 15 percent
Percent of area covered by surface fragments: About 5 percent subrounded boulders, about 10 percent subrounded stones, about 10 percent subrounded cobbles, about 25 percent subrounded gravel
Depth to first restrictive layer: Lithic bedrock: 4 to 20 inches
Slowest soil permeability to 60 inches, above first cemented restrictive layer: 0.2 to 0.6 in/hr (Moderately slow)
Slowest permeability to 60 inches, within and below first cemented restrictive layer: 0.06 to 0.2 in/hr (Slow)
Salinity, representative within 40 inches: Not saline
Salinity, maximum within 40 inches: Not saline
Sodicity, representative within 40 inches: Not sodic

Sodicity, maximum within 40 inches: Not sodic
Representative total available water capacity to 60 inches: About 0.6 inches (Very low)
Natural drainage class: Well drained
Runoff: 1 to 5 percent slopes—low; 5 to 8 percent slopes—medium
Flooding frequency: None

Interpretive Groups

Land capability nonirrigated: 7s
Land capability irrigated: None specified
Ecological site name: Low Stony Hill PE 25-31
Ecological site number: R081BY336TX
Typical vegetation: The natural plant community for this site is short and mid grasses including sideoats grama, little bluestem, Texas cupgrass, and Texas wintergrass.

Rock outcrop

Position on landform: Side slope shoulder on ridge
Parent material: Limestone

Properties and Qualities

Slope: 1 to 15 percent
Percent of area covered by surface fragments: Unspecified
Depth to first restrictive layer: Lithic bedrock: 0 to 2 inches
Slowest soil permeability to 60 inches, above first cemented restrictive layer: Not specified
Slowest permeability to 60 inches, within and below first cemented restrictive layer: 0.06 to 0.2 in/hr (Slow)
Salinity, representative within 40 inches: Not saline
Salinity, maximum within 40 inches: Not saline
Sodicity, representative within 40 inches: Not sodic
Sodicity, maximum within 40 inches: Not sodic
Representative total available water capacity to 60 inches: About 0.0 (Very low)
Natural drainage class: Not specified
Runoff: Not specified
Flooding frequency: None

Interpretive Groups

Land capability nonirrigated: 8s
Land capability irrigated: None specified
Ecological site name: Not specified
Ecological site number: Not specified
Typical vegetation: Not specified

Note: Additional information specific to the components of this map unit is available in the “Tables” section.

Use and Management

Major land uses: Rangeland and wildlife habitat

Rangeland
Major limitations:
- The very shallow or shallow rooting depth and very low available water capacity limit the amount of forage produced.
- The large amount of Rock outcrop limits the amount of forage produced.

Wildlife habitat
Major limitations:
- The very shallow or shallow rooting depth and very low available water capacity limit the amount of wild herbaceous plants and shrubs.
- The large amount of Rock outcrop limits the amount of wild herbaceous plants and shrubs.

Urban development
Major limitations:
- The depth to hard bedrock and large stones limits use for dwellings, commercial buildings, shallow excavations, lawns, landscaping, septic tank absorption fields, sewage lagoons, and landfills.
- Low strength limits use for local roads and streets.
- Droughtiness limits use for lawns and landscaping.
- Slope limits use for building sites and sewage lagoons.
- The clayey texture limits use for landfills and daily cover for landfills.

Minor limitations:
- Shrink-swell potential limits use for homesites.

Note: For more information about managing this map unit, see the section on "Soil Properties," and the section on "Use and Management" which includes subsections on "Engineering," “Rangeland,” "Recreation," and "Wildlife Habitat."

TRG—Tarrant-Rock outcrop complex, 15 to 40 percent slopes

Setting

General location: West central Texas and Oklahoma, mostly in Central and West Texas Edwards Plateau
Major land resource area: 81B—Edwards Plateau, Central Part
Landscape: Dissected plateau
Elevation: 800 to 3,100 feet (244 to 945 meters)
Mean annual precipitation: 10 to 35 inches (254 to 889 millimeters)
Mean annual air temperature: 52 to 73 degrees F (11 to 23 degrees C)
Frost-free period: 120 to 320 days

Composition

Tarrant and similar soils: 60 percent
Rock outcrop: 30 percent
Contrasting soils: 10 percent

Based on transect data and other field observations of the map unit during the survey, the best estimate is that Tarrant soils and similar soils make up about 60 percent, Rock outcrop makes up 30 percent, and contrasting soils make up 10 percent of the map unit. Similar soils include Noelke and Ector soils, which are loamier and generally higher on the landscape. Other similar soils are noncalcareous above the limestone bedrock. Contrasting soils such as Mailtrail and Pandale soils are lower on the landscape. Mailtrail soils are loamy and underlain by indurated caliche layers at less than 20 inches. Pandale soils are deep, loamy and gravelly soils.

Soil Description

Tarrant

Position on landform: Side slope backslope on ridge; side slope footslope on ridge; base slope backslope on ridge; base slope footslope on ridge

Parent material: Residuum weathered from limestone

Typical Profile

Surface layer:
0 to 13 inches—very dark grayish brown, moderately alkaline very cobbly clay
Underlying material:
13 to 30 inches—fractured, indurated limestone bedrock

Note: A complete soil description with range in characteristics is included, in alphabetical order, in the "Soil Series and Morphology" section.

Properties and Qualities

Slope: 15 to 40 percent
Percent of area covered by surface fragments: About 20 percent subrounded stones, about 30 percent subrounded cobbles, about 40 percent subrounded gravel
Depth to first restrictive layer: Lithic bedrock: 4 to 20 inches
Slowest soil permeability to 60 inches, above first cemented restrictive layer: 0.2 to 0.6 in/hr (Moderately slow)
Slowest permeability to 60 inches, within and below first cemented restrictive layer: 0.06 to 0.2 in/hr (Slow)
Salinity, representative within 40 inches: Not saline
Salinity, maximum within 40 inches: Not saline
Sodicity, representative within 40 inches: Not sodic
Sodicity, maximum within 40 inches: Not sodic
Representative total available water capacity to 60 inches: About 1.0 inches (Very low)
Natural drainage class: Well drained
Runoff: 15 to 20 percent—high; 20 to 40 percent—very high
Flooding frequency: None

Interpretive Groups

Land capability nonirrigated: 7s
Land capability irrigated: None specified
Ecological site name: Steep Rocky PE 25-31
Ecological site number: R081BY349TX
Typical vegetation: The natural plant community for this site is short and mid grasses including little bluestem, silver bluestem, sideoats grama, and yellow indiangrass.

Rock outcrop

Position on landform: Side slope backslope on ridge; side slope footslope on ridge; base slope backslope on ridge; base slope footslope on ridge
Parent material: Limestone

Properties and Qualities

Slope: 15 to 40 percent
Percent of area covered by surface fragments: Unspecified
Depth to first restrictive layer: Lithic bedrock: 0 to 2 inches
Slowest soil permeability to 60 inches, above first cemented restrictive layer: Not specified
Slowest permeability to 60 inches, within and below first cemented restrictive layer: 0.06 to 0.2 in/hr (Slow)
Salinity, representative within 40 inches: Not saline
Salinity, maximum within 40 inches: Not saline
Sodicity, representative within 40 inches: Not sodic
Sodicity, maximum within 40 inches: Not sodic

Representative total available water capacity to 60 inches: About 0.0 (Very low)
Natural drainage class: Not specified
Runoff: Not specified
Flooding frequency: None

Interpretive Groups

Land capability nonirrigated: 8s
Land capability irrigated: None specified
Ecological site name: Not specified
Ecological site number: Not specified
Typical vegetation: Not specified

Note: Additional information specific to the components of this map unit is available in the “Tables” section.

Use and Management

Major land uses: Rangeland and wildlife habitat

Rangeland
Major limitations:
- The very shallow or shallow rooting depth and very low available water capacity limit the amount of forage produced.
- The large amount of Rock outcrop limits the amount of forage produced.

Minor limitations:
- Slope limits access by livestock to some areas.

Wildlife habitat
Major limitations:
- The very shallow or shallow rooting depth and very low available water capacity limit the amount of wild herbaceous plants and shrubs.
- The large amount of Rock outcrop limits the amount of wild herbaceous and shrubs.

Urban development
Major limitations:
- The depth to hard bedrock, slope, and large stone content limit use for dwellings, commercial buildings, shallow excavations, lawns, landscaping, septic tank absorption fields, sewage lagoons, and landfills.
- The clayey textures limit use for landfills and daily cover for landfills.

Note: For more information about managing this map unit, see the section on "Soil Properties,” and the section on "Use and Management" which includes subsections on "Engineering,” “Rangeland,” "Recreation,” and "Wildlife Habitat.”

TsB—Tobosa clay, 0 to 2 percent slopes

Setting

General location: Edwards Plateau and Rolling Plains of Texas
Major land resource area: 81A—Edwards Plateau, Western Part
Landscape: Plateau
Elevation: 1,495 to 2,495 feet (457 to 762 meters)
Mean annual precipitation: 15 to 21 inches (381 to 533 millimeters)
Mean annual air temperature: 63 to 70 degrees F (17 to 21 degrees C)
Frost-free period: 215 to 235 days

Composition

Tobosa and similar soils: 80 percent
Contrasting soils: 20 percent

Based on transect data and other field observations of the map unit during the survey, the best estimate is that Tobosa soils and similar soils make up about 80 percent, and contrasting soils make up 20 percent of the map unit. Similar soils include Irion soils in shallow depressions, and Texon soils on slightly higher positions on the landscape. Contrasting soils are Noelke and Ector soils which are higher on the landscape and underlain by limestone at less than 20 inches. Ozona soils are underlain by indurated caliche layers at less than 20 inches.

Soil Description

Tobosa

Position on landform: Flat plain
Parent material: Calcareous clayey materials

Typical Profile

Surface layer:
0 to 15 inches—brown, moderately alkaline clay
Subsoil:
15 to 80 inches—brown, moderately alkaline clay

Note: A complete soil description with range in characteristics is included, in alphabetical order, in the "Soil Series and Morphology" section.

Properties and Qualities

Slope: 0 to 2 percent
Percent of area covered by surface fragments: Unspecified
Depth to first restrictive layer: Not present
Slowest soil permeability to 60 inches, above first cemented restrictive layer: 0.001 to 0.06 in/hr (Very slow)
Slowest permeability to 60 inches, within and below first cemented restrictive layer: No restrictive layer
Salinity, representative within 40 inches: Not saline
Salinity, maximum within 40 inches: Not saline
Sodicity, representative within 40 inches: Not sodic
Sodicity, maximum within 40 inches: Not sodic
Representative total available water capacity to 60 inches: About 8.4 inches (Moderate)
Natural drainage class: Well drained
Runoff: 0 to 1 percent—high; 1 to 2 percent—very high
Flooding frequency: None

Interpretive Groups

Land capability nonirrigated: 3e
Land capability irrigated: None specified
Ecological site name: Clay Flat PE 19-25
Ecological site number: R081AY290TX
Typical vegetation: The natural plant community for this site is short and mid grasses including sideoats grama, tobosagrass, Arizona cottontop, silver bluestem, and vine mesquite.

Note: Additional information specific to the components of this map unit is available in the “Tables” section.

Use and Management

Major land uses: Rangeland and wildlife habitat

Rangeland
Major limitations:
- There are no major limitations that affect this use.

Wildlife habitat
Major limitations:
- There are no major limitations that affect this use.

Urban development
Major limitations:
- The high shrink-swell potential limits use for homesites, building sites, local roads and streets, and shallow excavations.
- Low strength limits use for roads and streets.
- The clayey nature of the soil limits use for lawns, landscaping, and cover for landfills.
- The very slow permeability limits use for septic tank absorption fields.
- Shallow excavations should be shored to prevent cave-ins.

Minor limitations:
- The clayey nature of the soil limits use for shallow excavations.

Note: For more information about managing this map unit, see the section on "Soil Properties," and the section on "Use and Management" which includes subsections on "Engineering," “Rangeland,” "Recreation," and "Wildlife Habitat."

UpD—Upton gravelly loam, 1 to 8 percent slopes

Setting

General location: West Texas (MLRA 81 and 42) and southern New Mexico
Major land resource area: 81A—Edwards Plateau, Western Part
Landscape: Dissected plateau
Elevation: 1,095 to 3,995 feet (335 to 1,219 meters)
Mean annual precipitation: 7 to 13 inches (178 to 330 millimeters)
Mean annual air temperature: 61 to 70 degrees F (16 to 21 degrees C)
Frost-free period: 210 to 240 days

Composition

Upton and similar soils: 80 percent
Contrasting soils: 20 percent

Based on transect data and other field observations of the map unit during the survey, the best estimate is that Upton soils and similar soils make up about 80 percent, and contrasting soils make up 20 percent of the map unit. Similar soils include Paisano soils that are more gravelly than Upton. Contrasting soils include Ector soils which are higher on the landscape and underlain by limestone bedrock at less than 20 inches. Reagan and Pandale soils are lower on the landscape. Pandale soils are deep gravelly loams on gentle slopes, and Reagan soils are silt loams on broad flats.

Soil Description

Upton

Position on landform: Incised valley or piedmont valley slopes
Parent material: Loamy alluvium derived from limestone

Typical Profile

Surface layer:
0 to 7 inches—brown, moderately alkaline gravelly loam
Subsoil:
7 to 14 inches—pale brown, moderately alkaline gravelly loam
14 to 20 inches—very pale brown, moderately alkaline caliche
20 to 80 inches—very pale brown, moderately alkaline weakly cemented loamy caliche and marl

Note: A complete soil description with range in characteristics is included, in alphabetical order, in the "Soil Series and Morphology" section.

Properties and Qualities

Slope: 1 to 8 percent
Percent of area covered by surface fragments: About 2 percent (shape or size unspecified), about 5 percent (shape or size unspecified), about 15 percent (shape or size unspecified), about 8 percent (shape or size unspecified)
Depth to first restrictive layer: Petrocalcic: 7 to 20 inches
Slowest soil permeability to 60 inches, above first cemented restrictive layer: 0.6 to 2.0 in/hr (Moderate)
Slowest permeability to 60 inches, within and below first cemented restrictive layer: 0.06 to 0.2 in/hr (Slow)
Salinity, representative within 40 inches: Not saline
Salinity, maximum within 40 inches: Not saline
Sodicity, representative within 40 inches: Not sodic
Sodicity, maximum within 40 inches: Not sodic
Representative total available water capacity to 60 inches: About 1.6 inches (Very low)
Natural drainage class: Well drained
Runoff: 1 to 5 percent slopes—medium; 5 to 8 percent slopes—high
Flooding frequency: None

Interpretive Groups

Land capability nonirrigated: 7s
Land capability irrigated: None specified
Ecological site name: Gravelly PE 19-25
Ecological site number: R081AY296TX
Typical vegetation: The natural plant community on this site is short and mid grasses. Grasses include black grama, bush muhly, blue grama, burrograss, and sideoats grama.

Note: Additional information specific to the components of this map unit is available in the “Tables” section.

Use and Management

Major land uses: Rangeland and wildlife habitat

Rangeland
Major limitations:

- The very shallow or shallow rooting depth and very low available water capacity limit the amount of forage produced.

Wildlife habitat
Major limitations:
- The very shallow or shallow rooting depth and very low available water capacity limit the amount of wild herbaceous plants and shrubs.

Urban development
Major limitations:
- The depth to a cemented pan limits use for dwellings, commercial buildings, shallow excavations, lawns, landscaping, septic tank absorption fields, sewage lagoons, and landfills.
- Droughtiness and carbonate content limit use for lawns and landscaping.
- The carbonate content limits use for cover for landfills.

Minor limitations:
- Slope limits use for sewage lagoons.

Note: For more information about managing this map unit, see the section on "Soil Properties," and the section on "Use and Management" which includes subsections on "Engineering," "Rangeland," "Recreation," and "Wildlife Habitat."

W—Water

These areas are natural or constructed bodies of surface water.

WkB—Wickett loamy fine sand, 0 to 3 percent slopes

Setting

General location: Western Texas in the Trans-Pecos and southwestern High Plains, and possibly southeastern New Mexico
Major land resource area: 42—Southern Desertic Basins, Plains, and Mountains
Landscape: Limestone plateau
Elevation: 2,295 to 3,500 feet (701 to 1,067 meters)
Mean annual precipitation: 10 to 16 inches (254 to 406 millimeters)
Mean annual air temperature: 63 to 68 degrees F (17 to 20 degrees C)
Frost-free period: 210 to 240 days

Composition

Wickett and similar soils: 85 percent
Contrasting soils: 15 percent

Based on transect data and other field observations of the map unit during the survey, the best estimate is that Wickett soils and similar soils make up 85 percent of the map unit, and contrasting soils make up 15 percent. Similar soils include Conger and Upton soils which are loamier, have more gravel, and are less than 20 inches to hard caliche. Contrasting soils are small areas of Kinco and Ima soils that are deep, sandy soils without an indurated caliche layer and occur on lower positions.

Soil Description

Wickett

Position on landform: Eolian plain
Parent material: Loamy eolian deposits

Typical Profile

Surface layer:
0 to 9 inches—brown, neutral loamy fine sand
Subsoil:
9 to 31 inches—yellowish red, moderately alkaline fine sandy loam
Underlying material:
31 to 34 inches—white fractured, moderately alkaline weakly cemented caliche
34 to 80 inches—very pale brown, moderately alkaline gravelly fine sandy loam

Note: A complete soil description with range in characteristics is included, in alphabetical order, in the "Soil Series and Morphology" section.

Properties and Qualities

Slope: 0 to 3 percent
Percent of area covered by surface fragments: Unspecified
Depth to first restrictive layer: Petrocalcic: 20 to 40 inches
Slowest soil permeability to 60 inches, above first cemented restrictive layer: 2.0 to 6.0 in/hr (Moderately rapid)
Slowest permeability to 60 inches, within and below first cemented restrictive layer: 0.00 to 0.06 in/hr (Very slow)
Salinity, representative within 40 inches: Not saline
Salinity, maximum within 40 inches: Not saline
Sodicity, representative within 40 inches: Not sodic
Sodicity, maximum within 40 inches: Not sodic
Representative total available water capacity to 60 inches: About 3.6 inches (Low)
Natural drainage class: Well drained
Runoff: 0 to 1 percent slopes—negligible; 1 to 3 percent slopes—very low
Flooding frequency: None

Interpretive Groups

Land capability nonirrigated: 6e
Land capability irrigated: 4e
Ecological site name: Loamy Sand (desert Grassland)
Ecological site number: R042XY251TX
Typical vegetation: The natural plant community for this site is short and mid grasses including little bluestem, black grama, giant dropseed, plains bristlegrass, and sand bluestem.

Note: Additional information specific to the components of this map unit is available in the “Tables” section.

Use and Management

Major land uses: This soil is primarily used for rangeland and wildlife habitat.

Rangeland
Major limitations:
- The low available water capacity limits the amount of forage produced.

Wildlife habitat
Major limitations:
- The low available water capacity limits production of wild herbaceous plants and shrubs.

Urban development
Major limitations:

- The depth to a cemented pan limits use for septic tank absorption fields, sewage lagoons, and landfills.
- Seepage limits use for sewage lagoons.

Minor limitations:

- The depth to a cemented pan limits use for homesites, shallow excavations, lawns, and landscaping.

Note: For more information about managing this map unit, see the section on "Soil Properties," and the section on "Use and Management" which includes subsections on "Engineering," “Rangeland,” "Recreation," and "Wildlife Habitat."

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. In addition, 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 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, and lawns.

Interpretive Ratings

The interpretive tables in this survey rate the soils in the survey area for various uses. Many of the tables identify the limitations that affect specified uses and indicate the severity of those limitations. The ratings in these tables are both verbal and numerical.

Rating Class Terms

Rating classes are expressed in the tables in terms that indicate the extent to which the soils are limited by all of the soil features that affect a specified use or in terms that indicate the suitability of the soils for the use. Thus, the tables may show limitation classes or suitability classes. Terms for the limitation classes are *not limited, somewhat limited,* and *very limited*. The suitability ratings are expressed as *well suited, moderately suited, poorly suited,* and *unsuited* or as *good, fair,* and *poor*.

Numerical Ratings

Numerical ratings in the tables indicate the relative severity of individual limitations. The ratings are shown as decimal fractions ranging from 0.00 to 1.00. They indicate gradations between the point at which a soil feature has the greatest negative impact on the use and the point at which the soil feature is not a limitation.

The limitations appear in order from the most limiting to the least limiting. Thus, if more than one limitation is identified, the most severe limitation is listed first and the least severe one is listed last.

Land Capability Classification

Land capability classification shows, in a general way, the suitability of soils for most kinds of field crops. Crops that require special management are excluded. The soils are grouped according to their limitations for field crops, the risk of damage if they are used for crops, and the way they respond to management. The criteria used in grouping the soils do not include major and generally expensive landforming that would change slope, depth, or other characteristics of the soils, nor do they include possible but unlikely major reclamation projects. Capability classification is not a substitute for interpretations designed to show suitability and limitations of groups of soils for rangeland, for forestland, or for engineering purposes. Capability classes are listed for each map unit in the section “Detailed Soil Map Units”.

In the capability system, soils are generally grouped at three levels—capability class, subclass, and unit (15).

Capability classes, the broadest groups, are designated by the numbers 1 through 8. The numbers indicate progressively greater limitations and narrower choices for practical use. The classes are defined as follows:

Class 1 soils have slight limitations that restrict their use.

Class 2 soils have moderate limitations that restrict the choice of plants or that require moderate conservation practices.

Class 3 soils have severe limitations that restrict the choice of plants or that require special conservation practices, or both.

Class 4 soils have very severe limitations that restrict the choice of plants or that require very careful management, or both.

Class 5 soils are subject to little or no erosion but have other limitations, impractical to remove, that restrict their use mainly to pasture, rangeland, forestland, or wildlife habitat.

Class 6 soils have severe limitations that make them generally unsuitable for cultivation and that restrict their use mainly to pasture, rangeland, forestland, or wildlife habitat.

Class 7 soils have very severe limitations that make them unsuitable for cultivation and that restrict their use mainly to grazing, forestland, or wildlife habitat.

Class 8 soils and miscellaneous areas have limitations that preclude commercial plant production and that restrict their use to recreational purposes, wildlife habitat, watershed, or esthetic purposes.

Capability subclasses are soil groups within one class. They are designated by adding a small letter, *e, w, s,* or *c,* to the class numeral, for example, 2e. The letter *e* shows that the main hazard is the risk of erosion unless close-growing plant cover is maintained; *w* shows that water in or on the soil interferes with plant growth or cultivation (in some soils the wetness can be partly corrected by artificial drainage); *s* shows that the soil is limited mainly because it is shallow, droughty, or stony; and *c*, used in only some parts of the United States, shows that the chief limitation is climate that is very cold or very dry.

In class 1, there are no subclasses because the soils of this class have few limitations. Class 5 contains only the subclasses indicated by *w, s,* or *c* because the soils in class 5 are subject to little or no erosion. They have other limitations that restrict their use to pasture, rangeland, forestland, wildlife habitat, or recreation.

Capability units are soil groups within a subclass. The soils in a capability unit are enough alike to be suited to the same crops and pasture plants, to require similar management, and to have similar productivity. Capability units are generally designated by adding an Arabic numeral to the subclass symbol, for example, 2e-4 and 3e-6. These units are not given in all soil surveys.

Rangeland

Rangeland is land on which the native vegetation (the climax plant community) is predominantly grasses, grasslike plants, forbs, shrubs, and trees. Rangeland receives no regular or frequent cultural treatment. The composition and production of the natural plant community is determined mainly by soil, climate, and topography. The management needed to conserve soil and water resources and improve production includes balancing livestock numbers with forage production and rotating livestock to allow desirable plants to improve vigor, produce seed, and establish seedlings.

Most of the land area of Crockett County is used for grazing of livestock (fig. 12) and for use as wildlife habitat. Most ranches are cow-calf operations that produce stocker calves for fall delivery. When additional forage is produced, stocker calves may be raised for later markets. Wildlife habitat as a land use is discussed in the "Wildlife Habitat" section.

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 an ecological site, sometimes called a range site. Many different kinds of ecological sites occur in the survey area.

An *ecological site* for rangeland is a distinctive kind of land with specific physical characteristics that makes it different from other kinds of land in its ability to produce a distinctive kind and amount of vegetation (a characteristic plant community). Rangeland ecological sites generally can be determined directly from the soil map. Soil properties that affect moisture supply and plant nutrients have the greatest influence on the productivity of plants. Soil reaction, salt content, and a seasonal high water table are also important. The "Field Office Technical Guide" can provide specific information about ecological sites. This guide is available at local offices of the Natural Resources Conservation Service or online at http://www.nrcs.usda.gov/technical/efotg,

Figure 12.—A herd of Angora goats on an area of Tarrant-Rock outcrop Complex, 1 to 15 percent slopes. Crockett County is a major producer of wool and mohair in Texas.

Over historical time, the combination of plants best suited to a particular soil and climate became dominant. If the soil is not excessively disturbed, this group of plants is the historic climax plant community for the site. Historic climax plant communities are not static but vary slightly from year to year and place to place.

Nearly all plant communities have undergone changes over time. Many years of continuous livestock grazing, the absence of fire, the invasion of plants that were not originally in the plant community, and climatic events, such as major droughts, have all interacted to affect changes in the vegetation on rangeland.

Abnormal disturbances that change the historic climax plant community include repeated overuse by livestock, excessive burning, erosion, and plowing. Grazing animals select the most palatable plants. These plants will eventually die if they are continually grazed at a severity that does not allow for recovery. Under these conditions, less desirable plants, such as annuals and weed-like plants can increase. Usually, these degradation processes (also called retrogression) take place over many years. If the plant community and soils have not degraded significantly, high quality native plants may return, with proper grazing management.

The Natural Resources Conservation Service and other agencies assist landowners in identifying problems and concerns, as well as opportunities to maintain or improve their rangeland resources. A rangeland ecological site may be evaluated by three distinct methods: similarity index, rangeland trend, and rangeland health.

A similarity index is a comparison of the present plant community to the historic climax plant community. A similarity index is the percentage, by weight, of historic climax vegetation that is found in the present plant community. This index provides an indication of past disturbance as well as potential for improvement.

Rangeland trend determinations assess the direction of change occurring in the present plant community compared to the historic climax plant community. The plant community may be either moving toward or away from the historic climax plant community. This rating provides information regarding the direction of change in the plant community in response to present management.

Rangeland health is a determination of how the ecological processes on a rangeland ecological site are functioning. Ecological processes evaluated include water cycle, nutrient cycle, and energy flow.

How rangeland is managed affects forage production, species composition, plant health, and the ability of the vegetation to protect the soil. Rangeland management requires knowledge of the kinds of soil and of the historic climax plant community. Effective range management conserves rainfall, enhances water quality, reduces the hazard of downstream flooding, improves yields, provides forage for livestock and wildlife, enhances recreational opportunities, and protects the soil.

The primary range management practices used in Crockett County include prescribed grazing, stock-water developments, and fences. If undesirable plants become dominant, range seeding, brush management, or prescribed burning are commonly used. Other range management concerns include fire suppression, invasion of woody species, perennial grasses, and forbs.

Ecological Sites

Knowledge of the ecological site is necessary as a basis for planning and applying the management needed to maintain or improve the desired plant community for selected uses. Such information is needed to support management objectives, develop planned grazing systems and stocking rates, determine suitable wildlife management practices, evaluate the potential for recreational uses, and determine the condition of watersheds.

Ecological sites in the Trans-Pecos Land Resource Area are grouped according to vegetative zones. The ecological sites in the Trans-Pecos part of the survey are in the Desert Grassland vegetative zone. Ecological sites in the Edwards Plateau Land

Resource Area are in Western Edwards Plateau PE Zone 19-25 and Central Edwards Plateau PE Zone 25-31.

Growth of native vegetation in Crockett County is quite variable because of large variations in annual and seasonal rainfall. Droughts are very common. Low, inconsistent rainfall combined with high evaporation rates cause a depletion in soil moisture with a corresponding decrease in forage production. Grazing management should be flexible and closely correlated to plant growth curves and to fluctuations in seasonal and annual forage production.

A typical growth curve for native vegetation representing the percentage of total growth occurring each month for the Desert Grassland and Edwards Plateau vegetative zones would be:

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	2	3	7	20	30	15	5	10	4	2	1

These growth curves show that approximately 72 percent of the annual production of forage occurs in the months of April through July responding to the spring and early summer rains.

Table 5 lists each soil that supports rangeland vegetation; the ecological site and the total dry-weight production of vegetation in favorable, normal, and unfavorable years. An ecological site and the assigned vegetative or climatic zone is indicated for each soil.

An *ecological site* is the product of all the environmental factors responsible for its development. It has characteristic soils that have developed over time throughout the soil development process; a characteristic hydrology, particularly infiltration and runoff that has developed over time; and a characteristic plant community (kind and amount of vegetation). The hydrology of the site is influenced by development of the soil and plant community. The vegetation, soils, and hydrology are all interrelated. Each is influenced by the others and influences the development of the others. The plant community on an ecological site is typified by an association of species that differs from that of other ecological sites in the kind and/or proportion of species or in total production. Descriptions of ecological sites are provided in the Field Office Technical Guide, which is available in local offices of the Natural Resources Conservation Service or online at http://www.nrcs.usda.gov/technical/efotg.

Total dry-weight production is the amount of vegetation that can be expected to grow annually in a well managed area that is supporting the potential natural plant community. It includes all vegetation, whether or not it is palatable to grazing animals. It includes the current year's growth of leaves, twigs, and fruits of woody plants. It does not include the increase in stem diameter of trees and shrubs. It is expressed in pounds per acre of air-dry vegetation for favorable, normal, and unfavorable years. In a favorable year, the amount and distribution of precipitation and the temperatures make growing conditions substantially better than average. In a normal year, growing conditions are about average. In an unfavorable year, growing conditions are well below average, generally because of low available soil moisture. Yields are adjusted to a common percent of air-dry moisture content.

Crockett County is divided into two major land resource areas: Edwards Plateau and Trans-Pecos. The Edwards Plateau Land Resource Area is broken into two subregions: Western Edwards Plateau and Central Edwards Plateau. There are 12 ecological sites within these areas. The Trans-Pecos Land Resource Area is divided into six vegetative zones, with only one of the zones, the Desert Grassland vegetative zone, occurring in Crockett County. There are six ecological sites within this area.

A general description is given for each subregion or vegetative zone followed by a description of each ecological site within that zone. The composition of the climax plant community is given for each site. A brief description of what happens to the plant community under retrogression is also explained.

Western Edwards Plateau

The Western Edwards Plateau land resource area comprises at least 95 percent of the county. The climate and soils support a climax vegetation of mid and short grasses and an abundant variety of forbs and shrubs.

The climax vegetation is primarily such mid grasses as sideoats grama, cane bluestem, Arizona cottontop, plains bristlegrass, and black grama. Other dominant perennials include orange zexmenia, bushsunflower, Indian mallow, hackberry, butterflybush, and fourwing saltbush. Much of this resource area has been invaded by woody species such as mesquite on the deeper soils and junipers on the shallow, rough, rocky areas.

Clay Flat Ecological Site—This site is situated low in the landscape and may or may not receive extra water. The site is normally found on top of the divide. The site is normally very flat. Runoff on this site when the soils is dry if very low because water runs into open cracks; when cracks are swelled shut, runoff may be very high if vegetation is sparse. These soils have high moisture holding capacity. Aquifer recharge from these soils is negligible since the existing plant community normally takes advantage of available soil moisture.

The climax plant community, which was somewhat influenced by fire, consists of up to 40 percent tobosagrass; 25 percent sideoats grama, cane bluestem, vine mesquite, Arizona cottontop, Texas cupgrass, and plains bristlegrass. Buffalograss and curly mesquite made up approximately 10 percent of the total production on the site. Other grasses that would have occurred on the site were Hall panicum, fall witchgrass, and Texas wintergrass. Perennial forbs comprised approximately percent of the total production. Ruellia species, Engelmann daisy, bundleflower, croton species, verbena species, and other perennial and annual forbs would be present. Ephedra, fourwing saltbush and butterfly bush accounted for up to 5 percent of total production.

Under continuous heavy grazing, sideoats grama, cane bluestem, vine mesquite and Arizona cottontop would disappear from the site and be replace by tobosagrass, buffalograss and curly mesquite. As further degradation occurs, the site is dominated by mesquite, prickly pear and annual forbs, such as broomweed. Tobosagrass will be present though production may be greatly reduced.

Clay Loam Ecological Site—This site is usually situated relatively low in the landscape (fig. 13) and may or may not receive extra water. In Crockett County, this site can be found on top of the divides in association with the Clay Flat ecological site. It is also located in defined drainages occurring up from the Draw and Loamy Bottomland ecological sites. The soils have high moisture holding capacity and may contribute to aquifer recharge, but usually do not because the existing plant community takes advantage of available soil moisture. The climax plant community is a mid grass community with a few scattered trees and shrubs. This site was influenced by fire.

Sideoats grama, cane and silver bluestem, and Texas cupgrass accounted for approximately 30 percent of the total production. Arizona cottontop, vine mesquite, plains bristlegrass and tall and meadow dropseed would have made up another 15 percent of total production. Buffalograss, curly mesquite, tobosagrass, Canada wildrye, Texas wintergrass, reverchon bristlegrass, Hall panicum, fall witchgrass, slim tridens, Wright threeawn, Texas grama, red grama, hairy grama, and hairy tridens also occupied the site. Perennial forbs produced approximately 4 percent of the total production. The forb component would have included bushsunflower, bundleflower, Engelmann daisy, Indian mallow, trailing ratany, upright prairie coneflower, mendora species, ruellia species, Mexican sagewort, and annual forbs. Tree species occupying the site are western soapberry, elm, live oak, netleaf hackberry, Texas mulberry, Texas sophora, white honeysuckle, and honey mesquite. Trees made up approximately 4 percent of the total production.

Figure 13.—Foreground is example of Clay Loam Ecological Site. The background is a Low Stony Hill Ecological Site.

Heavy continuous grazing has lead to degradation of the site in most places. As retrogression occurred, the more palatable grasses such as sideoats grama, cane bluestem, Texas cupgrass, and Arizona cottontop would have been replaced with tobosagrass, buffalograss, curly mesquite slim tridens, and other short grasses. Further degradation resulted in dominance of undesirable short grasses, and large increases in mesquite, agarito, condalia, and prickly pear. This change in vegetative communities leads to reduced soil organic matter. The soil surface then crusts and become almost impermeable to rainfall. These conditions make this site one of the most difficult to restore to its once productive state.

Draw Ecological Site—This site occurs as long, narrow terraces or flood plains along intermittent streams and valley floors. Site receives extra runoff water from adjoining sites. The climax plant community is a grassland savannah with scattered to thick stands of woody species.

The climax plant community consists of approximately 40 percent sideoats grama, blue grama, and cane bluestem; 10 percent vine mesquite, green sprangletop, and black grama; 10 percent plains bristlegrass, Arizona cottontop, and bush muhly; 5 percent buffalograss; 10 percent alkali or giant sacaton and tobosagrass; 5 percent perennial threeawns, burrograss, and hairy grama; 5 percent Texas wintergrass and Canada wildrye; 5 percent perennial forbs such as orange zexmenia, bush sunflower, Indian mallow, sagewort, and upright prairie coneflower; 5 percent littleleaf sumac, skeletonleaf goldeneye, feather dalea, forestiera, and ephedra; and 5 percent live oak, hackberry, Mexican redbud, and little walnut.

Under continuous heavy grazing, sideoats grama, cane bluestem, black grama, and vine mesquite decrease and eventually disappear, being replaced by increasing amounts of buffalograss, perennial threeawns, burrograss, and weedy annuals. As retrogression continues, the site becomes dominated by perennial threeawns, burrograss, weedy annuals, and such woody species as mesquite, juniper, agarito, and other shrubby woody species.

Gravelly Ecological Site—This site usually occurs as a narrow band at the foot of large limestone hills but may be found adjacent to the intermittent streams as mixed alluvial soils. The climax vegetation is characterized by warm-season bunch grasses consisting of both mid and short grasses. Perennial forbs and woody plants commonly occur in association with the bunch grasses.

The climax plant community consists of approximately 50 percent sideoats grama, cane bluestem, black grama, vine mesquite, and bush muhly; 20 percent slim or rough tridens, sand dropseed, and perennial threeawns; 10 percent plains bristlegrass, green sprangletop, and Arizona cottontop; 5 percent hairy grama, fall witchgrass, Hall panicum, and buffalograss; 5 percent burrograss, hairy tridens, and red grama; 5 percent perennial forbs such as orange zexmenia, bushsunflower, Indian mallow, and mendora; and 5 percent woody species such as tarbush, ephedra, fourwing saltbush, range ratany, and littleleaf sumac. Under continuous heavy grazing, mid grasses and palatable forbs decrease quite rapidly. As retrogression continues, hairy tridens, red grama, fluffgrass, ear muhly, broom snakeweed, and paperflower increase. Creosotebush, mesquite, cacti, and condalia increase or invade the site. Creosotebush is the predominant invader.

Limestone Hill Ecological Site—This site is characterized by rolling hills that are located at higher elevations in the landscape. The climax plant community was mid grass dominated grassland with numerous forbs and some shrubs.

Sideoats grama, black grama, cane bluestem, green sprangletop, and plains bristlegrass dominated the site accounting for up to 60 percent of the total production of the site. Forbs contributed up to 10 percent of the total production with the more important forbs being sagewort, bushsunflower, mendora, and bundleflower. Shrubs included kidneywood, acacia, skeletonleaf goldeneye, ephedra, and daleas. There are few trees on this site because of the shallow nature of the soils and non-fractured parent material.

Overgrazing is the main factor leading to degradation. Retrogression of the site leads to sideoats grama, black grama, cane bluestem, and the other more palatable mid grasses being eliminated and being replaced by short grasses, such as, slim tridens, threeawns, buffalograss, and other undesirable short grasses. Climax forbs and shrubs can also be removed from the site by overgrazing. As further degradation occurs, the site becomes dominated by threeawns; hairy tridens; hairy, Texas, and red gramas; weedy annuals; mesquite; juniper; sotol, and prickly pear.

Loamy Bottomland Ecological Site—This site occurs as a band along streams and rivers. The soils of this site are alluvial clay loams, loams, and silty clay loams. This site takes up water rapidly. The historic climax plant community was mid grass dominated grassland. This site is valuable when functioning properly, it acts as a sponge storing water for slow release into the streams and rivers.

Plains lovegrass, sideoats grama, blue grama, cane bluestem, Texas cupgrass, Arizona cottontop, green sprangletop, and plains bristlegrass accounted for up to 50 percent of the total production of the site in the climax condition. Perennial forbs contributed up to 4 percent of the total production. Trees and shrubs contributed up to 5 percent of the total production.

Sideoats grama, plains lovegrass, Texas cupgrass, cane bluestem, and other more palatable bunchgrasses and forbs will decline and eventually be eliminated by heavy grazing by livestock. These species will be replaced by short grasses, annuals, and woody shrubs such as mesquite, condalia, and agarito. This change in composition over time will have a drastic impact on soil organic matter. This change will reduce the infiltration rate and negatively impact the sites potential to capture, store, and slowly release water.

Loamy Ecological Site—This site usually occurs as broad plains on nearly level and gentle slopes. The climax plant community is characterized by warm-season bunch and stoloniferous grasses and associated forbs and woody plants. Both short and mid grasses are common, with the dominant production being that of the mid grasses.

Sideoats grama, blue grama, black grama, cane bluestem, plains bristlegrass, Arizona cottontop, and green sprangletop accounted for up to 50 percent of the total production of the site in climax condition. Other species that could be found on the site are bush muhly, sand dropseed, sand muhly, slim or rough tridens, tobosagrass, vine mesquite, buffalograss, perennial threeawns, burrograss, fall witchgrass, and Hall panicum; 5 percent perennial forbs such as orange zexmenia, bushsunflower, and Indian mallow; and 5 percent woody species such hackberry, littleleaf sumac, tarbush, fourwing saltbush, and ephedra.

Under continuous heavy grazing, sideoats grama, plains bristlegrass, cane bluestem, Arizona cottontop, and green sprangletop will decrease and be replaced by perennial threeawns and burrograss. As retrogression continues, the site becomes dominated by burrograss, tarbush, and large bare areas. Once the community is changed to burrograss and tarbush, the site becomes very difficult to restore to a more productive state. Some other common invaders are red grama, ear muhly, broom snakeweed, fluffgrass, dogweed, paperflower, creosotebush, and mesquite.

Shallow Ecological Site—This site occurs in narrow bands on nearly level and gently sloping uplands. Sites located down slope from the site receive runoff water because of a slow infiltration rate. This site occurs in a limited amount in Crockett County.

The historic climax plant community was a mid grass prairie with very scattered shrubs. Up to 50 percent of the climax community production was made up of sideoats grama, cane bluestem, Arizona cottontop, Texas cupgrass, and plains bristlegrass. Black grama, buffalograss, curlymesquite, and bush muhly are also important grasses that were found on the site in climax condition. Perennial forbs; such as gaura, Mexican sagewort, dalea, and bush sunflower, produced up to 5 percent of the total climax community. Condalia, agarito, and other shrub species also contributed up to another 5 percent of the production.

Under continuous heavy grazing, buffalograss, curly mesquite, and threeawns will replace the mid grasses. As further degradation occurs the site becomes dominated by threeawns, hairy tridens, hairy grama, and undesirable woody species; such as juniper, mesquite, agarito and pricklypear.

Steep Rocky Ecological Site—This site occurs as rough broken limestone hills with steep slopes (fig. 14). The site consists of large fragments of boulders and outcrops of hard limestone. Pockets of soil occur between the fragments and boulders. The climax plant community consists of warm-season mid and short grasses, forbs, and woody shrubs. Species of both perennial and annual forbs are numerous on the site.

The climax plant community consists of approximately 5 percent little bluestem; 30 percent sideoats grama, cane bluestem, bush muhly, Texas cupgrass, and plains lovegrass; 10 percent plains bristlegrass, vine mesquite, and Arizona cottontop; 10 percent slim or rough tridens and sand dropseed; 10 percent hairy grama, perennial threeawns, fall witchgrass, Hall panicum, and hairy tridens; 5 percent Texas wintergrass and New Mexico feathergrass; 10 percent perennial forbs such as orange zexmenia, bushsunflower, sticky selloa, globemallow, and Indian mallow; 5 percent hackberry, sacahuista, and sotol; and 10 percent woody species such as littleleaf sumac, kidneywood, daleas, elbowbush, Texas colubrina, and littleleaf leadtree.

Under continuous heavy grazing, juniper, lechuguilla, hairy tridens, and annuals invade the site. Plants such as sideoats grama, cane bluestem, Arizona cottontop, green sprangletop, plains bristlegrass, orange zexmenia, and bushsunflower will decrease. Catclaw often is a common invader of the site. Other invaders are red grama, ear muhly, broom snakeweed, paperflower, and cacti.

Figure 14.—An area of Tarrant-Rock outcrop Complex, 15 to 40 percent slopes. This map unit is in the Steep Rocky Ecological Site.

Central Edwards Plateau

The Central Edwards Plateau land resource area is located in the eastern part of the county. Soils of this land resource area are intermixed with soils of the Western Edwards Plateau resource area. The climate and soils of this land resource area supported grasslands to oak savannahs depending upon the ecological site.

The climax vegetation is mainly drought tolerant grasses and shrubs. The dominant perennials include little bluestem, indiangrass, sideoats grama, cane bluestem, bushsunflower, Engelmanndaisy, orange zexmenia, sumac species, and numerous oak species.

Low Stony Hill Ecological Site—This site occurs in the eastern part of Crockett County in bands between the Limestone Hills and Clay Loam ecological sites. This site will yield water to the sites below it in the landscape.

The historic climax plant community was a fire climax mid grass prairie with interspersions of tall grasses, live oak, and shrub motts. Little bluestem, indiangrass, and sideoats grama dominate the site making up 30 to 50 percent of total production. This site is rich in forbs and desirable browse species. Forbs, shrubs, and tree species can account for up to 30 percent of the total production.

Overgrazing by livestock leads to the decrease and eventual elimination of the tall and mid grasses and palatable forbs. These species are replaced by buffalograss, curlymesquite, threeawns, hairy tridens, and hairy grama. Further degradation leads to the site being dominated by threeawns, hairy tridens, hairy grama, and brush species, such as juniper, agarito, and prickly pear.

Steep Rocky Ecological Site—This site is very limited in acreage and occurs in the southeast part of the county. This site occurs as rough broken limestone hills with steep slopes. The site consists of large fragments of boulders and outcrops of hard limestone.

Pockets of soil occur between the fragments and boulders. The climax plant community consists of warm-season mid and short grasses, forbs, and woody shrubs. Species of both perennial and annual forbs are numerous on the site.

The historic climax plant community is a savannah site with 15 to 20 percent tree canopy. Little bluestem dominated the herbaceous plant production by accounting for 20 to 25 percent of climax plant community production. Big bluestem, indiangrass, sideoats grama, green sprangletop, plains lovegrass, and cane bluestem are also important grass species that grow on the site. Forbs produce up to 10 percent of site production with bush sunflower, Engelmanndaisy, orange zexmenia and a myriad of other forbs. This site is rich in shrub species with sumac species, Texas kidneywood, elbowbush, and white honeysuckle are among the important shrubs on the site. Texas oak, live oak, leadtree, and other oak species produced up to 10 percent of total site production.

Overgrazing by livestock led to the decrease and eventual elimination of the more palatable grasses, forbs, browse, and tree species. Continued degradation leads to juniper, persimmon, and other woody species to form dense thickets.

Very Shallow Ecological Site—This site occurs as narrow bands as an interface between the rockier ecological sites; such as Steep Rocky, Limestone Hill and Low Stony Hills; and the deeper soil ecological sites, such as Clay Loam and Loamy. The soils are very shallow in nature. This site provides additional water for the Clay Loam and Loamy ecological sites.

The climax plant community is a fire climax mid and short grass complex with scattered shrubs. Little bluestem, cane bluestem, silver bluestem and sideoats grama make up 45 to 50 percent of the production for the climax community. Perennial forbs and shrubs each can account for up to 5 percent of the total production of the site. Bush sunflower, orange zexmenia, Engelmanndaisy are a few of the important forb species that grow on the site. Sumac species, Texas kidneywood and elbowbush are among the important shrub species on the site.

Overgrazing by livestock will lead to the decrease in and elimination of the more palatable mid grasses, forbs and browse species. Buffalograss, curlymesquite, and hairy tridens are some of the undesirable species that increase as the more palatable species are grazed out. Continued overgrazing will lead to the site being dominated by hairy tridens, threeawns, red grama, Texas grama and hairy grama. Undesirable shrubs, such as javalinabush and agarito will also exist as co-dominants.

Trans-Pecos Desert Grassland

The Trans-Pecos major land resource area (MLRA) of Texas is part of the Chihuahuan Desert of the southwest. Elevation ranges from approximately 1,000 feet along the Rio Grande to over 8,000 feet on numerous mountain peaks. Elevation change has a dramatic effect on rainfall amounts, radiant heating from the sun, and evapotranspiration. For this reason the Trans-Pecos MLRA has been subdivided into land resource units (LRU). These LRU divisions are Desert Shrub, Desert Grassland, Mixed Prairie, and Mountain Savannah. The extreme western portion of Crockett County includes some to the Desert Grassland LRU.

Gravelly Ecological Site—This site usually occurs over broad areas as gently to moderately sloping hills and ridges. Elevation ranges from 2,500 to 5,000 feet above sea level. The climax plant community is dominated by drought tolerant short grasses of the bunch and stoloniferous forms. Some mid grasses occur on the site. Vegetation occurs naturally as thin stands with an abundance of bare soil among sparsely distributed plants.

Bush muhly, black grama, slim tridens, and perennial threeawns accounted for approximately 40 percent of the total production of the historic climax plant community. Sideoats grama, Arizona cottontop, cane bluestem, and plains bristlegrass are the mid grasses that grew on the site. These mid grasses accounted for around 8 percent of the total production. Creosotebush, range ratany, tarbush, and mariola comprised approximately 15 percent of the total production for the site. Forbs, such as perennial

bladderpod, hairy tubetongue, globemallow, and mendora accounted for another 5 percent of the production.

Overgrazing by livestock leads to a decrease in the grass species. This change increases the droughtiness of the site. Creosotebush increases as the site deteriorates. Broom snakeweed, fluffgrass, and annual forbs and grass species also increase on the site as it degrades. The site is not generally suited for revegetation.

Limestone Hill and Mountain Ecological Site—This site occurs as rolling to moderately steep limestone hills in the far northwest part of Crockett County. Mountain slopes can be as steep as 30 percent. Elevation ranges from 3,500 to 5,000 feet above sea level.

Climax vegetation is characterized by short and mid bunch and stoloniferous grasses growing in association with and abundance of perennial forbs and shrubs. Sideoats grama, cane bluestem, and tanglehead produce approximately 30 percent of the total vegetation. Skeletonleaf goldeneye is estimated to have made up 5 percent of the total production for the site. Other important shrub species include feather dalea, black dalea, range ratany, mountain mahogany, and kidneywood. The shrub component accounted for approximately 15 percent of the total site production. Mendora, bushsunflower, purple dalea, blackfoot daisy, and sundrop are few of the forbs that can grow on the site.

As retrogression of the site occurs from livestock overgrazing, slim and rough tridens, perennial threeawn, fluffgrass, red grama, and annual threeawns will increase. Other species invading or increasing on the site are lechuguilla, whitethorn acacia, creosotebush, mesquite, ocotillo, catclaw, and various cacti.

Loamy Sand Ecological Site—This site normally occurs as nearly level to rolling sandy plains (fig. 15). The elevation range for this site is 2,400 to 3,000 feet. This site is limited in size occurring in a small area of northwest Crockett County.

Figure 15.—An area of Wickett loamy fine sand, 0 to 3 percent slopes. The Wickett soils are in the Loamy Sand Ecological Site.

The historic climax plant community was an open grassland with mid grasses, a few short grasses and an occasional tall grass dominating the plant community. Perennial forbs and limited shrubs occur in association with the grasses. Giant dropseed, sand bluestem, little bluestem, cane bluestem, spike dropseed, mesa dropseed, and sand dropseed accounted for approximately 50 percent of the annual production of the site. Sundrop, purple dalea, gaura, bladderpod, globemallow, mendora, and grassland croton were the primary perennial forbs occurring on the site. Sand sagebrush and Harvard oak are the primary shrub species and are very beneficial in stabilizing dunes.

Retrogression from livestock grazing initially sees an increase in mesa dropseed and sand dropseed. Continued degradation of the site leads to greatly reduced grass cover with perennial threeawns, signalgrass, and numerous annuals making up the bulk of the herbaceous production. Sand sagebrush and Harvard oak also increase. Other woody and forb species invading or increasing are mesquite, broom snakeweed, and groundsel species.

Salty Bottomland Ecological Site—In Crockett County, this site occurs as nearly level flood plains along the Pecos River. The floodplains are of varying widths and occur along the entire stretch of the Pecos. This site can receive additional water from flooding.

The climax vegetation is dominated by salt tolerant grasses in association with salt tolerant shrubs and halophytic forbs. Alkali sacaton, giant sacaton, and twoflower trichloris are estimated to have produced 65 percent of all vegetation, with alkali sacaton accounting for 45 percent of the total production for the site. Fourwing saltbush comprised 15 percent of the total with pickleweed, purslane, dockweed, pepperweed, and annual forbs adding another 5 percent.

Retrogression of the site can occur by overgrazing of livestock. Grasses are replaced by bare ground, pickleweed, and annual halophytic vegetation. Salt cedar is a major invasive species on the Pecos River.

Sandy Loam Ecological Site—This site occurs as nearly level to gently rolling plains in northwest Crockett County. This site is very limited in the county. Elevations range from 2,400 to 3,000 feet. The climax plant community of this site is an open grassland of mid and short grasses.

Black and blue grama accounted for 35 percent of the production of the historic climax plant community. Mesa, and sand and spike dropseeds accounted for another 25 percent of the production. Forbs made a contribution of 10 percent with gaura, globemallow, mendora, sundrop, wildbuckwheat, and bladderpod being the main forb species. Fourwing saltbush, range ratany, and sand sagebrush were the main shrub species, which produced less than 5 percent of the total production.

As retrogression occurs, mesa and sand dropseeds increase strongly. Black grama, plains bristlegrass, Arizona cottontop, and bush muhly decrease. Sand sagebrush, catclaw, javalinabush, wolfberry, and lotebush are the shrub species that increase most on the site. Mesquite, broom snakeweed, and groundsels will also invade the site.

Shallow Sandy Loam Ecological Site—This site occurs as level to gently rolling areas of varying sizes. This site occurs in the northwest part of county, and is a minor portion. The climax plant community is an open grassland dominated by short and mid grasses.

Black grama is the dominant species for the site producing 70 percent of total site production. Mesa, sand and spike dropseed, bristle panicum, and plains bristlegrass account for another 10 percent of the site production. Feather dalea, fourwing saltbush, and catclaw are the main shrubs species that produce about 5 percent of total site production. Perennial bladderpod, groundcherry, wild mercury, mendora, trailing ratany, sida, angel trumpet, mat spurge, plains blackfoot daisy, and plains zinnia are estimated to have accounted for approximately 8 percent of total production.

Black grama, bush muhly, plains bristlegrass, mesa dropseed, most perennial forbs, feather dalea, and fourwing saltbush will decrease sharply because of overgrazing. Threeawns, fluffgrass, and annual grasses and forbs along with catclaw, pricklypear,

tasajillo, javalinabush, mesquite, and creosotebush invade or increase on the site when retrogression occurs.

Recreation

The soils of the survey area are rated in Table 6 and Table 7 according to limitations that affect their suitability for recreation. The ratings are both verbal and numerical. Rating class terms indicate the extent to which the soils are limited by all of the soil features that affect the recreational uses. Not limited indicates that the soil has features that are very favorable for the specified use. Good performance and very low maintenance can be expected. Somewhat limited indicates that the soil has features that are moderately favorable for the specified use. The limitations can be overcome or minimized by special planning, design, or installation. Fair performance and moderate maintenance can be expected. Very limited indicates that the soil has one or more features that are unfavorable for the specified use. The limitations generally cannot be overcome without major soil reclamation, special design, or expensive installation procedures. Poor performance and high maintenance can be expected.

Numerical ratings in the tables indicate the severity of individual limitations. The ratings are shown as decimal fractions ranging from 0.01 to 1.00. They indicate gradations between the point at which a soil feature has the greatest negative impact on the use (1.00) and the point at which the soil feature is not a limitation (0.00).

The ratings in the tables are based on restrictive soil features, such as wetness, slope, and texture of the surface layer. Susceptibility to flooding is considered. Not considered in the ratings, but important in evaluating a site, are the location and accessibility of the area, the size and shape of the area and its scenic quality, vegetation, access to water, potential water impoundment sites, and access to public sewer lines. The capacity of the soil to absorb septic tank effluent and the ability of the soil to support vegetation also are important. Soils that are subject to flooding are limited for recreational uses by the duration and intensity of flooding and the season when flooding occurs. In planning recreational facilities, onsite assessment of the height, duration, intensity, and frequency of flooding is essential.

The information in Table 6 and Table 7 can be supplemented by other information in this survey, for example, interpretations for building site development, construction materials, sanitary facilities, and water management.

Camp areas require site preparation, such as shaping and leveling the tent and parking areas, stabilizing roads and intensively used areas, and installing sanitary facilities and utility lines. Camp areas are subject to heavy foot traffic and some vehicular traffic. The ratings are based on the soil properties that affect the ease of developing camp areas and the performance of the areas after development. Slope, stoniness, and depth to bedrock or a cemented pan are the main concerns affecting the development of camp areas. The soil properties that affect the performance of the areas after development are those that influence trafficability and promote the growth of vegetation, especially in heavily used areas. For good trafficability, the surface of camp areas should absorb rainfall readily, remain firm under heavy foot traffic, and not be dusty when dry. The soil properties that influence trafficability are texture of the surface layer, depth to a water table, ponding, flooding, permeability, and large stones. The soil properties that affect the growth of plants are depth to bedrock or a cemented pan, permeability, and toxic substances in the soil.

Picnic areas are subject to heavy foot traffic. Most vehicular traffic is confined to access roads and parking areas. The ratings are based on the soil properties that affect the ease of developing picnic areas and that influence trafficability and the growth of vegetation after development. Slope and stoniness are the main concerns affecting the development of picnic areas. For good trafficability, the surface of picnic areas should absorb rainfall readily, remain firm under heavy foot traffic, and not be dusty when dry.

The soil properties that influence trafficability are texture of the surface layer, depth to a water table, ponding, flooding, permeability, and large stones. The soil properties that affect the growth of plants are depth to bedrock or a cemented pan, permeability, and toxic substances in the soil.

Playgrounds require soils that are nearly level, are free of stones, and can withstand intensive foot traffic. The ratings are based on the soil properties that affect the ease of developing playgrounds and that influence trafficability and the growth of vegetation after development. Slope and stoniness are the main concerns affecting the development of playgrounds. For good trafficability, the surface of the playgrounds should absorb rainfall readily, remain firm under heavy foot traffic, and not be dusty when dry. The soil properties that influence trafficability are texture of the surface layer, depth to a water table, ponding, flooding, permeability, and large stones. The soil properties that affect the growth of plants are depth to bedrock or a cemented pan, permeability, and toxic substances in the soil.

Paths and trails for hiking and horseback riding should require little or no slope modification through cutting and filling. The ratings are based on the soil properties that affect trafficability and erodibility. These properties are stoniness, depth to a water table, ponding, flooding, slope, and texture of the surface layer.

Off-road motorcycle trails require little or no site preparation. They are not covered with surfacing material or vegetation. Considerable compaction of the soil material is likely. The ratings are based on the soil properties that influence erodibility, trafficability, dustiness, and the ease of revegetation. These properties are stoniness, slope, depth to a seasonal high water table, ponding, flooding, and texture of the surface layer.

Golf course fairways are subject to heavy foot traffic and some light vehicular traffic. Cutting or filling may be required. Irrigation is not considered in the ratings. The ratings are based on the soil properties that affect plant growth and trafficability after vegetation is established. The properties that affect plant growth are reaction; depth to a water table; ponding; depth to bedrock or a cemented pan; the available water capacity in the upper 40 inches; the content of salts, sodium, or calcium carbonate; and sulfidic materials. The properties that affect trafficability are flooding,

Wildlife

Steve Nelle, Wildlife Biologist, Natural Resources Conservation Service, prepared this section.

Wildlife is an important component of the natural resources of Crockett County. The diversity and abundance of wild animals is important ecologically, aesthetically, and economically. Historically, the kinds and numbers of wildlife have changed somewhat since European settlement. The landscape appearance and the nature of wildlife habitat have changed because of livestock grazing practices, the elimination of widespread wildfires, and the increase of woody cover. Semi-open grasslands and savannahs have become inhabited by a moderate to dense cover of woody plants, cactus, and brush. Animals that once inhabited the survey area but are no longer present include bison, gray wolf, Montezuma quail, black-footed ferret, and lesser prairie chicken.

Although more emphasis has traditionally been placed on the management and conservation of a few game species which are hunted, the numerous non-game species are just as much a part of the natural environment and equally worthy of conservation and management.

The basic habitat needs for any wildlife population are food, cover, and water in the proper amount and in the proper arrangement. Each species of wildlife has its own unique requirements for food, cover, and water. In order for wildlife to inhabit an area, the land must either naturally provide these habitat needs, or it must be specifically managed to provide needed habitat. Land treatment that promotes maximum plant diversity usually favors the greatest wildlife diversity.

The soils of Crockett County affect the kinds and amounts of vegetation that are available for wildlife food and cover. Soils also influence the distribution of surface water for wildlife use. However, in most cases, the past and present management of the land has a much greater influence on wildlife than do the soils themselves. Each kind of soil can be managed to either harm or benefit wildlife habitat; therefore, a good understanding of soils, vegetation, and their response to management is essential for proper wildlife management. Refer to the section on Rangeland for a more detailed discussion of the kinds and amounts of vegetation that can be found on each soil.

The management practices that affect wildlife habitat the most include past and present grazing management, past and present brush control efforts, and livestock water development.

Rodents are the most common type of mammal, with over 20 species living in Crockett County. The burrowing activities of rodents helps aerate and churn the soil, and contributes to improved water infiltration. The accumulation of organic matter in burrows and dens may also add nutrients to the soil. Rodents, which are important to the natural ecological balance, eat a variety of insects and the seeds of shrubs, brush, forbs, weeds, and grasses. Cottontail rabbits and jackrabbits are common. Several kinds of bats are found in the survey area. Over 10 species of carnivorous mammals are found in the county, including coyote, gray fox, red fox, bobcat, mountain lion, raccoon, badger, ringtail, and several species of skunks.

Because of the conflict between predators and livestock raisers, trapping and other predator control efforts are common. Despite the damage they may cause to livestock, these larger predators play an important role in keeping rodent, rabbit, and deer populations in balance.

Four species of native hoofed animals are found in the survey area, including white-tailed deer, mule deer, pronghorn antelope, and javelina. These animals, especially deer, are economically important to most ranching operations. Ranchers commonly lease hunting rights to sportsmen who selectively harvest surplus animals helping to keep populations in balance with habitat carrying capacity.

White-tailed deer are distributed throughout most of the county with densities ranging from about 10 to 50 acres per deer. White-tailed deer numbers have increased significantly in the past 30 to 50 years. The elimination of the screwworm fly, the widespread development of livestock water, and the increase in woody cover have contributed to these increases.

A small but stable population of mule deer exists in the northwestern part of the county. Densities in the better habitat vary from 75 to 100 acres per deer.

Both kinds of deer prefer to feed on green forbs, mast, and browse. Forbs are generally preferred, when available, but browse makes up the bulk of their diet since it is available yearlong and abundant. Mast, such as acorns, mesquite beans, and pricklypear fruit are a very important food for deer when available. Grass makes up less than 10 percent of the deer diet. Deer require substantial areas of moderate to thick brush, for cover and shade as well as food. Tall and dense areas of grass growing among brush are preferred fawning cover.

A few small scattered populations of pronghorn still exist across the county. Pronghorn do not require brush for escape cover, but rely more on their keen eyesight and speed to detect and flee from danger. Their preferred diet consists primarily of green forbs, but they also eat considerable amounts of browse. Pronghorn do not eat much grass, but they do require grass cover to hide fawns from predators. During dry periods, they must be able to find green browse and sometimes they travel great distances to find it. Since the movement of pronghorn is restricted by conventional net wire fences, large pastures are normally considered essential for their survival. In lieu of large pastures, net wire fences can be modified or replaced by barb wire fencing to allow pronghorn movement to other pastures.

Heavy and continuous yearlong grazing by livestock, especially sheep and goats, is detrimental to the habitat of deer and pronghorn. Under these conditions, competition for the preferred food plants limits the food supply and leads to degradation of habitat. Management that favors the improvement of deer and pronghorn habitat includes light to moderate stocking rates, grazing rotations that provide regular periods of rest from grazing, and grazing primarily with cattle instead of sheep or goats. The harvest of excess deer numbers, especially females is also an essential part of maintaining good habitat.

Some of the important perennial forbs eaten by deer and pronghorn include Engelmanndaisy, bushsunflower, orange zexmenia, bundleflower, knotweed leafflower, purple milkwort, showy mendora, spreading sida, Texas snoutbean, rock daisy, noseburn, Indian mallow, and wild mercury. Annual forbs eaten by deer and pronghorn include Texas filaree, California filaree, tallow weed, Nuttall peavine, deer vetch, huisachedaisy, prostrate spurge, bladderpod, doveweed croton, and common broomweed.

Some of the important shrubs and trees that are browsed by deer include live oak, shin oak, hackberry, bumelia, Roemer acacia, elbowbush, skunkbush sumac, littleleaf sumac, ephedra, fourwing saltbush, and juniper.

Large scale brush control can be detrimental to deer habitat. However, selective or patterned brush management can be beneficial, since deer often feed in small clearings with brushy cover nearby. The selective mechanical removal of mesquite and juniper on 25 to 50 percent of the landscape can be beneficial for both livestock ranching and deer habitat. Normally, cleared areas should be no wider than about 300 feet with alternating bands of woody cover. Brush management plans and brush patterns should be developed on a ranch by ranch basis, customized to the specific conditions and objectives of the landowner.

Scattered bands of javelina exist primarily where the heaviest brush occurs. Javelina eat primarily pricklypear pads and fruits, mesquite beans, and the flower stalks, leaves, and roots of yucca and lechuguilla. Javelina also consume grasses, forbs, and browse, insects, rodents, and carrion.

The bird life of Crockett County is also quite diverse with well over 100 species. Many of these are permanent yearlong residents while the others are migratory and spend only a part of the year in the area.

Each bird species has its own unique habitat requirements for food, cover, and water. Some prefer sparsely vegetated land, some prefer open grasslands, or moderately wooded shrublands, and others prefer thick brush and trees. Some birds eat insects only; some eat succulent berries and fruits; and others prefer to eat small seeds. Nesting and roosting requirements likewise vary widely among birds.

The intermittent shallow lake beds, sometimes called playas, occur on the Irion soils. These fill with water infrequently after prolonged or heavy rainfall events and may attract large numbers of water birds and shore birds. These birds feed on invertebrates as well as the vegetation and seeds that these areas support.

Raptorial birds of prey are common and are important in the natural regulation of rodent, rabbit, and reptile numbers. Some which nest in the county include red-tailed hawk, zone-tailed hawk, Swainson’s hawk, Harris’s hawk, great horned owl, and screech owl. Species which are present in the winter months include northern harrier, sharp-shinned hawk, Cooper’s hawk, ferruginous hawk, American kestrel, and golden eagle. Turkey vultures and ravens are the primary scavengers and carrion eaters.

A large group of birds in the survey area are almost exclusively insect eaters. The more common ones include nighthawks, poorwills, woodpeckers, flycatchers, swallows, wrens, warblers, and vireos. The loggerhead shrike and roadrunner not only eat insects, but also reptiles and mice. Another group of birds eat primarily seeds. These include longspurs, buntings, sparrows, grosbeaks, cardinals, pyrrhuloxia, goldfinches, and doves.

Birds that readily eat insects, fruits, or seeds include horned larks, cedar waxwings, mockingbirds, thrashers, bluebirds, robins, titmice, tanagers, orioles, blackbirds, meadowlarks, cowbirds, house sparrows, and starlings.

Upland game birds are also common in the survey area. These include mourning dove, scaled quail, bobwhite quail, and turkey (fig. 16). These birds are hunted throughout the county and the leasing of hunting rights is an economic asset. Landowners sometimes perform specific management practices intended to increase the numbers of these birds.

Quail spend their entire life in a rather small area, usually 40 to 80 acres and therefore must have all their habitat needs in close proximity. Nesting cover, which is often the weakest link in quail habitat, consists of large clumps of grass left from the previous year. Heavy grazing or drought can greatly limit nesting success. Quail prefer to feed on insects when they are available. The presence of insects is especially important for the survival of young chicks. When insects are not plentiful, quail feed on the hard seeds of forbs, grasses, and some woody species. In many cases, it is the "weedy" kinds of plants that produce the best quail food. Quail require low-growing brush for cover and protection from hot summer sun, cold winter winds, rain, and predators. The best quail habitat consists of areas with scattered, low-growing, thick bushes interspersed with bunchgrasses, some bare ground, and lots of forbs and weeds. Bobwhites do better in rainy years when there is more abundant ground cover. Scaled quail can survive in drier years with less ground cover. The presence of surface water is not considered essential for quail since they derive water from the foods they eat. However, quail are attracted to surface water and it may increase quail survival in dry years.

Figure 16.—A turkey chick is camouflaged in the grass. Wildlife provides extra income for Crockett County.

Plants which provide a good source of seed for quail include doveweed croton, grassland croton, leatherweed croton, spurges, Nuttall peavine, buffalobur, pricklypoppy, cowpen daisy, broomweed, bundleflower, slim tridens, Hall panicum, plains bristlegrass, mesquite, bumelia, hackberry, sumacs, wolfberry, and tasajillo. Shrubs which provide good cover include sumacs, catclaw mimosa, catclaw acacia, green condalia, lotebush, algerita, elbowbush, and wolfberry. Some of the grasses commonly used as nest cover for quail include sideoats grama, silver bluestem, tobosagrass, vine-mesquite, Texas wintergrass, and slim tridens. Quail will also nest in clumps of pricklypear, especially if grass cover is lacking.

Turkeys range over a much wider area than do quail and will travel 10 to 30 miles to find suitable habitat. They require large clumps of grass or weeds to nest in and nest success can be affected by heavy grazing. They eat the fruits and seeds of forbs, shrubs, trees, vines, and cactus as well as grass seed. Young, succulent grasses and forbs are also grazed, and insects are essential for good survival of young poults. Turkeys need considerable brush for escape and concealment as well as food. They roost in taller trees, especially groves of trees in bottomlands and draws such as live oak, pecan, and western soapberry. In the absence of trees, they may roost on utility transmission poles, oil field tank batteries, and even pump jacks. They must drink water daily and almost always nest within a quarter mile of water. Turkey have benefited greatly from the development of livestock water.

The mourning dove can fly long distances to find suitable food, cover, and water. Doves eat seeds, and prefer to feed in areas of bare ground or with sparse cover where seeds can be easily seen. Some of the favorite dove plants are doveweed croton, buffalobur, sunflower, common broomweed, pricklypoppy, snow-on-the-mountain, and prostrate spurge. Doves require water every day and will fly long distances from feeding grounds to water.

Livestock water troughs do not provide ideal water sources for quail, turkeys, doves, songbirds, or small mammals. However, troughs can be modified to provide more suitable ground level water by adding an overflow pipe leading to a small, nearby earthen depression. Ranchers commonly place ramps, rocks, or floating objects in water troughs to allow small birds and mammals a way to escape if they fall in.

Riparian areas are the long narrow bands that lie adjacent to rivers, creeks, and draws. Riparian areas along the Pecos River are predominantly made up of Harkey soils. Riparian areas along Live Oak Creek, Howard Draw, Taylor Box Draw, Johnson Draw, and their tributaries are made up of Dev soils. These areas, which make up only one or two percent of the total landscape, provide critical habitat for a large variety of wildlife. Proper management which maintains desirable native grasses, sedges, shrubs, and trees is important for the proper functioning of creeks and riparian areas. A properly functioning riparian area will stabilize creek banks and channels, slow the velocity of floodwater, filter and trap sediment, build floodplains, store water and increase the recharge of shallow aquifers. These benefits can occur when riparian areas are lightly or moderately grazed for only a part of the year, and rested from grazing for the majority of the year. The fencing of riparian corridors helps landowners to be able to implement this kind of specialized grazing management.

Amphibians, including several species of toad, frog, and salamander occur in the Pecos River, some major creeks which support seasonal water holes, and periodically wet depressions. Overflow pits near windmills also provide habitat for amphibians. Occasionally, enough heavy rains fall to fill some of the larger and deeper natural depressions on Irion soils, which may stay partly full for several months and produce large numbers of toads.

Numerous reptiles inhabit the survey area. The ornate box turtle lives on uplands and several species of water turtles inhabit the county. Over 30 species of snakes live in the survey area, including the coachwhip, racer, rat snake, bull snake, hog nose, king snake,

five species of rattlesnake, and the Trans-Pecos copperhead. Over 15 species of lizards and skinks are in the area, including the collared lizard, spiny lizard, horned lizard, earless lizard, racerunner, whiptail lizard, geckos, and Great Plains skink.

Fish are mostly restricted to the Pecos River, which forms the entire western boundary of Crockett County, about 55 miles. The aquatic habitat of the Pecos River has been heavily impacted by upstream dams and the withdrawal of water upstream for irrigation. These factors have caused a degradation of water quality and quantity. Occasional toxic plankton blooms also contribute to poor water quality and periodic fish die-offs in the river. Fish present in the Pecos River include several species of sunfish, black bass, channel catfish, blue catfish, flathead catfish, buffalo, carp, gar, shad, and a variety of minnows

The upper reaches of the Pecos River do not flood as frequently or as severely as it did prior to the construction of dams in New Mexico and Texas. This lack of natural periodic flooding has changed the ecology of the river and its riparian area. The lower reaches of the river have a more natural hydrology and are somewhat less impacted. The establishment of the exotic and invasive shrub, salt cedar has also contributed to the degradation of riparian habitat and possibly a reduction in the flow. This shrub, which is known to transpire large amounts of water, had dominated the banks of the river for many years until a widespread control effort was initiated by NRCS, the State of Texas, and landowners.

Wildlife is a valuable part of the natural resources in Crockett County. They have aesthetic value, enriching the lives of people who enjoy seeing them. They have ecological value; each species playing a role in the complex balance of nature. Some species may have scientific value that is not yet recognized. Some kinds of wildlife also have legitimate economic value, which encourages proper habitat management. The conservation of wildlife is an important part of good land stewardship.

Wildlife Habitat

Soils affect the kind and amount of vegetation that is available to wildlife as food and cover. They also affect the construction of water impoundments. The kind and abundance of wildlife depend largely on the amount and distribution of food, cover, and water. Wildlife habitat can be created or improved by planting appropriate vegetation, by maintaining the existing plant cover, or by promoting the natural establishment of desirable plants.

Table 8, Table 9, and Table 10 show the degree and kind of soil limitations that affect various kinds of habitat for wildlife. The tables show limitations of the soils for grain and seed crops for food and cover; domestic grasses and legumes for food and cover; irrigated grain and seed crops for food and cover; irrigated domestic grasses and legumes for food and cover; desertic herbaceous plants; habitat for burrowing mammals and reptiles; upland wild herbaceous plants; upland desertic shrubs and trees; upland shrubs and vines; upland deciduous trees; upland coniferous trees; upland mixed deciduous-coniferous trees; riparian herbaceous plants; riparian shrubs, vines, and trees; and freshwater wetland plants; This information can be used in planning parks, wildlife refuges, nature study areas, and other developments for wildlife; in selecting areas for establishing, improving, or maintaining specific elements of wildlife habitat; and in determining the intensity of management needed for each element of the habitat.

Rating class terms indicate the extent to which the soils are limited by all of the soil features that affect the element or kind of habitat. *Not limited indicates* that the soil has features that are very favorable for the element or kind of habitat. Good performance and very low maintenance can be expected. *Slightly limited* indicates that the soil has features that are favorable for the specified use. The limitations are minor and can be easily overcome. Good performance and low maintenance can be expected. *Somewhat*

limited indicates that the soil has features that are moderately favorable for the specified use. The limitations can be overcome or minimized by special planning, design, or installation. Fair performance and moderate maintenance can be expected. *Very limited* indicates that the soil has one or more features that are unfavorable for the specified use. The limitations generally cannot be overcome without major soil reclamation, special design, or expensive installation procedures. Creating, improving, or maintaining habitat is impractical or impossible.

Numerical ratings in the tables indicate the severity of individual limitations. The ratings are shown as decimal fractions ranging from 0.01 to 1.00. They indicate gradations between the point at which a soil feature has the greatest negative impact on the use (1.00) and the point at which the soil feature is not a limitation (0.00).

Ratings for *grain and seed crops for food and cover* can be used in the selection of sites that have the soil properties and plant species necessary to sustain wildlife habitat. The ratings do not reflect the limitation for commercial agronomic production. The soil properties and features that affect the growth of grain and seed crops are soil texture, content of organic matter, the amount of rock fragments on or near the soil surface, available water capacity, depth to bedrock or a cemented pan, soil moisture and temperature regimes, depth to a high water table, ponding, flooding, permeability of the soil surface, slope, presence of excess salts in the soil, and susceptibility of the soil surface to water erosion and wind erosion. Examples of grain and seed crops are corn, grain sorghum, wheat, and oats.

Ratings for *domestic grasses and forbs for food and cover* can be used in the selection of sites that have the soil properties and plant species necessary to sustain wildlife habitat. The ratings do not reflect the limitations for commercial agronomic production. The soil properties and features that affect the growth of grasses and legumes are soil texture, content of organic matter, the amount of rock fragments on or near the soil surface, available water capacity, depth to bedrock or a cemented pan, soil moisture and temperature regimes, depth to a high water table, ponding, flooding, permeability of the soil surface, slope, presence of excess salts in the soil, and susceptibility of the soil surface to water erosion and wind erosion. Examples of grasses and forbs for birds are plains bristlegrass, green sprangletop, buffalograss, and bush sunflower.

Ratings for *upland wild herbaceous plants* indicate the limitation of the soils as a growing medium for a diverse upland herbaceous plant community. This community is adapted to soils that are drier than the common soils in moist riparian and wetland zones but that are not so dry as the soils in upland desert areas. The soil properties and features that affect the ability of these species to thrive include soil texture, available water capacity, the presence of excess salts in the soil, soil moisture and temperature regimes, depth to a high water table, and rock fragments on the soil surface. Examples of upland wild herbaceous plants used by birds are doveweed croton, grassland croton, leatherweed croton, spurges, buffalobur, pricklypoppy, cowpen daisy, broomweed, bundleflower, and bumelia. Examples of grasses *for cover and nesting* include sideoats grama, silver bluestem, tobosagrass, bladderpod, doveweed croton, and common broomweed. Deer use Englemanndaisy, bushsunflower, orange zexmania, bundleflower, knotweed leafflower, purple milkwort, showy mendora, spreading sida, Texas snoutbean, rock daisy, noseburn, Indian mallow, wild mercury, Texas filaree, California filaree, tallow weed, nuttall peavine, deer vetch, huisachedaisy, prostrate spurge, bladderpod, doveweed croton, and common broomweed.

Ratings for *upland shrubs and vines* indicate the limitation of the soils as a growing medium for a diverse upland shrub and vine community. This community is adapted to soils that are drier than those common in the moist riparian and wetland zones but that are not so dry as those in upland desert areas. The soil properties and features that affect the ability of these species to thrive include soil texture, content of organic matter, available water capacity, depth to bedrock or a cemented pan, the presence of excess

salts in the soil, soil moisture and temperature regimes, depth to a high water table, and rock fragments on the soil surface. Examples of upland shrubs and vines used by birds are catclaw acacia, catclaw mimosa, green condalia, lotebush, algerita, elbowbush, wolfberry sumac, and hackberry. Deer use live oak, shin oak, hackberry, bumelia, Roemer acacia, elbowbush, skunkbush sumac, littleleaf sumac, ephedra, fourwing saltbush, and juniper.

Ratings for *riparian herbaceous plants* indicate the limitation of the soils as a growing medium for herbaceous plants that are adapted to soil conditions that are wetter than those common in the drier upland areas. The soils suitable for this habitat generally are on flood plains, in depressions, on bottomland, in drainageways adjacent to streams, or in any other area where the soil is either saturated for some period during the year or is subject to periodic overflow from ponding or flooding. The soil properties and features that affect the ability of riparian herbaceous plants to persist include soil texture, content of organic matter, depth to a high water table, the frequency and duration of ponding and flooding, the presence of excess salts in the soil, rock fragments, and the soil temperature regime. Examples of riparian herbaceous plants are switchgrass, giant sacaton, spikerush, knotgrass, and inland saltgrass.

Ratings for *riparian shrubs, vines, and trees* indicate the limitation of the soils as a growing medium for shrubs, vines, and trees that are adapted to soil conditions that are wetter than those common in the drier upland areas. The soils suitable for this habitat generally are on flood plains, in depressions, on bottomland, in drainageways adjacent to streams, in areas of springs and seeps, or in any other area where the soil is either saturated for some period during the year or is subject to periodic overflow from ponding or flooding. The soil properties and features that affect the ability of riparian shrubs, vines, and trees to persist include available water capacity, depth to a high water table, the frequency and duration of ponding and flooding, the presence of excess salts in the soil, and the soil temperature regime. Examples of riparian shrubs, vines, and trees are buttonbush, blackwillow, little walnut, baccharis, and sycamore.

Hydric Soils

In this section, hydric soils are defined and described.

The three essential characteristics of wetlands are hydrophytic vegetation, hydric soils, and wetland hydrology (3,7,13,14). Criteria for each of the characteristics must be met for areas to be identified as wetlands.

Hydric soils are defined by the National Technical Committee for Hydric Soils (NTCHS) as soils that formed under conditions of saturation, flooding, or ponding long enough during the growing season to develop anaerobic conditions in the upper part (4). These soils are either saturated or inundated long enough during the growing season to support the growth and reproduction of hydrophytic vegetation.

The NTCHS definition identifies general soil properties that are associated with wetness. In order to determine whether a specific soil is a hydric soil or nonhydric soil, however, more specific information, such as information about the depth and duration of the water table, is needed. Thus, criteria that identify those estimated soil properties unique to hydric soils have been established (5). The criteria are used to identify a phase of a soil series that normally is also a hydric soil. The criteria used are selected estimated soil properties that are described in "Soil Taxonomy" (12) and "Keys to Soil Taxonomy" (11) and in the "Soil Survey Manual" (9).

If soils are wet enough for a long enough period to be considered hydric, they generally exhibit certain properties that can be observed in the field. These visible properties are indicators of hydric soils. The indicators used to make onsite determinations of hydric soils in this survey area are specified in "Field Indicators of Hydric Soils in the United States" (6).

For information regarding hydric soils in the soil survey area, refer to the USDA Natural Resources Conservation Service Soil Data Mart at http://soildatamart.nrcs.usda.gov.

Engineering

This section provides information for planning land uses related to urban development and to water management. Soils are rated for various uses, and the most limiting features are identified. Ratings are given for building site development, sanitary facilities, construction materials, and water management. The ratings are based on observed performance of the soils and on the data in the tables described under the heading "Soil Properties."

Information in this section is intended for land use planning, for evaluating land use alternatives, and for planning site investigations prior to design and construction. The information, however, has limitations. For example, estimates and other data generally apply only to that part of the soil between the surface and a depth of 5 to 7 feet. Because of the map scale, small areas of different soils may be included within the mapped areas of a specific soil.

The information is not site specific and does not eliminate the need for onsite investigation of the soils or for testing and analysis by personnel experienced in the design and construction of engineering works.

Government ordinances and regulations that restrict certain land uses or impose specific design criteria were not considered in preparing the information in this section. Local ordinances and regulations should be considered in planning, in site selection, and in design.

Soil properties, site features, and observed performance were considered in determining the ratings in this section. During the fieldwork for this soil survey, determinations were made about particle-size distribution, liquid limit, plasticity index, soil reaction, depth to bedrock, hardness of bedrock within 5 to 7 feet of the surface, soil wetness, depth to a water table, ponding, slope, likelihood of flooding, natural soil structure aggregation, and soil density. Data were collected about kinds of clay minerals, mineralogy of the sand and silt fractions, and the kinds of adsorbed cations. Estimates were made for erodibility, permeability, corrosivity, shrink-swell potential, available water capacity, and other behavioral characteristics affecting engineering uses.

This information can be used to evaluate the potential of areas for residential, commercial, industrial, and recreational uses; make preliminary estimates of construction conditions; evaluate alternative routes for roads, streets, highways, pipelines, and underground cables; evaluate alternative sites for sanitary landfills, septic tank absorption fields, and sewage lagoons; plan detailed onsite investigations of soils and geology; locate potential sources of gravel, sand, earthfill, and topsoil; plan drainage systems, irrigation systems, ponds, terraces, and other structures for soil and water conservation; and predict performance of proposed small structures and pavements by comparing the performance of existing similar structures on the same or similar soils.

The information in the tables, along with the soil maps, the soil descriptions, and other data provided in this survey, can be used to make additional interpretations.

Some of the terms used in this soil survey have a special meaning in soil science and are defined in the Glossary.

Building Site Development

Soil properties influence the development of building sites, including the selection of the site, the design of the structure, construction, performance after construction, and maintenance. Table 11 and Table 12 shows the degree and kind of soil limitations that affect dwellings with and without basements, small commercial buildings, local roads and streets, shallow excavations, and lawns and landscaping.

Rating class terms indicate the extent to which the soils are limited by all of the soil features that affect building site development. *Not limited* indicates that the soil has features that are very favorable for the specified use. Good performance and very low maintenance can be expected. *Somewhat limited* indicates that the soil has features that are moderately favorable for the specified use. The limitations can be overcome or minimized by special planning, design, or installation. Fair performance and moderate maintenance can be expected. *Very limited* indicates that the soil has one or more features that are unfavorable for the specified use. The limitations generally cannot be overcome without major soil reclamation, special design, or expensive installation procedures. Poor performance and high maintenance can be expected.

Numerical ratings in the tables indicate the severity of individual limitations. The ratings are shown as decimal fractions ranging from 0.01 to 1.00. They indicate gradations between the point at which a soil feature has the greatest negative impact on the use (1.00) and the point at which the soil feature is not a limitation (0.00).

Dwellings are single-family houses of three stories or less. For dwellings without basements, the foundation is assumed to consist of spread footings of reinforced concrete built on undisturbed soil at a depth of 2 feet or at the depth of maximum frost penetration, whichever is deeper. For dwellings with basements, the foundation is assumed to consist of spread footings of reinforced concrete built on undisturbed soil at a depth of about 7 feet. The ratings for dwellings are based on the soil properties that affect the capacity of the soil to support a load without movement and on the properties that affect excavation and construction costs. The properties that affect the load-supporting capacity include depth to a water table, ponding, flooding, subsidence, linear extensibility (shrink-swell potential), and compressibility. Compressibility is inferred from the Unified classification. The properties that affect the ease and amount of excavation include depth to a water table, ponding, flooding, slope, depth to bedrock or a cemented pan, hardness of bedrock or a cemented pan, and the amount and size of rock fragments.

Small commercial buildings are structures that are less than three stories high and do not have basements. The foundation is assumed to consist of spread footings of reinforced concrete built on undisturbed soil at a depth of 2 feet or at the depth of maximum frost penetration, whichever is deeper. The ratings are based on the soil properties that affect the capacity of the soil to support a load without movement and on the properties that affect excavation and construction costs. The properties that affect the load-supporting capacity include depth to a water table, ponding, flooding, subsidence, linear extensibility (shrink-swell potential), and compressibility (which is inferred from the Unified classification). The properties that affect the ease and amount of excavation include flooding, depth to a water table, ponding, slope, depth to bedrock or a cemented pan, hardness of bedrock or a cemented pan, and the amount and size of rock fragments.

Local roads and streets have an all-weather surface and carry automobile and light truck traffic all year. They have a subgrade of cut or fill soil material; a base of gravel, crushed rock, or soil material stabilized by lime or cement; and a surface of flexible material (asphalt), rigid material (concrete), or gravel with a binder. The ratings are based on the soil properties that affect the ease of excavation and grading and the traffic-supporting capacity. The properties that affect the ease of excavation and grading are depth to bedrock or a cemented pan, hardness of bedrock or a cemented pan, depth to a water table, ponding, flooding, the amount of large stones, and slope. The properties that affect the traffic-supporting capacity are soil strength (as inferred from the AASHTO group index number), subsidence, linear extensibility (shrink-swell potential), the potential for frost action, depth to a water table, and ponding.

Shallow excavations are trenches or holes dug to a maximum depth of 5 or 6 feet for graves, utility lines, open ditches, or other purposes. The ratings are based on the soil properties that influence the ease of digging and the resistance to sloughing. Depth to bedrock or a cemented pan, hardness of bedrock or a cemented pan, the amount of large

stones, and dense layers influence the ease of digging, filling, and compacting. Depth to the seasonal high water table, flooding, and ponding may restrict the period when excavations can be made. Slope influences the ease of using machinery. Soil texture, depth to the water table, and linear extensibility (shrink-swell potential) influence the resistance to sloughing.

Lawns and landscaping require soils on which turf and ornamental trees and shrubs can be established and maintained. Irrigation is not considered in the ratings. The ratings are based on the soil properties that affect plant growth and trafficability after vegetation is established. The properties that affect plant growth are reaction; depth to a water table; ponding; depth to bedrock or a cemented pan; the available water capacity in the upper 40 inches; the content of salts, sodium, or calcium carbonate; and sulfidic materials. The properties that affect trafficability are flooding, depth to a water table, ponding, slope, stoniness, and the amount of sand, clay, or organic matter in the surface layer.

Sanitary Facilities

Table 13 and Table 14 shows the degree and kind of soil limitations that affect septic tank absorption fields, sewage lagoons, sanitary landfills, and daily cover for landfill. The ratings are both verbal and numerical. Rating class terms indicate the extent to which the soils are limited by all of the soil features that affect these uses. *Not limited* indicates that the soil has features that are very favorable for the specified use. Good performance and very low maintenance can be expected. *Somewhat limited* indicates that the soil has features that are moderately favorable for the specified use. The limitations can be overcome or minimized by special planning, design, or installation. Fair performance and moderate maintenance can be expected. *Very limited* indicates that the soil has one or more features that are unfavorable for the specified use. The limitations generally cannot be overcome without major soil reclamation, special design, or expensive installation procedures. Poor performance and high maintenance can be expected.

Numerical ratings in the tables indicate the severity of individual limitations. The ratings are shown as decimal fractions ranging from 0.01 to 1.00. They indicate gradations between the point at which a soil feature has the greatest negative impact on the use (1.00) and the point at which the soil feature is not a limitation (0.00).

Septic tank absorption fields are areas in which effluent from a septic tank is distributed into the soil through subsurface tiles or perforated pipe. Only that part of the soil between depths of 24 and 60 inches is evaluated. The ratings are based on the soil properties that affect absorption of the effluent, construction and maintenance of the system, and public health. Permeability, depth to a water table, ponding, depth to bedrock or a cemented pan, and flooding affect absorption of the effluent. Stones and boulders, ice, and bedrock or a cemented pan interfere with installation. Subsidence interferes with installation and maintenance. Excessive slope may cause lateral seepage and surfacing of the effluent in down slope areas.

Some soils are underlain by loose sand and gravel or fractured bedrock at a depth of less than 4 feet below the distribution lines. In these soils the absorption field may not adequately filter the effluent, particularly when the system is new. As a result, the ground water may become contaminated.

Sewage lagoons are shallow ponds constructed to hold sewage while aerobic bacteria decompose the solid and liquid wastes. Lagoons should have a nearly level floor surrounded by cut slopes or embankments of compacted soil. Nearly impervious soil material for the lagoon floor and sides is required to minimize seepage and contamination of ground water. Considered in the ratings are slope, permeability, depth to a water table, ponding, depth to bedrock or a cemented pan, flooding, large stones, and content of organic matter.

Soil permeability is a critical property affecting the suitability for sewage lagoons. Most porous soils eventually become sealed when they are used as sites for sewage lagoons. Until sealing occurs, however, the hazard of pollution is severe. Soils that have

a permeability rate of more than 2 inches per hour are too porous for the proper functioning of sewage lagoons. In these soils, seepage of the effluent can result in contamination of the ground water. Ground-water contamination is also a hazard if fractured bedrock is within a depth of 40 inches, if the water table is high enough to raise the level of sewage in the lagoon, or if floodwater overtops the lagoon.

A high content of organic matter is detrimental to proper functioning of the lagoon because it inhibits aerobic activity. Slope, bedrock, and cemented pans can cause construction problems, and large stones can hinder compaction of the lagoon floor. If the lagoon is to be uniformly deep throughout, the slope must be gentle enough and the soil material must be thick enough over bedrock or a cemented pan to make land smoothing practical.

A *trench sanitary landfill* is an area where solid waste is placed in successive layers in an excavated trench. The waste is spread, compacted, and covered daily with a thin layer of soil excavated at the site. When the trench is full, a final cover of soil material at least 2 feet thick is placed over the landfill. The ratings in the table are based on the soil properties that affect the risk of pollution, the ease of excavation, trafficability, and revegetation. These properties include permeability, depth to bedrock or a cemented pan, depth to a water table, ponding, slope, flooding, texture, stones and boulders, highly organic layers, soil reaction, and content of salts and sodium. Unless otherwise stated, the ratings apply only to that part of the soil within a depth of about 6 feet. For deeper trenches, onsite investigation may be needed.

Hard, nonrippable bedrock, creviced bedrock, or highly permeable strata in or directly below the proposed trench bottom can affect the ease of excavation and the hazard of ground-water pollution. Slope affects construction of the trenches and the movement of surface water around the landfill. It also affects the construction and performance of roads in areas of the landfill.

Soil texture and consistence affect the ease with which the trench is dug and the ease with which the soil can be used as daily or final cover. They determine the workability of the soil when dry and when wet. Soils that are plastic and sticky when wet are difficult to excavate, grade, or compact and are difficult to place as a uniformly thick cover over a layer of refuse.

The soil material used as the final cover for a trench landfill should be suitable for plants. It should not have excess sodium or salts and should not be too acid. The surface layer generally has the best workability, the highest content of organic matter, and the best potential for plants. Material from the surface layer should be stockpiled for use as the final cover.

In an *area sanitary landfill*, solid waste is placed in successive layers on the surface of the soil. The waste is spread, compacted, and covered daily with a thin layer of soil from a source away from the site. A final cover of soil material at least 2 feet thick is placed over the completed landfill. The ratings in the table are based on the soil properties that affect trafficability and the risk of pollution. These properties include flooding, permeability, depth to a water table, ponding, slope, and depth to bedrock or a cemented pan.

Flooding is a serious problem because it can result in pollution in areas downstream from the landfill. If permeability is too rapid or if fractured bedrock, a fractured cemented pan, or the water table is close to the surface, the leachate can contaminate the water supply. Slope is a consideration because of the extra grading required to maintain roads in the steeper areas of the landfill. Also, leachate may flow along the surface of the soils in the steeper areas and cause difficult seepage problems.

Daily cover for landfill is the soil material that is used to cover compacted solid waste in an area sanitary landfill. The soil material is obtained offsite, transported to the landfill, and spread over the waste. The ratings in the table also apply to the final cover for a landfill. They are based on the soil properties that affect workability, the ease of digging, and the ease of moving and spreading the material over the refuse daily during wet and

dry periods. These properties include soil texture, depth to a water table, ponding, rock fragments, slope, depth to bedrock or a cemented pan, reaction, and content of salts, sodium, or lime.

Loamy or silty soils that are free of large stones and excess gravel are the best cover for a landfill. Clayey soils may be sticky and difficult to spread; sandy soils are subject to wind erosion.

Slope affects the ease of excavation and of moving the cover material. Also, it can influence runoff, erosion, and reclamation of the borrow area.

After soil material has been removed, the soil material remaining in the borrow area must be thick enough over bedrock, a cemented pan, or the water table to permit revegetation. The soil material used as the final cover for a landfill should be suitable for plants. It should not have excess sodium, salts, or lime and should not be too acid.

Construction Materials

Table 15 and Table 16 provides information about the soils as potential sources of gravel, sand, topsoil, reclamation material, and roadfill. Normal compaction, minor processing, and other standard construction practices are assumed.

Sand and *gravel* are natural aggregates suitable for commercial use with a minimum of processing. They are used in many kinds of construction. Specifications for each use vary widely. In table 15, only the likelihood of finding material in suitable quantity is evaluated. The suitability of the material for specific purposes is not evaluated, nor are factors that affect excavation of the material. The properties used to evaluate the soil as a source of sand or gravel are gradation of grain sizes (as indicated by the Unified classification of the soil), the thickness of suitable material, and the content of rock fragments. If the bottom layer of the soil contains sand or gravel, the soil is considered a likely source regardless of thickness. The assumption is that the sand or gravel layer below the depth of observation exceeds the minimum thickness.

The soils are rated *good, fair*, or *poor* as potential sources of sand and gravel. A rating of good or fair means that the source material is likely to be in or below the soil. The bottom layer and the thickest layer of the soils are assigned numerical ratings. These ratings indicate the likelihood that the layer is a source of sand or gravel. The number 0.00 indicates that the layer is a poor source. The number 1.00 indicates that the layer is a good source. A number between 0.00 and 1.00 indicates the degree to which the layer is a likely source.

The soils are rated *good, fair*, or *poor* as potential sources of topsoil, reclamation material, and roadfill. The features that limit the soils as sources of these materials are specified in the tables. The numerical ratings given after the specified features indicate the degree to which the features limit the soils as sources of topsoil, reclamation material, or roadfill. The lower the number, the greater the limitation.

Topsoil is used to cover an area so that vegetation can be established and maintained. The upper 40 inches of a soil is evaluated for use as topsoil. Also evaluated is the reclamation potential of the borrow area. The ratings are based on the soil properties that affect plant growth; the ease of excavating, loading, and spreading the material; and reclamation of the borrow area. Toxic substances, soil reaction, and the properties that are inferred from soil texture, such as available water capacity and fertility, affect plant growth. The ease of excavating, loading, and spreading is affected by rock fragments, slope, depth to a water table, soil texture, and thickness of suitable material. Reclamation of the borrow area is affected by slope, depth to a water table, rock fragments, depth to bedrock or a cemented pan, and toxic material.

The surface layer of most soils is generally preferred for topsoil because of its organic matter content. Organic matter greatly increases the absorption and retention of moisture and nutrients for plant growth.

Reclamation material is used in areas that have been drastically disturbed by surface mining or similar activities. When these areas are reclaimed, layers of soil material or unconsolidated geological material, or both, are replaced in a vertical sequence. The reconstructed soil favors plant growth. The ratings in the table do not apply to quarries and other mined areas that require an offsite source of reconstruction material. The ratings are based on the soil properties that affect erosion and stability of the surface and the productive potential of the reconstructed soil. These properties include the content of sodium, salts, and calcium carbonate; reaction; available water capacity; erodibility; texture; content of rock fragments; and content of organic matter and other features that affect fertility.

Roadfill is soil material that is excavated in one place and used in road embankments in another place. 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 whole soil, from the surface to a depth of about 5 feet. It is assumed that soil layers will be mixed when the soil material is excavated and spread.

The ratings are based on the amount of suitable material and on soil properties that affect the ease of excavation and the performance of the material after it is in place. The thickness of the suitable material is a major consideration. The ease of excavation is affected by large stones, depth to a water table, and slope. How well the soil performs in place after it has been compacted and drained is determined by its strength (as inferred from the AASHTO classification of the soil) and linear extensibility (shrink-swell potential).

Water Management

Table 17 provides information on the soil properties and site features that affect water management. The degree and kind of soil limitations are given for pond reservoir areas; embankments, dikes, and levees; and aquifer-fed excavated ponds. The ratings are both verbal and numerical. Rating class terms indicate the extent to which the soils are limited by all of the soil features that affect these uses. Not limited indicates that the soil has features that are very favorable for the specified use. Good performance and very low maintenance can be expected. Somewhat limited indicates that the soil has features that are moderately favorable for the specified use. The limitations can be overcome or minimized by special planning, design, or installation. Fair performance and moderate maintenance can be expected. Very limited indicates that the soil has one or more features that are unfavorable for the specified use. The limitations generally cannot be overcome without major soil reclamation, special design, or expensive installation procedures. Poor performance and high maintenance can be expected.

Numerical ratings in the tables indicate the severity of individual limitations. The ratings are shown as decimal fractions ranging from 0.01 to 1.00. They indicate gradations between the point at which a soil feature has the greatest negative impact on the use (1.00) and the point at which the soil feature is not a limitation (0.00).

Pond reservoir areas (fig. 17) hold water behind a dam or embankment. Soils best suited to this use have low seepage potential in the upper 60 inches. The seepage potential is determined by the permeability of the soil and the depth to fractured bedrock or other permeable material. Excessive slope can affect the storage capacity of the reservoir area.

Embankments, dikes, and levees are raised structures of soil material, generally less than 20 feet high, constructed to impound water or to protect land against overflow. Embankments that have zoned construction (core and shell) are not considered. In this table, the soils are rated as a source of material for embankment fill. The ratings apply to the soil material below the surface layer to a depth of about 5 feet. It is assumed that soil layers will be uniformly mixed and compacted during construction.

Figure 17.—A pond located near a windmill. Soils in the foreground are Reagan silty clay loam, 0 to 2 percent slopes. The background soils are Ector-Rock outcrop Complex, 15 to 50 percent slopes. Water is critical for domestic and wild animals.

The ratings do not indicate the ability of the natural soil to support an embankment. Soil properties to a depth even greater than the height of the embankment can affect performance and safety of the embankment. Generally, deeper onsite investigation is needed to determine these properties.

Soil material in embankments must be resistant to seepage, piping, and erosion and have favorable compaction characteristics. Unfavorable features include less than 5 feet of suitable material and a high content of stones or boulders, organic matter, or salts or sodium. A high water table affects the amount of usable material. It also affects trafficability.

Aquifer-fed excavated ponds are pits or dugouts that extend to a ground-water aquifer or to a depth below a permanent water table. Excluded are ponds that are fed only by surface runoff and embankment ponds that impound water 3 feet or more above the original surface. Excavated ponds are affected by depth to a permanent water table, permeability of the aquifer, and quality of the water as inferred from the salinity of the soil. Depth to bedrock and the content of large stones affect the ease of excavation.

Soil Properties

Data relating to soil properties are collected during the course of the soil survey.

Soil properties are ascertained by field examination of the soils and by laboratory index testing of some benchmark soils. Established standard procedures are followed. During the survey, many shallow borings are made and examined to identify and classify the soils and to delineate them on the soil maps. Samples are taken from some typical profiles and tested in the laboratory to determine particle-size distribution, plasticity, and compaction characteristics.

Estimates of soil properties are based on field examinations, on laboratory tests of samples from the survey area, and on laboratory tests of samples of similar soils in nearby areas. Tests verify field observations, verify properties that cannot be estimated accurately by field observation, and help to characterize key soils.

The estimates of soil properties are shown in tables. They include physical and chemical properties, and clay mineralogy.

Engineering Index Properties

Table 18 provides the engineering classifications and the range of index properties for the layers of each soil in the survey area.

Depth to the upper and lower boundaries of each layer is indicated.

Texture is given in the standard terms used by the U.S. Department of Agriculture. These terms are defined according to percentages of sand, silt, and clay in the fraction of the soil that is less than 2 millimeters across. "Loam," for example, is soil that is 7 to 27 percent clay, 28 to 50 percent silt, and less than 52 percent sand. If the content of particles coarser than sand is 15 percent or more, an appropriate modifier is added, for example, "gravelly." Textural terms are defined in the Glossary.

Classification of the soils is determined according to the Unified soil classification system (2) and the system adopted by the American Association of State Highway and Transportation Officials (1).

The Unified system classifies soils according to properties that affect their use as construction material. Soils are classified according to particle-size distribution of the fraction less than 3 inches across and according to plasticity index, liquid limit, and organic matter content. Sandy and gravelly soils are identified as GW, GP, GM, GC, SW, SP, SM, and SC; silty and clayey soils as ML, CL, OL, MH, CH, and OH; and highly organic soils as PT. Soils exhibiting engineering properties of two groups can have a dual classification, for example, CL-ML.

The AASHTO system classifies soils according to those properties that affect roadway construction and maintenance. In this system, the fraction of a mineral soil that is less than 3 inches across is classified in one of seven groups from A-1 through A-7 on the basis of particle-size distribution, liquid limit, and plasticity index. Soils in group A-1 are coarse grained and low in content of fines (silt and clay). At the other extreme, soils in group A-7 are fine grained. Highly organic soils are classified in group A-8 on the basis of visual inspection. If laboratory data are available, the A-1, A-2, and A-7 groups are further classified as A-1-a, A-1-b, A-2-4, A-2-5, A-2-6, A-2-7, A-7-5, or A-7-6. As an additional refinement, the suitability of a soil as subgrade material can be indicated by a group index number. Group index numbers range from 0 for the best subgrade material to 20 or higher for the poorest.

Rock fragments larger than 10 inches across and 3 to 10 inches across are indicated as a percentage of the total soil on a dry-weight basis. The percentages are estimates determined mainly by converting volume percentage in the field to weight percentage.

Percentage (of soil particles) passing designated sieves is the percentage of the soil fraction less than 3 inches across based on an ovendry weight. The sieves, numbers 4, 10, 40, and 200 (USA Standard Series), have openings of 4.76, 2.00, 0.420, and 0.074 millimeters, respectively. Estimates are based on laboratory tests of soils sampled in the survey area and in nearby areas and on estimates made in the field.

Liquid limit and *plasticity index* (Atterberg limits) indicate the plasticity characteristics of a soil. The estimates are based on test data from the survey area or from nearby areas and on field examination.

The estimates of particle-size distribution, liquid limit, and plasticity index are generally rounded to the nearest 5 percent. Thus, if the ranges of gradation and Atterberg limits extend a marginal amount (1 or 2 percentage points) across classification boundaries, the classification in the marginal zone is generally omitted in the table.

Physical Soil Properties

Table 19 shows estimates of some physical characteristics and features that affect soil behavior. These estimates are given for the layers of each soil in the survey area. The estimates are based on field observations and on test data for these and similar soils.

Depth to the upper and lower boundaries of each layer is indicated.

Particle-size is the effective diameter of a soil particle as measured by sedimentation, sieving, or micrometric methods. Particle-sizes are expressed as classes with specific effective diameter class limits. The broad classes are sand, silt, and clay, ranging from the larger to the smaller.

Clay as a soil separate consists of mineral soil particles that are less than 0.002 millimeter in diameter. In table 19, the estimated clay content of each soil layer is given as a percentage, by weight, of the soil material that is less than 2 millimeters in diameter.

The content of sand, silt, and clay affects the physical behavior of a soil. Particle-size is important for engineering and agronomic interpretations, for determination of soil hydrologic qualities, and for soil classification.

The amount and kind of clay affect the fertility and physical condition of the soil and the ability of the soil to adsorb cations and to retain moisture. They influence shrink-swell potential, permeability, plasticity, the ease of soil dispersion, and other soil properties. The amount and kind of clay in a soil also affect tillage and earthmoving operations.

Moist bulk density is the weight of soil (ovendry) per unit volume. Volume is measured when the soil is at field moisture capacity, that is, the moisture content at 1/3 bar or 1/10 bar (33kPa or 10kPa) moisture tension. Weight is determined after the soil is dried at 105 degrees C. In the table, the estimated moist bulk density of each soil horizon is expressed in grams per cubic centimeter of soil material that is less than 2 millimeters in diameter. Bulk density data are used to compute shrink-swell potential, available water capacity, total pore space, and other soil properties. The moist bulk density of a soil indicates the pore space available for water and roots. Depending on soil texture, a bulk density of more than 1.4 can restrict water storage and root penetration. Moist bulk density is influenced by texture, kind of clay, content of organic matter, and soil structure.

*Permeability (*K-sat*)* refers to the ability of a soil to transmit water or air. The term "permeability," as used in soil surveys, indicates saturated hydraulic conductivity (K-sat). The estimates in the table indicate the rate of water movement, in inches per hour, when the soil is saturated. They are based on soil characteristics observed in the field, particularly structure, porosity, and texture. Permeability is considered in the design of soil drainage systems and septic tank absorption fields.

Available water capacity refers to the quantity of water that the soil is capable of storing for use by plants. The capacity for water storage is given in inches of water per inch of soil for each soil layer. The capacity varies, depending on soil properties that affect retention of water. The most important properties are the content of organic matter, soil texture, bulk density, and soil structure. Available water capacity is an important factor in the choice of plants or crops to be grown and in the design and management of irrigation systems. Available water capacity is not an estimate of the quantity of water actually available to plants at any given time.

Linear extensibility refers to the change in length of an unconfined clod as moisture content is decreased from a moist to a dry state. It is an expression of the volume change between the water content of the clod at 1/3 bar or 1/10 bar tension (33kPa or 10kPa tension) and oven dryness. The volume change is reported in the table as percent change for the whole soil. Volume change is influenced by the amount and type of clay minerals in the soil. Linear extensibility is used to determine the shrink-swell potential of soils. The shrink-swell potential is low if the soil has a linear extensibility of less than 3 percent; moderate if 3 to 6 percent; high if 6 to 9 percent; and very high if more than 9 percent. If the linear extensibility is more than 3, shrinking and swelling can cause damage to buildings, roads, and other structures and to plant roots. Special design commonly is needed.

Organic matter is the plant and animal residue in the soil at various stages of decomposition. In table16, the estimated content of organic matter is expressed as a percentage, by weight, of the soil material that is less than 2 millimeters in diameter.

The content of organic matter in a soil can be maintained by returning crop residue to the soil. Organic matter has a positive effect on available water capacity, water infiltration, soil organism activity, and tilth. It is a source of nitrogen and other nutrients for crops and soil organisms.

Erosion factors are shown in table 19 as the K factor (Kw and Kf) and the T factor. Erosion factor K indicates the susceptibility of a soil to sheet and rill erosion by water. Factor K is one of several factors used in the Universal Soil Loss Equation (USLE) and the Revised Universal Soil Loss Equation (RUSLE) to predict the average annual rate of soil loss by sheet and rill erosion in tons per acre per year. The estimates are based primarily on percentage of silt, sand, and organic matter and on soil structure and permeability. Values of K range from 00.02 to 0.69. Other factors being equal, the higher the value, the more susceptible the soil is to sheet and rill erosion by water.

Erosion factor Kw indicates the erodibility of the whole soil. The estimates are modified by the presence of rock fragments.

Erosion factor Kf indicates the erodibility of the fine-earth fraction, or the material less than 2 millimeters in size.

Erosion factor T is an estimate of the maximum average annual rate of soil erosion by wind or water that can occur without affecting crop productivity over a sustained period. The rate is in tons per acre per year.

Wind erodibility groups are made up of soils that have similar properties affecting their susceptibility to wind erosion in cultivated areas. The soils assigned to group 1 are the most susceptible to wind erosion, and those assigned to group 8 are the least susceptible. The groups are as follows:

1. Coarse sands, sands, fine sands, and very fine sands.

2. Loamy coarse sands, loamy sands, loamy fine sands, loamy very fine sands, ash material, and sapric soil material.

3. Coarse sandy loams, sandy loams, fine sandy loams, and very fine sandy loams.

4L. Calcareous loams, silt loams, clay loams, and silty clay loams.

4. Clays, silty clays, noncalcareous clay loams, and silty clay loams that are more than 35 percent clay.

5. Noncalcareous loams and silt loams that are less than 20 percent clay and sandy clay loams, sandy clays, and hemic soil material.

6. Noncalcareous loams and silt loams that are more than 20 percent clay and noncalcareous clay loams that are less than 35 percent clay.

7. Silts, noncalcareous silty clay loams that are less than 35 percent clay, and fibric soil material.

8. Soils that are not subject to wind erosion because of rock fragments on the surface or because of surface wetness.

Wind erodibility index is a numerical value indicating the susceptibility of soil to wind erosion, or the tons per acre per year that can be expected to be lost to wind erosion. There is a close correlation between wind erosion and the texture of the surface layer, the size and durability of surface clods, rock fragments, organic matter, and a calcareous reaction. Soil moisture and frozen soil layers also influence wind erosion.

Chemical Soil Properties

Table 20 shows estimates of some chemical characteristics and features that affect soil behavior. These estimates are given for the layers of each soil in the survey area. The estimates are based on field observations and on test data for these and similar soils.

Depth to the upper and lower boundaries of each layer is indicated.

Cation-exchange capacity is the total amount of extractable bases that can be held by the soil, expressed in terms of milliequivalents per 100 grams of soil at neutrality (pH 7.0) or at some other stated pH value. Soils having a low cation-exchange capacity hold fewer cations and may require more frequent applications of fertilizer than soils having a high cation-exchange capacity. The ability to retain cations reduces the hazard of ground-water pollution.

Soil reaction is a measure of acidity or alkalinity. The pH of each soil horizon is based on many field tests. For many soils, values have been verified by laboratory analyses. Soil reaction is important in selecting crops and other plants, in evaluating soil amendments for fertility and stabilization, and in determining the risk of corrosion.

Calcium carbonate equivalent is the percent of carbonates, by weight, in the fraction of the soil less than 2 millimeters in size. The availability of plant nutrients is influenced by the amount of carbonates in the soil. Incorporating nitrogen fertilizer into calcareous soils helps to prevent nitrite accumulation and ammonium-N volatilization.

Gypsum is expressed as a percent, by weight, of hydrated calcium sulfates in the fraction of the soil less than 20 millimeters in size. Gypsum is partially soluble in water. Soils that have a high content of gypsum may collapse if the gypsum is removed by percolating water.

Salinity is a measure of soluble salts in the soil at saturation. It is expressed as the electrical conductivity of the saturation extract, in millimhos per centimeter (mmhos/cm) or decisiemens per meter (dS/m) at 25 degrees C. Estimates are based on field and laboratory measurements at representative sites of nonirrigated soils. The salinity of irrigated soils is affected by the quality of the irrigation water and by the frequency of water application. Hence, the salinity of soils in individual fields can

differ greatly from the value given in the table. Salinity affects the suitability of a soil for crop production, the stability of soil if used as construction material, and the potential of the soil to corrode metal and concrete.

Sodium adsorption ratio (SAR) is a measure of the amount of sodium (Na) relative to calcium (Ca) and magnesium (Mg) in the water extract from saturated soil paste. It is the ratio of the Na concentration divided by the square root of one-half of the Ca + Mg concentration. Soils that have SAR values of 13 or more may be characterized by an increased dispersion of organic matter and clay particles, reduced permeability and aeration, and a general degradation of soil structure.

Water Features

Table 21 gives estimates of various water features. The estimates are used in land use planning that involves engineering considerations.

Hydrologic soil groups are based on estimates of runoff potential. Soils are assigned to one of four groups according to the rate of water infiltration when the soils are not protected by vegetation, are thoroughly wet, and receive precipitation from long-duration storms.

The four hydrologic soil groups are:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, 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 or 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.

Surface runoff refers to the loss of water from an area by flow over the land surface. Surface runoff classes are based on slope, climate, and vegetative cover. It is assumed that the surface of the soil is bare and that the retention of surface water resulting from irregularities in the ground surface is minimal. The classes are negligible, very low, low, medium, high, and very high.

The *months* in the table indicate the portion of the year in which the feature is most likely to be a concern.

Water table refers to a saturated zone in the soil. Table 21 indicates, by month, depth to the top (*upper limit*) and base (*lower limit*) of the saturated zone in most years. Estimates of the upper and lower limits are based mainly on observations of the water table at selected sites and on evidence of a saturated zone, namely grayish colors or mottles (redoximorphic features) in the soil. A saturated zone that lasts for less than a month is not considered a water table.

Ponding is standing water in a closed depression. Unless a drainage system is installed, the water is removed only by percolation, transpiration, or evaporation. Table 21 indicates *surface water depth* and the *duration* and *frequency* of ponding. Duration is expressed as *very brief* if less than 2 days, *brief* if 2 to 7 days, *long* if 7 to 30 days, and *very long* if more than 30 days. Frequency is expressed as none, rare, occasional, and frequent. *None* means that ponding is not probable; *rare* that it is

unlikely but possible under unusual weather conditions (the chance of ponding is nearly 0 percent to 5 percent in any year); *occasional* that it occurs, on the average, once or less in 2 years (the chance of ponding is 5 to 50 percent in any year); and *frequent* that it occurs, on the average, more than once in 2 years (the chance of ponding is more than 50 percent in any year).

Flooding is the temporary inundation of an area caused by overflowing streams, by runoff from adjacent slopes, or by tides. Water standing for short periods after rainfall or snowmelt is not considered flooding, and water standing in swamps and marshes is considered ponding rather than flooding.

Duration and *frequency* are estimated. Duration is expressed as *extremely brief* if 0.1 hour to 4 hours, *very brief* if 4 hours to 2 days, *brief* if 2 to 7 days, *long* if 7 to 30 days, and *very long* if more than 30 days. Frequency is expressed as none, very rare, rare, occasional, frequent, and very frequent. *None* means that flooding is not probable; *very rare* that it is very unlikely but possible under extremely unusual weather conditions (the chance of flooding is less than 1 percent in any year); *rare* that it is unlikely but possible under unusual weather conditions (the chance of flooding is 1 to 5 percent in any year); *occasional* that it occurs infrequently under normal weather conditions (the chance of flooding is 5 to 50 percent in any year); *frequent* that it is likely to occur often under normal weather conditions (the chance of flooding is more than 50 percent in any year but is less than 50 percent in all months in any year); and *very frequent* that it is likely to occur very often under normal weather conditions (the chance of flooding is more than 50 percent in all months of any year).

The information is based on evidence in the soil profile, namely thin strata of gravel, sand, silt, or clay deposited by floodwater; irregular decrease in organic matter content with increasing depth; and little or no horizon development.

Also considered is local information about the extent and levels of flooding and the relation of each soil on the landscape to historic floods. Information on the extent of flooding based on soil data is less specific than that provided by detailed engineering surveys that delineate flood-prone areas at specific flood frequency levels.

Soil Features

Table 22 gives estimates of various soil features. The estimates are used in land use planning that involves engineering considerations.

A *restrictive layer* is a nearly continuous layer that has one or more physical, chemical, or thermal properties that significantly impede the movement of water and air through the soil or that restrict roots or otherwise provide an unfavorable root environment. Examples are bedrock, cemented layers, dense layers, and frozen layers. The table indicates the hardness and thickness of the restrictive layer, both of which significantly affect the ease of excavation. *Depth to top* is the vertical distance from the soil surface to the upper boundary of the restrictive layer.

Risk of corrosion pertains to potential soil-induced electrochemical or chemical action that corrodes or weakens uncoated steel or concrete. The rate of corrosion of uncoated steel is related to such factors as soil moisture, particle-size distribution, acidity, and electrical conductivity of the soil. The rate of corrosion of concrete is based mainly on the sulfate and sodium content, texture, moisture content, and acidity of the soil. Special site examination and design may be needed if the combination of factors results in a severe hazard of corrosion. The steel or concrete in installations that intersect soil boundaries or soil layers is more susceptible to corrosion than the steel or concrete in installations that are entirely within one kind of soil or within one soil layer.

For uncoated steel, the risk of corrosion, expressed as *low, moderate*, or *high*, is based on soil drainage class, total acidity, electrical resistivity near field capacity, and electrical conductivity of the saturation extract.

For concrete, the risk of corrosion also is expressed as *low, moderate*, or *high*. It is based on soil texture, acidity, and amount of sulfates in the saturation extract.

Physical, Chemical, and Clay Mineralogy Analyses of Selected Soils

The results of physical analysis of several typical pedons in the survey area are given in table 23, the results of chemical analysis in table 24, and the results of clay mineralogy analysis in table 25. The data are for soils sampled at carefully selected sites. Unless otherwise indicated, the pedons are typical of the series. They are described in the section "Soil Series and Their Morphology." Soil samples were analyzed by Soil Characterization Laboratory, Texas A&M University at College Station, Texas.

Depth to the upper and lower boundaries of each layer is indicated.

Most determinations, except those for grain-size analysis and bulk density, were made on soil material smaller than 2 millimeters across. Measurements reported as percent or quantity of unit weight were calculated on an ovendry basis. The methods used in obtaining the data are indicated in the list that follows. The codes in parentheses refer to published methods (15).

Sand—(0.05- to 2.0-millimeter fraction) weight percentages of material less than 2 millimeters (3A1).

Silt—(0.002- to 0.05-millimeter fraction) pipette extraction, weight percentages of all material less than 2 millimeters (3A1).

Clay—(fraction less than 0.002 millimeters) pipette extraction, weight percentages of material less than 2 millimeters (3A1).

Water retained—pressure extraction, percentage of ovendry weight of less than 2-millimeter material; 1/3 bar (3C1), 15 bars (3C2).

Bulk density—of less than 2-millimeter material, saran-coated clods field moist (3B1a), 1/3 bar (3B1b), ovendry (3B1c).

Coefficient of linear extensibility—change in clod dimension based on whole soil (3D4).

Extractable cations—ammonium acetate pH 7.0, ICP; calcium (6N2e, 6N2f), magnesium (6O2d, 6O2e), sodium (6P2b, 6P2c), potassium (6Q2b, 6Q2c).

Cation-exchange capacity—sum of cations (4B4b1).

Base saturation—ammonium acetate, pH 7.0 (4B4c1).

Organic carbon—wet combustion. Walkley-Black modified acid-dichromate, ferric sulfate titration (6A1c, obsolete).

Reaction (pH)—1:1 water dilution (4C1a2a1).

Electrical conductivity—saturation extract (4F2b1).

Sodium adsorption ratio (4F3b).

Classification of the Soils

The system of soil classification used by the National Cooperative Soil Survey has six categories (8,9). 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 26 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 Vertisol.

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 Ustert (Ust, meaning burnt, plus ert, from Vertisol).

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 Haplusterts (Hapl, meaning minimal horizonation, plus usterts, the suborder of the Vertisols 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 Haplusterts.

FAMILY. Families are established within a subgroup on the basis of physical and chemical properties and other characteristics that affect management. Generally, the properties are those of horizons below plow depth where there is much biological activity. Among the properties and characteristics considered are particle-size class, mineralogy class, cation-exchange activity class, soil temperature regime, soil depth, and reaction class. A family name consists of the name of a subgroup preceded by terms that indicate soil properties. An example is fine, smectitic, thermic Typic Haplusterts.

SERIES. The series consists of soils within a family that have horizons similar in color, texture, structure, reaction, consistence, mineral and chemical composition, and arrangement in the profile.

Soil Series and Their Morphology

In this section, each soil series recognized in the survey area is described. Characteristics of the soil and the material in which it formed are identified for each series. A pedon, a small three-dimensional area of soil that is typical of the series in the survey area is described. The detailed description of each soil horizon follows

standards in the "Soil Survey Manual" (9). Many of the technical terms used in the descriptions are defined in "Soil Taxonomy" (12) and in "Keys to Soil Taxonomy" (10,11). Unless otherwise indicated, colors in the descriptions are for moist soil. Following the pedon description is the range of important characteristics of the soils in the series.

Angelo Series

The Angelo series consist of very deep or deep, well drained, moderately slowly permeable soils in valley fill positions or ancient stream terraces. These soils formed in calcareous loamy and clayey sediments. Slopes range from 0 to 2 percent. The soils are fine-silty, mixed, superactive, thermic Aridic Calciustolls.

Typical pedon of Angelo silty clay loam, 0 to 2 percent slopes; from the intersection of Interstate Highway 10 and Texas Highway 163 in Ozona, 6.2 miles east on Interstate 10, 4.6 miles south on Taylor Box Road, and 94 feet west in rangeland.

A1—0 to 9 inches; brown (7.5YR 4/2) silty clay loam, dark brown (7.5YR 3/2) moist; moderate fine granular and subangular blocky structure; hard, firm; common fine roots; few very fine tubular pores; few wormcasts; about 2 percent weathered limestone gravel; strongly effervescent; moderately alkaline; clear smooth boundary.

A2—9 to 16 inches; brown (7.5YR 4/2) silty clay loam, dark brown (7.5YR 3/2) moist; moderate medium subangular blocky structure; hard, firm; few fine roots; common fine tubular pores; few dark organic stains; about 1 percent weathered limestone gravel; strongly effervescent; moderately alkaline; clear smooth boundary.

Bw—16 to 25 inches; brown (7.5YR 5/4) silty clay loam, brown (7.5YR 4/4) moist; moderate medium subangular blocky structure; very hard, firm; few fine roots; few very fine tubular pores; very few faint clay films on ped faces; about 1 percent weathered limestone gravel; strongly effervescent; moderately alkaline; gradual smooth boundary.

Bk1—25 to 36 inches; light brown (7.5YR 6/4) silty clay loam, brown (7.5YR 5/4) moist; moderate fine granular and subangular blocky structure; hard, firm; few fine roots; about 15 percent masses of calcium carbonate; about 1 percent weathered limestone gravel; violently effervescent; moderately alkaline; gradual smooth boundary.

Bk2—36 to 61 inches, reddish yellow (7.5YR 6/6) silty clay loam, strong brown (7.5YR 5/6) moist; weak very fine subangular blocky structure; hard, firm; about 10 percent masses and concretions of calcium carbonate; violently effervescent; moderately alkaline; diffuse smooth boundary.

Bk3—61 to 80 inches, reddish yellow (5YR 6/6) silty clay loam, yellowish red (5YR 5/6) moist; weak fine subangular blocky structure; hard, friable; about 5 percent masses, films and threads of calcium carbonate; violently effervescent; moderately alkaline.

The solum thickness ranges from 60 to more than 80 inches. Distinct calcium carbonate accumulations begin at depths ranging from 24 to 40 inches. The silicate clay content of the control section ranges from 28 to 35 percent, with total clay ranging from 35 to 50 percent.

The A horizon has hue of 7.5YR or 10YR, value of 3 to 5, and chroma of 2 or 3. Silicate clay ranges from 28 to 42 percent and total clay ranges from 30 to 45 percent.

The Bw horizon has hue of 5YR to 10YR, value of 4 to 6, and chroma of 2 to 4. Texture is silty clay loam, clay loam, or silty clay. In some pedons, this horizon may contain a small amount of visible secondary carbonates.

The Bk horizons have hue of 5YR to 10YR, value of 5 to 8, and chroma of 2 through 6. Texture is silty clay loam or silty clay. Visible calcium carbonates in masses and threads range from 5 to 20 percent.

Blakeney Series

The Blakeney series consists of very shallow or shallow, well drained, moderately rapidly permeable soils on divides and ridges. These soils formed over caliche that is indurated in the upper part. Slopes range from 1 to 3 percent. The soils are loamy, mixed, superactive, thermic, shallow Ustic Petrocalcids

Typical pedon of Blakeney fine sandy loam, 1 to 3 percent slopes; from the intersection of U.S. Highway 67 and U.S. Highway 385 in McCamey, 3.6 miles west on U.S. Highway 67, 4.2 miles south on County Road 311, and 238 feet north in rangeland.

A—0 to 6 inches; brown (7.5YR 5/4) fine sandy loam, brown (7.5YR 4/4) moist; weak fine subangular blocky structure; slightly hard, friable; common fine and few medium roots; slightly effervescent; moderately alkaline; clear smooth boundary.

Bw—6 to 16 inches; strong brown (7.5YR 4/6) fine sandy loam, brown (7.5YR 4/4) moist; weak coarse prismatic structure parting to weak medium subangular blocky; slightly hard, friable; few fine and medium roots; many very fine and common fine tubular pores; few wormcasts; about 10 percent caliche fragments in the lower part; strongly effervescent; moderately alkaline; abrupt wavy boundary.

Bkm—16 to 24 inches; very pale brown (10YR 8/2) caliche, strongly cemented by calcium carbonate; oblong plates 2 to 6 inches in diameter; abrupt wavy boundary.

Bk—24 to 80 inches; pinkish white (7.5YR 8/2) weakly cemented by calcium carbonate; massive; about 20 percent masses of calcium carbonate; violently effervescent; moderately alkaline.

The thickness of the solum and the depth to the petrocalcic horizon ranges from 6 to 20 inches.

The A horizon has hue of 7.5YR or 10YR, value of 4 to 6, and chroma of 2 to 6.

The Bw horizon has hue of 7.5YR or 10YR, value of 4 to 6, and chroma of 2 to 6. Texture is fine sandy loam or loam.

The Bkm horizon is usually laminar in the upper 0.5 to 2 inches. Caliche plates are from 1 to 3 inches thick.

The Bk horizon has loamy calcareous materials that are massive to weakly cemented by calcium carbonates.

Conger Series

The Conger series consists of very shallow or shallow, well drained, moderately permeable soils on ridges and broad divides. The soil formed in calcareous, loamy materials. Slopes range from 0 to 3 percent. The soils are loamy, mixed, superactive, thermic, shallow Ustic Petrocalcids.

Typical pedon of Conger loam, 0 to 3 percent slopes; from the intersection of Business Loop 466 and Texas Highway 163 in Ozona, 2.8 miles north on Texas Highway 163, 17.4 miles northwest on Texas Highway 137, 5.1 miles west on U.S. Highway 190, 11.4 miles northwest on Powell Field Road, 4.1 miles north on Ranch Road 1676, and 1,420 feet west in rangeland.

A—0 to 6 inches; brown (10YR 5/3) loam, brown (10YR 4/3) moist; weak fine subangular blocky structure; slightly hard, friable; common fine roots; many very fine and fine tubular pores; common wormcasts; about 1 percent weathered limestone gravel less than 1 inch in diameter; very pale brown (10YR 7/3) platy surface crust about 0.25 inch thick; strongly effervescent; moderately alkaline; clear smooth boundary.

Bw—6 to 13 inches; pale brown (10YR 6/3) very cobbly loam, brown (10YR 4/3) moist; moderate medium subangular blocky structure; slightly hard, friable; few fine roots, about 40 percent caliche cobbles; violently effervescent; moderately alkaline; abrupt wavy boundary.

Bkm—13 to 21 inches; very pale brown (10YR 8/2) indurated caliche plate with a laminar upper surface layer 0.75 inch thick; abrupt wavy boundary.

Bk—21 to 80 inches; very pale brown (10YR 8/2) weakly cemented caliche materials with about 40 percent masses of calcium carbonate; massive.

The thickness of the solum and the depth to the petrocalcic horizon ranges from 8 to 20 inches. Clay content of the control section is 18 to 35 percent.

The A horizon has hue of 7.5YR or 10YR, value of 4 to 6, and chroma of 2 or 3. A few areas have a surface pavement of caliche gravel.

The Bw horizon has hue of 7.5YR or 10YR, value of 5 to 7, and chroma of 2 to 4. Texture is loam, sandy clay loam, or clay loam with counterparts that are gravelly or cobbly. Coarse fragments of caliche range from 5 to 45 percent.

The Bkm horizon has cemented plates 1 to 4 inches thick and is laminar in the upper 0.5 to 2 inches. It is white, pink, pinkish white, or very pale brown. This horizon is indurated or strongly cemented.

The Bk horizon is white, pink, pinkish white, or very pale brown loamy caliche materials that are weakly to strongly cemented.

Dev Series

The Dev series consists of very deep, well drained, moderately rapidly permeable soils on flood plains (fig. 18). The soils formed in gravelly alluvium from high velocity streams that drain limestone hills. Slopes range from 0 to 3 percent. The soils are loamy-skeletal, carbonatic, thermic Cumulic Haplustolls.

Typical pedon of Dev very gravelly loam, 0 to 3 percent slopes, frequently flooded; from the intersection of Interstate Highway 10 and Texas Highway 163 in Ozona, 14.3 miles south on Texas Highway 163, 14.5 miles south on Ranch Road 1973, and 240 feet west in rangeland.

A1—0 to 8 inches; dark grayish brown (10YR 4/2) very gravelly loam, very dark grayish brown (10YR 3/2) moist; moderate fine granular and subangular blocky structure; hard, friable; few fine and medium roots; about 35 percent by volume of coarse fragments of which 30 percent is subrounded limestone gravel and 5 percent is limestone cobbles; strongly effervescent; moderately alkaline; clear wavy boundary.

A2—8 to 25 inches; dark grayish brown (10YR 4/2) extremely gravelly loam, very dark grayish brown (10YR 3/2) moist; weak fine granular structure; hard, friable; few fine and medium roots; about 75 percent by volume of coarse fragments of which 60 percent is subrounded limestone gravel and 15 percent is subrounded limestone cobbles; strongly effervescent; moderately alkaline; diffuse wavy boundary.

Bk1—25 to 38 inches; brown (10YR 5/3) extremely gravelly loam, brown (10YR 4/3) moist; weak medium subangular blocky and weak fine granular structure; hard, friable; about 65 percent by volume of coarse fragments of which 62 percent is limestone gravel and 3 percent cobbles and stones; common films

and threads of calcium carbonate; violently effervescent; moderately alkaline; diffuse wavy boundary.

Bk2—38 to 80 inches; yellowish brown (10YR 5/4) very gravelly loam, dark yellowish brown (10YR 4/4) moist; weak medium subangular blocky structure; hard, friable; about 55 percent by volume coarse fragments of which 40 percent is subrounded limestone gravel and 15 percent is limestone cobbles with a few stones; many films and threads of calcium carbonate; violently effervescent; moderately alkaline.

The thickness of the solum ranges from 60 to more than 80 inches. The 10- to 40-inch particle-size control section contains 35 to 90 percent by volume coarse fragments of mostly limestone gravel with the majority being less than 3 inches in diameter. The texture excluding coarse fragments is loam, sandy clay loam, or clay loam. In some pedons, there are stratified recent sediments of loam or clay loam in the upper few inches or fragmental strata consisting of nearly all coarse fragments.

The A horizon has hue of 10YR, values of 3 to 5, and chroma of 2 or 3. Some pedons have only an A horizon.

The Bk horizon has hue of 7.5YR or 10YR, values of 5 to 7, and chroma of 2 to 4. Textures range from loam, sandy clay loam, or clay loam with their very gravelly or extremely gravelly counterparts. Films, threads, and coatings of secondary calcium carbonate range from none to about 5 percent by volume. Buried soils occur below 20 inches in some pedons.

Figure 18.—Profile of Dev very gravelly loam, 0 to 3 percent slopes, frequently flooded. Limestone coarse fragments comprise 35 to 90 percent of the profile. Stratification is an indication of past flooding events.

Ector Series

The Ector series consists of very shallow or shallow well drained, moderately permeable soils above very slowly permeable limestone bedrock on ridges, hills, and mesa tops. The soil formed in indurated limestone bedrock. Slopes range from 1 to 60 percent. The soils are loamy-skeletal, carbonatic, thermic Lithic Calciustolls.

Typical pedon of Ector very cobbly clay loam in an area of Ector-Rock outcrop, 1 to 15 percent slopes; from the intersection of Business Loop 466 and Texas Highway 163 in Ozona, 2.8 miles north on Texas Highway 163, 22.2 miles northwest on Texas Highway 137, 1.9 miles northwest on private ranch road past headquarters, and 1,920 feet north in rangeland.

A—0 to 5 inches; dark grayish brown (10YR 4/2) very cobbly clay loam, very dark grayish brown (10YR 3/2) moist; moderate fine subangular blocky structure; slightly hard, friable; common very fine and fine roots; about 50 percent coarse fragments of which 30 percent are limestone cobbles, 20 percent are limestone gravel and 1 percent stones; strongly effervescent; moderately alkaline; clear smooth boundary.

Rk/Bk—5 to 8 inches; dark grayish brown (10YR 4/2) extremely cobbly clay loam, very dark grayish brown (10YR 3/2) moist; moderate fine subangular blocky structure; slightly hard, friable; common very fine and fine roots; approximately 85 percent coarse fragments of which 65 percent are limestone cobbles and 20 percent are stones; pendants of calcium carbonate are on the underside of cobbles and stones; strongly effervescent; moderately alkaline; abrupt smooth boundary.

R—8 to 30 inches; indurated fractured limestone bedrock; filled seams of calcium carbonate in fractures in the upper part.

The thickness of the solum and the depth to limestone bedrock ranges from 6 to 20 inches. Content of coarse fragments of limestone or hard calcium carbonate fragments range from 35 to 80 percent of the soil mass. About 30 to 75 percent are gravel size, 5 to 35 percent cobble size, and 0 to 20 percent stone size.

The A or Ak horizons have hue of 7.5YR or 10YR, value of 3 to 5, and chroma of 2 or 3. Texture exclusive of coarse fragments, is silt loam, loam, clay loam, or silty clay loam, with clay content ranging from about 20 to 35 percent in the particle-size control section.

The Rk/Bk horizon has soil material between fractures and coarse fragments. Colors and textures are similar to the overlying horizon. Many fracture faces and fragments are coated with calcium carbonate.

The R horizon is indurated fractured limestone bedrock.

Harkey Series

The Harkey series consists of very deep, well drained, moderately permeable soils that are on flood plains and low terraces of the Pecos River. They formed in calcareous mixed alluvial sediments. Slopes range from 0 to 2 percent. The soils are coarse-silty, mixed, superactive, calcareous, thermic Typic Torrifluvents.

Typical pedon of Harkey very fine sandy loam, 0 to 2 percent slopes, rarely flooded; from the intersection of Interstate Highway 10 and Texas Highway 163 in Ozona, 24.6 miles west on Interstate Highway 10, 9.9 miles southwest on U.S. Highway 290, 3.9 miles south on county road, and 275 feet west in rangeland.

A—0 to 6 inches; brown (10YR 5/3) very fine sandy loam, dark brown (10YR 4/3) moist; moderate fine subangular blocky structure; slightly hard, friable; few fine roots; common very fine and few fine tubular pores; few wormcasts; violently effervescent; moderately alkaline; clear smooth boundary.

C1—6 to 16 inches; pale brown (10YR 6/3) very fine sandy loam, brown (10YR 5/3) moist; massive; slightly hard, friable; few fine roots; common very fine tubular pores; few wormcasts; about 1 percent very fine quartz gravel; violently effervescent; moderately alkaline; gradual wavy boundary.
C2—16 to 35 inches; brown (10YR 5/3) loam, brown (10YR 4/3) moist; massive; hard, friable; few fine roots; common very fine tubular pores; about 1 percent very fine quartz gravel; violently effervescent; moderately alkaline; gradual wavy boundary.
C3—35 to 80 inches; pale brown (10YR 6/3) very fine sandy loam, brown (10YR 5/3) moist; massive; slightly hard, friable; few fine roots in upper part; common very fine tubular pores; violently effervescent; moderately alkaline.

The thickness of the solum is more than 80 inches. Fine or very fine quartz gravel ranges from 0 to 5 percent throughout the solum.

The A horizon has hue of 7.5YR or 10YR, value of 4 to 6, and chroma of 3 or 4.

The C horizon has hue of 7.5YR or 10YR, value of 4 to 6, and chroma of 3 or 4. Texture is very fine sandy loam, loam, or silt loam.

Ima Series

The Ima series consist of deep or very deep, well drained, moderately rapidly permeable soils on broad flats and terraces of the Pecos River. The soils formed in loamy alluvium and eolian deposits. Slopes range from 0 to 2 percent. These soils are coarse-loamy, mixed, superactive, thermic Ustic Haplocambids.

Typical pedon of Ima fine sandy loam in an area of Kinco-Ima complex, 0 to 2 percent slopes; from the intersection of Ranch Road 1901 and Ranch Road 305 in McCamey, 6.9 miles south on Ranch Road 305, 1.6 miles southwest, 0.5 mile south on private ranch road to gate, 0.9 mile south on private road, and 330 feet west in rangeland.

A1—0 to 5 inches; brown (7.5YR 5/4) fine sandy loam, brown (7.5YR 4/4) moist; weak fine granular structure; soft, very friable; few fine and medium roots; few very fine and fine tubular pores; slightly effervescent; moderately alkaline; clear smooth boundary.
A2—5 to 18 inches; reddish brown (5YR 5/4) fine sandy loam, reddish brown (5YR 4/4) moist; weak fine subangular blocky structure; slightly hard, very friable; few fine and medium roots; common very fine and fine tubular pores; slightly effervescent; moderately alkaline; clear smooth boundary.
Bw1—18 to 26 inches; reddish yellow (7.5YR 6/6) fine sandy loam, strong brown (7.5YR 5/6) moist; weak fine prismatic structure parting to weak medium subangular blocky; slightly hard, very friable; many very fine and fine tubular pores; strongly effervescent; moderately alkaline; clear smooth boundary.
Bw2—26 to 50 inches; light brown (7.5YR 6/4) fine sandy loam, brown (7.5YR 5/4) moist; weak fine prismatic structure parting to weak fine subangular blocky; slightly hard, very friable; many very fine and fine tubular pores; strongly effervescent; moderately alkaline; clear smooth boundary.
Bk—50 to 80 inches; light brown (7.5YR 6/4) fine sandy loam, brown (7.5YR 5/4) moist; weak fine subangular blocky structure; hard, friable; few very fine tubular pores; about 2 percent masses of calcium carbonate; strongly effervescent; moderately alkaline.

The thickness of the solum ranges from 60 to more than 80 inches. The clay content of the 10- to 40-inch particle-size control section ranges from 10 to 18 percent. Below 40 inches, the clay content is variable ranging from 15 to 35 percent. Reaction ranges from slightly alkaline to moderately alkaline throughout the solum.

The A horizon has hue of 5YR to 10YR, value of 4 to 6, and chroma of 3 or 4.

The Bw horizon has hue of 2.5YR to 7.5YR, value of 4 to 7, and chroma of 3 to 6. Texture is fine sandy loam, sandy loam, or loam.

The Bk horizon has hue of 2.5YR to 7.5YR, value of 4 to 7, and chroma of 3 to 6. Texture is fine sandy loam, sandy loam, or loam. Secondary calcium carbonate of masses, films, and threads ranges from 0 to 3 percent.

Iraan Series

The Iraan series consists of very deep, well drained, moderately slowly permeable soils on nearly level flood plains of larger streams. The soil formed in loamy alluvial sediments derived from limestone hills. Slopes range from 0 to 2 percent. These soils are fine-silty, mixed, superactive, thermic Cumulic Haplustolls.

Typical pedon of Iraan silty clay loam, 0 to 2 percent slopes, occasionally flooded; from the intersection of U. S. Highway 190 and Texas Highway 349 in Iraan, 4.4 miles west on U. S. Highway 190, 8.0 miles north on Texas Highway 349, 0.8 mile west on private ranch road, and 590 feet north in rangeland.

A1—0 to 6 inches; dark grayish brown (10YR 4/2) silty clay loam, very dark grayish brown (10YR 3/2) moist; weak fine granular and weak medium subangular blocky structure; hard, friable; common fine and few medium roots; common wormcasts; about 1 percent limestone gravel; slightly effervescent; moderately alkaline; gradual smooth boundary.

A2—6 to 25 inches; brown (10YR 4/3) silty clay loam, dark brown (10YR 3/3) moist; moderate fine subangular blocky structure; hard, firm; few fine and medium roots; few tubular pores; few wormcasts; about 1 percent limestone gravel; strongly effervescent; moderately alkaline; clear smooth boundary.

Bw1—25 to 42 inches; brown (10YR 5/3) silty clay loam, brown (10YR 4/3) moist; moderate medium subangular blocky structure; hard, firm; few fine roots, few very fine and fine tubular pores; about 2 percent films and threads of calcium carbonate; about 1 percent limestone gravel; strongly effervescent; moderately alkaline; gradual wavy boundary.

Bw2—42 to 51 inches; yellowish brown (10YR 5/4) clay loam, dark yellowish brown (10YR 4/4) moist; moderate fine subangular blocky structure; hard, firm; about 2 percent films and threads of calcium carbonate; about 5 percent limestone gravel; strongly effervescent; moderately alkaline; diffuse wavy boundary.

Bw3—51 to 80 inches; pale brown (10YR 6/3) clay loam, brown (10YR 5/3) moist; weak fine subangular blocky structure; hard, friable; about 1 percent films and threads of calcium carbonate; about 1 percent limestone gravel; strongly effervescent; moderately alkaline.

The thickness of the solum ranges from 60 to more than 80 inches. The mollic epipedon is 20 to 40 inches thick. The clay content of the 10- to 40-inch particle-size control section ranges from 30 to 45 percent. Limestone gravel ranges from 0 to 15 percent.

The A horizon has hue of 7.5YR or 10YR, value of 3 to 5, and chroma of 2 or 3.

The Bw horizons have hue of 7.5YR to 10YR, value of 4 to 6, and chroma of 2 to 4. Texture is silty clay loam, clay loam, or silty clay.

Irion Series

The Irion series consists of very deep, well drained, very slowly permeable soils in shallow depressions. The soil formed in clayey sediments over limestone bedrock. Slopes are 0 to 1 percent. These soils are fine, smectitic, thermic Typic Haplusterts.

Typical pedon of Irion clay, 0 to 1 percent slopes; from the intersection of Texas Highway 137 and Texas Highway 163 about 1 mile north of Ozona, 5.4 miles north

on Texas Highway 163, 3.7 miles east on County Road 109, 1.7 miles east and 0.4 mile south on private ranch road, and 510 feet southwest in rangeland.

A1—0 to 4 inches; very dark grayish brown (10YR 3/2) clay, very dark grayish brown (10YR 3/2) moist; moderate fine subangular blocky structure; hard, firm; common fine roots; about 1 percent fine limestone gravel; strongly effervescent; moderately alkaline; clear smooth boundary.

A2—4 to 14 inches; dark grayish brown (10YR 4/2) clay, very dark grayish brown (10YR 3/2) moist; moderate fine and medium angular blocky structure; very hard, very firm; few fine roots; few distinct pressure faces on ped surfaces; about 1 percent fine and medium limestone gravel; strongly effervescent; moderately alkaline; gradual smooth boundary.

Bss1—14 to 40 inches; dark grayish brown (10YR 4/2) clay, very dark grayish brown (10YR 3/2) moist; moderate medium prismatic structure parting to moderate fine and medium angular blocky; very hard, very firm; few fine roots on surface of peds; many prominent slickensides; few distinct pressure faces on ped surfaces; about 1 percent fine and coarse limestone gravel; strongly effervescent; moderately alkaline; gradual smooth boundary.

Bss2—40 to 54 inches; dark grayish brown (10YR 4/2) clay, very dark grayish brown (10YR 3/2) moist; weak medium prismatic structure parting to weak medium angular blocky; very hard, very firm; few fine roots on surface of peds; common prominent slickensides; few brown (10YR 4/3) stains on ped surfaces; few black concretions; about 5 percent fine limestone gravel; strongly effervescent; moderately alkaline; gradual smooth boundary.

Bk—54 to 72 inches; grayish brown (10YR 5/2) clay, dark grayish brown (10YR 4/2) moist; weak medium prismatic structure parting to weak coarse angular blocky; very hard, very firm; common distinct pressure faces on ped surfaces; common brown (10YR 4/3) stains on ped surfaces; about 2 percent fine limestone gravel; about 1 percent masses of calcium carbonate in lower part; strongly effervescent; moderately alkaline; abrupt smooth boundary.

R—72 to 75 inches; indurated platy limestone bedrock interbedded with thin layers of marl.

The thickness of the solum and the depth to indurated limestone ranges from 60 to more than 80 inches. Slickensides begin at a depth of 8 to 24 inches. Gilgai microrelief on native rangeland have microlows that are 2 to 12 inches lower than the microhigh. Distance between microhighs and microlows range from 6 to 15 feet. The soil is clay or silty clay throughout. In any horizon, limestone cobbles, stones, and gravel comprise 0 to 15 percent by volume.

The A horizon has hue of 7.5YR to 2.5Y, value of 2 to 5, and chroma of 1 to 3. Color is the same on microhighs and microlows.

The Bss horizon has hue of 7.5YR or 10YR, value of 3 to 5, and chroma of 1 to 3.

The Bk horizon, where present, has hue of 5YR to 10YR, value of 4 to 6, and chroma of 2 to 4. Concretions and masses of calcium carbonate range from few to common.

The R horizon is indurated platy limestone interbedded with thin layers of marl.

Kinco Series

The Kinco series consists of very deep, well drained, moderately rapidly permeable soils on broad flats and terraces along the Pecos River. The soils formed in calcareous loamy alluvium and eolian sediments. Slopes range from 0 to 2 percent. The soils are coarse-loamy, mixed, superactive, thermic Ustic Haplocalcids.

Typical pedon of Kinco fine sandy loam in an area of Kinco-Ima complex, 0 to 2 percent slopes; from the intersection of U.S. Highway 385 and U.S. Highway 67 in

McCamey, 3.6 miles west on U.S. Highway 67, 4.5 miles south on County Road 311, and 120 feet west in rangeland.

A—0 to 10 inches; brown (7.5YR 5/4) fine sandy loam, brown (7.5YR 4/4) moist; weak fine granular structure; slightly hard, very friable; few fine roots; few fine tubular pores; few insect burrows; strongly effervescent; moderately alkaline; clear smooth boundary.

Bw—10 to 29 inches; light brown (7.5YR 6/4) fine sandy loam, brown (7.5YR 5/4) moist; weak coarse prismatic structure parting to weak fine granular; slightly hard, friable; few fine roots; common very fine and fine tubular pores; strongly effervescent; moderately alkaline; gradual smooth boundary.

Bk1—29 to 38 inches; light brown (7.5YR 6/4) fine sandy loam, brown (7.5YR 5/4) moist; weak coarse prismatic structure parting to weak fine granular; slightly hard, friable; few fine tubular pores; about 5 percent weakly cemented calcium carbonate concretions; violently effervescent; moderately alkaline; diffuse wavy boundary.

Bk2—38 to 80 inches; pink (7.5YR 7/4) fine sandy loam, light brown (7.5YR 6/4) moist; weak coarse prismatic structure; slightly hard, friable; about 5 percent concretions, films and threads of calcium carbonate; about 2 percent by volume of weathered limestone gravel; violently effervescent; moderately alkaline.

The thickness of the solum ranges from 60 to more than 80 inches. Depth to a calcic horizon ranges from 24 to 40 inches. Coarse fragments range from none to 5 percent limestone gravel throughout the soil.

The A horizon has hue of 7.5YR or 10YR, value of 5 or 6, and chromas of 3 or 6.

The Bw horizon has hue of 7.5YR or 10YR, value of 5 to 7, and chroma of 3 or 6. The texture is fine sandy loam or loam.

The Bk horizon has hue of 5YR or 7.5YR, value of 6 to 8, and chroma of 2 to 6. The texture is fine sandy loam or loam. The content of calcium carbonate in the form of masses, threads, and films ranges from 15 to 60 percent by volume.

Lozier Series

The Lozier series consists of very shallow or shallow, well drained, moderately permeable soils over very slowly permeable bedrock in uplands (fig. 19). The soils formed in loamy residuum over limestone bedrock. Slopes range from 2 to 55 percent. These soils are loamy-skeletal, carbonatic, thermic Lithic Haplocalcids.

Typical pedon of Lozier very gravelly loam in an area of Lozier-rock outcrop complex, 2 to 15 percent slopes; from the intersection of County Road 305 and Ranch Road 1901 in McCamey, 5.8 miles south on Ranch Road 1901, 1.3 miles east and 0.5 mile south on ranch road, and 1,300 feet southwest on ridge top in rangeland.

A—0 to 3 inches; brown (10YR 5/3) very gravelly loam, dark brown (10YR 3/3) moist; weak fine subangular blocky structure; slightly hard, friable; common fine roots; common fine pores; about 40 percent limestone gravel; violently effervescent; moderately alkaline; clear smooth boundary.

Bk—3 to 9 inches; brown (10YR 5/3) very gravelly loam, dark brown (10YR 3/3) moist; weak medium subangular blocky structure; slightly hard, friable; common fine roots; common fine pores; about 60 percent limestone gravel with calcium carbonate coatings; violently effervescent; moderately alkaline; abrupt wavy boundary.

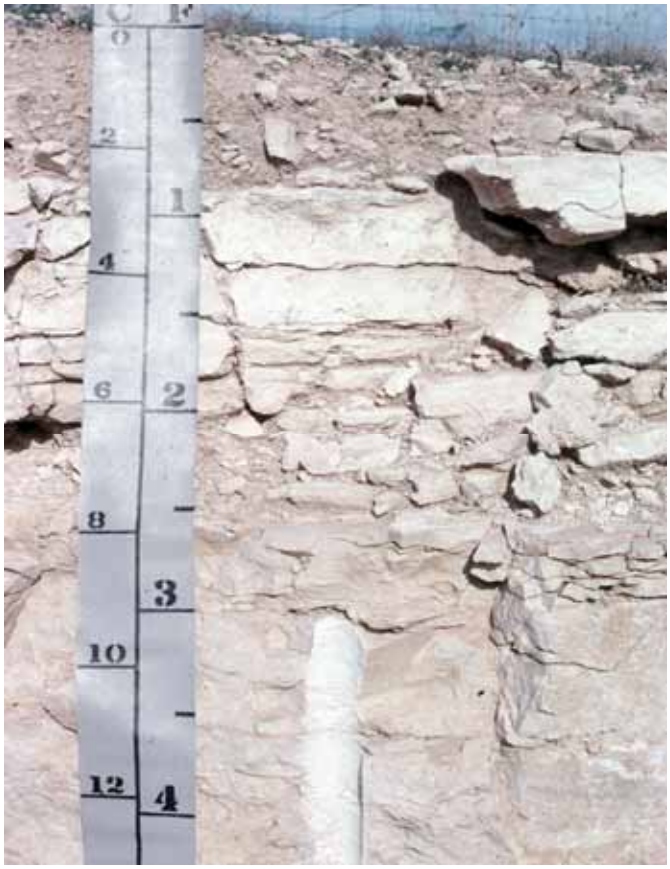

Figure 19.—Profile of Lozier very gravelly loam in an area of Lozier-rock outcrop complex, 2 to 15 percent slopes. Limestone bedrock begins at a depth of 10 inches.

Rk/Bk—9 to 15 inches; fractured platy limestone; calcium carbonate coatings on surface; cracks and fractures are less than 4 inches apart and are filled and partially sealed with calcium carbonate; violently effervescent; gradual wavy boundary.

R—15 to 30 inches; fractured platy limestone bedrock with hardness about 4, Moh's scale; few thin seams of calcium carbonate in partings in upper part.

The thickness of the solum over limestone bedrock ranges from 4 to 20 inches. Volume of coarse fragments ranges from 35 to 80 percent. About 15 to 60 percent is gravel-size, 0 to 20 percent cobble-size, and 0 to 20 percent stone-size. More than 40 percent of the soil mass is made up of limestone fragments less than 1 inch in diameter, concretions, and re-precipitated calcium carbonate.

The A horizon has hue of 7.5YR to 2.5Y, value of 5 to 8, and chroma of 2 to 4. The clay content ranges from 15 to 35 percent. Calcium carbonate coatings on the fragments are from faint discontinuous films to 1 inch thick pendants.

The Bk horizon has hue of 7.5YR to 2.5Y, value of 5 to 8, and chroma of 2 to 4. Texture, exclusive of coarse fragments, is loam, silt loam, clay loam, or silty clay loam. The clay content ranges from 15 to 35 percent. Calcium carbonate coatings on the fragments are from faint discontinuous films to 1 inch thick pendants

The Rk/Bk horizon has fractures less than 4 inches apart. Hard calcium carbonate coatings on rock fractures and coarse fragments range from 0.25 inch to 3 inches thick.

The R horizon is fractured platy limestone bedrock with hardness of about 4 on Moh's scale.

Mailtrail Series

The Mailtrail series consists of very shallow and shallow, well drained, moderately permeable soils on fans or footslopes below limestone hills. The soil formed in highly calcareous, gravelly, loamy alluvium from limestone and marl. Slopes range from 1 to 8 percent. The soils are loamy-skeletal, carbonatic, thermic, shallow Petrocalcic Calciustolls.

Typical pedon of Mailtrail very gravelly clay loam, 1 to 8 percent slopes; from intersection of Interstate Highway 10 and Texas Highway 163 in Ozona, 6.2 miles east on Interstate Highway 10, 5.6 miles south on Taylor Box Road, 0.4 mile east on private road, and 60 feet west in rangeland.

A1—0 to 5 inches; dark grayish brown (10YR 4/2) very gravelly clay loam, very dark grayish brown (10YR 3/2) moist; moderate fine subangular blocky structure; slightly hard, very friable; common fine roots; few very fine tubular pores; about 45 percent coarse fragments, which are about 60 percent caliche gravel and 40 percent weathered limestone gravel; strongly effervescent; moderately alkaline; clear wavy boundary.

A2—5 to 12 inches; brown (10YR 4/3) extremely cobbly clay loam, dark brown (10YR 3/3) moist; moderate medium subangular blocky structure parting to moderate very fine granular; slightly hard, very friable; common fine and few medium roots; common tubular pores; few wormcasts; about 75 percent coarse fragments of which 65 percent is cobble-size caliche fragments and 10 percent is caliche gravel; coarse fragments are pitted on lower surface; strongly effervescent; moderately alkaline; abrupt wavy boundary.

Bkm—12 to 16 inches; very pale brown (10YR 8/2) indurated caliche that has less than 0.5 inch pale brown (10YR 6/3) laminar cap; strongly effervescent; abrupt wavy boundary.

BCk—16 to 80 inches; pink (7.5YR 7/4) weakly cemented marly material; about 20 percent limestone cobbles and 10 percent limestone gravel; violently effervescent; moderately alkaline.

The thickness of the solum and the depth to indurated caliche ranges from 4 to 20 inches. Limestone and caliche fragments cover 5 to 75 percent of the surface.

The A horizons have hue of 7.5YR or 10YR, value of 3 to 5, and chroma of 1 to 3. It ranges from 35 to 85 percent by volume of coarse fragments of caliche and limestone. Total clay ranges from 25 to 40 percent and silicate clay ranges from 20 to 35 percent.

The Bkm horizon has hue of 7.5YR or 10YR, value of 5 to 8, and chroma of 1 to 5. It is strongly cemented caliche indurated by calcium carbonates.

The BCk horizon has same colors of Bkm horizon. It is weakly to moderately cemented with calcium carbonate. It contains 2 to 90 percent limestone, caliche, and chert fragments.

Noelke Series

The Noelke series consists of very shallow or shallow, well drained, moderately permeable soils on hilltops and ridges in uplands. The soil formed in material weathered from limestone. Slopes range from 0 to 5 percent. The soils are loamy-skeletal, mixed, superactive, thermic Lithic Petrocalcic Calciustolls.

Typical pedon of Noelke very gravelly clay loam in an area of Noelke-Ector complex, 0 to 5 percent slopes; from intersection of Business Loop 466 and Texas

Highway 163 in Ozona, 21.3 miles north on Texas Highway 163, 15.1 miles east on County Road 209, and 154 feet west in rangeland.

A—0 to 10 inches; brown (10YR 4/3) very gravelly clay loam, dark brown (10YR 3/3) moist; weak fine subangular blocky structure parting to moderate fine granular; hard, friable; common fine roots; few fine tubular pores; few wormcasts; about 60 percent coarse fragments, of which 45 percent is limestone gravel, 15 percent is limestone and caliche cobbles; strongly effervescent; moderately alkaline; abrupt wavy boundary.

Bkm—10 to 16 inches; very pale brown (10YR 8/2) indurated caliche; brown (10YR 5/3) laminar cap about 12 mm thick.

R—16 to 80 inches; indurated limestone bedrock.

The thickness of the solum and the depth to the petrocalcic horizon ranges from 6 to 20 inches.

The A horizon has hue of 7.5YR or 10YR, value of 4 to 5, and chroma of 2 or 3. The coarse fragment content ranges from 35 to 75 percent. The total clay content ranges from 28 to 45 percent. The silicate clay content ranges from 25 to 35 percent.

The Bkm horizon extends into the cracks in the limestone. It is white, pink, or very pale brown.

The R layer is white or yellow indurated limestone bedrock.

Ozona Series

The Ozona series consists of very shallow or shallow, well drained, moderately permeable soils on broad, undissected plateaus (fig. 20). The soils formed in calcareous loamy eolian materials overlying marl and limestone. Slopes range from 0 to 3 percent. The soils are loamy mixed, superactive, thermic, shallow Petrocalcic Calciustolls.

Typical pedon of Ozona silty clay loam in an area of Texon-Ozona complex, 0 to 3 percent slopes; from the intersection of Business Loop 466 and Texas Highway 163 in Ozona, 14.4 miles north on Texas Highway 163, 4.6 miles west on U.S. Highway 190, 0.9 mile north on private ranch road, and 80 feet east in rangeland.

A1—0 to 2 inches; brown (10YR 5/3) silty clay loam, dark brown (10YR 3/3) moist; moderate fine and medium granular structure; slightly hard, friable; common very fine and fine roots; common fine and medium interstitial pores; about 2 percent weathered fine limestone gravel; slightly effervescent; moderately alkaline; clear smooth boundary.

A2—2 to 10 inches; brown (7.5YR 4/3) silty clay loam, dark brown (7.5YR 3/3) moist; weak coarse prismatic structure parting to moderate medium and coarse subangular blocky; hard, firm; common very fine and fine roots; common very fine and fine interstitial pores; about 2 percent weathered fine limestone gravel; slightly effervescent; moderately alkaline; clear smooth boundary.

Bk—10 to 16 inches; brown (7.5YR 5/3) silty clay loam, brown (7.5YR 4/3) moist; weak coarse prismatic structure parting to moderate medium and coarse subangular blocky; hard, firm; common very fine and fine roots; common very fine and fine interstitial pores; about 2 percent fine threads and concretions of calcium carbonate; about 10 percent coarse weathered caliche fragments; strongly effervescent; moderately alkaline; abrupt wavy boundary.

Bkm—16 to 24 inches; very pale brown (10YR 8/2) caliche, very pale brown (10YR 7/3) laminar cap about 0.5 inch thick on upper surface; few thin laminae streaks of very pale brown (10YR 7/3); few solution channels filled with brown (7.5YR 5/3) silty clay loam material; violently effervescent; moderately alkaline; abrupt wavy boundary.

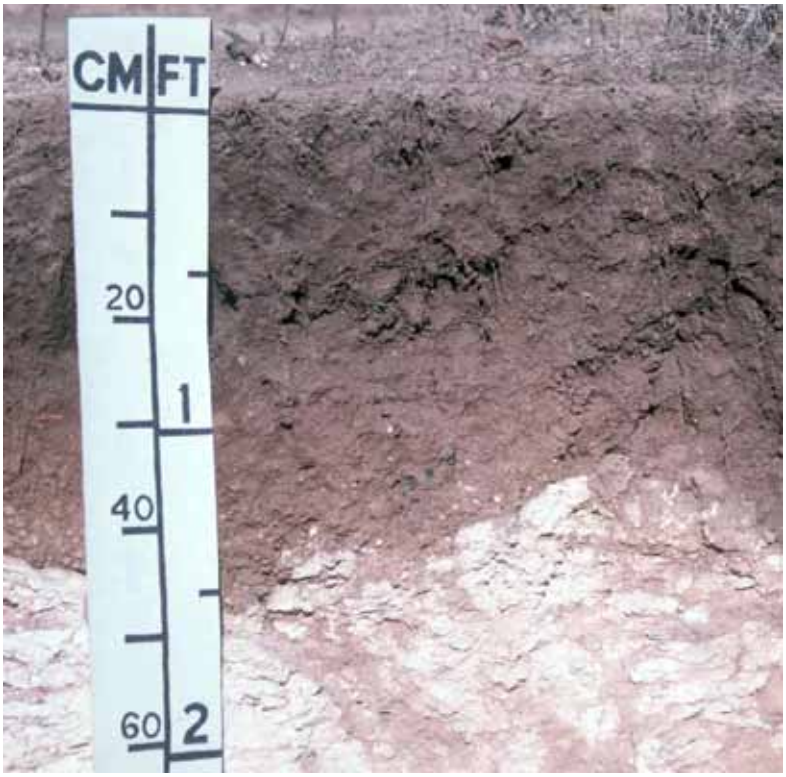

Figure 20.—Profile of Ozona silty clay loam in an area of Texon-Ozona complex, 0 to 3 percent slopes. The petrocalcic layer begins at a depth of 16 inches.

BCk—24 to 80 inches; very pale brown (10YR 8/2) weakly cemented calcareous loamy material that has distinct layers of weathered material; 1 to 2 percent soil material between plates that is discontinuous horizontally; violently effervescent; moderately alkaline.

The thickness of the solum and the depth to the petrocalcic horizon ranges from 4 to 20 inches. The total clay content ranges from 28 to 40 percent. The silicate clay content ranges from 25 to 35 percent.

The A horizon has hues of 7.5YR or 10YR, value of 3 to 5, and chroma of 2 or 3.

The Bk horizon has hues of 7.5YR or 10YR, value of 3 to 5, and chroma of 3 to 5. Coarse fragments of caliche from 0.25 inch to 3 inches across range from a few in the upper part to as much as 45 percent by volume just above the petrocalcic horizon.

The Bkm horizon ranges from strongly cemented to indurated. The upper 0.5 to 1 inches is laminar.

The BCk horizon is weakly cemented to moderately cemented with calcium carbonate and contains weathered caliche gravel, limestone gravel, and cobbles.

Paisano Series

The Paisano series consists of soils that are very shallow or shallow over a petrocalcic horizon. These soils are well drained and moderately rapidly permeable over the very slowly permeable petrocalcic horizon. They formed in gravelly alluvium from limestone and caliche. They are on fan piedmonts and fan remnants. Slopes range from 1 to 8 percent slopes. The soils are loamy-skeletal, carbonatic, thermic, shallow Calcic Petrocalcids.

Typical pedon of Paisano very gravelly loam, 1 to 8 percent slopes; from the intersection of Farm Road 305 and Farm Road 1901 in McCamey, 6 miles south on Farm Road 1901, 3.2 miles west on county road, and 72 feet north in rangeland.

A—0 to 3 inches; brown (10YR 5/3) very gravelly loam, brown (10YR 4/3) moist; weak medium subangular blocky structure; hard, friable; few fine roots; few very fine tubular pores; about 40 percent by volume of caliche and limestone gravel; strongly effervescent; moderately alkaline; clear smooth boundary.

Bk—3 to 8 inches; pale brown (10YR 6/3) extremely gravelly loam, brown (10YR 5/3) moist; weak fine granular structure; hard, friable; few fine roots; about 70 percent by volume coarse fragments of which 65 percent is caliche and limestone gravel and 5 percent is caliche and limestone cobbles; strongly effervescent; moderately alkaline; abrupt wavy boundary.

Bkm—8 to 17 inches; very pale brown (10YR 8/2) indurated caliche; very pale brown (10YR 7/3) upper 0.25 to 0.5 inch laminar cap; laminar streaks both horizontally and vertically of the same color; massive; violently effervescent; clear wavy boundary.

BCk—17 to 21 inches; very pale brown (10YR 8/2) weakly cemented gravelly loam; massive; hard, friable; about 20 percent caliche and limestone gravel; violently effervescent.

The thickness of the solum and the depth to the petrocalcic horizon ranges from 7 to 14 inches. Coarse fragments of caliche and limestone range from 35 to 60 percent above the petrocalcic horizon. They are mainly less than 3 inches in diameter. Cobble-size fragments range from 0 to 10 percent by volume.

The A horizon has hue of 7.5YR or 10YR, value of 4 to 7, and chroma of 2 to 5. The total clay content ranges from 12 to 20 percent.

The Bk horizon has hue of 7.5YR or 10YR, value of 4 to 7, and chroma of 2 to 5. Texture of the fine earth fraction is loam or fine sandy loam. The total clay content ranges from 12 to 20 percent.

The Bkm horizon has hue of 7.5YR or 10YR, value of 6 to 8, and chroma of 1 to 5. Induration is continuous except for scattered cracks and pockets.

The BCk horizon has hue of 7.5YR or 10YR, value of 6 to 8, and chroma of 2 to 4. Texture of the fine earth fraction is sandy loam, loam, or sandy clay loam. Coarse fragments of caliche and limestone gravel range from 35 to 60 percent.

Pandale Series

The Pandale series consists of very deep, well drained, moderately permeable soils in broad, valley fill areas and alluvial fans (fig. 21). The soils formed in loamy alluvium and reworked eolian sediments of Pleistocene and Holocene age. Slopes range from 0 to 5 percent. The soils are fine-loamy, mixed, superactive, thermic Ustic Haplocalcids.

Typical pedon of Pandale gravelly loam, in an area of Pandale-Upton complex, 0 to 5 percent slopes; from the intersection of Business Loop 466 and Texas Highway 163 at the courthouse in Ozona, 2.1 miles west on Business Loop 466, 10.5 miles west on Farm Road 2398, 2.8 miles south on Clayton Road, and 150 feet east in rangeland.

A1—0 to 6 inches; brown (10YR 5/3) gravelly loam, brown (10YR 4/3) moist; moderate medium subangular blocky structure; slightly hard, friable; many fine and medium roots; about 20 percent fine and medium rounded limestone gravel; surface has about 30 percent cover of fine and medium gravel; slightly effervescent; moderately alkaline; gradual smooth boundary.

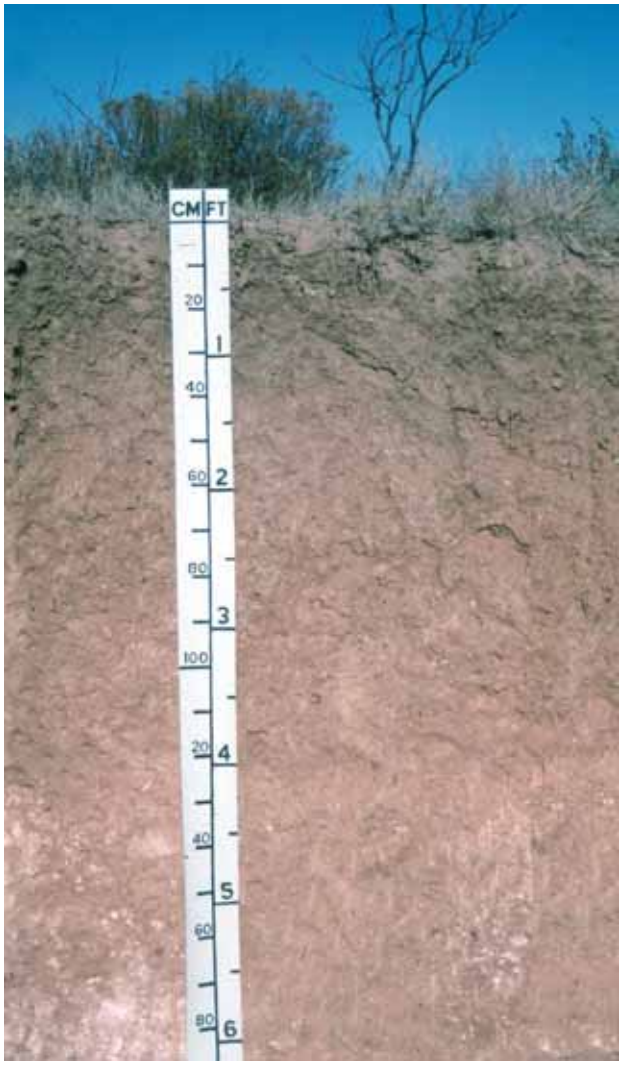

Figure 21.—Profile of Pandale gravelly loam, 0 to 3 percent slopes. Accumulations of calcium carbonate begin at a depth of about 28 inches.

A2—6 to 16 inches; brown (10YR 5/3) gravelly clay loam, brown (10YR 4/3) moist; weak coarse prismatic structure parting to moderate fine and medium subangular blocky; slightly hard, friable; common fine and medium roots; few very fine tubular pores; about 18 percent fine and medium limestone gravel; slightly effervescent; moderately alkaline; gradual smooth boundary.

Bw—16 to 28 inches; brown (7.5YR 5/4) gravelly clay loam, brown (7.5YR 4/4) moist; weak coarse prismatic structure parting to moderate medium subangular blocky; hard, firm; common fine and medium roots; few very fine tubular pores; about 20 percent fine and medium rounded limestone gravel; about 2 percent films and threads of calcium carbonate; strongly effervescent; moderately alkaline; gradual smooth boundary.

Bk1—28 to 45 inches; brown (7.5YR 5/4) gravelly clay loam, brown (7.5YR 4/4) moist; weak coarse prismatic structure parting to moderate medium subangular blocky; hard, firm; common fine roots; common very fine tubular pores; about 3 to 5 percent films and threads and about 1 percent masses of

calcium carbonate; about 15 percent fine and medium limestone gravel; violently effervescent; moderately alkaline; gradual smooth boundary.

Bk2-45 to 61 inches; light brown (7.5YR 6/4) gravelly clay loam**,** brown (7.5YR 5/4) moist; weak coarse prismatic structure parting to moderate medium subangular blocky; hard, firm; few fine roots; many very fine and fine tubular pores; about 5 percent films, threads, and masses of calcium carbonate; about 20 percent fine and medium limestone gravel; violently effervescent; moderately alkaline; gradual smooth boundary.

Bk3—61 to 80 inches; pink (7.5YR 7/4) gravelly clay loam, light brown (7.5YR 6/4) moist; weak fine and medium subangular blocky structure; hard, friable; few fine roots; many very fine and fine tubular pores; about 25 percent masses and films less than 1 inch in diameter of calcium carbonate; about 20 percent fine and medium limestone gravel; violently effervescent; moderately alkaline.

The thickness of the solum is more than 80 inches. Depth to a calcic horizon ranges from 20 to 40 inches. Calcium carbonate equivalent ranges from 15 to 40 percent. Coarse fragments of rounded limestone gravel, less than 3 inches in diameter in the control section, range from about 5 to 35 percent. Sand, coarser than very fine sand, ranges from about 15 to 25 percent. Silicate clay content of the 10- to 40-inch particle-size control section ranges from about 20 to 30 percent with total clay content ranging from 30 to 40 percent.

The A horizon has hue of 7.5YR or 10YR, value of 4 to 6, and chroma of 2 to 4.

The Bw, where present, has hue of 7.5YR or 10YR, value of 5 to 7, and chroma of 2 to 4. Visible films, threads, masses, and concretions of calcium carbonate range from 1 to 3 percent. Texture is silty clay loam, silt loam, clay loam, or their gravelly counterparts.

The Bk horizon has hue of 5YR to 10YR, value of 5 to 8, and chroma of 2 to 6. Visible films, threads, masses, and concretions of calcium carbonate range from 5 to 25 percent. Texture is silt loam, silty clay loam, clay loam, or their gravelly counterparts.

Patrole Series

The Patrole series consists of very deep, well drained, very slowly permeable soils formed on flood plains. These soils formed in stratified silty over clayey alluvium. Slopes are 0 to 1 percent. These soils are fine-silty over clayey, mixed, superactive, calcareous, thermic Typic Torrifluvents.

Typical pedon of Patrole silt loam in an area of Harkey-Patrole Association, 0 to 1 percent slopes, rarely flooded; from the intersection of U.S. Highway 190 and Texas Highway 349 in Iraan, 10.4 miles south on Texas Highway 349, 1.3 miles east and 1.1 miles northeast on private ranch road, and 150 feet southwest of road in rangeland.

A—0 to 9 inches; brown (10YR 5/3) silt loam, dark brown (10YR 3/3) moist; weak subangular blocky structure; slightly hard, friable; moderately sticky; surface crust of 0.5 inch; common fine roots; many fine and medium roots; many fine and medium pores; few insect burrows; many fine strata of very fine sandy loam, bedding planes evident; slightly saline; slightly effervescent; moderately alkaline; gradual wavy boundary.

Bwyz1—9 to 28 inches; brown (10YR 5/3) silt loam, brown (10YR 4/3) moist; weak subangular blocky structure; slightly hard, friable; moderately sticky; many fine and medium roots; many fine and medium pores; few insect burrows; many fine strata of very fine sandy loam, bedding planes evident;

slightly saline; slightly effervescent; moderately alkaline; gradual wavy boundary.

Bwyz2—28 to 33 inches; pinkish gray (7.5YR 6/2) silty clay loam, brown (7.5YR 5/3) moist; weak coarse subangular blocky structure; hard, firm, moderately sticky; few fine roots; common fine pores; few strata of clay, 0.25 to 0.50 inch thick; bedding planes evident; many fine threads and masses of calcium sulfate and other salts; moderately saline; strongly effervescent; moderately alkaline; clear wavy boundary.

2Bwy—33 to 50 inches; brown (7.5YR 5/3) clay, brown (7.5YR 4/3) moist; weak coarse angular blocky structure; very hard, very firm; many threads and elongated masses of calcium sulfate and other salts; moderately saline; few bedding planes; lenses of clay loam and other textures; strongly effervescent; moderately alkaline.

3Bwy—50 to 80 inches; brown (7.5YR 5/3) silty clay loam, brown (7.5YR 4/3) moist; weak coarse angular blocky structure; hard, firm; many threads and elongated masses of calcium sulfate and other salts; moderately saline; few bedding planes; lenses of clay loam and other textures; strongly effervescent; moderately alkaline.

The thickness of the solum ranges from 60 to more than 80 inches. The combined thickness of the fine-silty horizons over the clayey horizon ranges from 20 to 36 inches. The upper part of the 10- to 40-inch particle-size control section is very fine sandy loam, loam, silt loam, or silty clay loam and has a clay content of 18 to 30 percent. The lower part of the control section is silty clay or clay and has a clay content of 40 to 60 percent.

The A horizon has hue of 5YR to 10YR, value of 4 to 6, and chroma of 2 to 4. Electrical conductivity ranges from 4 to 8 dS/m.

The Bw horizon has hue of 2.5YR to 7.5YR, value of 4 to 6, and chroma of 2 to 4. Some pedons have redoximorphic features in shades of brown, gray, or olive. It is loam, silt loam, or silty clay loam. Electrical conductivity ranges from 4 to 16 dS/m.

The 2Bwy and 3Bwy horizons have hue of 2.5YR to 7.5YR, value of 4 to 6, and chroma of 2 to 4. Some pedons have redoximorphic features in shades of brown, gray, or olive. They are silty clay loam, clay loam, or sandy clay loam. Electrical conductivity ranges from 4 to 16 dS/m.

Reagan Series

The Reagan series consists of very deep, well drained, moderately permeable soils in broad plains, filled valleys, and fans on uplands (fig. 22). These soils formed in loamy alluvium. Slopes range from 0 to 2 percent. The soils are fine-silty, mixed, superactive, thermic Ustic Haplocalcids.

Typical pedon of Reagan silty clay loam, 0 to 2 percent slopes; from intersection of U.S. Highway 67 and Texas Highway 137 in Big Lake, 4.7 miles west on U.S. Highway 67, 13.2 miles south on Farm Road 1676, 1.9 miles west on ranch road, and 400 feet south in rangeland.

A—0 to 8 inches; brown (10YR 5/3) silty clay loam, brown (10YR 4/3) moist; weak fine and medium subangular structure; hard, friable; surface crust of 0.5 inch; many very fine and fine and few medium roots; common very fine and fine pores; strongly effervescent; moderately alkaline; clear wavy boundary.

Bw—8 to 20 inches; light brown (7.5YR 5/4) silty clay loam, brown (7.5YR 4/4) moist; weak medium subangular blocky structure parting to medium fine subangular blocky; hard, firm; common very fine and fine and few medium roots; common very fine and fine pores; few fine wormcasts; about 2 percent fine threads and films of calcium carbonate; strongly effervescent; moderately alkaline; clear smooth boundary.

Figure 22.—Profile of Reagan silty clay loam, 0 to 2 percent slopes. The texture is silty clay loam throughout.

Bk1—20 to 30 inches; light brown (7.5YR 6/4) silty clay loam; brown (7.5YR 4/4) moist; weak medium subangular blocky structure parting to moderate fine subangular blocky; hard, firm; few very fine, fine, and medium roots; common very fine and fine pores; few fine wormcasts; about 20 percent fine threads and films of calcium carbonate; violently effervescent; moderately alkaline; clear smooth boundary.

Bk2—30 to 41 inches; reddish yellow (7.5YR 7/6) silty clay loam; yellowish red (7.5YR 6/6) moist; weak fine subangular blocky structure; slightly hard, friable; few very fine and fine roots; few very fine and fine pores; about 20 percent fine threads and films of calcium carbonate; violently effervescent; moderately alkaline; clear smooth boundary.

Bk3—41 to 80 inches; strong brown (5YR 5/6) silty clay loam; strong brown (5YR 4/6) moist; weak medium subangular blocky structure; slightly hard, friable; about 10 percent fine threads and films of calcium carbonate; strongly effervescent; moderately alkaline; clear smooth boundary.

The thickness of the solum ranges from 40 to more than 80 inches. The 10- to 40-inch particle-size control section has a noncarbonate clay content that ranges from 18 to 35 percent, with less than 15 percent coarser than very fine sand. Calcium carbonate equivalent ranges from 15 to 40 percent.

The A horizon has hue of 7.5YR or 10YR, value of 4 to 6, and chroma of 2 to 4.

The Bw horizon has hue of 7.5YR or 10YR, value of 5 to 7, and chroma of 2 to 4. Visible calcium carbonate in the Bw horizon ranges from few films and threads to about 5 percent by volume fine masses or weakly to strongly cemented concretions. Texture is silt loam, silty clay loam, or silty clay.

The Bk horizon has hue of 5YR to 10YR, value of 6 to 8, and chroma of 2 to 6. Texture is silt loam, silty clay loam, or silty clay. Visible secondary calcium carbonate in the Bk2 horizon ranges from about 15 to 50 percent. Where this horizon is at or near the minimum depth of 20 inches, the upper part is intermittently, weakly cemented to strongly cemented.

Rio Diablo Series

The Rio Diablo series consists of very deep, well drained, moderately slowly permeable soils that are in valleys and on stream terraces. These soils formed in calcareous alluvium derived from limestone. Slopes range from 0 to 2 percent. These soils are fine, mixed, superactive, thermic Aridic Haplustolls

Typical pedon of Rio Diablo silty clay loam, 0 to 2 percent slopes, rarely flooded; from the intersection of Texas Highway 163 and Texas Highway 137 north of Ozona, 17.4 miles northwest on Texas Highway 137, 2.6 miles west on U.S. Highway 190, 2.2 miles south on Hoover Ranch Road, 0.9 mile east on private ranch road, and 400 feet south of road in rangeland.

A1—0 to 3 inches; grayish brown (10YR 5/2) silty clay loam, very dark grayish brown (10YR 3/2) moist; weak medium and coarse subangular blocky structure; hard, friable; many very fine and fine roots; few fine pores; common insect or wormcasts; violently effervescent; moderately alkaline; abrupt smooth boundary.

A2—3 to 10 inches; grayish brown (10YR 5/2) silty clay loam, very dark grayish brown (10YR 3/2) moist; moderate fine and medium subangular blocky structure; hard, friable; common very fine and fine roots; few fine pores; about 2 percent limestone gravel; violently effervescent; moderately alkaline; clear smooth boundary.

Bw—10 to 33 inches; light brown (7.5YR 6/3) silty clay loam, brown (7.5YR 4/3) moist; moderate fine and medium subangular blocky structure; hard, friable; common very fine and fine roots; about 2 percent limestone gravel; violently effervescent; moderately alkaline; gradual wavy boundary.

Bk—33 to 80 inches; light brown (7.5YR 6/4) silty clay loam, brown (7.5YR 4/4) moist; moderate fine and medium subangular blocky structure; hard, friable; few fine roots; about 10 percent threads and films of calcium carbonate; violently effervescent; moderately alkaline.

The thickness of the solum ranges from 60 to more than 80 inches. Limestone gravel ranges from 0 to 15 percent by volume. The clay content of the 10- to 40-inch particle-size control section ranges from 40 to 55 percent. The silicate clay ranges from 35 to 45 percent.

The A horizon has hue of 10YR, chroma of 3 to 5, and value of 2 or 3.

The Bw and Bk horizon has hue of 7.5YR or 10YR, chroma of 5 to 7, and value of 3 or 4. Texture is silty clay loam, silty clay, or clay. Secondary calcium carbonates in the form of threads, films, masses, and concretions make up less than 5 percent of any horizon that has its upper boundary within 40 inches of the surface.

Rioconcho Series

The Rioconcho series consists of very deep, moderately well drained, slowly permeable soils on flood plains and in narrow valleys. They formed in clayey or silty alluvium. Slopes range from 0 to 2 percent. The soils are fine, mixed, superactive, thermic Vertic Haplustolls.

Typical pedon Rioconcho silty clay, 0 to 2 percent slopes, occasionally flooded; from the intersection of Texas Highway 163 and Texas Highway 137 north of Ozona, 17.4 miles northwest on Texas Highway 137, 3.6 miles west on U.S. Highway 190,

2.7 miles south on county road, and 700 feet north-northeast of county road in rangeland.

A—0 to 24 inches; very dark grayish brown (10YR 3/2) silty clay, black (10YR 2/1) moist; moderate fine and medium angular blocky structure; very hard, firm; few fine roots, few fine pores; few wormcasts; strongly effervescent; moderately alkaline; diffuse wavy boundary.

Bw—24 to 42 inches; brown (7.5YR 4/4) silty clay loam; dark brown (7.5YR 3/4) moist; weak fine angular blocky structure; very hard, friable; few fine roots; strongly effervescent; moderately alkaline.

Bk—42 to 80 inches; light brown (7.5YR 6/4) clay loam; brown (7.5YR 5/4) moist; weak fine angular blocky structure; very hard, friable; few fine roots; about 10 percent thin coatings of calcium carbonate on surfaces of peds, and 15 percent threads of calcium carbonate in pores; strongly effervescent; moderately alkaline.

The thickness of the solum is more than 80 inches. The clay content of the 10- to 40-inch particle-size control section ranges from 35 to 55 percent. Limestone fragments and quartz fragments of gravel-size and cobble-size range from 0 to 15 percent by volume. When the soil is dry, cracks 0.5 inch to 1 inch wide extend to depths of 20 to 30 inches. Calcium carbonate equivalent ranges from 5 to about 30 percent. Reaction is slightly alkaline or moderately alkaline.

The A horizon has hue of 7.5YR or 10YR, value of 3 to 5, and chroma of 1 to 3. It ranges from noneffervescent to strongly effervescent.

The Bw or Bk horizon has hue of 7.5YR or 10YR, value of 5 to 7, and chroma of 2 to 4. It is clay loam, silty clay loam, or silty clay. Below 40 inches, some pedons have strata that contain as much as 20 to 40 percent gravel-size and stone-size fragments of limestone, quartz, and caliche.

Sanderson Series

The Sanderson series consists of very deep, well drained, moderately permeable soils on fans and footslopes in uplands. These soils formed in gravelly alluvium and colluvium. Slopes range from 1 to 8 percent. These soils are loamy-skeletal, carbonatic, thermic Ustic Haplocambids.

Typical pedon of Sanderson gravelly loam, in area of Sanderson-Upton complex, 1 to 8 percent slopes; from the intersection of Texas Highway 163 and Texas Highway 137 north of Ozona, 17.4 miles northwest on Texas Highway 137, 14.8 miles west on U.S. Highway 190, 2.4 miles south on County Road, 0.5 mile east and 1.7 miles northeast on private ranch road, and 500 feet north in rangeland.

A1—0 to 3 inches; pale brown (10YR 6/3) gravelly loam, brown (10YR 4/3) moist; weak fine subangular blocky structure; slightly hard, friable; about 30 percent limestone coarse fragments of 25 percent gravel and 5 percent cobbles; slightly effervescent; moderately alkaline; abrupt smooth boundary.

A2—3 to 7 inches; pale brown (10YR 6/3) gravelly loam, brown (10YR 4/3) moist; moderate fine and medium subangular blocky structure; slightly hard, friable; about 30 percent limestone coarse fragments of 25 percent gravel and 5 percent cobbles; about 1 percent thin films and threads of calcium carbonate on ped faces; violently effervescent; moderately alkaline; gradual smooth boundary.

Bk1—7 to 21 inches; light yellowish brown (10YR 6/4) very gravelly clay loam, yellowish brown (10YR 5/4) moist; weak moderate and moderate fine subangular blocky structure; hard, firm; about 40 percent limestone coarse fragments of 35 percent gravel and 5 percent cobbles; about 5 percent thin

films and threads of calcium carbonate throughout; violently effervescent; moderately alkaline; gradual smooth boundary.

Bk2—21 to 31 inches; brownish yellow (10YR 6/6) very gravelly clay loam, yellowish brown (10YR 5/6) moist; weak moderate subangular blocky structure; hard, firm; about 40 percent limestone coarse fragments of 35 percent gravel and 5 percent cobbles; about 4 percent thin films and threads of calcium carbonate throughout; violently effervescent; moderately alkaline; gradual smooth boundary.

Bk3—31 to 53 inches; light brown (7.5YR 6/4) very gravelly clay loam, brown (7.5YR 5/4) moist; weak moderate and moderate fine subangular blocky structure; hard, firm; about 40 percent limestone coarse fragments of 30 percent gravel and 10 percent cobbles; about 2 percent thin films and threads of calcium carbonate throughout; violently effervescent; moderately alkaline; gradual smooth boundary.

Ck—53 to 80 inches; light brown (7.5YR 6/4) very gravelly loam, brown (7.5YR 5/4) moist; hard, friable; about 55 percent limestone coarse fragments of 40 percent gravel, 10 percent cobbles, and 5 percent stones; about 2 percent thin films and threads of calcium carbonate throughout; violently effervescent; moderately alkaline; gradual smooth boundary.

The thickness of the solum ranges from 24 to more than 40 inches. Amount of coarse fragments in the control section ranges from 35 to 80 percent by volume and is 30 to 70 percent gravel, 0 to 20 percent cobbles, and 0 to 10 percent stones. The clay content of the 10- to 40-inch particle-size control section ranges from 18 and 35 percent.

The A horizon has hue of 7.5YR to 2.5Y, value of 5 to 7, and chroma of 2 to 4. Coarse fragments range from 15 to 50 percent, and comprise 15 to 50 percent gravel, 0 to 20 percent cobbles, and 0 to 10 percent stones.

The Bk horizon has hue of 7.5YR or 10YR, value of 5 to 7, and chroma of 2 to 4. Texture is very gravelly loam, very gravelly sandy clay loam, or very gravelly clay loam. Films, threads, and concretions of calcium carbonate range from none to about 5 percent.

The Ck horizon has hue of 7.5YR or 10YR, value of 6 to 8, and chroma of 2 to 4. Texture is very gravelly loam, very gravelly sandy loam, or very gravelly clay loam. Films, threads, and concretions of calcium carbonate range from none to about 2 percent.

Tarrant Series

The Tarrant series consists of very shallow or shallow, well drained, moderately slowly permeable soils on uplands. These soils formed in residuum from limestone. Slopes range from 1 to 40. These soils are clayey-skeletal, smectitic, thermic Lithic Calciustolls.

Typical pedon of Tarrant silty clay in an area of Tarrant-rock outcrop complex, 1 to 15 percent slopes; from the intersection of Texas Highway 163 and Interstate Highway 10 in Ozona, 6.8 miles east on Interstate Highway 10 to Taylor Box Road exit, 0.1 miles north on Taylor Box Road, 4.7 miles east on Interstate Highway 10 frontage road, 3.8 miles northeast and 1.0 mile west-northwest on private ranch road, and 2,200 feet north of road in rangeland.

A—0 to 8 inches; very dark gray (10YR 3/1) very cobbly silty clay; black (10YR 2/1) moist; moderate medium subangular blocky structure; very hard, firm; common fine roots; common fine pores; about 35 percent by volume of cobbles and 5 percent limestone gravel; strongly effervescent; moderately alkaline; abrupt smooth boundary.

R—8 to 30 inches; fractured indurated and platy limestone bedrock and strata of strongly to weakly cemented limestone about 0.5 inch to 6 inches thick; about 1 percent by volume brown (10YR 4/3) clay, dark brown (10YR 3/3) moist, in vertical and horizontal bands 0.03 to 0.5 inch wide; moderate very fine subangular blocky structure; very hard, firm; few fine roots extend into the crevices and clay between the plates of the limestone; thin patchy calcium carbonate coating on limestone plates.

The thickness of the solum ranges from 6 to 20 inches, and corresponds to the depth to indurated limestone. The solum contains 35 to 85 percent coarse fragments, the amount ranging from 10 to 60 percent in the A horizon. Coarse fragments are dominantly limestone but some pedons include quartziferous fragments. The fragments greater than 3 inches in diameter comprise 25 to 70 percent of the soil and consist of cobbles, flags, and stones. Fragments less than 3 inches in diameter are mostly larger than 0.75 inch in diameter. Secondary coating of calcium carbonate on the fragments is lacking in the upper 4 inches of some pedons, but is 1 cm or more thick on some fragments immediately above the R layer. Carbonates are in the form of coatings and pendants.

The A horizon has hue of 7.5YR or 10YR, value of 2 to 5, and chroma of 1 to 3. Many pedons have an extremely cobbly or flaggy layer immediately above the bedrock. The clay content of the fine earth fraction is 40 to 60 percent.

The R horizon is fractured indurated and platy limestone bedrock with strata of weakly cemented to strongly cemented limestone about 0.5 to 6 inches thick.

Texon Series

The Texon series consists of very deep, well drained, moderately slowly permeable soils on plain surfaces of the Edwards Plateau. They formed in eolian sediments overlying marl and limestone of the Cretaceous-age Buda Limestone Formation. Slopes range from 0 to 3 percent. The soils are fine, smectitic, thermic Torrertic Calciustolls.

Typical pedon of Texon silt loam in area of Texon-Ozona complex, 0 to 3 percent slopes; from the intersection of Business Loop 466 and Texas Highway 163 in Ozona, 14.4 miles north on Texas Highway 163, 4.6 miles west on U.S. Highway 190, 0.9 mile north on ranch road, and 80 feet east of road in rangeland.

A—0 to 2 inches; grayish brown (10YR 5/2) silt loam, very dark grayish brown (10YR 3/2) moist; moderate very fine and fine subangular blocky structure; slightly hard, friable; common very fine and fine roots; few fine tubular pores; slightly effervescent; moderately alkaline; gradual smooth boundary.

Bw—2 to 9 inches; brown (7.5YR 4/2) silty clay, dark brown (7.5YR 3/2) moist; moderate fine and medium subangular blocky structure; very hard, firm; common very fine and fine roots; few fine and medium tubular pores; about 1 percent weathered fine limestone gravel; few shell fragments; few wormcasts; slightly effervescent; moderately alkaline; gradual smooth boundary.

Bss1—9 to 18 inches; brown (7.5YR 5/4) silty clay, brown (7.5YR 4/4) moist; weak coarse prismatic structure parting to moderate fine and medium angular blocky; very hard, very firm; few fine roots; few distinct continuous pressure faces on vertical and horizontal surfaces of peds; few distinct slickensides; about 1 percent weathered fine limestone gravel; slightly effervescent; moderately alkaline; gradual smooth boundary.

Bss2—18 to 24 inches; brown (7.5YR 5/4) clay, brown (7.5YR 4/4) moist; weak coarse prismatic structure parting to moderate fine and medium angular blocky; very hard, very firm; few fine roots; common very dark grayish brown (10YR 3/2) soil material in filled cracks and along ped surfaces; few distinct

pressure faces on vertical and horizontal surfaces of peds; few distinct slickensides; about 1 percent weathered fine limestone gravel; slightly effervescent; moderately alkaline; gradual wavy boundary.

Bkss—24 to 34 inches; light brown (7.5YR 6/4) clay, brown (7.5YR 5/4) moist; weak coarse prismatic structure parting to weak fine and medium angular blocky; very hard, firm; few fine roots; few distinct slickensides; about 5 percent concretions and masses of calcium carbonate; violently effervescent; moderately alkaline; gradual wavy boundary.

Bk1—34 to 46 inches; pink (7.5YR 7/4) clay, brown (7.5YR 5/4) moist; weak fine and very fine subangular blocky structure; hard, firm; few fine roots; few fine tubular pores; about 15 percent limestone cobbles; about 5 percent masses of calcium carbonate; violently effervescent; moderately alkaline; clear wavy boundary.

Bk2—46 to 80 inches; white (10YR 8/1) clay, very pale brown (10YR 8/2) moist; massive; slightly hard, friable; violently effervescent; moderately alkaline.

The thickness of the solum ranges from 72 to more than 80 inches. The mollic epipedon ranges from 7 to 12 inches thick. The soil, when dry, has cracks 0.5 inch to 2 inches wide that extend from the surface to a depth of about 24 to 36 inches. The 10- to 40-inch particle-size control section is silty clay or clay containing 40 to 60 percent total clay. Silicate clay content ranges from 35 to 45 percent. Linear extensibility ranges from 6 to 10 cm in the upper 100 cm of the pedon. Reaction is moderately alkaline throughout the pedon. Calcium carbonate equivalent ranges from 10 to 30 percent in the upper 40 inches of the solum and from 30 to 75 percent below 40 inches.

The A horizon has hue of 7.5YR or 10YR, value of 3 to 5, and chroma of 2 to 3. Effervescence is slight to strong.

The Bw horizon has hue of 7.5YR or 10YR, value of 3 to 5, and chroma of 2 to 3. Texture is silty clay loam or silty clay. Effervescence is slight to strong.

The Bss horizon has a hue of 7.5YR or 10YR, value of 3 to 6, and chroma of 2 to 4. Texture is silty clay loam, silty clay, or clay. Distinct or prominent pressure faces and slickensides are in the horizon. Effervescence is slight to strong.

The Bkss horizon has hue of 5YR or 7.5YR, value of 4 to 6, and chroma 4 and 6. Texture is silty clay loam, silty clay, or clay. Effervescence is strong to violent.

The Bk horizon has hue of 5YR or 7.5YR, value of 5 to 8, and chroma 1 to 8. Texture is silty clay loam, silty clay, or clay. Effervescence is violent.

Some pedons are underlain by an R horizon below a depth of 72 inches. The R horizon is indurated limestone.

Tobosa Series

The Tobosa series consists of very deep, well drained, very slowly permeable soils on uplands. These soils formed in calcareous clayey materials. Slopes range from 0 to 2 percent. These soils are fine, smectitic, thermic Aridic Haplusterts.

Typical pedon of Tobosa clay, 0 to 2 percent slopes; from the intersection of Texas Highway 163 and U.S. Highway 67 in Barnhart, 2.3 miles southwest on railroad right-of-way road, 3.4 miles south, 2.4 miles southwest, 0.7 mile south, 1.7 miles east to Twelve Foot windmill, 0.6 mile south on private ranch road, and 900 feet west of road in rangeland.

A—0 to 15 inches; brown (7.5YR 4/2) clay, dark brown (7.5YR 3/2) moist; moderate medium angular blocky structure; very hard, very firm; common fine roots; about 1 percent masses of calcium carbonate; strongly effervescent; moderately alkaline; gradual wavy boundary.

Bss—15 to 48 inches; brown (7.5YR 4/2) clay, dark brown (7.5YR 3/2) moist; moderate medium angular blocky structure; extremely hard, very firm; few fine roots; few fine pores; common distinct slickensides; about 1 percent masses of calcium carbonate; strongly effervescent; moderately alkaline; gradual wavy boundary.

Bkss1—48 to 62 inches; brown (7.5YR 5/3) clay, brown (7.5YR 4/2) moist; weak medium angular blocky structure; very hard, very firm; few fine roots; common distinct slickensides; about 10 percent masses of calcium carbonate; violently effervescent; moderately alkaline; gradual wavy boundary.

Bkss2—62 to 80 inches; brown (7.5YR 5/3) clay, brown (7.5YR 4/3) moist; weak medium angular blocky structure; extremely hard, very firm; about 8 percent masses of calcium carbonate; few iron-manganese concretions; violently effervescent; moderately alkaline.

The thickness of the solum ranges from 60 to more than 80 inches. When dry these soils have cracks as much as 1 inch wide that extend from the surface to depths of 20 to 60 inches. Slickensides begin at depths of 14 to 30 inches. Texture is silty clay or clay throughout. Weighted average silicate clay content of the particle-size control section ranges from 35 to 55 percent. Carbonate clay content ranges from 1 to about 12 percent. Quartz gravel and limestone gravel, cobbles, and stones comprise 0 to 15 percent. Cycles in this soil consist of microflats and microlows with the microlows occupying 5 to 25 percent of the pedon, which is repeated horizontally each 12 to 24 feet.

The A horizon has hue of 7.5YR or 10YR, value of 3 to 5, and chroma of 2 to 4.

The Bss and Bssk horizon has hue of 7.5YR or 10YR, value of 4 to 6, and chroma of 2 to 4. Visible calcium carbonate content ranges from 0 to 10 percent in the form of masses and concretions.

Some pedons are underlain by C horizons of marl, shale, or limestone below 40 inches.

Upton Series

The Upton series consists of very shallow or shallow, well drained, moderately permeable soils on uplands. These soils formed in loamy alluvium derived from limestone. Slopes range from 1 to 8 percent. The soils are loamy, carbonatic, thermic, shallow Calcic Petrocalcids.

Typical pedon of Upton gravelly loam, 1 to 8 percent slopes; from the intersection of Farm Road 305 and Farm Road 1901 in McCamey, 7.2 miles south on Farm Road 305, and 240 feet east in rangeland.

A—0 to 7 inches; brown (10YR 5/3) gravelly loam, dark brown (10YR 3/3) moist; weak fine subangular and granular structure; hard, friable; common fine and few medium roots; about 15 percent caliche gravel; violently effervescent; moderately alkaline; clear wavy boundary.

Bk—7 to 14 inches; pale brown (10YR 6/3) gravelly loam, brown (10YR 4/3) moist; weak fine subangular blocky and granular structure; slightly hard, friable; few medium roots; about 25 percent caliche gravel; violently effervescent; moderately alkaline; abrupt wavy boundary.

Bkm—14 to 20 inches; very pale brown (10YR 7/3) indurated caliche; laminar cap pale brown (10YR 6/3) on upper surface about 0.5 inch thick; violently effervescent; clear smooth boundary.

BCk—20 to 80 inches; very pale brown (10YR 8/2) weakly cemented loamy caliche and marly materials with imbedded caliche gravel of about 35 percent and about 1 percent limestone cobbles.

The thickness of the solum and the depth to a petrocalcic horizon ranges from 7 to 20 inches. Texture of the fine-earth fraction is loam, sandy clay loam, or clay loam. The clay content of the fine earth fraction ranges from 15 to 30 percent. Coarse fragments of caliche or limestone gravel range from 15 to 35 percent.

The A horizon has hue of 7.5YR or 10YR, value of 5 or 6, and chroma of 2 to 4.

The Bk horizon has hue of 7.5YR or 10YR, value of 5 to 8, and chroma of 2 to 4.

The Bkm horizon has hue of 7.5YR or 10YR, value of 6 to 8, and chroma of 2 to 4.

The BCk horizon has hue of 7.5YR or 10YR, value of 6 to 8, and chroma of 1 to 3. It is noncemented to weakly cemented caliche and marly materials with 15 to 70 percent coarse fragments of which about 85 percent is caliche gravel and 15 percent limestone cobbles.

Wickett Series

The Wickett series consists of well drained soils that are moderately deep over a petrocalcic horizon on broad uplands. These soils are moderately rapidly permeable over and below the very slowly permeable petrocalcic horizon. They formed in sandy and loamy eolian material over thick beds of caliche. Slope range from 0 to 3 percent. The soils are coarse-loamy, siliceous, superactive, thermic, Ustalfic Petrocalcids.

Typical pedon of Wickett loamy fine sand, 0 to 3 percent slopes; from intersection of Farm Road 1901 and Farm Road 305 in McCamey, 3 miles south on Farm Road 1901, and 820 feet east in rangeland.

A—0 to 9 inches; brown (7.5YR 5/4) loamy fine sand, brown (7.5YR 4/4) moist; single grain; loose; common fine and few medium roots; neutral; clear smooth boundary.

Bt—9 to 31 inches; yellowish red (5YR 5/6) fine sandy loam, yellowish red (5YR 4/6) moist; slightly hard, very friable; few fine roots; few fine tubular pores with clay linings; sand grains coated and bridged with clay; moderately alkaline; abrupt wavy boundary.

Bkm—31 to 34 inches; fractured, weakly cemented caliche.

BCK—34 to 80 inches; pinkish white (7.5YR 8/2) gravelly loam, pink (7.5YR7/4) moist; 15 percent calcium carbonate concretions; violently effervescent; moderately alkaline.

The thickness of the solum and the depth to cemented or indurated caliche ranges from 20 to 40 inches.

The A horizon has hue of 5YR or 7.5YR, value of 3 to 5, and chroma of 3 to 6. Reaction is neutral or slightly alkaline.

The Bt horizon has hue of 2.5YR to 7.5YR, value of 4 or 5, and chroma of 4 to 8. Texture is fine sandy loam or loam. The clay content ranges from 8 to 18 percent. Reaction is slightly alkaline or moderately alkaline.

The Bkm horizon ranges from indurated to strongly cemented caliche. The upper part of the horizon is laminated in some pedons.

The BCk horizon is white to pink caliche in textures of fine sandy loam, loam, and gravelly loam. The content of coarse fragments in the form of caliche ranges from 0 to 35 percent.

Formation of the Soils

In this section, the factors of soil formation are related to the formation of the soils in Crockett County. Also, processes of horizon differentiation and the surface geology of the county are described.

Factors of Soil Formation

Soil is formed by the action of soil-forming processes on material deposited or accumulated by geological forces. The characteristics of a soil depend on the physical and mineralogical composition of the parent material, the climate under which the soil material has accumulated and has existed since accumulation, the plant and animal life on and in the soil, the relief, and the length of time the forces of soil development have acted on the soil material.

Climate and living organisms are active factors of soil formation. They act on the parent material that has accumulated through the weathering of rocks and slowly change it into a natural body that has genetically related horizons. The effects of climate and living organisms are conditioned by relief. The parent material affects the kind of soil profile that forms and, in extreme cases, determines it almost entirely. Finally, time is needed for changing the parent material into soil. Generally, a long time is needed for the development of distinct horizons.

The factors of soil formation are so closely interrelated in their effects on the soil that few generalizations can be made regarding the effect of any one factor unless conditions are specified for the other factors.

Parent Material

Parent material is the unconsolidated mass in which a soil forms. It affects the chemical and mineral composition of the soil.

Climate

Precipitation, temperature, and wind have had a major effect on the formation of soils in Crockett County.

Crockett County has a semiarid climate with mild, dry winters and hot summers. Rainfall, evaporation rate, temperature, wind, and length of growing season are some of the climatic factors that influence soil formation.

Expansion at high temperatures and contraction at low temperatures causes rocks to fracture. The small fragments become parent material of soils.

The rainfall pattern causes the soils to be alternately wet and dry. When a clayey soil such as Tobosa clay dries, it becomes severely cracked. During rains, the cracks fill with water, wetting the soil thoroughly. Then the soil swells and the cracks close. This alternate shrinking and swelling causes the soil to churn and mix and prevents accumulation of clay in the subsoil.

Water moving through the soil carries calcium carbonate and clay particles downward from the surface layer and deposits them as the water slows. As the calcium carbonate accumulates, it forms calcic horizons. Angelo soils have an accumulation of calcium carbonate.

Plant and Animal Life

Plants, microorganisms, earthworms, and other living organisms have contributed to the formation of the soils. They provide organic matter, help to decompose plant residue, influence the chemistry of the soil, and contribute to soil development. Gains in content of organic matter and nitrogen in the soil, gains and losses in plant nutrients, and changes in structure and porosity are caused by plants and animals.

Plants have played a major role in soil development in Crockett County. The fibrous root system of grasses contributes large amounts of organic matter to the soils. Roots of grasses, shrubs, and trees decay and leave holes and pores that carry water and air.

Earthworms, insects, rodents, and other mammals have worked and mixed the soil to some degree. Worms and insects hasten the decay of organic matter, and their tunnels improve soil structure and aid movement of air and water through the soil. Bacteria and fungi help in the decay of organic matter, improving fertility and tilth.

Man has also influenced soil formation. He has changed the character of the plant community by grazing sheep, goats, and cattle. He has changed soil structure by plowing and planting crops, and he has altered soil development by construction and excavation.

Relief

Relief, or topography influences soil development through its effect on drainage and runoff. If other factors are equal, the degree of profile development depends mainly on the average amount of water in the soil. The relief in Crockett County ranges from nearly level along major drainageways to very steep on escarpments across the county.

Profile development depends on the amount and depth of penetration of moisture. Soils that are sloping to very steep absorb less moisture and normally have less developed profiles than nearly level soils. Many of the more sloping soils erode almost as fast as they develop.

Some of the deepest soils in the county are the nearly level Angelo, Rio Diablo, and Rioconcho. Shallow and very shallow Ector, Lozier, and Tarrant soils are on steeper side slopes and ridges. These soils range from well developed to almost not developed at all.

Relief also affects the kind and amount of vegetation on a soil. Slopes that face north and east receive less direct sunlight and lose less moisture through evaporation than slopes facing south and west. As a result, vegetation is usually denser on slopes that face north and east.

Time

The length of time that the soil-forming factors have acted on the parent material determines, to a large degree, the characteristics of the soil. Usually a long time is required for formation of soils that have distinct horizons.

The soils in Crockett County range from young to old. Young soils have very little profile development. Older soils have well expressed horizons. Harkey soils are an example of a young soil that lack development. Ector, Lozier, and Tarrant soils are young, shallow and very shallow soils. Erosion removes material from their surface as fast as new material is weathered from bedrock. Angelo, Irion, and Tobosa are older soils and show a little more development.

Some older soils have a calcic horizon in the lower part of the profile. As time passes, water leaches calcium carbonate downward and deposits it in the form of masses and concretions in the lower horizons. Kinco, Reagan, and Texon soils have

calcium carbonate in the lower horizons. Some soils have calcium carbonate concretions that have become cemented or indurated. Indurated, or petrocalcic horizons require a long time to develop. Blakeney, Conger, Mailtrail, and Upton soils are examples of soils that have a petrocalcic horizon.

Processes of Horizon Differentiation

Soils are derived from the decomposition of the mineral particles they contain and from the plant and animal remains added to them. Silicate clays, mineral particles, humus, living organisms, and water have a major influence in determining the character of the soil. Soil layers, or horizons, are formed by additions, removals, transfers, and transformations within the soil profile (17). These processes include additions or losses of organic, mineral, and gaseous materials to the soil, transfers of material from one point to another within the soil, and physical and chemical transformation of mineral and organic materials within the soil. In most soils, more than one of these processes have been active in the development of horizons and many processes occur simultaneously.

Soil profiles are made up of a series of horizons that extend from the surface to the parent material. The parent material has been influenced little by the processes of soil formation. The horizons that make up a soil profile differ in one or more properties, such as color, texture, structure, consistence, porosity, and reaction.

Most profiles have three major horizons. These are the A, B, C, or R horizons. Some soils do not have B or C horizons. In Crockett County, the main processes are leaching of calcium carbonate and bases, accumulation of organic matter, and formation and translocation of silicate clay minerals. In most soils, more than one of these processes has been active in the development of the horizons.

The A horizon is the surface layer. It is the horizon that has the maximum accumulation of organic matter. The soils of Crockett County range from low to medium in organic matter content. Organic matter has accumulated, partially decomposed, and been incorporated into the soil. The accumulation of organic matter in soils is greatest in and above the surface layer. Many of the more stable products of organic matter decomposition remain as finely divided materials that result in darker colors, increased water-holding and cation-exchange capacities, and granulation of the soil.

The B horizon is the subsoil. It is directly below the A horizon. It is the horizon that has the maximum accumulation of dissolved or suspended materials, such as clay and iron. It may also be an altered horizon that has a distinctly different structure than that of the A horizon but shows little evidence of clay translocation or accumulation.

A B horizon that has a significant amount of clay accumulation is called a Bt horizon. Clay accumulates in horizons largely because of translocation from upper to lower horizons. As water moves downward, it can carry small amounts of clay in suspension. This clay accumulates at depths penetrated by water. It accumulates in fine pores in the soil and as clay films on surfaces of peds. Over long periods of time, at least a few thousand years, such processes can result in distinct horizons.

A B horizon that has distinct structure or color development with little or no evidence of clay accumulation is called a Bw horizon. Plant roots and other organisms contribute to the rearrangement of soil materials into secondary aggregates. Organic residues and secretions of organisms serve as cementing agents that help stabilize structural aggregates. Soils that have appreciable amounts of clay develop structural aggregates because of drying and wetting and because of shrinking and swelling.

Some soils in Crockett County have a high content of clay that has montmorillonite (smectite) as the dominant clay mineral. These soils shrink and develop wide, deep cracks when dry and swell and become very plastic and cohesive

when wet. Because of overburden pressure, soil movement, and stress caused by wetting and drying, a platy and wedge-like structure can form in the Bss horizon. Individual structural aggregates have distinct cleavage planes and polished faces known as slickensides. When the soil is dry, soil material from the surface often falls into the wide, deep cracks or is washed into the cracks by rain. When the soil is wet, lateral pressure caused by the swelling can result in surface heaving, which eventually leads to the formation of gilgai microrelief that consists of microhighs and microlows. This gilgai microrelief is locally referred to as "buffalo wallows." Irion and Tobosa soils have Bss horizons that have slickensides. They have gilgai microrelief.

Another important process in soil formation is the loss of components from the soil. Water can leach many soluble components, such as calcium carbonate, to the lower horizons in the profile. A horizon that has a significant accumulation of calcium carbonate is designated by the addition of the symbol "k." Dev, Ima, Kinco, and Reagan soils are examples of soils that have accumulations of calcium carbonate in the lower horizons.

Some soils have an indurated layer of calcium carbonate, known locally as caliche. The same process that formed the Bk horizons also formed the Bkm horizon. Soils with Bkm horizons in Crockett County include Conger, Mailtrail, Ozona, and Wickett soils.

The C horizon is relatively unchanged by soil-forming processes, although in some places it is modified by weathering. It is generally below the B horizon, such as in Sanderson soils. In some alluvial sediments near streams, rivers, and bays, the C horizon is directly below the A horizon. Harkey soils have C horizons directly below the A horizons.

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Glossary

Many of the terms relating to landforms, geology, and geomorphology are defined in more detail in the "National Soil Survey Handbook" (available in local offices of the Natural Resources Conservation Service or on the Internet).

ABC soil. A soil having an A, a B, and a C horizon.

AC soil. A soil having only an A and a C horizon. Commonly, such soil formed in recent alluvium or on steep, rocky slopes.

Aeration, soil. The exchange of air in soil with air from the atmosphere. The air in a well aerated soil is similar to that in the atmosphere; the air in a poorly aerated soil is considerably higher in carbon dioxide and lower in oxygen.

Aggregate, soil. Many fine particles held in a single mass or cluster. Natural soil aggregates, such as granules, blocks, or prisms, are called peds. Clods are aggregates produced by tillage or logging.

Alkali (sodic) soil. A soil having so high a degree of alkalinity (pH 8.5 or higher) or so high a percentage of exchangeable sodium (15 percent or more of the total exchangeable bases), or both, that plant growth is restricted.

Alluvial fan. A low, outspread mass of loose materials and/or rock material, commonly with gentle slopes. It is shaped like an open fan or a segment of a cone. The material was deposited by a stream at the place where it issues from a narrow mountain valley or upland valley or where a tributary stream is near or at its junction with the main stream. The fan is steepest near its apex, which points upstream, and slopes gently and convexly outward (downstream) with a gradual decrease in gradient.

Alluvium. Unconsolidated material, such as gravel, sand, silt, clay, and various mixtures of these, deposited on land by running water.

Animal unit month (AUM). The amount of forage required by one mature cow of approximately 1,000 pounds weight, with or without a calf, for 1 month.

Aquic conditions. Current soil wetness characterized by saturation, reduction, and redoximorphic features.

Argillic horizon. A subsoil horizon characterized by an accumulation of illuvial clay.

Arroyo. The flat-floored channel of an ephemeral stream, commonly with very steep to vertical banks cut in unconsolidated material. It is usually dry but can be transformed into a temporary watercourse or short-lived torrent after heavy rain within the watershed.

Aspect. The direction toward which a slope faces. Also called slope aspect.

Association, soil. A group of soils or miscellaneous areas geographically associated in a characteristic repeating pattern and defined and delineated as a single map unit.

Available water capacity (available moisture capacity). The capacity of soils to hold water available for use by most plants. It is commonly defined as the difference between the amount of soil water at field moisture capacity and the amount at wilting point. It is commonly expressed as inches of water per inch of soil. The capacity, in inches, in a 60-inch profile or to a limiting layer is expressed as:

Very low	0 to 3
Low	3 to 6
Moderate	6 to 9
High	9 to 12
Very high	more than 12

Backslope. The position that forms the steepest and generally linear, middle portion of a hillslope. In profile, backslopes are commonly bounded by a convex shoulder above and a concave footslope below.

Backswamp. A flood-plain landform. Extensive, marshy or swampy, depressed areas of flood plains between natural levees and valley sides or terraces.

Base saturation. The degree to which material having cation-exchange properties is saturated with exchangeable bases (sum of Ca, Mg, Na, and K), expressed as a percentage of the total cation-exchange capacity.

Base slope (geomorphology). A geomorphic component of hills consisting of the concave to linear (perpendicular to the contour) slope that, regardless of the lateral shape, forms an apron or wedge at the bottom of a hillside dominated by colluvium and slope-wash sediments (for example, slope alluvium).

Bedding plane. A planar or nearly planar bedding surface that visibly separates each successive layer of stratified sediment or rock (of the same or different lithology) from the preceding or following layer; a plane of deposition. It commonly marks a change in the circumstances of deposition and may show a parting, a color difference, a change in particle-size, or various combinations of these. The term is commonly applied to any bedding surface, even one that is conspicuously bent or deformed by folding.

Bedrock. The solid rock that underlies the soil and other unconsolidated material or that is exposed at the surface.

Bedrock-controlled topography. A landscape where the configuration and relief of the landforms are determined or strongly influenced by the underlying bedrock.

Bench terrace. A raised, level or nearly level strip of earth constructed on or nearly on a contour, supported by a barrier of rocks or similar material, and designed to make the soil suitable for tillage and to prevent accelerated erosion.

Bisequum. Two sequences of soil horizons, each of which consists of an illuvial horizon and the overlying eluvial horizons.

Bottom land. An informal term loosely applied to various portions of a flood plain.

Boulders. Rock fragments larger than 2 feet (60 centimeters) in diameter.

Breaks. A landscape or tract of steep, rough or broken land dissected by ravines and gullies and marking a sudden change in topography.

Brush management. Use of mechanical, chemical, or biological methods to make conditions favorable for reseeding or to reduce or eliminate competition from woody vegetation and thus allow understory grasses and forbs to recover. Brush management increases forage production and thus reduces the hazard of erosion. It can improve the habitat for some species of wildlife.

Butte. An isolated, generally flat-topped hill or mountain with relatively steep slopes and talus or precipitous cliffs and characterized by summit width that is less than the height of bounding escarpments; commonly topped by a caprock of resistant material and representing an erosion remnant carved from flat-lying rocks.

Calcareous soil. A soil containing enough calcium carbonate (commonly combined with magnesium carbonate) to effervesce visibly when treated with cold, dilute hydrochloric acid.

Caliche. A general term for a prominent zone of secondary carbonate accumulation in surficial materials in warm, subhumid to arid areas. Caliche is formed by both geologic and pedologic processes. Finely crystalline calcium carbonate forms a nearly continuous surface-coating and void-filling medium in geologic (parent) materials. Cementation ranges from weak in nonindurated forms to very strong in indurated forms. Other minerals (e.g., carbonates, silicate, and sulfate) may occur as accessory cements. Most petrocalcic horizons and some calcic horizons are caliche.

California bearing ratio (CBR). The load-supporting capacity of a soil as compared to that of standard crushed limestone, expressed as a ratio. First standardized in

California. A soil having a CBR of 16 supports 16 percent of the load that would be supported by standard crushed limestone, per unit area, with the same degree of distortion.

Canyon. A long, deep, narrow valley with high, precipitous walls in an area of high local relief.

Capillary water. Water held as a film around soil particles and in tiny spaces between particles. Surface tension is the adhesive force that holds capillary water in the soil.

Catena. A sequence, or "chain," of soils on a landscape that formed in similar kinds of parent material and under similar climatic conditions but that have different characteristics as a result of differences in relief and drainage.

Cation. An ion carrying a positive charge of electricity. The common soil cations are calcium, potassium, magnesium, sodium, and hydrogen.

Cation-exchange capacity. The total amount of exchangeable cations that can be held by the soil, expressed in terms of milliequivalents per 100 grams of soil at neutrality (pH 7.0) or at some other stated pH value. The term, as applied to soils, is synonymous with base-exchange capacity but is more precise in meaning.

Cement rock. Clayey limestone used in the manufacture of cement.

Channery soil material. Soil material that has, by volume, 15 to 35 percent thin, flat fragments of sandstone, shale, slate, limestone, or schist as much as 6 inches (15 centimeters) along the longest axis. A single piece is called a channer.

Chemical treatment. Control of unwanted vegetation through the use of chemicals.

Clay. As a soil separate, the mineral soil particles less than 0.002 millimeter in diameter. As a soil textural class, soil material that is 40 percent or more clay, less than 45 percent sand, and less than 40 percent silt.

Clay depletions. See Redoximorphic features.

Clay film. A thin coating of oriented clay on the surface of a soil aggregate or lining pores or root channels. Synonyms: clay coating, clay skin.

Climax plant community. The stabilized plant community on a particular site. The plant cover reproduces itself and does not change so long as the environment remains the same.

Coarse textured soil. Sand or loamy sand.

Cobble (or cobblestone). A rounded or partly rounded fragment of rock 3 to 10 inches (7.6 to 25 centimeters) in diameter.

Cobbly soil material. Material that has 15 to 35 percent, by volume, rounded or partially rounded rock fragments 3 to 10 inches (7.6 to 25 centimeters) in diameter. Very cobbly soil material has 35 to 60 percent of these rock fragments, and extremely cobbly soil material has more than 60 percent.

COLE (coefficient of linear extensibility). See Linear extensibility.

Colluvium. Unconsolidated, unsorted earth material being transported or deposited on side slopes and/or at the base of slopes by mass movement (e.g., direct gravitational action) and by local, unconcentrated runoff.

Complex slope. Irregular or variable slope. Planning or establishing terraces, diversions, and other water-control structures on a complex slope is difficult.

Complex, soil. A map unit of two or more kinds of soil or miscellaneous areas in such an intricate pattern or so small in area that it is not practical to map them separately at the selected scale of mapping. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas.

Concretions. Cemented bodies with crude internal symmetry organized around a point, a line, or a plane. They typically take the form of concentric layers visible to the naked eye. Calcium carbonate, iron oxide, and manganese oxide are compounds making up concretions. See Redoximorphic features.

Conglomerate. A coarse grained, clastic sedimentary rock composed of rounded or subangular rock fragments more than 2 millimeters in diameter. It commonly has

a matrix of sand and finer textured material. Conglomerate is the consolidated equivalent of gravel.

Conservation cropping system. Growing crops in combination with needed cultural and management practices. In a good conservation cropping system, the soil-improving crops and practices more than offset the effects of the soil-depleting crops and practices. Cropping systems are needed on all tilled soils. Soil-improving practices in a conservation cropping system include the use of rotations that contain grasses and legumes and the return of crop residue to the soil. Other practices include the use of green manure crops of grasses and legumes, proper tillage, adequate fertilization, and weed and pest control.

Conservation tillage. A tillage system that does not invert the soil and that leaves a protective amount of crop residue on the surface throughout the year.

Consistence, soil. Refers to the degree of cohesion and adhesion of soil material and its resistance to deformation when ruptured. Consistence includes resistance of soil material to rupture and to penetration; plasticity, toughness, and stickiness of puddled soil material; and the manner in which the soil material behaves when subject to compression. Terms describing consistence are defined in the "Soil Survey Manual."

Control section. The part of the soil on which classification is based. The thickness varies among different kinds of soil, but for many it is that part of the soil profile between depths of 10 inches and 40 or 80 inches.

Corrosion (geomorphology). A process of erosion whereby rocks and soil are removed or worn away by natural chemical processes, especially by the solvent action of running water, but also by other reactions, such as hydrolysis, hydration, carbonation, and oxidation.

Corrosion (soil survey interpretations). Soil-induced electrochemical or chemical action that dissolves or weakens concrete or uncoated steel.

Cover crop. A close-growing crop grown primarily to improve and protect the soil between periods of regular crop production, or a crop grown between trees and vines in orchards and vineyards.

Crop residue management. Returning crop residue to the soil, which helps to maintain soil structure, organic matter content, and fertility and helps to control erosion.

Cropping system. Growing crops according to a planned system of rotation and management practices.

Cutbanks cave (in tables)**.** The walls of excavations tend to cave in or slough.

Decreasers. The most heavily grazed climax range plants. Because they are the most palatable, they are the first to be destroyed by overgrazing.

Deferred grazing. Postponing grazing or resting grazing land for a prescribed period.

Dense layer (in tables)**.** A very firm, massive layer that has a bulk density of more than 1.8 grams per cubic centimeter. Such a layer affects the ease of digging and can affect filling and compacting.

Depth, soil. Generally, the thickness of the soil over bedrock. Very deep soils are more than 60 inches deep over bedrock; deep soils, 40 to 60 inches; moderately deep, 20 to 40 inches; shallow, 10 to 20 inches; and very shallow, less than 10 inches.

Diversion (or diversion terrace). A ridge of earth, generally a terrace, built to protect downslope areas by diverting runoff from its natural course.

Drainage class (natural). Refers to the frequency and duration of wet periods under conditions similar to those under which the soil formed. Alterations of the water regime by human activities, either through drainage or irrigation, are not a consideration unless they have significantly changed the morphology of the soil. Seven classes of natural soil drainage are recognized—*excessively drained, somewhat excessively drained, well drained, moderately well drained, somewhat*

poorly drained, poorly drained, and *very poorly drained*. These classes are defined in the "Soil Survey Manual."

Drainage, surface. Runoff, or surface flow of water, from an area.

Drainageway. A general term for a course or channel along which water moves in draining an area. A term restricted to relatively small, linear depressions that at some time move concentrated water and either do not have a defined channel or have only a small defined channel.

Draw. A small stream valley that generally is shallower and more open than a ravine or gulch and that has a broader bottom. The present stream channel may appear inadequate to have cut the drainageway that it occupies.

Duff. A generally firm organic layer on the surface of mineral soils. It consists of fallen plant material that is in the process of decomposition and includes everything from the litter on the surface to underlying pure humus.

Earthy fill. See Mine spoil.

Ecological site. An area where climate, soil, and relief are sufficiently uniform to produce a distinct natural plant community. An ecological site is the product of all the environmental factors responsible for its development. It is typified by an association of species that differ from those on other ecological sites in kind and/or proportion of species or in total production.

Eluviation. The movement of material in true solution or colloidal suspension from one place to another within the soil. Soil horizons that have lost material through eluviation are eluvial; those that have received material are illuvial.

Endosaturation. A type of saturation of the soil in which all horizons between the upper boundary of saturation and a depth of 2 meters are saturated.

Eolian deposit. Sand-, silt-, or clay-sized clastic material transported and deposited primarily by wind, commonly in the form of a dune or a sheet of sand or loess.

Ephemeral stream. A stream, or reach of a stream, that flows only in direct response to precipitation. It receives no long-continued supply from melting snow or other source, and its channel is above the water table at all times.

Episaturation. A type of saturation indicating a perched water table in a soil in which saturated layers are underlain by one or more unsaturated layers within 2 meters of the surface.

Erosion. The wearing away of the land surface by water, wind, ice, or other geologic agents and by such processes as gravitational creep.

Erosion (accelerated). Erosion much more rapid than geologic erosion, mainly as a result of human or animal activities or of a catastrophe in nature, such as a fire, that exposes the surface.

Erosion (geologic). Erosion caused by geologic processes acting over long geologic periods and resulting in the wearing away of mountains and the building up of such landscape features as flood plains and coastal plains. Synonym: natural erosion.

Erosion pavement. A surficial lag concentration or layer of gravel and other rock fragments that remains on the soil surface after sheet or rill erosion or wind has removed the finer soil particles and that tends to protect the underlying soil from further erosion.

Erosion surface. A land surface shaped by the action of erosion, especially by running water.

Escarpment. A relatively continuous and steep slope or cliff breaking the general continuity of more gently sloping land surfaces and resulting from erosion or faulting. Most commonly applied to cliffs produced by differential erosion. Synonym: scarp.

Fallow. Cropland left idle in order to restore productivity through accumulation of moisture. Summer fallow is common in regions of limited rainfall where cereal

grain is grown. The soil is tilled for at least one growing season for weed control and decomposition of plant residue.

Fan remnant. A general term for landforms that are the remaining parts of older fan landforms, such as alluvial fans, that have been either dissected or partially buried.

Fertility, soil. The quality that enables a soil to provide plant nutrients, in adequate amounts and in proper balance, for the growth of specified plants when light, moisture, temperature, tilth, and other growth factors are favorable.

Field moisture capacity. The moisture content of a soil, expressed as a percentage of the ovendry weight, after the gravitational, or free, water has drained away; the field moisture content 2 or 3 days after a soaking rain; also called *normal field capacity, normal moisture capacity,* or *capillary capacity*.

Fill slope. A sloping surface consisting of excavated soil material from a road cut. It commonly is on the downhill side of the road.

Fine textured soil. Sandy clay, silty clay, or clay.

Firebreak. An area cleared of flammable material to stop or help control creeping or running fires. It also serves as a line from which to work and to facilitate the movement of firefighters and equipment. Designated roads also serve as firebreaks.

First bottom. An obsolete, informal term loosely applied to the lowest flood-plain steps that are subject to regular flooding.

Flaggy soil material. Material that has, by volume, 15 to 35 percent flagstones. Very flaggy soil material has 35 to 60 percent flagstones, and extremely flaggy soil material has more than 60 percent flagstones.

Flagstone. A thin fragment of sandstone, limestone, slate, shale, or (rarely) schist 6 to 15 inches (15 to 38 centimeters) long.

Flood plain. The nearly level plain that borders a stream and is subject to flooding unless protected artificially.

Flood-plain landforms. A variety of constructional and erosional features produced by stream channel migration and flooding. Examples include backswamps, flood-plain splays, meanders, meander belts, meander scrolls, oxbow lakes, and natural levees.

Flood-plain step. An essentially flat, terrace-like alluvial surface within a valley that is frequently covered by floodwater from the present stream; any approximately horizontal surface still actively modified by fluvial scour and/or deposition. May occur individually or as a series of steps.

Fluvial. Of or pertaining to rivers or streams; produced by stream or river action.

Foothills. A region of steeply sloping hills that fringes a mountain range or high-plateau escarpment. The hills have relief of as much as 1,000 feet (300 meters).

Footslope. The concave surface at the base of a hillslope. A footslope is a transition zone between upslope sites of erosion and transport (shoulders and backslopes) and downslope sites of deposition (toeslopes).

Forb. Any herbaceous plant not a grass or a sedge.

Fragipan. A loamy, brittle subsurface horizon low in porosity and content of organic matter and low or moderate in clay but high in silt or very fine sand. A fragipan appears cemented and restricts roots. When dry, it is hard or very hard and has a higher bulk density than the horizon or horizons above. When moist, it tends to rupture suddenly under pressure rather than to deform slowly.

Genesis, soil. The mode of origin of the soil. Refers especially to the processes or soil-forming factors responsible for the formation of the solum, or true soil, from the unconsolidated parent material.

Gilgai. Commonly, a succession of microlows (microbasins) and microhighs (microknolls) in nearly level areas or of microvalleys and microridges parallel with

the slope. Typically, the microrelief of clayey soils that shrink and swell considerably with changes in moisture content.

Grassed waterway. A natural or constructed waterway, typically broad and shallow, seeded to grass as protection against erosion. Conducts surface water away from cropland.

Gravel. Rounded or angular fragments of rock as much as 3 inches (2 millimeters to 7.6 centimeters) in diameter. An individual piece is a pebble.

Gravelly soil material. Material that has 15 to 35 percent, by volume, rounded or angular rock fragments, not prominently flattened, as much as 3 inches (7.6 centimeters) in diameter.

Ground water. Water filling all the unblocked pores of the material below the water table.

Gully. A small channel with steep sides caused by erosion and cut in unconsolidated materials by concentrated but intermittent flow of water. The distinction between a gully and a rill is one of depth. A gully generally is an obstacle to farm machinery and is too deep to be obliterated by ordinary tillage; a rill is of lesser depth and can be smoothed over by ordinary tillage.

Hard bedrock. Bedrock that cannot be excavated except by blasting or by the use of special equipment that is not commonly used in construction.

Hard to reclaim (in tables)**.** Reclamation is difficult after the removal of soil for construction and other uses. Revegetation and erosion control are extremely difficult.

Hardpan. A hardened or cemented soil horizon, or layer. The soil material is sandy, loamy, or clayey and is cemented by iron oxide, silica, calcium carbonate, or other substance.

Head slope (geomorphology). A geomorphic component of hills consisting of a laterally concave area of a hillside, especially at the head of a drainageway. The overland waterflow is converging.

High-residue crops. Such crops as small grain and corn used for grain. If properly managed, residue from these crops can be used to control erosion until the next crop in the rotation is established. These crops return large amounts of organic matter to the soil.

Hill. A generic term for an elevated area of the land surface, rising as much as 1,000 feet above surrounding lowlands, commonly of limited summit area and having a well defined outline. Slopes are generally more than 15 percent. The distinction between a hill and a mountain is arbitrary and may depend on local usage.

Hillslope. A generic term for the steeper part of a hill between its summit and the drainage line, valley flat, or depression floor at the base of a hill.

Horizon, soil. A layer of soil, approximately parallel to the surface, having distinct characteristics produced by soil-forming processes. In the identification of soil horizons, an uppercase letter represents the major horizons. Numbers or lowercase letters that follow represent subdivisions of the major horizons. An explanation of the subdivisions is given in the "Soil Survey Manual." The major horizons of mineral soil are as follows:

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.

R layer.—Consolidated bedrock beneath the soil. The bedrock commonly underlies a C horizon, but it can be directly below an A or a B horizon.

Humus. The well decomposed, more or less stable part of the organic matter in mineral soils.

Hydrologic soil groups. Refers to soils grouped according to their runoff potential. The soil properties that influence this potential are those that affect the minimum rate of water infiltration on a bare soil during periods after prolonged wetting when the soil is not frozen. These properties are depth to a seasonal high water table, the infiltration rate and permeability after prolonged wetting, and depth to a very slowly permeable layer. The slope and the kind of plant cover are not considered but are separate factors in predicting runoff.

Illuviation. The movement of soil material from one horizon to another in the soil profile. Generally, material is removed from an upper horizon and deposited in a lower horizon.

Impervious soil. A soil through which water, air, or roots penetrate slowly or not at all. No soil is absolutely impervious to air and water all the time.

Increasers. Species in the climax vegetation that increase in amount as the more desirable plants are reduced by close grazing. Increasers commonly are the shorter plants and the less palatable to livestock.

Infiltration. The downward entry of water into the immediate surface of soil or other material, as contrasted with percolation, which is movement of water through soil layers or material.

Infiltration capacity. The maximum rate at which water can infiltrate into a soil under a given set of conditions.

Infiltration rate. The rate at which water penetrates the surface of the soil at any given instant, usually expressed in inches per hour. The rate can be limited by the infiltration capacity of the soil or the rate at which water is applied at the surface.

Intake rate. The average rate of water entering the soil under irrigation. Most soils have a fast initial rate; the rate decreases with application time. Therefore, intake rate for design purposes is not a constant but is a variable depending on the net irrigation application. The rate of water intake, in inches per hour, is expressed as follows:

Less than 0.2	very low
0.2 to 0.4	low
0.4 to 0.75	moderately low
0.75 to 1.25	moderate
1.25 to 1.75	moderately high
1.75 to 2.5	high
More than 2.5	very high

Interfluve. A landform composed of the relatively undissected upland or ridge between two adjacent valleys containing streams flowing in the same general direction. An elevated area between two drainageways that sheds water to those drainageways.

Interfluve (geomorphology). A geomorphic component of hills consisting of the uppermost, comparatively level or gently sloping area of a hill; shoulders of backwearing hillslopes can narrow the upland or can merge, resulting in a strongly convex shape.

Intermittent stream. A stream, or reach of a stream, that does not flow year-round but that is commonly dry for 3 or more months out of 12 and whose channel is generally below the local water table. It flows only during wet periods or when it receives ground-water discharge or long, continued contributions from melting snow or other surface and shallow subsurface sources.

Invaders. On range, plants that encroach into an area and grow after the climax vegetation has been reduced by grazing. Generally, plants invade following disturbance of the surface.

Iron depletions. See Redoximorphic features.

Knoll. A small, low, rounded hill rising above adjacent landforms.

K-sat. Saturated hydraulic conductivity. (See Permeability.)

Landslide. A general, encompassing term for most types of mass movement landforms and processes involving the downslope transport and outward deposition of soil and rock materials caused by gravitational forces; the movement may or may not involve saturated materials. The speed and distance of movement, as well as the amount of soil and rock material, vary greatly.

Large stones (in tables)**.** Rock fragments 3 inches (7.6 centimeters) or more across. Large stones adversely affect the specified use of the soil.

Leaching. The removal of soluble material from soil or other material by percolating water.

Linear extensibility. Refers to the change in length of an unconfined clod as moisture content is decreased from a moist to a dry state. Linear extensibility is used to determine the shrink-swell potential of soils. It is an expression of the volume change between the water content of the clod at 1/3- or 1/10bar tension (33kPa or 10kPa tension) and oven dryness. Volume change is influenced by the amount and type of clay minerals in the soil. The volume change is the percent change for the whole soil. If it is expressed as a fraction, the resulting value is COLE, coefficient of linear extensibility.

Liquid limit. The moisture content at which the soil passes from a plastic to a liquid state.

Loam. Soil material that is 7 to 27 percent clay particles, 28 to 50 percent silt particles, and less than 52 percent sand particles.

Low strength. The soil is not strong enough to support loads.

Low-residue crops. Such crops as corn used for silage, peas, beans, and potatoes. Residue from these crops is not adequate to control erosion until the next crop in the rotation is established. These crops return little organic matter to the soil.

Marl. An earthy, unconsolidated deposit consisting chiefly of calcium carbonate mixed with clay in approximately equal proportions; formed primarily under freshwater lacustrine conditions but also formed in more saline environments.

Mass movement. A generic term for the dislodgment and downslope transport of soil and rock material as a unit under direct gravitational stress.

Masses. Concentrations of substances in the soil matrix that do not have a clearly defined boundary with the surrounding soil material and cannot be removed as a discrete unit. Common compounds making up masses are calcium carbonate, gypsum or other soluble salts, iron oxide, and manganese oxide. See Redoximorphic features.

Mechanical treatment. Use of mechanical equipment for seeding, brush management, and other management practices.

Medium textured soil. Very fine sandy loam, loam, silt loam, or silt.

Mesa. A broad, nearly flat topped and commonly isolated landmass bounded by steep slopes or precipitous cliffs and capped by layers of resistant, nearly horizontal rocky material. The summit width is characteristically greater than the height of the bounding escarpments.

Mineral soil. Soil that is mainly mineral material and low in organic material. Its bulk density is more than that of organic soil.

Minimum tillage. Only the tillage essential to crop production and prevention of soil damage.

Miscellaneous area. A kind of map unit that has little or no natural soil and supports little or no vegetation.

Moderately coarse textured soil. Coarse sandy loam, sandy loam, or fine sandy loam.

Moderately fine textured soil. Clay loam, sandy clay loam, or silty clay loam.

Mollic epipedon. A thick, dark, humus-rich surface horizon (or horizons) that has high base saturation and pedogenic soil structure. It may include the upper part of the subsoil.

Morphology, soil. The physical makeup of the soil, including the texture, structure, porosity, consistence, color, and other physical, mineral, and biological properties of the various horizons, and the thickness and arrangement of those horizons in the soil profile.

Mottling, soil. Irregular spots of different colors that vary in number and size. Descriptive terms are as follows: abundance—*few, common*, and *many; size*—*fine, medium*, and *coarse*; and *contrast—faint, distinct,* and *prominent*. The size measurements are of the diameter along the greatest dimension. *Fine* indicates less than 5 millimeters (about 0.2 inch)*; medium,* from 5 to 15 millimeters (about 0.2 to 0.6 inch)*;* and *coarse,* more than 15 millimeters (about 0.6 inch).

Mountain. A generic term for an elevated area of the land surface, rising more than 1,000 feet (300 meters) above surrounding lowlands, commonly of restricted summit area (relative to a plateau) and generally having steep sides. A mountain can occur as a single, isolated mass or in a group forming a chain or range. Mountains are formed primarily by tectonic activity and/or volcanic action but can also be formed by differential erosion.

Munsell notation. A designation of color by degrees of three simple variables—hue, value, and chroma. For example, a notation of 10YR 6/4 is a color with hue of 10YR, value of 6, and chroma of 4.

Natric horizon. A special kind of argillic horizon that contains enough exchangeable sodium to have an adverse effect on the physical condition of the subsoil.

Neutral soil. A soil having a pH value of 6.6 to 7.3. (See Reaction, soil.)

Nodules. Cemented bodies lacking visible internal structure. Calcium carbonate, iron oxide, and manganese oxide are common compounds making up nodules. See Redoximorphic features.

Nose slope (geomorphology). A geomorphic component of hills consisting of the projecting end (laterally convex area) of a hillside. The overland waterflow is predominantly divergent. Nose slopes consist dominantly of colluvium and slope-wash sediments (for example, slope alluvium).

Nutrient, plant. Any element taken in by a plant essential to its growth. Plant nutrients are mainly nitrogen, phosphorus, potassium, calcium, magnesium, sulfur, iron, manganese, copper, boron, and zinc obtained from the soil and carbon, hydrogen, and oxygen obtained from the air and water.

Organic matter. Plant and animal residue in the soil in various stages of decomposition. The content of organic matter in the surface layer is described as follows:

Very low	less than 0.5 percent
Low	0.5 to 1.0 percent
Moderately low	1.0 to 2.0 percent
Moderate	2.0 to 4.0 percent
High	4.0 to 8.0 percent
Very high	more than 8.0 percent

Pan. A compact, dense layer in a soil that impedes the movement of water and the growth of roots. For example, *hardpan, fragipan, claypan, plowpan*, and *traffic pan*.

Parent material. The unconsolidated organic and mineral material in which soil forms.

Peat. Unconsolidated material, largely undecomposed organic matter, that has accumulated under excess moisture. (See Fibric soil material.)

Ped. An individual natural soil aggregate, such as a granule, a prism, or a block.

Pedon. The smallest volume that can be called "a soil." A pedon is three-dimensional and large enough to permit study of all horizons. Its area ranges from about 10 to 100 square feet (1 square meter to 10 square meters), depending on the variability of the soil.

Percolation. The movement of water through the soil.

Permeability. The quality of the soil that enables water or air to move downward through the profile. The rate at which a saturated soil transmits water is accepted as a measure of this quality. In soil physics, the rate is referred to as "saturated hydraulic conductivity," which is defined in the "Soil Survey Manual." In line with conventional usage in the engineering profession and with traditional usage in published soil surveys, this rate of flow continues to be expressed as "permeability." Terms describing permeability, measured in inches per hour, are as follows:

Impermeable	less than 00.0015 inch
Very slow	00.0015 to 00.06 inch
Slow	00.06 to 0.2 inch
Moderately slow	0.2 to 0.6 inch
Moderate	0.6 inch to 2.0 inches
Moderately rapid	2.0 to 6.0 inches
Rapid	6.0 to 20 inches
Very rapid	more than 20 inches

pH value. A numerical designation of acidity and alkalinity in soil. (See Reaction, soil.)

Phase, soil. A subdivision of a soil series based on features that affect its use and management, such as slope, stoniness, and flooding.

Piping (in tables)**.** Formation of subsurface tunnels or pipelike cavities by water moving through the soil.

Pitting (in tables)**.** Pits caused by melting around ice. They form on the soil after plant cover is removed.

Plastic limit. The moisture content at which a soil changes from semisolid to plastic.

Plasticity index. The numerical difference between the liquid limit and the plastic limit; the range of moisture content within which the soil remains plastic.

Plateau (geomorphology). A comparatively flat area of great extent and elevation; specifically, an extensive land region that is considerably elevated (more than 100 meters) above the adjacent lower lying terrain, is commonly limited on at least one side by an abrupt descent, and has a flat or nearly level surface. A comparatively large part of a plateau surface is near summit level.

Playa. The generally dry and nearly level lake plain that occupies the lowest parts of closed depressions, such as those on intermontane basin floors. Temporary flooding occurs primarily in response to precipitation and runoff. Playa deposits are fine grained and may or may not have a high water table and saline conditions.

Ponding. Standing water on soils in closed depressions. Unless the soils are artificially drained, the water can be removed only by percolation or evapotranspiration.

Poorly graded. Refers to a coarse grained soil or soil material consisting mainly of particles of nearly the same size. Because there is little difference in size of the particles, density can be increased only slightly by compaction.

Pore linings. See Redoximorphic features.

Potential native plant community. See Climax plant community.

Potential rooting depth (effective rooting depth). Depth to which roots could penetrate if the content of moisture in the soil were adequate. The soil has no properties restricting the penetration of roots to this depth.

Prescribed burning. Deliberately burning an area for specific management purposes, under the appropriate conditions of weather and soil moisture and at the proper time of day.

Productivity, soil. The capability of a soil for producing a specified plant or sequence of plants under specific management.

Profile, soil. A vertical section of the soil extending through all its horizons and into the parent material.

Proper grazing use. Grazing at an intensity that maintains enough cover to protect the soil and maintain or improve the quantity and quality of the desirable vegetation. This practice increases the vigor and reproduction capacity of the key plants and promotes the accumulation of litter and mulch necessary to conserve soil and water.

Rangeland. Land on which the potential natural vegetation is predominantly grasses, grasslike plants, forbs, or shrubs suitable for grazing or browsing. It includes natural grasslands, savannas, many wetlands, some deserts, tundras, and areas that support certain forb and shrub communities.

Reaction, soil. A measure of acidity or alkalinity of a soil, expressed as pH values. A soil that tests to pH 7.0 is described as precisely neutral in reaction because it is neither acid nor alkaline. The degrees of acidity or alkalinity, expressed as pH values, are:

Ultra acid	less than 3.5
Extremely acid	3.5 to 4.4
Very strongly acid	4.5 to 5.0
Strongly acid	5.1 to 5.5
Moderately acid	5.6 to 6.0
Slightly acid	6.1 to 6.5
Neutral	6.6 to 7.3
Slightly alkaline	7.4 to 7.8
Moderately alkaline	7.9 to 8.4
Strongly alkaline	8.5 to 9.0
Very strongly alkaline	9.1 and higher

Redoximorphic concentrations. See Redoximorphic features.

Redoximorphic depletions. See Redoximorphic features.

Redoximorphic features. Redoximorphic features are associated with wetness and result from alternating periods of reduction and oxidation of iron and manganese compounds in the soil. Reduction occurs during saturation with water, and oxidation occurs when the soil is not saturated. Characteristic color patterns are created by these processes. The reduced iron and manganese ions may be removed from a soil if vertical or lateral fluxes of water occur, in which case there is no iron or manganese precipitation in that soil. Wherever the iron and manganese are oxidized and precipitated, they form either masses or hard concretions or nodules. Movement of iron and manganese as a result of redoximorphic processes in a soil may result in redoximorphic features that are defined as follows:

1. Redoximorphic concentrations.—These are zones of apparent accumulation of iron-manganese oxides, including:

a. Nodules and concretions, which are cemented bodies that can be removed from the soil intact. Concretions are distinguished from nodules on the basis of internal organization. A concretion typically has concentric layers that are visible to the naked eye. Nodules do not have visible organized internal structure; and
b. Masses, which are noncemented concentrations of substances within the soil matrix; and
c. Pore linings, i.e., zones of accumulation along pores that may be either coatings on pore surfaces or impregnations from the matrix adjacent to the pores.

2. Redoximorphic depletions.—These are zones of low chroma (chromas less than those in the matrix) where either iron-manganese oxides alone or both iron-manganese oxides and clay have been stripped out, including:
a. Iron depletions, i.e., zones that contain low amounts of iron and manganese oxides but have a clay content similar to that of the adjacent matrix; and
b. Clay depletions, i.e., zones that contain low amounts of iron, manganese, and clay (often referred to as silt coatings or skeletans).

3. Reduced matrix.—This is a soil matrix that has low chroma *in situ* but undergoes a change in hue or chroma within 30 minutes after the soil material has been exposed to air.

Reduced matrix. See Redoximorphic features.

Regolith. All unconsolidated earth materials above the solid bedrock. It includes material weathered in place from all kinds of bedrock and alluvial, glacial, eolian, lacustrine, and pyroclastic deposits.

Relief. The relative difference in elevation between the upland summits and the lowlands or valleys of a given region.

Residuum (residual soil material). Unconsolidated, weathered or partly weathered mineral material that accumulated as bedrock disintegrated in place.

Rill. A very small, steep-sided channel resulting from erosion and cut in unconsolidated materials by concentrated but intermittent flow of water. A rill generally is not an obstacle to wheeled vehicles and is shallow enough to be smoothed over by ordinary tillage.

Riser. The vertical or steep side slope (e.g., escarpment) of terraces, flood-plain steps, or other stepped landforms; commonly a recurring part of a series of natural, steplike landforms, such as successive stream terraces.

Road cut. A sloping surface produced by mechanical means during road construction. It is commonly on the uphill side of the road.

Rock fragments. Rock or mineral fragments having a diameter of 2 millimeters or more; for example, pebbles, cobbles, stones, and boulders.

Root zone. The part of the soil that can be penetrated by plant roots.

Runoff. The precipitation discharged into stream channels from an area. The water that flows off the surface of the land without sinking into the soil is called surface runoff. Water that enters the soil before reaching surface streams is called ground-water runoff or seepage flow from ground water.

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.

Saturated hydraulic conductivity (K-sat). See Permeability.

Saturation. Wetness characterized by zero or positive pressure of the soil water. Under conditions of saturation, the water will flow from the soil matrix into an unlined auger hole.

Sedimentary rock. A consolidated deposit of clastic particles, chemical precipitates, or organic remains accumulated at or near the surface of the earth under normal low temperature and pressure conditions. Sedimentary rocks include consolidated equivalents of alluvium, colluvium, drift, and eolian, lacustrine, and marine deposits. Examples are sandstone, siltstone, mudstone, claystone, shale, conglomerate, limestone, dolomite, and coal.

Sequum. A sequence consisting of an illuvial horizon and the overlying eluvial horizon. (See Eluviation.)

Series, soil. A group of soils that have profiles that are almost alike, except for differences in texture of the surface layer. All the soils of a series have horizons that are similar in composition, thickness, and arrangement.

Shale. Sedimentary rock that formed by the hardening of a deposit of clay, silty clay, or silty clay loam and that has a tendency to split into thin layers.

Sheet erosion. The removal of a fairly uniform layer of soil material from the land surface by the action of rainfall and surface runoff.

Shoulder. The convex, erosional surface near the top of a hillslope. A shoulder is a transition from summit to backslope.

Shrink-swell (in tables)**.** The shrinking of soil when dry and the swelling when wet. Shrinking and swelling can damage roads, dams, building foundations, and other structures. It can also damage plant roots.

Side slope (geomorphology). A geomorphic component of hills consisting of a laterally planar area of a hillside. The overland waterflow is predominantly parallel. Side slopes are dominantly colluvium and slope-wash sediments.

Silica. A combination of silicon and oxygen. The mineral form is called quartz.

Silica-sesquioxide ratio. The ratio of the number of molecules of silica to the number of molecules of alumina and iron oxide. The more highly weathered soils or their clay fractions in warm-temperate, humid regions, and especially those in the tropics, generally have a low ratio.

Silt. As a soil separate, individual mineral particles that range 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.

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 (pedogenic). Grooved, striated, and/or glossy (shiny) slip faces on structural peds, such as wedges; produced by shrink-swell processes, most commonly in soils that have a high content of expansive clays.

Slope. The inclination of the land surface from the horizontal. Percentage of slope is the vertical distance divided by horizontal distance, then multiplied by 100. Thus, a slope of 20 percent is a drop of 20 feet in 100 feet of horizontal distance. In this survey, classes for simple slopes are as follows:

Nearly level	0 to 1 percent
Very gently sloping	1 to 3 percent
Gently sloping	3 to 5 percent
Moderately sloping	5 to 8 percent
Strongly sloping	8 to 12 percent
Moderately steep	12 to 20 percent
Steep	20 to 45 percent
Very steep	45 percent and higher

Slope alluvium. Sediment gradually transported down the slopes of mountains or hills primarily by nonchannel alluvial processes (i.e., slope-wash processes) and

characterized by particle sorting. Lateral particle sorting is evident on long slopes. In a profile sequence, sediments may be distinguished by differences in size and/or specific gravity of rock fragments and may be separated by stone lines. Burnished peds and sorting of rounded or subrounded pebbles or cobbles distinguish these materials from unsorted colluvial deposits.

Slow refill (in tables)**.** The slow filling of ponds, resulting from restricted permeability in the soil.

Sodic (alkali) soil. A soil having so high a degree of alkalinity (pH 8.5 or higher) or so high a percentage of exchangeable sodium (15 percent or more of the total exchangeable bases), or both, that plant growth is restricted.

Sodicity. The degree to which a soil is affected by exchangeable sodium. Sodicity is expressed as a sodium adsorption ratio (SAR) of a saturation extract, or the ratio of Na+ to Ca ++ + Mg++. The degrees of sodicity and their respective ratios are:

Slight	less than 13:1
Moderate	13-30:1
Strong	more than 30:1

Sodium adsorption ratio (SAR). A measure of the amount of sodium (Na) relative to calcium (Ca) and magnesium (Mg) in the water extract from saturated soil paste. It is the ratio of the Na concentration divided by the square root of one-half of the Ca + Mg concentration.

Soft bedrock. Bedrock that can be excavated with trenching machines, backhoes, small rippers, and other equipment commonly used in construction.

Soil. A natural, three-dimensional body at the earth's surface. It is capable of supporting plants and has properties resulting from the integrated effect of climate and living matter acting on earthy parent material, as conditioned by relief and by the passage of time.

Soil separates. Mineral particles less than 2 millimeters in equivalent diameter and ranging between specified size limits. The names and sizes, in millimeters, of separates recognized in the United States are as follows:

Very coarse sand	2.0 to 1.0
Coarse sand	1.0 to 0.5
Medium sand	0.5 to 0.25
Fine sand	0.25 to 0.10
Very fine sand	0.10 to 0.05
Silt	0.05 to 0.002
Clay	less than 0.002

Solum. The upper part of a soil profile, above the C horizon, in which the processes of soil formation are active. The solum in soil consists of the A, E, and B horizons. Generally, the characteristics of the material in these horizons are unlike those of the material below the solum. The living roots and plant and animal activities are largely confined to the solum.

Stones. Rock fragments 10 to 24 inches (25 to 60 centimeters) in diameter if rounded or 15 to 24 inches (38 to 60 centimeters) in length if flat.

Stony. Refers to a soil containing stones in numbers that interfere with or prevent tillage.

Stream terrace. One of a series of platforms in a stream valley, flanking and more or less parallel to the stream channel, originally formed near the level of the stream; represents the remnants of an abandoned flood plain, stream bed, or valley floor produced during a former state of fluvial erosion or deposition.

Stripcropping. Growing crops in a systematic arrangement of strips or bands that provide vegetative barriers to wind erosion and water erosion.

Structure, soil. The arrangement of primary soil particles into compound particles or aggregates. The principal forms of soil structure are—*platy* (laminated), *prismatic*

(vertical axis of aggregates longer than horizontal), *columnar* (prisms with rounded tops), *blocky* (angular or subangular), and *granular*. *Structureless soils are either single grained* (each grain by itself, as in dune sand) or *massive* (the particles adhering without any regular cleavage, as in many hardpans).

Substratum. See Underlying material.

Subsurface layer. Any surface soil horizon (A, E, A2, A3, A4) below the surface layer.

Summit. The topographically highest position of a hillslope. It has a nearly level (planar or only slightly convex) surface.

Surface layer. The soil ordinarily moved in tillage, or its equivalent in uncultivated soil, ranging in depth from 4 to 10 inches (10 to 25 centimeters). Frequently designated as the "plow layer," or the "Ap horizon."

Surface soil. The A, E, AB, and EB horizons, considered collectively. It includes all subdivisions of these horizons.

Talus. Rock fragments of any size or shape (commonly coarse and angular) derived from and lying at the base of a cliff or very steep rock slope. The accumulated mass of such loose broken rock formed chiefly by falling, rolling, or sliding.

Taxadjuncts. Soils that cannot be classified in a series recognized in the classification system. Such soils are named for a series they strongly resemble and are designated as taxadjuncts to that series because they differ in ways too small to be of consequence in interpreting their use and behavior. Soils are recognized as taxadjuncts only when one or more of their characteristics are slightly outside the range defined for the family of the series for which the soils are named.

Terrace (geomorphology). A steplike surface, bordering a valley floor or shoreline, that represents the former position of a flood plain, lake, or seashore. The term is usually applied both to the relatively flat summit surface (tread) that was cut or built by stream or wave action and to the steeper descending slope (scarp or riser) that has graded to a lower base level of erosion.

Texture, soil. The relative proportions of sand, silt, and clay particles in a mass of soil. The basic textural classes, in order of increasing proportion of fine particles, are *sand, loamy sand, sandy loam, loam, silt loam, silt, sandy clay loam, clay loam, silty clay loam, sandy clay, silty clay,* and *clay*. The sand, loamy sand, and sandy loam classes may be further divided by specifying "coarse," "fine," or "very fine."

Thin layer (in tables)**.** Otherwise suitable soil material that is too thin for the specified use.

Tilth, soil. The physical condition of the soil as related to tillage, seedbed preparation, seedling emergence, and root penetration.

Toeslope. The gently inclined surface at the base of a hillslope. Toeslopes in profile are commonly gentle and linear and are constructional surfaces forming the lower part of a hillslope continuum that grades to valley or closed-depression floors.

Topsoil. The upper part of the soil, which is the most favorable material for plant growth. It is ordinarily rich in organic matter and is used to topdress roadbanks, lawns, and land affected by mining.

Trace elements. Chemical elements, for example, zinc, cobalt, manganese, copper, and iron, in soils in extremely small amounts. They are essential to plant growth.

Tread. The flat to gently sloping, topmost, laterally extensive slope of terraces, flood-plain steps, or other stepped landforms; commonly a recurring part of a series of natural steplike landforms, such as successive stream terraces.

Upland. An informal, general term for the higher ground of a region, in contrast with a low-lying adjacent area, such as a valley or plain, or for land at a higher elevation than the flood plain or low stream terrace; land above the footslope zone of the hillslope continuum.

Underlying material. The part of the soil below the solum.

Valley fill. The unconsolidated sediment deposited by any agent (water, wind, ice, or mass wasting) so as to fill or partly fill a valley.

Variegation. Refers to patterns of contrasting colors assumed to be inherited from the parent material rather than to be the result of poor drainage.

Water bars. Smooth, shallow ditches or depressional areas that are excavated at an angle across a sloping road. They are used to reduce the downward velocity of water and divert it off and away from the road surface. Water bars can easily be driven over if constructed properly.

Weathering. All physical disintegration, chemical decomposition, and biologically induced changes in rocks or other deposits at or near the earth's surface by atmospheric or biologic agents or by circulating surface waters but involving essentially no transport of the altered material.

Well graded. Refers to soil material consisting of coarse grained particles that are well distributed over a wide range in size or diameter. Such soil normally can be easily increased in density and bearing properties by compaction. Contrasts with poorly graded soil.

Wilting point (or permanent wilting point). The moisture content of soil, on an ovendry basis, at which a plant (specifically a sunflower) wilts so much that it does not recover when placed in a humid, dark chamber.

Tables

Table 1.—Temperature and Precipitation

(Recorded in the period 1971-2000 at Ozona, Texas)

Month	Temperature (Degrees F)						Precipitation (Inches)				
				2 years in 10 will have				2 years in 10 will have			
	Average daily maximum	Average daily minimum	Average	Maximum temperature higher than	Minimum temperature less than	Average number of growing degree days*	Average	less than	more than	Average number of days w/.1 or more	Average total snow fall
	°F	°F	°F	°F	°F	Units	In	In	In		In
January---	59.0	29.9	44.5	81	8	38	0.79	0.06	1.40	1	0.1
February--	63.9	33.8	48.8	85	14	82	0.82	0.05	1.45	1	0.0
March-----	72.2	42.0	57.1	92	19	251	1.06	0.03	2.13	2	0.0
April-----	79.3	49.3	64.3	97	27	429	1.37	0.25	2.33	2	0.0
May-------	86.0	59.5	72.7	101	39	699	2.45	1.09	3.72	3	0.0
June------	90.3	66.2	78.3	103	52	833	1.96	0.57	3.19	3	0.0
July------	92.8	68.4	80.6	103	58	934	1.56	0.00	2.62	2	0.0
August----	92.4	67.5	80.0	102	58	929	2.28	0.32	3.82	3	0.0
September-	86.8	61.5	74.1	99	40	717	2.92	0.48	5.14	3	0.0
October---	78.1	51.2	64.6	93	28	454	2.22	0.42	3.95	3	0.1
November--	67.1	39.5	53.3	85	17	166	0.99	0.00	1.82	1	0.2
December--	59.6	31.0	45.3	79	10	44	0.69	0.00	1.31	1	0.0
Yearly:											
Average-	77.3	50.0	63.6	---	---	---	---	---	---	---	---
Extreme-	107	-2	---	105	6	---	---	---	---	---	---
Total---	---	---	---	---	---	5,576	19.11	13.78	22.82	25	0.5

* A growing degree day is a unit of heat available for plant growth. It can be calculated by adding the maximum and minimum daily temperatures, dividing the sum by 2, and subtracting the temperature below which growth is minimal for the principal crops in the area (50 degrees F)

Table 2.—Freeze Dates in Spring and Fall

(Recorded in the period 1971-2000 at Ozona, Texas)

Probability	Temperature		
	24°F or lower	28°F or lower	32°F or lower
Last freezing temperature in spring:			
1 year in 10 later than--	March 30	April 8	April 15
2 years in 10 later than--	March 22	April 2	April 11
5 years in 10 later than--	March 6	March 22	April 2
First freezing temperature in fall:			
1 year in 10 earlier than--	November 1	October 27	October 14
2 years in 10 earlier than--	November 7	November 1	October 21
5 years in 10 earlier than--	November 20	November 12	November 1

Table 3.—Growing Season

(Recorded for the period 1971-2000 at Ozona, Texas)

Probability	Daily Minimum Temperature		
	Number of days higher than 24°F	Number of days higher than 28°F	Number of days higher than 32°F
9 years in 10	224	211	192
8 years in 10	236	219	200
5 years in 10	258	235	214
2 years in 10	279	251	228
1 year in 10	291	259	236

Table 4.—Acreage and Proportionate Extent of the Soils

Map symbol	Soil name	Acres	Percent
AnB	Angelo silty clay loam, 0 to 2 percent slopes	88,656	4.9
ANS	Area not surveyed, access denied	76,621	4.3
BkB	Blakeney fine sandy loam, 1 to 3 percent slopes	668	*
CoC	Conger loam, 0 to 3 percent slopes	3,124	0.2
DAM	Dams	79	*
DvB	Dev very gravelly loam, 0 to 3 percent slopes, frequently flooded	22,562	1.3
ERD	Ector-Rock outcrop complex, 1 to 15 percent slopes	377,840	21.0
ERG	Ector-Rock outcrop complex, 15 to 60 percent slopes	270,506	15.1
HaB	Harkey very fine sandy loam, 0 to 2 percent slopes, rarely flooded	4,047	0.2
HRA	Harkey-Patrole association, 0 to 1 percent slopes, rarely flooded	3,736	0.2
IDB	Iraan and Dev soils, 0 to 2 percent slopes, occasionally flooded	4,523	0.3
InB	Iraan silty clay loam, 0 to 2 percent slopes, occasionally flooded	7,596	0.4
IrA	Irion clay, 0 to 1 percent slopes	4,283	0.2
IsA	Irion clay, 0 to 1 percent slopes, stony	2,349	0.1
KiB	Kinco-Ima complex, 0 to 2 percent slopes	6,352	0.4
LRD	Lozier-Rock outcrop complex, 2 to 15 percent slopes	3,654	0.2
LRG	Lozier-Rock outcrop complex, 15 to 55 percent slopes, very stony	5,481	0.3
M-W	Miscellaneous water	62	*
MaD	Mailtrail very gravelly clay loam, 1 to 8 percent slopes	38,743	2.2
NoD	Noelke-Ector complex, 0 to 5 percent slopes	260,691	14.5
OaC	Ozona-Tarrant complex, 0 to 5 percent slopes	8,980	0.5
PaD	Paisano very gravelly loam, 1 to 8 percent slopes	11,723	0.7
PdB	Pandale gravelly loam, 0 to 3 percent slopes	15,317	0.9
PoC	Pandale-Upton complex, 0 to 5 percent slopes	78,720	4.4
RaB	Reagan silty clay loam, 0 to 2 percent slopes	67,761	3.8
RdB	Rio Diablo silty clay loam, 0 to 2 percent slopes, rarely flooded	56,193	3.1
RoB	Rioconcho silty clay, 0 to 2 percent slopes, occasionally flooded	1,324	*
RVB	Riverwash and Dev soils, 0 to 3 percent slopes, frequently flooded	2,695	0.2
SuD	Sanderson-Upton complex, 1 to 8 percent slopes	85,103	4.7
ToB	Texon-Ozona complex, 0 to 3 percent slopes	144,959	8.1
TRD	Tarrant-Rock outcrop complex, 1 to 15 percent slopes	41,925	2.3
TRG	Tarrant-Rock outcrop complex, 15 to 40 percent slopes	6,165	0.3
TsB	Tobosa clay, 0 to 2 percent slopes	87,408	4.9
UpD	Upton gravelly loam, 1 to 8 percent slopes	2,660	0.1
W	Water	1,483	*
WkB	Wickett loamy fine sand, 0 to 3 percent slopes	1,870	0.1
	Total	1,795,859	100.0

* Less than 0.1 percent.

Table 5.—Rangeland Productivity

(Only the soils that support rangeland vegetation suitable for grazing are rated.)

Map symbol and soil name	Ecological site	Total dry-weight production		
		Favorable year	Normal year	Unfavorable year
		Lb/acre	Lb/acre	Lb/acre
AnB:				
Angelo	Clay Loam PE 19-25	2,600	2,100	1,000
ANS:				
Area not surveyed	---	---	---	---
BkB:				
Blakeney	Shallow Sandy Loam (desert Grassland)	1,400	1,000	700
CoC:				
Conger	Shallow PE 19-25	1,400	850	450
DAM:				
Dams	---	---	---	---
DvB:				
Dev	Draw PE 19-25	3,000	2,000	1,000
ERD:				
Ector	Limestone Hill PE 19-25	2,300	1,900	800
Rock outcrop	---	---	---	---
ERG:				
Ector	Steep Rocky PE 19-25	2,200	1,800	800
Rock outcrop	---	---	---	---
HaB:				
Harkey	Salty Bottomland (desert Grassland)	1,200	---	650
HRA:				
Harkey	Salty Bottomland (desert Grassland)	2,200	1,600	1,000
Patrole	Salty Bottomland (desert Grassland)	2,000	1,500	1,000
IDB:				
Iraan	Draw PE 19-25	1,900	1,400	1,000
Dev	Draw PE 19-25	3,000	2,000	1,000
InB:				
Iraan	Draw PE 19-25	1,900	1,400	1,000
IrA:				
Irion	Clay Flat PE 19-25	3,000	1,500	500
IsA:				
Irion	Clay Flat PE 19-25	3,000	1,500	500
KiB:				
Kinco	Sandy Loam (desert Grassland)	1,500	1,200	600
Ima	Sandy Loam (desert Grassland)	1,500	1,200	600

Table 5.—Rangeland Productivity—Continued

Map symbol and soil name	Ecological site	Total dry-weight production		
		Favorable year	Normal year	Unfavorable year
		Lb/acre	Lb/acre	Lb/acre
LRD:				
Lozier	Limestone Hill & Mountain (desert Grassland)	900	600	400
Rock outcrop	---	---	---	---
LRG:				
Lozier	Limestone Hill & Mountain (desert Grassland)	900	600	400
Rock outcrop	---	---	---	---
M-W:				
Water, miscellaneous	---	---	---	---
MaD:				
Mailtrail	Very Shallow PE 25-31	2,700	1,800	1,300
NoD:				
Noelke	Limestone Hill PE 19-25	2,000	1,750	800
Ector	Limestone Hill PE 19-25	2,300	1,900	800
OaC:				
Ozona	Shallow PE 19-25	1,800	1,200	600
Tarrant	Low Stony Hill PE 25-31	2,500	1,800	1,200
PaD:				
Paisano	Gravelly (desert Grassland)	900	600	300
PdB:				
Pandale	Loamy PE 19-25	1,800	1,200	600
PoC:				
Pandale	Loamy PE 19-25	1,800	1,200	600
Upton	Gravelly PE 19-25	1,000	850	500
RaB:				
Reagan	Loamy PE 19-25	1,800	1,200	600
RdB:				
Rio Diablo	Clay Loam PE 19-25	3,800	3,000	1,900
RoB:				
Rioconcho	Loamy Bottomland PE 19-25	4,000	3,500	2,500
RVB:				
Riverwash	---	---	---	---
Dev	Draw PE 19-25	3,000	2,000	1,000
SuD:				
Sanderson	Gravelly PE 19-25	1,000	950	300
Upton	Gravelly PE 19-25	1,000	850	500

Table 5.—Rangeland Productivity—Continued

Map symbol and soil name	Ecological site	Total dry-weight production		
		Favorable year	Normal year	Unfavorable year
		Lb/acre	Lb/acre	Lb/acre
ToB:				
Texon	Clay Loam PE 19-25	2,600	2,100	1,000
Ozona	Shallow PE 19-25	1,800	1,200	600
TRD:				
Tarrant	Low Stony Hill PE 25-31	2,500	1,800	1,200
Rock outcrop	---	---	---	---
TRG:				
Tarrant	Steep Rocky PE 25-31	1,800	1,400	800
Rock outcrop	---	---	---	---
TsB:				
Tobosa	Clay Flat PE 19-25	3,000	2,500	1,000
UpD:				
Upton	Gravelly PE 19-25	800	600	300
W:				
Water	---	---	---	---
WkB:				
Wickett	Loamy Sand (desert Grassland)	1,700	1,250	800

Table 6.—Camp Areas, Picnic Areas, and Playgrounds

(The information in this table indicates the dominant soil condition but does not eliminate the need for onsite investigation. The numbers in the value columns range from 0.01 to 1.00. The larger the value, the greater the limitation. See text for further explanation of ratings in this table.)

Map symbol and soil name	Pct. of map unit	Camp areas		Picnic areas		Playgrounds	
		Rating class and limiting features	Value	Rating class and limiting features	Value	Rating class and limiting features	Value
AnB:							
Angelo	80	Not limited		Not limited		Not limited	
ANS:							
Area not surveyed	100	Not rated		Not rated		Not rated	
BkB:							
Blakeney	85	Very limited		Very limited		Very limited	
		Depth to cemented pan	1.00	Depth to cemented pan	1.00	Depth to cemented pan	1.00
						Gravel content	0.18
CoC:							
Conger	80	Very limited		Very limited		Very limited	
		Depth to cemented pan	1.00	Depth to cemented pan	1.00	Depth to cemented pan	1.00
		Dusty	0.50	Dusty	0.50	Dusty	0.50
DAM:							
Dams	100	Not rated		Not rated		Not rated	
DvB:							
Dev	80	Very limited		Somewhat limited		Very limited	
		Flooding	1.00	Gravel content	0.76	Flooding	1.00
		Gravel content	0.76	Flooding	0.40	Gravel content	1.00
ERD:							
Ector	65	Very limited		Very limited		Very limited	
		Large stones content	1.00	Large stones content	1.00	Large stones content	1.00
		Depth to bedrock	1.00	Depth to bedrock	1.00	Depth to bedrock	1.00
		Gravel content	0.27	Gravel content	0.27	Gravel content	1.00
Rock outcrop	25	Not rated		Not rated		Not rated	
ERG:							
Ector	70	Very limited		Very limited		Very limited	
		Slope	1.00	Large stones content	1.00	Large stones content	1.00
		Large stones content	1.00	Slope	1.00	Slope	1.00
		Depth to bedrock	1.00	Depth to bedrock	1.00	Depth to bedrock	1.00
Rock outcrop	20	Not rated		Not rated		Not rated	
HaB:							
Harkey	80	Very limited		Somewhat limited		Somewhat limited	
		Flooding	1.00	Dusty	0.50	Dusty	0.50
		Dusty	0.50				

Table 6.—Camp Areas, Picnic Areas, and Playgrounds—Continued

Map symbol and soil name	Pct. of map unit	Camp areas		Picnic areas		Playgrounds	
		Rating class and limiting features	Value	Rating class and limiting features	Value	Rating class and limiting features	Value
HRA:							
Harkey	45	Very limited		Very limited		Very limited	
		Flooding	1.00	Salinity	1.00	Salinity	1.00
		Salinity	1.00	Dusty	0.50	Dusty	0.50
		Dusty	0.50				
Patrole	40	Very limited		Very limited		Very limited	
		Flooding	1.00	Salinity	1.00	Salinity	1.00
		Salinity	1.00	Dusty	0.50	Dusty	0.50
		Dusty	0.50	Slow water movement	0.45	Slow water movement	0.45
IDB:							
Iraan	70	Very limited		Not limited		Somewhat limited	
		Flooding	1.00			Flooding	0.60
Dev	20	Very limited		Somewhat limited		Very limited	
		Flooding	1.00	Gravel content	0.76	Flooding	1.00
		Gravel content	0.76	Flooding	0.40	Gravel content	1.00
InB:							
Iraan	90	Very limited		Not limited		Somewhat limited	
		Flooding	1.00			Flooding	0.60
						Gravel content	0.04
IrA:							
Irion	90	Very limited		Very limited		Very limited	
		Ponding	1.00	Ponding	1.00	Ponding	1.00
		Too clayey	0.50	Too clayey	0.50	Too clayey	0.50
		Slow water movement	0.45	Slow water movement	0.45	Slow water movement	0.45
IsA:							
Irion	90	Very limited		Very limited		Very limited	
		Ponding	1.00	Ponding	1.00	Ponding	1.00
		Large stones content	1.00	Large stones content	1.00	Large stones content	1.00
		Too clayey	0.50	Too clayey	0.50	Too clayey	0.50
KiB:							
Kinco	50	Not limited		Not limited		Not limited	
Ima	35	Not limited		Not limited		Not limited	
LRD:							
Lozier	55	Very limited		Very limited		Very limited	
		Depth to bedrock	1.00	Depth to bedrock	1.00	Gravel content	1.00
		Gravel content	1.00	Gravel content	1.00	Depth to bedrock	1.00
		Dusty	0.50	Dusty	0.50	Slope	1.00
Rock outcrop	35	Not rated		Not rated		Not rated	

Table 6.—Camp Areas, Picnic Areas, and Playgrounds—Continued

Map symbol and soil name	Pct. of map unit	Camp areas		Picnic areas		Playgrounds	
		Rating class and limiting features	Value	Rating class and limiting features	Value	Rating class and limiting features	Value
LRG:							
Lozier	60	Very limited		Very limited		Very limited	
		Slope	1.00	Large stones content	1.00	Large stones content	1.00
		Large stones content	1.00	Slope	1.00	Slope	1.00
		Depth to bedrock	1.00	Depth to bedrock	1.00	Depth to bedrock	1.00
Rock outcrop	30	Not rated		Not rated		Not rated	
M-W:							
Water, miscellaneous	100	Not rated		Not rated		Not rated	
MaD:							
Mailtrail	85	Very limited		Very limited		Very limited	
		Depth to cemented pan	1.00	Depth to cemented pan	1.00	Depth to cemented pan	1.00
		Gravel content	1.00	Gravel content	1.00	Gravel content	1.00
						Slope	0.88
NoD:							
Noelke	50	Very limited		Very limited		Very limited	
		Depth to bedrock	1.00	Depth to bedrock	1.00	Depth to bedrock	1.00
		Depth to cemented pan	1.00	Depth to cemented pan	1.00	Depth to cemented pan	1.00
		Gravel content	0.95	Gravel content	0.95	Gravel content	1.00
Ector	35	Very limited		Very limited		Very limited	
		Depth to bedrock	1.00	Depth to bedrock	1.00	Gravel content	1.00
		Gravel content	0.86	Gravel content	0.86	Depth to bedrock	1.00
		Large stones content	0.18	Large stones content	0.18	Large stones content	0.18
OaC:							
Ozona	45	Very limited		Very limited		Very limited	
		Depth to cemented pan	1.00	Depth to cemented pan	1.00	Depth to cemented pan	1.00
						Slope	0.12
Tarrant	40	Very limited		Very limited		Very limited	
		Depth to bedrock	1.00	Depth to bedrock	1.00	Depth to bedrock	1.00
		Large stones content	1.00	Large stones content	1.00	Large stones content	1.00
		Too clayey	0.50	Too clayey	0.50	Too clayey	0.50
PaD:							
Paisano	80	Very limited		Very limited		Very limited	
		Depth to cemented pan	1.00	Depth to cemented pan	1.00	Gravel content	1.00
		Gravel content	1.00	Gravel content	1.00	Depth to cemented pan	1.00
		Dusty	0.50	Dusty	0.50	Slope	0.88
PdB:							
Pandale	80	Somewhat limited		Somewhat limited		Very limited	
		Gravel content	0.08	Gravel content	0.08	Gravel content	1.00

Table 6.—Camp Areas, Picnic Areas, and Playgrounds—Continued

Map symbol and soil name	Pct. of map unit	Camp areas		Picnic areas		Playgrounds	
		Rating class and limiting features	Value	Rating class and limiting features	Value	Rating class and limiting features	Value
PoC:							
Pandale	65	Somewhat limited		Somewhat limited		Very limited	
		Dusty	0.50	Dusty	0.50	Gravel content	1.00
		Gravel content	0.08	Gravel content	0.08	Dusty	0.50
Upton	25	Very limited		Very limited		Very limited	
		Depth to cemented pan	1.00	Depth to cemented pan	1.00	Depth to cemented pan	1.00
		Large stones content	0.76	Large stones content	0.76	Gravel content	1.00
		Dusty	0.50	Dusty	0.50	Large stones content	0.76
RaB:							
Reagan	85	Not limited		Not limited		Not limited	
RdB:							
Rio Diablo	85	Very limited		Somewhat limited		Somewhat limited	
		Flooding	1.00	Slow water movement	0.39	Slow water movement	0.39
		Slow water movement	0.39				
RoB:							
Rioconcho	85	Very limited		Very limited		Very limited	
		Flooding	1.00	Salinity	1.00	Salinity	1.00
		Salinity	1.00	Too clayey	0.50	Flooding	0.60
		Too clayey	0.50	Slow water movement	0.45	Too clayey	0.50
RVB:							
Riverwash	60	Very limited		Very limited		Very limited	
		Flooding	1.00	Gravel content	1.00	Gravel content	1.00
		Gravel content	1.00	Flooding	0.40	Flooding	1.00
		Large stones content	0.01	Large stones content	0.01	Large stones content	0.01
Dev	30	Very limited		Somewhat limited		Very limited	
		Flooding	1.00	Gravel content	0.50	Flooding	1.00
		Gravel content	0.50	Flooding	0.40	Gravel content	1.00
SuD:							
Sanderson	50	Very limited		Very limited		Very limited	
		Gravel content	1.00	Gravel content	1.00	Gravel content	1.00
		Dusty	0.50	Dusty	0.50	Slope	0.88
						Dusty	0.50
Upton	35	Very limited		Very limited		Very limited	
		Depth to cemented pan	1.00	Depth to cemented pan	1.00	Depth to cemented pan	1.00
		Dusty	0.50	Dusty	0.50	Gravel content	1.00
		Large stones content	0.19	Large stones content	0.19	Slope	0.88

Table 6.—Camp Areas, Picnic Areas, and Playgrounds—Continued

Map symbol and soil name	Pct. of map unit	Camp areas		Picnic areas		Playgrounds	
		Rating class and limiting features	Value	Rating class and limiting features	Value	Rating class and limiting features	Value
ToB:							
Texon	50	Very limited		Very limited		Very limited	
		Salinity	1.00	Salinity	1.00	Salinity	1.00
		Dusty	0.50	Dusty	0.50	Dusty	0.50
		Slow water movement	0.45	Slow water movement	0.45	Slow water movement	0.45
Ozona	35	Very limited		Very limited		Very limited	
		Depth to cemented pan	1.00	Depth to cemented pan	1.00	Depth to cemented pan	1.00
						Gravel content	0.04
TRD:							
Tarrant	55	Very limited		Very limited		Very limited	
		Large stones content	1.00	Large stones content	1.00	Large stones content	1.00
		Depth to bedrock	1.00	Depth to bedrock	1.00	Depth to bedrock	1.00
		Too clayey	0.50	Too clayey	0.50	Slope	1.00
Rock outcrop	35	Not rated		Not rated		Not rated	
TRG:							
Tarrant	50	Very limited		Very limited		Very limited	
		Slope	1.00	Large stones content	1.00	Large stones content	1.00
		Large stones content	1.00	Slope	1.00	Slope	1.00
		Depth to bedrock	1.00	Depth to bedrock	1.00	Depth to bedrock	1.00
Rock outcrop	40	Not rated		Not rated		Not rated	
TsB:							
Tobosa	75	Somewhat limited		Somewhat limited		Somewhat limited	
		Too clayey	0.50	Too clayey	0.50	Too clayey	0.50
		Slow water movement	0.45	Slow water movement	0.45	Slow water movement	0.45
UpD:							
Upton	80	Very limited		Very limited		Very limited	
		Depth to cemented pan	1.00	Depth to cemented pan	1.00	Depth to cemented pan	1.00
		Large stones content	0.76	Large stones content	0.76	Gravel content	1.00
		Dusty	0.50	Dusty	0.50	Slope	0.88
W:							
Water	100	Not rated		Not rated		Not rated	
WkB:							
Wickett	80	Somewhat limited		Somewhat limited		Somewhat limited	
		Too sandy	0.87	Too sandy	0.87	Too sandy	0.87
		Depth to cemented pan	0.35	Depth to cemented pan	0.35		

Table 7.—Paths, Trails, and Golf Course Fairways

(The information in this table indicates the dominant soil condition but does not eliminate the need for onsite investigation. The numbers in the value columns range from 0.01 to 1.00. The larger the value, the greater the limitation. See text for further explanation of ratings in this table.)

Map symbol and soil name	Pct. of map unit	Paths and trails		Off-road motorcycle trails		Golf course fairways	
		Rating class and limiting features	Value	Rating class and limiting features	Value	Rating class and limiting features	Value
AnB:							
Angelo	80	Not limited		Not limited		Not limited	
ANS:							
Area not surveyed	100	Not rated		Not rated		Not rated	
BkB:							
Blakeney	85	Not limited		Not limited		Very limited	
						Depth to cemented pan	1.00
						Droughty	1.00
						Carbonate content	1.00
CoC:							
Conger	80	Somewhat limited		Somewhat limited		Very limited	
		Dusty	0.50	Dusty	0.50	Depth to cemented pan	1.00
						Droughty	1.00
						Carbonate content	1.00
DAM:							
Dams	100	Not rated		Not rated		Not rated	
DvB:							
Dev	80	Somewhat limited		Somewhat limited		Very limited	
		Flooding	0.40	Flooding	0.40	Flooding	1.00
						Carbonate content	1.00
						Gravel content	0.76
ERD:							
Ector	65	Very limited		Very limited		Very limited	
		Large stones content	1.00	Large stones content	1.00	Depth to bedrock	1.00
						Droughty	1.00
						Carbonate content	1.00
Rock outcrop	25	Not rated		Not rated		Not rated	
ERG:							
Ector	70	Very limited		Very limited		Very limited	
		Large stones content	1.00	Large stones content	1.00	Depth to bedrock	1.00
		Slope	1.00	Slope	0.08	Slope	1.00
						Large stones content	1.00
Rock outcrop	20	Not rated		Not rated		Not rated	
HaB:							
Harkey	80	Somewhat limited		Somewhat limited		Not limited	
		Dusty	0.50	Dusty	0.50		

Table 7.—Paths, Trails, and Golf Course Fairways—Continued

Map symbol and soil name	Pct. of map unit	Paths and trails		Off-road motorcycle trails		Golf course fairways	
		Rating class and limiting features	Value	Rating class and limiting features	Value	Rating class and limiting features	Value
HRA:							
Harkey	45	Somewhat limited		Somewhat limited		Very limited	
		Dusty	0.50	Dusty	0.50	Salinity	1.00
						Droughty	0.01
Patrole	40	Somewhat limited		Somewhat limited		Very limited	
		Dusty	0.50	Dusty	0.50	Salinity	1.00
						Droughty	0.01
IDB:							
Iraan	70	Not limited		Not limited		Somewhat limited	
						Flooding	0.60
Dev	20	Somewhat limited		Somewhat limited		Very limited	
		Flooding	0.40	Flooding	0.40	Flooding	1.00
						Carbonate content	1.00
						Gravel content	0.76
InB:							
Iraan	90	Not limited		Not limited		Somewhat limited	
						Flooding	0.60
IrA:							
Irion	90	Very limited		Very limited		Very limited	
		Ponding	1.00	Ponding	1.00	Ponding	1.00
		Too clayey	0.50	Too clayey	0.50	Too clayey	1.00
IsA:							
Irion	90	Very limited		Very limited		Very limited	
		Ponding	1.00	Ponding	1.00	Ponding	1.00
		Large stones content	1.00	Large stones content	1.00	Too clayey	1.00
		Too clayey	0.50	Too clayey	0.50		
KiB:							
Kinco	50	Not limited		Not limited		Not limited	
Ima	35	Not limited		Not limited		Not limited	
LRD:							
Lozier	55	Somewhat limited		Somewhat limited		Very limited	
		Dusty	0.50	Dusty	0.50	Depth to bedrock	1.00
						Droughty	1.00
						Gravel content	1.00
Rock outcrop	35	Not rated		Not rated		Not rated	
LRG:							
Lozier	60	Very limited		Very limited		Very limited	
		Large stones content	1.00	Large stones content	1.00	Depth to bedrock	1.00
		Slope	1.00	Dusty	0.50	Slope	1.00
		Dusty	0.50	Slope	0.08	Droughty	1.00
Rock outcrop	30	Not rated		Not rated		Not rated	

Table 7.—Paths, Trails, and Golf Course Fairways—Continued

Map symbol and soil name	Pct. of map unit	Paths and trails		Off-road motorcycle trails		Golf course fairways	
		Rating class and limiting features	Value	Rating class and limiting features	Value	Rating class and limiting features	Value
M-W:							
Water, miscellaneous	100	Not rated		Not rated		Not rated	
MaD:							
Mailtrail	85	Not limited		Not limited		Very limited	
						Depth to cemented pan	1.00
						Droughty	1.00
						Carbonate content	1.00
NoD:							
Noelke	50	Not limited		Not limited		Very limited	
						Depth to bedrock	1.00
						Depth to cemented pan	1.00
						Droughty	1.00
Ector	35	Somewhat limited		Somewhat limited		Very limited	
		Large stones content	0.18	Large stones content	0.18	Depth to bedrock	1.00
						Droughty	1.00
						Large stones content	1.00
OaC:							
Ozona	45	Not limited		Not limited		Very limited	
						Depth to cemented pan	1.00
						Carbonate content	1.00
						Droughty	0.25
Tarrant	40	Very limited		Very limited		Very limited	
		Large stones content	1.00	Large stones content	1.00	Depth to bedrock	1.00
		Too clayey	0.50	Too clayey	0.50	Large stones content	1.00
						Droughty	1.00
PaD:							
Paisano	80	Somewhat limited		Somewhat limited		Very limited	
		Dusty	0.50	Dusty	0.50	Depth to cemented pan	1.00
						Droughty	1.00
						Gravel content	1.00
PdB:							
Pandale	80	Not limited		Not limited		Very limited	
						Carbonate content	1.00
						Gravel content	0.08
						Droughty	0.01

Table 7.—Paths, Trails, and Golf Course Fairways—Continued

Map symbol and soil name	Pct. of map unit	Paths and trails		Off-road motorcycle trails		Golf course fairways	
		Rating class and limiting features	Value	Rating class and limiting features	Value	Rating class and limiting features	Value
PoC:							
Pandale	65	Somewhat limited		Somewhat limited		Very limited	
		Dusty	0.50	Dusty	0.50	Carbonate content	1.00
						Gravel content	0.08
						Droughty	0.01
Upton	25	Somewhat limited		Somewhat limited		Very limited	
		Large stones content	0.76	Large stones content	0.76	Depth to cemented pan	1.00
		Dusty	0.50	Dusty	0.50	Droughty	1.00
						Carbonate content	1.00
RaB:							
Reagan	85	Not limited		Not limited		Not limited	
RdB:							
Rio Diablo	85	Not limited		Not limited		Not limited	
RoB:							
Rioconcho	85	Somewhat limited		Somewhat limited		Very limited	
		Too clayey	0.50	Too clayey	0.50	Salinity	1.00
						Too clayey	1.00
						Flooding	0.60
RVB:							
Riverwash	60	Very limited		Very limited		Very limited	
		Gravel content	1.00	Gravel content	1.00	Flooding	1.00
		Flooding	0.40	Flooding	0.40	Droughty	1.00
		Large stones content	0.01	Large stones content	0.01	Gravel content	1.00
Dev	30	Somewhat limited		Somewhat limited		Very limited	
		Flooding	0.40	Flooding	0.40	Flooding	1.00
						Carbonate content	1.00
						Large stones content	0.74
SuD:							
Sanderson	50	Somewhat limited		Somewhat limited		Very limited	
		Dusty	0.50	Dusty	0.50	Gravel content	1.00
						Carbonate content	1.00
						Droughty	0.15
Upton	35	Somewhat limited		Somewhat limited		Very limited	
		Dusty	0.50	Dusty	0.50	Depth to cemented pan	1.00
		Large stones content	0.19	Large stones content	0.19	Droughty	1.00
						Carbonate content	1.00

Table 7.—Paths, Trails, and Golf Course Fairways—Continued

Map symbol and soil name	Pct. of map unit	Paths and trails		Off-road motorcycle trails		Golf course fairways	
		Rating class and limiting features	Value	Rating class and limiting features	Value	Rating class and limiting features	Value
ToB:							
Texon	50	Somewhat limited Dusty	 0.50	Somewhat limited Dusty	 0.50	Very limited Salinity	 1.00
Ozona	35	Not limited		Not limited		Very limited Depth to cemented pan Carbonate content Droughty	 1.00 1.00 0.41
TRD:							
Tarrant	55	Very limited Large stones content Too clayey	 1.00 0.50	Very limited Large stones content Too clayey	 1.00 0.50	Very limited Depth to bedrock Large stones content Droughty	 1.00 1.00 1.00
Rock outcrop	35	Not rated		Not rated		Not rated	
TRG:							
Tarrant	50	Very limited Large stones content Slope Too clayey	 1.00 1.00 0.50	Very limited Large stones content Too clayey Slope	 1.00 0.50 0.08	Very limited Depth to bedrock Slope Large stones content	 1.00 1.00 1.00
Rock outcrop	40	Not rated		Not rated		Not rated	
TsB:							
Tobosa	75	Somewhat limited Too clayey	 0.50	Somewhat limited Too clayey	 0.50	Very limited Too clayey	 1.00
UpD:							
Upton	80	Somewhat limited Large stones content Dusty	 0.76 0.50	Somewhat limited Large stones content Dusty	 0.76 0.50	Very limited Depth to cemented pan Droughty Carbonate content	 1.00 1.00 1.00
W:							
Water	100	Not rated		Not rated		Not rated	
WkB:							
Wickett	80	Somewhat limited Too sandy	 0.87	Somewhat limited Too sandy	 0.87	Somewhat limited Depth to cemented pan Droughty	 0.35 0.07

Table 8.—Grain and Seed Crops, Domestic Grasses and Legumes for Wildlife Habitat

(The information in this table indicates the dominant soil condition but does not eliminate the need for onsite investigation. The numbers in the value columns range from 0.01 to 1.00. The larger the value, the greater the limitation. See text for further explanation of ratings in this table.)

Map symbol and soil name	Pct of map unit	Grain and seed crops for food and cover		Domestic grasses and forbs for food and cover	
		Rating class and limiting features	Value	Rating class and limiting features	Value
AnB:					
Angelo	80	Very limited		Somewhat limited	
		HEL wind	1.00	Too clayey	0.70
		Too clayey	0.70	Too arid	0.50
		Too arid	0.50		
ANS:					
Area not surveyed	100	Not rated		Not rated	
BkB:					
Blakeney	85	Very limited		Very limited	
		Droughty	1.00	Droughty	1.00
		HEL wind	1.00	Potentially or highly erodible	1.00
		Potentially or highly erodible	1.00	Too arid	1.00
		Too arid	1.00	Cemented pan	1.00
		Cemented pan	1.00		
CoC:					
Conger	80	Very limited		Very limited	
		Droughty	1.00	Potentially or highly erodible	1.00
		HEL wind	1.00	Percs slowly	1.00
		Percs slowly	1.00	Too arid	1.00
		Potentially or highly erodible	1.00	Cemented pan	1.00
		Too arid	1.00	Droughty	1.00
DAM:					
Dams	100	Not rated		Not rated	
DvB:					
Dev	80	Very limited		Very limited	
		Droughty	1.00	Too gravelly, cobbly, or stony	1.00
		Too gravelly, cobbly, or stony	1.00	Droughty	0.52
		Flooding	0.50	Flooding	0.50
ERD:					
Ector	65	Very limited		Very limited	
		Droughty	1.00	Droughty	1.00
		Bedrock	1.00	Potentially or highly erodible	1.00
		Potentially or highly erodible	1.00	Bedrock	1.00
		Too gravelly, cobbly, or stony	1.00	Too gravelly, cobbly, or stony	1.00
Rock outcrop	25	Not rated		Not rated	

Table 8.—Grain and Seed Crops, Domestic Grasses and Legumes for Wildlife Habitat—Continued

Map symbol and soil name	Pct of map unit	Grain and seed crops for food and cover		Domestic grasses and forbs for food and cover	
		Rating class and limiting features	Value	Rating class and limiting features	Value
ERG:					
Ector	70	Very limited		Very limited	
		Droughty	1.00	Droughty	1.00
		Bedrock	1.00	Potentially or highly erodible	1.00
		Potentially or highly erodible	1.00	Bedrock	1.00
		Too gravelly, cobbly, or stony	1.00	Too gravelly, cobbly, or stony	1.00
		Slope	0.96	Slope	0.96
Rock outcrop	20	Not rated		Not rated	
HaB:					
Harkey	80	Very limited		Not limited	
		HEL wind	1.00		
HRA:					
Harkey	45	Very limited		Very limited	
		HEL wind	1.00	Excess salt	1.00
		Excess salt	1.00		
		Droughty	0.99		
Patrole	40	Very limited		Very limited	
		HEL wind	1.00	Percs slowly	1.00
		Percs slowly	1.00	Excess salt	1.00
		Excess salt	1.00		
		Droughty	0.99		
IDB:					
Iraan	70	Very limited		Somewhat limited	
		HEL wind	1.00	Flooding	0.50
		Flooding	0.50	Too clayey	0.03
		Too clayey	0.03		
Dev	20	Very limited		Very limited	
		HEL wind	1.00	Too gravelly, cobbly, or stony	1.00
		Droughty	1.00	Droughty	0.52
		Too gravelly, cobbly, or stony	1.00	Flooding	0.50
		Flooding	0.50		
InB:					
Iraan	90	Very limited		Somewhat limited	
		HEL wind	1.00	Flooding	0.50
		Flooding	0.50	Too clayey	0.50
		Too clayey	0.50		
IrA:					
Irion	90	Very limited		Very limited	
		Ponding	1.00	Ponding	1.00
		HEL wind	1.00	Too clayey	1.00
		Too clayey	1.00	Percs slowly	0.50
		Percs slowly	0.50		

Table 8.—Grain and Seed Crops, Domestic Grasses and Legumes for Wildlife Habitat—Continued

Map symbol and soil name	Pct of map unit	Grain and seed crops for food and cover		Domestic grasses and forbs for food and cover	
		Rating class and limiting features	Value	Rating class and limiting features	Value
IsA:					
Irion	90	Very limited		Very limited	
		Ponding	1.00	Ponding	1.00
		Too clayey	1.00	Too clayey	1.00
		Percs slowly	0.50	Percs slowly	0.50
		Droughty	0.32		
KiB:					
Kinco	50	Very limited		Very limited	
		HEL wind	1.00	Too arid	1.00
		Too arid	1.00		
		Droughty	0.95		
Ima	35	Very limited		Very limited	
		HEL wind	1.00	Too arid	1.00
		Too arid	1.00		
		Droughty	0.32		
LRD:					
Lozier	55	Very limited		Very limited	
		Droughty	1.00	Droughty	1.00
		Bedrock	1.00	Potentially or highly erodible	1.00
		Potentially or highly erodible	1.00	Bedrock	1.00
		Too gravelly, cobbly, or stony	1.00	Too gravelly, cobbly, or stony	1.00
Rock outcrop	35	Not rated		Not rated	
LRG:					
Lozier	60	Very limited		Very limited	
		Droughty	1.00	Droughty	1.00
		Bedrock	1.00	Potentially or highly erodible	1.00
		Potentially or highly erodible	1.00	Bedrock	1.00
		Too gravelly, cobbly, or stony	1.00	Too gravelly, cobbly, or stony	1.00
		Slope	0.96	Slope	0.96
Rock outcrop	30	Not rated		Not rated	
M-W:					
Water, miscellaneous	100	Not rated		Not rated	

Table 8.—Grain and Seed Crops, Domestic Grasses and Legumes for Wildlife Habitat—Continued

Map symbol and soil name	Pct of map unit	Grain and seed crops for food and cover		Domestic grasses and forbs for food and cover	
		Rating class and limiting features	Value	Rating class and limiting features	Value
MaD:					
Mailtrail	85	Very limited		Very limited	
		Droughty	1.00	Droughty	1.00
		Potentially or highly erodible	1.00	Potentially or highly erodible	1.00
		Cemented pan	1.00	Cemented pan	1.00
		Too gravelly, cobbly, or stony	1.00	Too gravelly, cobbly, or stony	1.00
NoD:					
Noelke	50	Very limited		Very limited	
		Droughty	1.00	Droughty	1.00
		Bedrock	1.00	Potentially or highly erodible	1.00
		Potentially or highly erodible	1.00	Bedrock	1.00
		Cemented pan	1.00	Cemented pan	1.00
		Too gravelly, cobbly, or stony	1.00	Too gravelly, cobbly, or stony	1.00
Ector	35	Very limited		Very limited	
		Too gravelly, cobbly, or stony	1.00	Too gravelly, cobbly, or stony	1.00
		Droughty	1.00	Droughty	1.00
		Bedrock	1.00	Potentially or highly erodible	1.00
		Potentially or highly erodible	1.00	Bedrock	1.00
OaC:					
Ozona	45	Very limited		Very limited	
		Droughty	1.00	Potentially or highly erodible	1.00
		HEL wind	1.00	Cemented pan	1.00
		Potentially or highly erodible	1.00	Too clayey	0.93
		Cemented pan	1.00	Droughty	0.24
		Too clayey	0.93		
Tarrant	40	Very limited		Very limited	
		Droughty	1.00	Droughty	1.00
		HEL wind	1.00	Potentially or highly erodible	1.00
		Bedrock	1.00	Bedrock	1.00
		Too clayey	1.00	Too clayey	1.00
		Potentially or highly erodible	1.00	Too gravelly, cobbly, or stony	1.00

Table 8.—Grain and Seed Crops, Domestic Grasses and Legumes for Wildlife Habitat—Continued

Map symbol and soil name	Pct of map unit	Grain and seed crops for food and cover		Domestic grasses and forbs for food and cover	
		Rating class and limiting features	Value	Rating class and limiting features	Value
PaD:					
Paisano	80	Very limited		Very limited	
		Droughty	1.00	Droughty	1.00
		Cemented pan	1.00	Potentially or highly erodible	1.00
		Potentially or highly erodible	1.00	Cemented pan	1.00
		Too gravelly, cobbly, or stony	1.00	Too gravelly, cobbly, or stony	1.00
PdB:					
Pandale	80	Very limited		Somewhat limited	
		HEL wind	1.00	Too gravelly, cobbly, or stony	0.08
		Droughty	0.99		
		Too gravelly, cobbly, or stony	0.08		
PoC:					
Pandale	65	Very limited		Very limited	
		HEL wind	1.00	Too arid	1.00
		Too arid	1.00	Too gravelly, cobbly, or stony	0.08
		Droughty	0.99		
		Too gravelly, cobbly, or stony	0.08		
Upton	25	Very limited		Very limited	
		Droughty	1.00	Droughty	1.00
		HEL wind	1.00	Cemented pan	1.00
		Cemented pan	1.00	Too gravelly, cobbly, or stony	0.43
		Too gravelly, cobbly, or stony	0.43		
RaB:					
Reagan	85	Very limited		Very limited	
		Too arid	1.00	Too arid	1.00
		Droughty	0.26	Too clayey	0.19
		Too clayey	0.19		
RdB:					
Rio Diablo	85	Very limited		Somewhat limited	
		HEL wind	1.00	Too clayey	0.99
		Too clayey	0.99	Too arid	0.50
		Too arid	0.50		
RoB:					
Rioconcho	85	Very limited		Very limited	
		HEL wind	1.00	Too clayey	1.00
		Too clayey	1.00	Excess salt	1.00
		Excess salt	1.00	Flooding	0.50
		Flooding	0.50	Percs slowly	0.33
		Percs slowly	0.33		

Table 8.—Grain and Seed Crops, Domestic Grasses and Legumes for Wildlife Habitat—Continued

Map symbol and soil name	Pct of map unit	Grain and seed crops for food and cover		Domestic grasses and forbs for food and cover	
		Rating class and limiting features	Value	Rating class and limiting features	Value
RVB:					
Riverwash	60	Not rated		Not rated	
Dev	30	Very limited		Very limited	
		Droughty	1.00	Too gravelly, cobbly, or stony	1.00
		Too gravelly, cobbly, or stony	1.00	Droughty	0.55
		Flooding	0.50	Flooding	0.50
SuD:					
Sanderson	50	Very limited		Very limited	
		Potentially or highly erodible	1.00	Potentially or highly erodible	1.00
		Too arid	1.00	Too arid	1.00
		Droughty	1.00	Too gravelly, cobbly, or stony	1.00
		Too gravelly, cobbly, or stony	1.00	Droughty	0.48
Upton	35	Very limited		Very limited	
		Droughty	1.00	Droughty	1.00
		Potentially or highly erodible	1.00	Potentially or highly erodible	1.00
		Cemented pan	1.00	Cemented pan	1.00
		Too gravelly, cobbly, or stony	0.43	Too gravelly, cobbly, or stony	0.43
ToB:					
Texon	50	Very limited		Very limited	
		HEL wind	1.00	Potentially or highly erodible	1.00
		Potentially or highly erodible	1.00	Excess salt	1.00
		Excess salt	1.00	Too arid	0.50
		Too arid	0.50	Percs slowly	0.25
		Percs slowly	0.25		
Ozona	35	Very limited		Very limited	
		Droughty	1.00	Potentially or highly erodible	1.00
		HEL wind	1.00	Cemented pan	1.00
		Potentially or highly erodible	1.00	Droughty	0.39
		Cemented pan	1.00	Too clayey	0.05
		Too clayey	0.05		

Table 8.—Grain and Seed Crops, Domestic Grasses and Legumes for Wildlife Habitat—Continued

Map symbol and soil name	Pct of map unit	Grain and seed crops for food and cover		Domestic grasses and forbs for food and cover	
		Rating class and limiting features	Value	Rating class and limiting features	Value
TRD:					
Tarrant	55	Very limited		Very limited	
		Droughty	1.00	Droughty	1.00
		Bedrock	1.00	Potentially or highly erodible	1.00
		Too clayey	1.00	Bedrock	1.00
		Potentially or highly erodible	1.00	Too clayey	1.00
		Too gravelly, cobbly, or stony	1.00	Too gravelly, cobbly, or stony	1.00
Rock outcrop	35	Not rated		Not rated	
TRG:					
Tarrant	50	Very limited		Very limited	
		Droughty	1.00	Droughty	1.00
		Bedrock	1.00	Potentially or highly erodible	1.00
		Too clayey	1.00	Bedrock	1.00
		Potentially or highly erodible	1.00	Too clayey	1.00
		Too gravelly, cobbly, or stony	1.00	Too gravelly, cobbly, or stony	1.00
Rock outcrop	40	Not rated		Not rated	
TsB:					
Tobosa	75	Very limited		Very limited	
		HEL wind	1.00	Too clayey	1.00
		Too clayey	1.00	Percs slowly	0.50
		Percs slowly	0.50	Too arid	0.50
		Too arid	0.50		
		Droughty	0.03		
UpD:					
Upton	80	Very limited		Very limited	
		Droughty	1.00	Potentially or highly erodible	1.00
		Potentially or highly erodible	1.00	Droughty	1.00
		Cemented pan	1.00	Cemented pan	1.00
		Too gravelly, cobbly, or stony	0.43	Too gravelly, cobbly, or stony	0.43
W:					
Water	100	Not rated		Not rated	
WkB:					
Wickett	80	Very limited		Somewhat limited	
		HEL wind	1.00	Cemented pan	0.83
		Droughty	1.00	Too sandy	0.50
		Cemented pan	0.83	Droughty	0.06
		Too sandy	0.50		

Table 9.—Upland Wild Herbaceous Plants, and Upland Shrubs and Vines for Wildlife Habitat

(The information in this table indicates the dominant soil condition but does not eliminate the need for onsite investigation. The numbers in the value columns range from 0.01 to 1.00. The larger the value, the greater the limitation. See text for further explanation of ratings in this table.)

Map symbol and soil name	Pct. of map unit	Upland wild herbaceous plants		Upland shrubs and vines	
		Rating class and limiting features	Value	Rating class and limiting features	Value
AnB:					
Angelo	80	Somewhat limited		Somewhat limited	
		Too clayey	0.70	Too clayey	0.70
		Too arid	0.50	Too arid	0.50
ANS:					
Area not surveyed	100	Not rated		Not rated	
BkB:					
Blakeney	85	Very limited		Very limited	
		Droughty	1.00	Droughty	1.00
		Too arid	1.00	Too arid	1.00
				Cemented pan	1.00
CoC:					
Conger	80	Very limited		Very limited	
		Too arid	1.00	Too arid	1.00
		Droughty	1.00	Cemented pan	1.00
				Droughty	1.00
DAM:					
Dams	100	Not rated		Not rated	
DvB:					
Dev	80	Somewhat limited		Somewhat limited	
		Droughty	0.52	Droughty	0.52
		Too gravelly, cobbly, or stony	0.06	Too gravelly, cobbly, or stony	0.06
ERD:					
Ector	65	Very limited		Very limited	
		Droughty	1.00	Droughty	1.00
		Too gravelly, cobbly, or stony	1.00	Bedrock	1.00
		Too clayey	0.01	Too gravelly, cobbly, or stony	1.00
				Too clayey	0.01
Rock outcrop	25	Not rated		Not rated	
ERG:					
Ector	70	Very limited		Very limited	
		Droughty	1.00	Droughty	1.00
		Too gravelly, cobbly, or stony	1.00	Bedrock	1.00
				Too gravelly, cobbly, or stony	1.00
Rock outcrop	20	Not rated		Not rated	

Table 9.—Upland Wild Herbaceous Plants, and Upland Shrubs and Vines for Wildlife Habitat—Continued

Map symbol and soil name	Pct. of map unit	Upland wild herbaceous plants		Upland shrubs and vines	
		Rating class and limiting features	Value	Rating class and limiting features	Value
HaB:					
Harkey	80	Not limited		Not limited	
HRA:					
Harkey	45	Very limited Excess salt	 1.00	Very limited Excess salt	 1.00
Patrole	40	Very limited Excess salt	 1.00	Very limited Excess salt	 1.00
IDB:					
Iraan	70	Somewhat limited Too clayey	 0.03	Somewhat limited Too clayey	 0.03
Dev	20	Somewhat limited Droughty Too gravelly, cobbly, or stony	 0.52 0.06	Somewhat limited Droughty Too gravelly, cobbly, or stony	 0.52 0.06
InB:					
Iraan	90	Somewhat limited Too clayey	 0.50	Somewhat limited Too clayey	 0.50
IrA:					
Irion	90	Very limited Too clayey	 1.00	Very limited Too clayey	 1.00
IsA:					
Irion	90	Very limited Too clayey	 1.00	Very limited Too clayey	 1.00
KiB:					
Kinco	50	Very limited Too arid	 1.00	Very limited Too arid	 1.00
Ima	35	Very limited Too arid	 1.00	Very limited Too arid	 1.00
LRD:					
Lozier	55	Very limited Droughty Too gravelly, cobbly, or stony	 1.00 0.69	Very limited Droughty Bedrock Too gravelly, cobbly, or stony	 1.00 1.00 0.69
Rock outcrop	35	Not rated		Not rated	

Table 9.—Upland Wild Herbaceous Plants, and Upland Shrubs and Vines for Wildlife Habitat—Continued

Map symbol and soil name	Pct. of map unit	Upland wild herbaceous plants		Upland shrubs and vines	
		Rating class and limiting features	Value	Rating class and limiting features	Value
LRG:					
Lozier	60	Very limited		Very limited	
		Droughty	1.00	Droughty	1.00
		Too gravelly, cobbly, or stony	0.84	Bedrock	1.00
				Too gravelly, cobbly, or stony	0.84
Rock outcrop	30	Not rated		Not rated	
M-W:					
Water, miscellaneous	100	Not rated		Not rated	
MaD:					
Mailtrail	85	Very limited		Very limited	
		Droughty	1.00	Droughty	1.00
		Too gravelly, cobbly, or stony	0.43	Cemented pan	1.00
		Too clayey	0.19	Too gravelly, cobbly, or stony	0.43
				Too clayey	0.19
NoD:					
Noelke	50	Very limited		Very limited	
		Droughty	1.00	Droughty	1.00
		Too gravelly, cobbly, or stony	0.48	Bedrock	1.00
		Too clayey	0.19	Cemented pan	1.00
				Too gravelly, cobbly, or stony	0.48
				Too clayey	0.19
Ector	35	Very limited		Very limited	
		Droughty	1.00	Droughty	1.00
		Too gravelly, cobbly, or stony	1.00	Bedrock	1.00
		Too clayey	0.19	Too gravelly, cobbly, or stony	1.00
				Too clayey	0.19
OaC:					
Ozona	45	Somewhat limited		Very limited	
		Too clayey	0.93	Cemented pan	1.00
		Droughty	0.24	Too clayey	0.93
				Droughty	0.24
Tarrant	40	Very limited		Very limited	
		Too clayey	1.00	Too clayey	1.00
		Droughty	1.00	Droughty	1.00
		Too gravelly, cobbly, or stony	0.86	Bedrock	1.00
				Too gravelly, cobbly, or stony	0.86

Table 9.—Upland Wild Herbaceous Plants, and Upland Shrubs and Vines for Wildlife Habitat—Continued

Map symbol and soil name	Pct. of map unit	Upland wild herbaceous plants		Upland shrubs and vines	
		Rating class and limiting features	Value	Rating class and limiting features	Value
PaD:					
Paisano	80	Very limited		Very limited	
		Droughty	1.00	Droughty	1.00
		Too gravelly, cobbly, or stony	0.61	Cemented pan	1.00
				Too gravelly, cobbly, or stony	0.61
PdB:					
Pandale	80	Not limited		Not limited	
PoC:					
Pandale	65	Very limited		Very limited	
		Too arid	1.00	Too arid	1.00
Upton	25	Very limited		Very limited	
		Droughty	1.00	Droughty	1.00
				Cemented pan	1.00
RaB:					
Reagan	85	Very limited		Very limited	
		Too arid	1.00	Too arid	1.00
		Too clayey	0.19	Too clayey	0.19
RdB:					
Rio Diablo	85	Somewhat limited		Somewhat limited	
		Too clayey	0.99	Too clayey	0.99
		Too arid	0.50	Too arid	0.50
RoB:					
Rioconcho	85	Very limited		Very limited	
		Too clayey	1.00	Too clayey	1.00
		Excess salt	1.00	Excess salt	1.00
RVB:					
Riverwash	60	Not rated		Not rated	
Dev	30	Somewhat limited		Somewhat limited	
		Droughty	0.55	Droughty	0.55
		Too gravelly, cobbly, or stony	0.23	Too gravelly, cobbly, or stony	0.23
SuD:					
Sanderson	50	Very limited		Very limited	
		Too arid	1.00	Too arid	1.00
		Droughty	0.48	Droughty	0.48
		Too gravelly, cobbly, or stony	0.15	Too gravelly, cobbly, or stony	0.15
Upton	35	Very limited		Very limited	
		Droughty	1.00	Droughty	1.00
				Cemented pan	1.00

Table 9.—Upland Wild Herbaceous Plants, and Upland Shrubs and Vines for Wildlife Habitat—Continued

Map symbol and soil name	Pct. of map unit	Upland wild herbaceous plants		Upland shrubs and vines	
		Rating class and limiting features	Value	Rating class and limiting features	Value
ToB:					
Texon	50	Very limited		Very limited	
		Excess salt	1.00	Excess salt	1.00
		Too arid	0.50	Too arid	0.50
Ozona	35	Somewhat limited		Very limited	
		Droughty	0.39	Cemented pan	1.00
		Too clayey	0.05	Droughty	0.39
				Too clayey	0.05
TRD:					
Tarrant	55	Very limited		Very limited	
		Too clayey	1.00	Too clayey	1.00
		Droughty	1.00	Droughty	1.00
		Too gravelly, cobbly, or stony	0.86	Bedrock	1.00
				Too gravelly, cobbly, or stony	0.86
Rock outcrop	35	Not rated		Not rated	
TRG:					
Tarrant	50	Very limited		Very limited	
		Too clayey	1.00	Too clayey	1.00
		Droughty	1.00	Droughty	1.00
		Too gravelly, cobbly, or stony	0.86	Bedrock	1.00
				Too gravelly, cobbly, or stony	0.86
Rock outcrop	40	Not rated		Not rated	
TsB:					
Tobosa	75	Very limited		Very limited	
		Too clayey	1.00	Too clayey	1.00
		Too arid	0.50	Too arid	0.50
UpD:					
Upton	80	Very limited		Very limited	
		Droughty	1.00	Droughty	1.00
				Cemented pan	1.00
W:					
Water	100	Not rated		Not rated	
WkB:					
Wickett	80	Somewhat limited		Somewhat limited	
		Too sandy	0.50	Cemented pan	0.83
		Droughty	0.06	Droughty	0.06

Table 10.—Riparian Herbaceous Plants, and Riparian Shrubs, Vines, and Trees for Wildlife Habitat

(The information in this table indicates the dominant soil condition but does not eliminate the need for onsite investigation. The numbers in the value columns range from 0.01 to 1.00. The larger the value, the greater the limitation. See text for further explanation of ratings in this table.)

Map symbol and soil name	Pct. of map unit	Riparian herbaceous plants		Riparian shrubs, vines, and trees	
		Rating class and limiting features	Value	Rating class and limiting features	Value
AnB:					
Angelo	80	Very limited Too dry Infrequent flooding	 1.00 1.00	Very limited Too dry	 1.00
ANS:					
Area not surveyed	100	Not rated		Not rated	
BkB:					
Blakeney	85	Very limited Too dry Infrequent flooding	 1.00 1.00	Very limited Too dry Droughty	 1.00 1.00
CoC:					
Conger	80	Very limited Too dry Infrequent flooding	 1.00 1.00	Very limited Too dry Droughty	 1.00 1.00
DAM:					
Dams	100	Not rated		Not rated	
DvB:					
Dev	80	Very limited Too dry Too gravelly, cobbly, or stony	 1.00 0.06	Very limited Too dry Droughty	 1.00 0.52
ERD:					
Ector	65	Very limited Too dry Infrequent flooding Too gravelly, cobbly, or stony	 1.00 1.00 1.00	Very limited Too dry Droughty	 1.00 1.00
Rock outcrop	25	Not rated		Not rated	
ERG:					
Ector	70	Very limited Too dry Infrequent flooding Too gravelly, cobbly, or stony	 1.00 1.00 1.00	Very limited Too dry Droughty	 1.00 1.00
Rock outcrop	20	Not rated		Not rated	

Table 10.—Riparian Herbaceous Plants, and Riparian Shrubs, Vines, and Trees for Wildlife Habitat—Continued

Map symbol and soil name	Pct. of map unit	Riparian herbaceous plants		Riparian shrubs, vines, and trees	
		Rating class and limiting features	Value	Rating class and limiting features	Value
HaB:					
Harkey	80	Very limited		Very limited	
		Too dry	1.00	Too dry	1.00
		Infrequent flooding	1.00		
HRA:					
Harkey	45	Very limited		Very limited	
		Too dry	1.00	Too dry	1.00
		Infrequent flooding	1.00	Excess salt	1.00
		Excess salt	1.00		
Patrole	40	Very limited		Very limited	
		Too dry	1.00	Too dry	1.00
		Infrequent flooding	1.00	Excess salt	1.00
		Excess salt	1.00		
IDB:					
Iraan	70	Very limited		Very limited	
		Too dry	1.00	Too dry	1.00
		Infrequent flooding	1.00		
Dev	20	Very limited		Very limited	
		Too dry	1.00	Too dry	1.00
		Too gravelly, cobbly, or stony	0.06	Droughty	0.52
InB:					
Iraan	90	Very limited		Very limited	
		Too dry	1.00	Too dry	1.00
		Infrequent flooding	1.00		
IrA:					
Irion	90	Very limited		Very limited	
		Too dry	1.00	Ponding	1.00
		Infrequent flooding	1.00	Too dry	1.00
		Ponding	0.50		
IsA:					
Irion	90	Very limited		Very limited	
		Too dry	1.00	Ponding	1.00
		Infrequent flooding	1.00	Too dry	1.00
		Ponding	0.50		

Table 10.—Riparian Herbaceous Plants, and Riparian Shrubs, Vines, and Trees for Wildlife Habitat—Continued

Map symbol and soil name	Pct. of map unit	Riparian herbaceous plants		Riparian shrubs, vines, and trees	
		Rating class and limiting features	Value	Rating class and limiting features	Value
KiB:					
Kinco	50	Very limited Too dry Infrequent flooding	 1.00 1.00	Very limited Too dry	 1.00
Ima	35	Very limited Too dry Infrequent flooding	 1.00 1.00	Very limited Too dry	 1.00
LRD:					
Lozier	55	Very limited Too dry Infrequent flooding Too gravelly, cobbly, or stony	 1.00 1.00 0.69	Very limited Too dry Droughty	 1.00 1.00
Rock outcrop	35	Not rated		Not rated	
LRG:					
Lozier	60	Very limited Too dry Infrequent flooding Too gravelly, cobbly, or stony	 1.00 1.00 0.84	Very limited Too dry Droughty	 1.00 1.00
Rock outcrop	30	Not rated		Not rated	
M-W:					
Water, miscellaneous	100	Not rated		Not rated	
MaD:					
Mailtrail	85	Very limited Too dry Infrequent flooding Too gravelly, cobbly, or stony	 1.00 1.00 0.43	Very limited Too dry Droughty	 1.00 1.00
NoD:					
Noelke	50	Very limited Too dry Infrequent flooding Too gravelly, cobbly, or stony	 1.00 1.00 0.48	Very limited Too dry Droughty	 1.00 1.00
Ector	35	Very limited Too dry Infrequent flooding Too gravelly, cobbly, or stony	 1.00 1.00 1.00	Very limited Too dry Droughty	 1.00 1.00

Table 10.—Riparian Herbaceous Plants, and Riparian Shrubs, Vines, and Trees for Wildlife Habitat—Continued

Map symbol and soil name	Pct. of map unit	Riparian herbaceous plants		Riparian shrubs, vines, and trees	
		Rating class and limiting features	Value	Rating class and limiting features	Value
OaC:					
Ozona	45	Very limited		Very limited	
		Too dry	1.00	Too dry	1.00
		Infrequent flooding	1.00	Droughty	0.24
Tarrant	40	Very limited		Very limited	
		Too dry	1.00	Too dry	1.00
		Infrequent flooding	1.00	Droughty	1.00
		Too gravelly, cobbly, or stony	0.86		
PaD:					
Paisano	80	Very limited		Very limited	
		Too dry	1.00	Too dry	1.00
		Infrequent flooding	1.00	Droughty	1.00
		Too gravelly, cobbly, or stony	0.61		
PdB:					
Pandale	80	Very limited		Very limited	
		Too dry	1.00	Too dry	1.00
		Infrequent flooding	1.00		
PoC:					
Pandale	65	Very limited		Very limited	
		Too dry	1.00	Too dry	1.00
		Infrequent flooding	1.00		
Upton	25	Very limited		Very limited	
		Too dry	1.00	Too dry	1.00
		Infrequent flooding	1.00	Droughty	1.00
RaB:					
Reagan	85	Very limited		Very limited	
		Too dry	1.00	Too dry	1.00
		Infrequent flooding	1.00		
RdB:					
Rio Diablo	85	Very limited		Very limited	
		Too dry	1.00	Too dry	1.00
		Infrequent flooding	1.00		

Table 10.—Riparian Herbaceous Plants, and Riparian Shrubs, Vines, and Trees for Wildlife Habitat—Continued

Map symbol and soil name	Pct. of map unit	Riparian herbaceous plants		Riparian shrubs, vines, and trees	
		Rating class and limiting features	Value	Rating class and limiting features	Value
RoB:					
Rioconcho	85	Very limited		Very limited	
		Too dry	1.00	Too dry	1.00
		Infrequent flooding	1.00	Excess salt	1.00
		Excess salt	1.00		
RVB:					
Riverwash	60	Not rated		Not rated	
Dev	30	Very limited		Very limited	
		Too dry	1.00	Too dry	1.00
		Too gravelly, cobbly, or stony	0.23	Droughty	0.55
SuD:					
Sanderson	50	Very limited		Very limited	
		Too dry	1.00	Too dry	1.00
		Infrequent flooding	1.00	Droughty	0.48
		Too gravelly, cobbly, or stony	0.15		
Upton	35	Very limited		Very limited	
		Too dry	1.00	Too dry	1.00
		Infrequent flooding	1.00	Droughty	1.00
ToB:					
Texon	50	Very limited		Very limited	
		Too dry	1.00	Too dry	1.00
		Infrequent flooding	1.00	Excess salt	1.00
		Excess salt	1.00		
Ozona	35	Very limited		Very limited	
		Too dry	1.00	Too dry	1.00
		Infrequent flooding	1.00	Droughty	0.39
TRD:					
Tarrant	55	Very limited		Very limited	
		Too dry	1.00	Too dry	1.00
		Infrequent flooding	1.00	Droughty	1.00
		Too gravelly, cobbly, or stony	0.86		
Rock outcrop	35	Not rated		Not rated	

Table 10.—Riparian Herbaceous Plants, and Riparian Shrubs, Vines, and Trees for Wildlife Habitat—Continued

Map symbol and soil name	Pct. of map unit	Riparian herbaceous plants		Riparian shrubs, vines, and trees	
		Rating class and limiting features	Value	Rating class and limiting features	Value
TRG:					
Tarrant	50	Very limited		Very limited	
		Too dry	1.00	Too dry	1.00
		Infrequent flooding	1.00	Droughty	1.00
		Too gravelly, cobbly, or stony	0.86		
Rock outcrop	40	Not rated		Not rated	
TsB:					
Tobosa	75	Very limited		Very limited	
		Too dry	1.00	Too dry	1.00
		Infrequent flooding	1.00		
UpD:					
Upton	80	Very limited		Very limited	
		Too dry	1.00	Too dry	1.00
		Infrequent flooding	1.00	Droughty	1.00
W:					
Water	100	Not rated		Not rated	
WkB:					
Wickett	80	Very limited		Very limited	
		Too dry	1.00	Too dry	1.00
		Infrequent flooding	1.00	Droughty	0.06
		Too sandy	0.50		

Table 11.—Dwellings and Small Commercial Buildings

(The information in this table indicates the dominant soil condition but does not eliminate the need for onsite investigation. The numbers in the value columns range from 0.01 to 1.00. The larger the value, the greater the limitation. See text for further explanation of ratings in this table.)

Map symbol and soil name	Pct. of map unit	Dwellings without basements		Dwellings with basements		Small commercial buildings	
		Rating class and limiting features	Value	Rating class and limiting features	Value	Rating class and limiting features	Value
AnB:							
Angelo	80	Somewhat limited Shrink-swell	0.50	Somewhat limited Shrink-swell	0.50	Somewhat limited Shrink-swell	0.50
ANS:							
Area not surveyed	100	Not rated		Not rated		Not rated	
BkB:							
Blakeney	85	Somewhat limited Depth to thin cemented pan	0.50	Very limited Depth to thin cemented pan	1.00	Somewhat limited Depth to thin cemented pan	1.00
CoC:							
Conger	80	Somewhat limited Depth to thin cemented pan	0.50	Very limited Depth to thin cemented pan	1.00	Somewhat limited Depth to thin cemented pan	1.00
DAM:							
Dams	100	Not rated		Not rated		Not rated	
DvB:							
Dev	80	Very limited Flooding	1.00	Very limited Flooding	1.00	Very limited Flooding	1.00
ERD:							
Ector	65	Very limited Depth to hard bedrock Large stones content Slope	1.00 0.03 0.01	Very limited Depth to hard bedrock Large stones content Slope	1.00 0.03 0.01	Very limited Depth to hard bedrock Slope Large stones content	1.00 1.00 0.03
Rock outcrop	25	Not rated		Not rated		Not rated	
ERG:							
Ector	70	Very limited Slope Depth to hard bedrock Large stones content	1.00 1.00 1.00	Very limited Slope Depth to hard bedrock Large stones content	1.00 1.00 1.00	Very limited Slope Depth to hard bedrock Large stones content	1.00 1.00 1.00
Rock outcrop	20	Not rated		Not rated		Not rated	
HaB:							
Harkey	80	Very limited Flooding	1.00	Very limited Flooding	1.00	Very limited Flooding	1.00

Table 11.—Dwellings and Small Commercial Buildings—Continued

Map symbol and soil name	Pct. of map unit	Dwellings without basements		Dwellings with basements		Small commercial buildings	
		Rating class and limiting features	Value	Rating class and limiting features	Value	Rating class and limiting features	Value
HRA:							
Harkey	45	Very limited		Very limited		Very limited	
		Flooding	1.00	Flooding	1.00	Flooding	1.00
Patrole	40	Very limited		Very limited		Very limited	
		Flooding	1.00	Flooding	1.00	Flooding	1.00
				Shrink-swell	1.00		
IDB:							
Iraan	70	Very limited		Very limited		Very limited	
		Flooding	1.00	Flooding	1.00	Flooding	1.00
		Shrink-swell	0.50	Shrink-swell	0.50	Shrink-swell	0.50
Dev	20	Very limited		Very limited		Very limited	
		Flooding	1.00	Flooding	1.00	Flooding	1.00
InB:							
Iraan	90	Very limited		Very limited		Very limited	
		Flooding	1.00	Flooding	1.00	Flooding	1.00
		Shrink-swell	0.50	Shrink-swell	0.50	Shrink-swell	0.50
IrA:							
Irion	90	Very limited		Very limited		Very limited	
		Ponding	1.00	Ponding	1.00	Ponding	1.00
		Shrink-swell	1.00	Shrink-swell	1.00	Shrink-swell	1.00
IsA:							
Irion	90	Very limited		Very limited		Very limited	
		Ponding	1.00	Ponding	1.00	Ponding	1.00
		Shrink-swell	1.00	Shrink-swell	1.00	Shrink-swell	1.00
KiB:							
Kinco	50	Not limited		Not limited		Not limited	
Ima	35	Not limited		Not limited		Not limited	
LRD:							
Lozier	55	Very limited		Very limited		Very limited	
		Depth to hard bedrock	1.00	Depth to hard bedrock	1.00	Depth to hard bedrock	1.00
		Slope	0.04	Slope	0.04	Slope	1.00
Rock outcrop	35	Not rated		Not rated		Not rated	
LRG:							
Lozier	60	Very limited		Very limited		Very limited	
		Slope	1.00	Slope	1.00	Slope	1.00
		Depth to hard bedrock	1.00	Depth to hard bedrock	1.00	Depth to hard bedrock	1.00
		Large stones content	0.39	Large stones content	0.39	Large stones content	0.39
Rock outcrop	30	Not rated		Not rated		Not rated	
M-W:							
Water, miscellaneous	100	Not rated		Not rated		Not rated	

Table 11.—Dwellings and Small Commercial Buildings—Continued

Map symbol and soil name	Pct. of map unit	Dwellings without basements		Dwellings with basements		Small commercial buildings	
		Rating class and limiting features	Value	Rating class and limiting features	Value	Rating class and limiting features	Value
MaD:							
Mailtrail	85	Very limited		Very limited		Very limited	
		Large stones content	0.99	Depth to thin cemented pan	1.00	Depth to thin cemented pan	1.00
		Depth to thin cemented pan	0.50	Large stones content	0.99	Large stones content	0.99
						Slope	0.12
NoD:							
Noelke	50	Very limited		Very limited		Very limited	
		Depth to hard bedrock	1.00	Depth to hard bedrock	1.00	Depth to hard bedrock	1.00
		Shrink-swell	0.50	Depth to thin cemented pan	1.00	Depth to thin cemented pan	1.00
		Depth to thin cemented pan	0.50	Shrink-swell	0.50	Shrink-swell	0.50
Ector	35	Very limited		Very limited		Very limited	
		Depth to hard bedrock	1.00	Depth to hard bedrock	1.00	Depth to hard bedrock	1.00
		Large stones content	0.68	Large stones content	0.68	Large stones content	0.68
OaC:							
Ozona	45	Somewhat limited		Very limited		Somewhat limited	
		Shrink-swell	0.50	Depth to thin cemented pan	1.00	Depth to thin cemented pan	1.00
		Depth to thin cemented pan	0.50	Shrink-swell	0.50	Shrink-swell	0.50
Tarrant	40	Very limited		Very limited		Very limited	
		Depth to hard bedrock	1.00	Depth to hard bedrock	1.00	Depth to hard bedrock	1.00
		Large stones content	1.00	Large stones content	1.00	Large stones content	1.00
		Shrink-swell	0.50	Shrink-swell	0.50	Shrink-swell	0.50
PaD:							
Paisano	80	Somewhat limited		Very limited		Somewhat limited	
		Depth to thin cemented pan	0.50	Depth to thin cemented pan	1.00	Depth to thin cemented pan	1.00
						Slope	0.12
PdB:							
Pandale	80	Not limited		Not limited		Not limited	
PoC:							
Pandale	65	Not limited		Not limited		Not limited	
Upton	25	Somewhat limited		Very limited		Somewhat limited	
		Depth to thin cemented pan	0.50	Depth to thin cemented pan	1.00	Depth to thin cemented pan	1.00
RaB:							
Reagan	85	Somewhat limited		Somewhat limited		Somewhat limited	
		Shrink-swell	0.50	Shrink-swell	0.50	Shrink-swell	0.50

Table 11.—Dwellings and Small Commercial Buildings—Continued

Map symbol and soil name	Pct. of map unit	Dwellings without basements		Dwellings with basements		Small commercial buildings	
		Rating class and limiting features	Value	Rating class and limiting features	Value	Rating class and limiting features	Value
RdB:							
Rio Diablo	85	Very limited		Very limited		Very limited	
		Flooding	1.00	Flooding	1.00	Flooding	1.00
		Shrink-swell	1.00	Shrink-swell	1.00	Shrink-swell	1.00
RoB:							
Rioconcho	85	Very limited		Very limited		Very limited	
		Flooding	1.00	Flooding	1.00	Flooding	1.00
		Shrink-swell	1.00	Shrink-swell	1.00	Shrink-swell	1.00
RVB:							
Riverwash	60	Very limited		Very limited		Very limited	
		Flooding	1.00	Flooding	1.00	Flooding	1.00
		Large stones content	0.05	Large stones content	0.05	Large stones content	0.05
Dev	30	Very limited		Very limited		Very limited	
		Flooding	1.00	Flooding	1.00	Flooding	1.00
SuD:							
Sanderson	50	Not limited		Not limited		Somewhat limited	
						Slope	0.12
Upton	35	Somewhat limited		Very limited		Somewhat limited	
		Depth to thin cemented pan	0.50	Depth to thin cemented pan	1.00	Depth to thin cemented pan	1.00
						Slope	0.12
ToB:							
Texon	50	Very limited		Very limited		Very limited	
		Shrink-swell	1.00	Shrink-swell	1.00	Shrink-swell	1.00
Ozona	35	Somewhat limited		Very limited		Somewhat limited	
		Shrink-swell	0.50	Depth to thin cemented pan	1.00	Depth to thin cemented pan	1.00
		Depth to thin cemented pan	0.50	Shrink-swell	0.50	Shrink-swell	0.50
TRD:							
Tarrant	55	Very limited		Very limited		Very limited	
		Depth to hard bedrock	1.00	Depth to hard bedrock	1.00	Depth to hard bedrock	1.00
		Large stones content	1.00	Large stones content	1.00	Large stones content	1.00
		Shrink-swell	0.50	Shrink-swell	0.50	Slope	1.00
Rock outcrop	35	Not rated		Not rated		Not rated	
TRG:							
Tarrant	50	Very limited		Very limited		Very limited	
		Slope	1.00	Slope	1.00	Slope	1.00
		Depth to hard bedrock	1.00	Depth to hard bedrock	1.00	Depth to hard bedrock	1.00
		Large stones content	1.00	Large stones content	1.00	Large stones content	1.00
Rock outcrop	40	Not rated		Not rated		Not rated	

Table 11.—Dwellings and Small Commercial Buildings—Continued

Map symbol and soil name	Pct. of map unit	Dwellings without basements		Dwellings with basements		Small commercial buildings	
		Rating class and limiting features	Value	Rating class and limiting features	Value	Rating class and limiting features	Value
TsB:							
Tobosa	75	Very limited Shrink-swell	1.00	Very limited Shrink-swell	1.00	Very limited Shrink-swell	1.00
UpD:							
Upton	80	Somewhat limited Depth to thin cemented pan	0.50	Very limited Depth to thin cemented pan	1.00	Somewhat limited Depth to thin cemented pan Slope	1.00 0.12
W:							
Water	100	Not rated		Not rated		Not rated	
WkB:							
Wickett	80	Not limited		Somewhat limited Depth to thin cemented pan	0.35	Not limited	

Table 12.—Roads and Streets, Shallow Excavations, and Lawns and Landscaping

(The information in this table indicates the dominant soil condition but does not eliminate the need for onsite investigation. The numbers in the value columns range from 0.01 to 1.00. The larger the value, the greater the limitation. See text for further explanation of ratings in this table.)

Map symbol and soil name	Pct. of map unit	Local roads and streets		Shallow excavations		Lawns and landscaping	
		Rating class and limiting features	Value	Rating class and limiting features	Value	Rating class and limiting features	Value
AnB:							
Angelo	80	Very limited		Somewhat limited		Not limited	
		Low strength	1.00	Cutbanks cave	0.10		
		Shrink-swell	0.50				
ANS:							
Area not surveyed	100	Not rated		Not rated		Not rated	
BkB:							
Blakeney	85	Somewhat limited		Very limited		Very limited	
		Depth to thin cemented pan	1.00	Depth to thin cemented pan	1.00	Depth to cemented pan	1.00
				Cutbanks cave	0.10	Droughty	1.00
						Carbonate content	1.00
CoC:							
Conger	80	Somewhat limited		Very limited		Very limited	
		Depth to thin cemented pan	1.00	Depth to thin cemented pan	1.00	Depth to cemented pan	1.00
				Cutbanks cave	0.10	Droughty	1.00
						Carbonate content	1.00
DAM:							
Dams	100	Not rated		Not rated		Not rated	
DvB:							
Dev	80	Very limited		Very limited		Very limited	
		Flooding	1.00	Cutbanks cave	1.00	Flooding	1.00
				Flooding	0.80	Carbonate content	1.00
						Gravel content	0.76
ERD:							
Ector	65	Very limited		Very limited		Very limited	
		Depth to hard bedrock	1.00	Depth to hard bedrock	1.00	Depth to bedrock	1.00
		Large stones content	0.03	Cutbanks cave	0.10	Droughty	1.00
		Slope	0.01	Large stones content	0.03	Carbonate content	1.00
Rock outcrop	25	Not rated		Not rated		Not rated	
ERG:							
Ector	70	Very limited		Very limited		Very limited	
		Depth to hard bedrock	1.00	Depth to hard bedrock	1.00	Depth to bedrock	1.00
		Slope	1.00	Slope	1.00	Slope	1.00
		Large stones content	1.00	Large stones content	1.00	Large stones content	1.00
Rock outcrop	20	Not rated		Not rated		Not rated	

Table 12.—Roads and Streets, Shallow Excavations, and Lawns and Landscaping—Continued

Map symbol and soil name	Pct. of map unit	Local roads and streets		Shallow excavations		Lawns and landscaping	
		Rating class and limiting features	Value	Rating class and limiting features	Value	Rating class and limiting features	Value
HaB:							
Harkey	80	Somewhat limited		Somewhat limited		Not limited	
		Flooding	0.40	Cutbanks cave	0.10		
HRA:							
Harkey	45	Somewhat limited		Somewhat limited		Very limited	
		Flooding	0.40	Cutbanks cave	0.10	Salinity	1.00
						Droughty	0.01
Patrole	40	Very limited		Somewhat limited		Very limited	
		Low strength	1.00	Too clayey	0.50	Salinity	1.00
		Flooding	0.40	Cutbanks cave	0.10	Droughty	0.01
IDB:							
Iraan	70	Very limited		Somewhat limited		Somewhat limited	
		Flooding	1.00	Flooding	0.60	Flooding	0.60
		Low strength	1.00	Cutbanks cave	0.10		
		Shrink-swell	0.50				
Dev	20	Very limited		Very limited		Very limited	
		Flooding	1.00	Cutbanks cave	1.00	Flooding	1.00
				Flooding	0.80	Carbonate content	1.00
						Gravel content	0.76
InB:							
Iraan	90	Very limited		Somewhat limited		Somewhat limited	
		Flooding	1.00	Flooding	0.60	Flooding	0.60
		Low strength	1.00	Cutbanks cave	0.10		
		Shrink-swell	0.50				
IrA:							
Irion	90	Very limited		Very limited		Very limited	
		Ponding	1.00	Ponding	1.00	Ponding	1.00
		Low strength	1.00	Cutbanks cave	1.00	Too clayey	1.00
		Shrink-swell	1.00	Too clayey	0.28		
IsA:							
Irion	90	Very limited		Very limited		Very limited	
		Ponding	1.00	Ponding	1.00	Ponding	1.00
		Low strength	1.00	Cutbanks cave	1.00	Too clayey	1.00
		Shrink-swell	1.00	Too clayey	0.28		
KiB:							
Kinco	50	Not limited		Somewhat limited		Not limited	
				Cutbanks cave	0.10		
Ima	35	Not limited		Somewhat limited		Not limited	
				Cutbanks cave	0.10		
LRD:							
Lozier	55	Very limited		Very limited		Very limited	
		Depth to hard bedrock	1.00	Depth to hard bedrock	1.00	Depth to bedrock	1.00
		Slope	0.04	Cutbanks cave	0.10	Droughty	1.00
				Slope	0.04	Gravel content	1.00
Rock outcrop	35	Not rated		Not rated		Not rated	

Table 12.—Roads and Streets, Shallow Excavations, and Lawns and Landscaping—Continued

Map symbol and soil name	Pct. of map unit	Local roads and streets		Shallow excavations		Lawns and landscaping	
		Rating class and limiting features	Value	Rating class and limiting features	Value	Rating class and limiting features	Value
LRG:							
Lozier	60	Very limited		Very limited		Very limited	
		Depth to hard bedrock	1.00	Depth to hard bedrock	1.00	Depth to bedrock	1.00
		Slope	1.00	Slope	1.00	Slope	1.00
		Large stones content	0.39	Large stones content	0.39	Droughty	1.00
Rock outcrop	30	Not rated		Not rated		Not rated	
M-W:							
Water, miscellaneous	100	Not rated		Not rated		Not rated	
MaD:							
Mailtrail	85	Very limited		Very limited		Very limited	
		Depth to thin cemented pan	1.00	Depth to thin cemented pan	1.00	Depth to cemented pan	1.00
		Large stones content	0.99	Cutbanks cave	1.00	Droughty	1.00
				Large stones content	0.99	Carbonate content	1.00
NoD:							
Noelke	50	Very limited		Very limited		Very limited	
		Depth to hard bedrock	1.00	Depth to hard bedrock	1.00	Depth to bedrock	1.00
		Depth to thin cemented pan	1.00	Depth to thin cemented pan	1.00	Depth to cemented pan	1.00
		Shrink-swell	0.50			Droughty	1.00
Ector	35	Very limited		Very limited		Very limited	
		Depth to hard bedrock	1.00	Depth to hard bedrock	1.00	Depth to bedrock	1.00
		Large stones content	0.68	Large stones content	0.68	Droughty	1.00
				Cutbanks cave	0.10	Large stones content	1.00
OaC:							
Ozona	45	Very limited		Very limited		Very limited	
		Depth to thin cemented pan	1.00	Depth to thin cemented pan	1.00	Depth to cemented pan	1.00
		Low strength	1.00	Cutbanks cave	0.10	Carbonate content	1.00
		Shrink-swell	0.50			Droughty	0.25
Tarrant	40	Very limited		Very limited		Very limited	
		Depth to hard bedrock	1.00	Depth to hard bedrock	1.00	Depth to bedrock	1.00
		Large stones content	1.00	Large stones content	1.00	Large stones content	1.00
		Low strength	1.00	Cutbanks cave	0.10	Droughty	1.00

Table 12.—Roads and Streets, Shallow Excavations, and Lawns and Landscaping—Continued

Map symbol and soil name	Pct. of map unit	Local roads and streets		Shallow excavations		Lawns and landscaping	
		Rating class and limiting features	Value	Rating class and limiting features	Value	Rating class and limiting features	Value
PaD:							
Paisano	80	Somewhat limited		Very limited		Very limited	
		Depth to thin cemented pan	1.00	Depth to thin cemented pan	1.00	Depth to cemented pan	1.00
				Cutbanks cave	1.00	Droughty	1.00
						Gravel content	1.00
PdB:							
Pandale	80	Not limited		Very limited		Very limited	
				Cutbanks cave	1.00	Carbonate content	1.00
						Gravel content	0.08
						Droughty	0.01
PoC:							
Pandale	65	Not limited		Very limited		Very limited	
				Cutbanks cave	1.00	Carbonate content	1.00
						Gravel content	0.08
						Droughty	0.01
Upton	25	Somewhat limited		Very limited		Very limited	
		Depth to thin cemented pan	1.00	Depth to thin cemented pan	1.00	Depth to cemented pan	1.00
				Cutbanks cave	1.00	Droughty	1.00
						Carbonate content	1.00
RaB:							
Reagan	85	Very limited		Somewhat limited		Not limited	
		Low strength	1.00	Cutbanks cave	0.10		
		Shrink-swell	0.50				
RdB:							
Rio Diablo	85	Very limited		Somewhat limited		Not limited	
		Low strength	1.00	Cutbanks cave	0.10		
		Shrink-swell	1.00				
		Flooding	0.40				
RoB:							
Rioconcho	85	Very limited		Somewhat limited		Very limited	
		Flooding	1.00	Flooding	0.60	Salinity	1.00
		Low strength	1.00	Too clayey	0.50	Too clayey	1.00
		Shrink-swell	1.00	Cutbanks cave	0.10	Flooding	0.60
RVB:							
Riverwash	60	Very limited		Very limited		Very limited	
		Flooding	1.00	Cutbanks cave	1.00	Flooding	1.00
		Large stones content	0.05	Flooding	0.80	Droughty	1.00
				Large stones content	0.05	Gravel content	1.00
Dev	30	Very limited		Very limited		Very limited	
		Flooding	1.00	Cutbanks cave	1.00	Flooding	1.00
				Flooding	0.80	Carbonate content	1.00
						Large stones content	0.74

Table 12.—Roads and Streets, Shallow Excavations, and Lawns and Landscaping—Continued

Map symbol and soil name	Pct. of map unit	Local roads and streets		Shallow excavations		Lawns and landscaping	
		Rating class and limiting features	Value	Rating class and limiting features	Value	Rating class and limiting features	Value
SuD:							
Sanderson	50	Not limited		Very limited		Very limited	
				Cutbanks cave	1.00	Gravel content	1.00
						Carbonate content	1.00
						Droughty	0.15
Upton	35	Somewhat limited		Very limited		Very limited	
		Depth to thin cemented pan	1.00	Depth to thin cemented pan	1.00	Depth to cemented pan	1.00
				Cutbanks cave	1.00	Droughty	1.00
						Carbonate content	1.00
ToB:							
Texon	50	Very limited		Somewhat limited		Very limited	
		Low strength	1.00	Too clayey	0.28	Salinity	1.00
		Shrink-swell	1.00	Cutbanks cave	0.10		
Ozona	35	Very limited		Very limited		Very limited	
		Depth to thin cemented pan	1.00	Depth to thin cemented pan	1.00	Depth to cemented pan	1.00
		Low strength	1.00	Cutbanks cave	0.10	Carbonate content	1.00
		Shrink-swell	0.50			Droughty	0.41
TRD:							
Tarrant	55	Very limited		Very limited		Very limited	
		Depth to hard bedrock	1.00	Depth to hard bedrock	1.00	Depth to bedrock	1.00
		Large stones content	1.00	Large stones content	1.00	Large stones content	1.00
		Low strength	1.00	Cutbanks cave	0.10	Droughty	1.00
Rock outcrop	35	Not rated		Not rated		Not rated	
TRG:							
Tarrant	50	Very limited		Very limited		Very limited	
		Depth to hard bedrock	1.00	Depth to hard bedrock	1.00	Depth to bedrock	1.00
		Slope	1.00	Slope	1.00	Slope	1.00
		Large stones content	1.00	Large stones content	1.00	Large stones content	1.00
Rock outcrop	40	Not rated		Not rated		Not rated	
TsB:							
Tobosa	75	Very limited		Very limited		Very limited	
		Shrink-swell	1.00	Cutbanks cave	1.00	Too clayey	1.00
		Low strength	1.00	Too clayey	0.50		
UpD:							
Upton	80	Somewhat limited		Very limited		Very limited	
		Depth to thin cemented pan	1.00	Depth to thin cemented pan	1.00	Depth to cemented pan	1.00
				Cutbanks cave	0.10	Droughty	1.00
						Carbonate content	1.00

Table 12.—Roads and Streets, Shallow Excavations, and Lawns and Landscaping—Continued

Map symbol and soil name	Pct. of map unit	Local roads and streets		Shallow excavations		Lawns and landscaping	
		Rating class and limiting features	Value	Rating class and limiting features	Value	Rating class and limiting features	Value
W:							
Water	100	Not rated		Not rated		Not rated	
WkB:							
Wickett	80	Not limited		Somewhat limited		Somewhat limited	
				Depth to thin cemented pan	0.35	Depth to cemented pan	0.35
				Cutbanks cave	0.10	Droughty	0.07

Table 13.—Sewage Disposal

(The information in this table indicates the dominant soil condition but does not eliminate the need for onsite investigation. The numbers in the value columns range from 0.01 to 1.00. The larger the value, the greater the limitation. See text for further explanation of ratings in this table.)

Map symbol and soil name	Pct. of map unit	Septic tank absorption fields		Sewage lagoons	
		Rating class and limiting features	Value	Rating class and limiting features	Value
AnB:					
Angelo	80	Somewhat limited		Somewhat limited	
		Slow water movement	0.50	Seepage	0.50
ANS:					
Area not surveyed	100	Not rated		Not rated	
BkB:					
Blakeney	85	Very limited		Very limited	
		Depth to cemented pan	1.00	Depth to cemented pan	1.00
				Seepage	1.00
CoC:					
Conger	80	Very limited		Very limited	
		Depth to cemented pan	1.00	Depth to cemented pan	1.00
				Seepage	0.50
DAM:					
Dams	100	Not rated		Not rated	
DvB:					
Dev	80	Very limited		Very limited	
		Flooding	1.00	Flooding	1.00
		Seepage, bottom layer	1.00	Seepage	1.00
ERD:					
Ector	65	Very limited		Very limited	
		Depth to bedrock	1.00	Depth to hard bedrock	1.00
		Large stones content	0.03	Slope	1.00
		Slope	0.01	Seepage	0.21
Rock outcrop	25	Not rated		Not rated	
ERG:					
Ector	70	Very limited		Very limited	
		Depth to bedrock	1.00	Depth to hard bedrock	1.00
		Slope	1.00	Slope	1.00
		Large stones content	1.00	Large stones content	1.00
Rock outcrop	20	Not rated		Not rated	

Table 13.—Sewage Disposal—Continued

Map symbol and soil name	Pct. of map unit	Septic tank absorption fields		Sewage lagoons	
		Rating class and limiting features	Value	Rating class and limiting features	Value
HaB:					
Harkey	80	Somewhat limited		Somewhat limited	
		Slow water movement	0.50	Seepage	0.50
		Flooding	0.40	Flooding	0.40
HRA:					
Harkey	45	Somewhat limited		Somewhat limited	
		Slow water movement	0.50	Seepage	0.50
		Flooding	0.40	Flooding	0.40
Patrole	40	Very limited		Somewhat limited	
		Slow water movement	1.00	Flooding	0.40
		Flooding	0.40		
IDB:					
Iraan	70	Very limited		Very limited	
		Flooding	1.00	Flooding	1.00
		Slow water movement	0.50	Seepage	0.50
Dev	20	Very limited		Very limited	
		Flooding	1.00	Flooding	1.00
		Seepage, bottom layer	1.00	Seepage	1.00
InB:					
Iraan	90	Very limited		Very limited	
		Flooding	1.00	Flooding	1.00
		Slow water movement	1.00		
IrA:					
Irion	90	Very limited		Very limited	
		Slow water movement	1.00	Ponding	1.00
		Ponding	1.00		
IsA:					
Irion	90	Very limited		Very limited	
		Slow water movement	1.00	Ponding	1.00
		Ponding	1.00		
KiB:					
Kinco	50	Not limited		Very limited	
				Seepage	1.00
Ima	35	Somewhat limited		Very limited	
		Slow water movement	0.50	Seepage	1.00

Table 13.—Sewage Disposal—Continued

Map symbol and soil name	Pct. of map unit	Septic tank absorption fields		Sewage lagoons	
		Rating class and limiting features	Value	Rating class and limiting features	Value
LRD:					
Lozier	55	Very limited		Very limited	
		Depth to bedrock	1.00	Depth to hard bedrock	1.00
		Slope	0.04	Slope	1.00
				Seepage	0.21
Rock outcrop	35	Not rated		Not rated	
LRG:					
Lozier	60	Very limited		Very limited	
		Depth to bedrock	1.00	Depth to hard bedrock	1.00
		Slope	1.00	Slope	1.00
		Large stones content	0.39	Seepage	0.50
Rock outcrop	30	Not rated		Not rated	
M-W:					
Water, miscellaneous	100	Not rated		Not rated	
MaD:					
Mailtrail	85	Very limited		Very limited	
		Depth to cemented pan	1.00	Depth to cemented pan	1.00
		Large stones content	0.99	Large stones content	0.98
				Slope	0.68
NoD:					
Noelke	50	Very limited		Very limited	
		Depth to bedrock	1.00	Depth to hard bedrock	1.00
		Depth to cemented pan	1.00	Depth to cemented pan	1.00
				Seepage	0.27
Ector	35	Very limited		Very limited	
		Depth to bedrock	1.00	Depth to hard bedrock	1.00
		Large stones content	0.68	Seepage	0.21
				Slope	0.08
OaC:					
Ozona	45	Very limited		Very limited	
		Depth to cemented pan	1.00	Depth to cemented pan	1.00
				Seepage	0.50
				Slope	0.08

Table 13.—Sewage Disposal—Continued

Map symbol and soil name	Pct. of map unit	Septic tank absorption fields		Sewage lagoons	
		Rating class and limiting features	Value	Rating class and limiting features	Value
Tarrant	40	Very limited		Very limited	
		Depth to bedrock	1.00	Depth to hard bedrock	1.00
		Large stones content	1.00	Large stones content	1.00
				Seepage	0.21
PaD:					
Paisano	80	Very limited		Very limited	
		Depth to cemented pan	1.00	Depth to cemented pan	1.00
				Seepage	1.00
				Slope	0.68
PdB:					
Pandale	80	Somewhat limited		Somewhat limited	
		Slow water movement	0.50	Seepage	0.50
PoC:					
Pandale	65	Somewhat limited		Somewhat limited	
		Slow water movement	0.50	Seepage	0.50
Upton	25	Very limited		Very limited	
		Depth to cemented pan	1.00	Depth to cemented pan	1.00
				Seepage	0.50
				Slope	0.08
RaB:					
Reagan	85	Somewhat limited		Somewhat limited	
		Slow water movement	0.50	Seepage	0.50
RdB:					
Rio Diablo	85	Very limited		Somewhat limited	
		Slow water movement	1.00	Flooding	0.40
		Flooding	0.40		
RoB:					
Rioconcho	85	Very limited		Very limited	
		Flooding	1.00	Flooding	1.00
		Slow water movement	1.00		
RVB:					
Riverwash	60	Very limited		Very limited	
		Flooding	1.00	Flooding	1.00
		Seepage, bottom layer	1.00	Seepage	1.00
		Filtering capacity	1.00	Large stones content	0.68

Table 13.—Sewage Disposal—Continued

Map symbol and soil name	Pct. of map unit	Septic tank absorption fields		Sewage lagoons	
		Rating class and limiting features	Value	Rating class and limiting features	Value
Dev	30	Very limited		Very limited	
		Flooding	1.00	Flooding	1.00
		Seepage, bottom layer	1.00	Seepage	1.00
				Large stones content	0.05
SuD:					
Sanderson	50	Not limited		Very limited	
				Seepage	1.00
				Slope	0.68
Upton	35	Very limited		Very limited	
		Depth to cemented pan	1.00	Depth to cemented pan	1.00
				Slope	0.68
				Seepage	0.50
ToB:					
Texon	50	Very limited		Not limited	
		Slow water movement	1.00		
Ozona	35	Very limited		Very limited	
		Depth to cemented pan	1.00	Depth to cemented pan	1.00
				Seepage	0.50
TRD:					
Tarrant	55	Very limited		Very limited	
		Depth to bedrock	1.00	Depth to hard bedrock	1.00
		Large stones content	1.00	Slope	1.00
		Slope	0.01	Seepage	0.21
Rock outcrop	35	Not rated		Not rated	
TRG:					
Tarrant	50	Very limited		Very limited	
		Depth to bedrock	1.00	Depth to hard bedrock	1.00
		Slope	1.00	Slope	1.00
		Large stones content	1.00	Large stones content	1.00
Rock outcrop	40	Not rated		Not rated	
TsB:					
Tobosa	75	Very limited		Not limited	
		Slow water movement	1.00		

Table 13.—Sewage Disposal—Continued

Map symbol and soil name	Pct. of map unit	Septic tank absorption fields		Sewage lagoons	
		Rating class and limiting features	Value	Rating class and limiting features	Value
UpD:					
Upton	80	Very limited		Very limited	
		Depth to cemented pan	1.00	Depth to cemented pan	1.00
				Slope	0.68
				Seepage	0.50
W:					
Water	100	Not rated		Not rated	
WkB:					
Wickett	80	Very limited		Very limited	
		Depth to cemented pan	1.00	Depth to cemented pan	1.00
				Seepage	1.00

Table 14.—Landfills

(The information in this table indicates the dominant soil condition but does not eliminate the need for onsite investigation. The numbers in the value columns range from 0.01 to 1.00. The larger the value, the greater the limitation. See text for further explanation of ratings in this table.)

Map symbol and soil name	Pct. of map unit	Trench sanitary landfill		Area sanitary landfill		Daily cover for landfill	
		Rating class and limiting features	Value	Rating class and limiting features	Value	Rating class and limiting features	Value
AnB:							
Angelo	80	Not limited		Not limited		Not limited	
ANS:							
Area not surveyed	100	Not rated		Not rated		Not rated	
BkB:							
Blakeney	85	Somewhat limited		Not limited		Very limited	
		Depth to thin cemented pan	0.50			Depth to cemented pan	1.00
						Seepage	0.50
CoC:							
Conger	80	Somewhat limited		Not limited		Very limited	
		Depth to thin cemented pan	0.50			Depth to cemented pan	1.00
						Carbonate content	1.00
DAM:							
Dams	100	Not rated		Not rated		Not rated	
DvB:							
Dev	80	Very limited		Very limited		Very limited	
		Flooding	1.00	Flooding	1.00	Carbonate content	1.00
		Seepage, bottom layer	1.00	Seepage	1.00	Seepage	0.50
ERD:							
Ector	65	Very limited		Very limited		Very limited	
		Depth to bedrock	1.00	Depth to bedrock	1.00	Depth to bedrock	1.00
		Large stones content	0.03	Slope	0.01	Carbonate content	1.00
		Slope	0.01			Gravel content	0.27
Rock outcrop	25	Not rated		Very limited		Not rated	
				Depth to bedrock	1.00		
				Seepage	1.00		
				Slope	0.01		
ERG:							
Ector	70	Very limited		Very limited		Very limited	
		Slope	1.00	Slope	1.00	Depth to bedrock	1.00
		Depth to bedrock	1.00	Depth to bedrock	1.00	Slope	1.00
		Large stones	1.00			Large stones	1.00
Rock outcrop	20	Not rated		Very limited		Not rated	
				Slope	1.00		
				Depth to bedrock	1.00		
				Seepage	1.00		

Table 14.—Landfills—Continued

Map symbol and soil name	Pct. of map unit	Trench sanitary landfill		Area sanitary landfill		Daily cover for landfill	
		Rating class and limiting features	Value	Rating class and limiting features	Value	Rating class and limiting features	Value
HaB:							
Harkey	80	Somewhat limited		Somewhat limited		Not limited	
		Flooding	0.40	Flooding	0.40		
HRA:							
Harkey	45	Somewhat limited		Somewhat limited		Not limited	
		Flooding	0.40	Flooding	0.40		
Patrole	40	Somewhat limited		Somewhat limited		Very limited	
		Flooding	0.40	Flooding	0.40	Hard to compact	1.00
IDB:							
Iraan	70	Very limited		Very limited		Somewhat limited	
		Flooding	1.00	Flooding	1.00	Too clayey	0.50
		Too clayey	0.50				
Dev	20	Very limited		Very limited		Very limited	
		Flooding	1.00	Flooding	1.00	Carbonate content	1.00
		Seepage, bottom layer	1.00	Seepage	1.00	Gravel content	0.86
						Seepage	0.50
InB:							
Iraan	90	Very limited		Very limited		Somewhat limited	
		Flooding	1.00	Flooding	1.00	Too clayey	0.50
		Too clayey	0.50				
IrA:							
Irion	90	Very limited		Very limited		Very limited	
		Ponding	1.00	Ponding	1.00	Ponding	1.00
		Depth to bedrock	1.00			Too clayey	1.00
		Too clayey	1.00			Hard to compact	1.00
IsA:							
Irion	90	Very limited		Very limited		Very limited	
		Ponding	1.00	Ponding	1.00	Ponding	1.00
		Depth to bedrock	1.00			Too clayey	1.00
		Too clayey	1.00			Hard to compact	1.00
KiB:							
Kinco	50	Not limited		Not limited		Somewhat limited	
						Seepage	0.50
Ima	35	Not limited		Not limited		Somewhat limited	
						Seepage	0.50
LRD:							
Lozier	55	Very limited		Somewhat limited		Very limited	
		Depth to bedrock	1.00	Slope	0.04	Depth to bedrock	1.00
		Slope	0.04			Gravel content	1.00
						Carbonate content	1.00
Rock outcrop	35	Not rated		Very limited		Not rated	
				Depth to bedrock	1.00		
				Seepage	1.00		
				Slope	0.04		

Table 14.—Landfills—Continued

Map symbol and soil name	Pct. of map unit	Trench sanitary landfill		Area sanitary landfill		Daily cover for landfill	
		Rating class and limiting features	Value	Rating class and limiting features	Value	Rating class and limiting features	Value
LRG:							
Lozier	60	Very limited		Very limited		Very limited	
		Slope	1.00	Slope	1.00	Depth to bedrock	1.00
		Depth to bedrock	1.00			Slope	1.00
		Large stones content	0.39			Carbonate content	1.00
Rock outcrop	30	Not rated		Very limited		Not rated	
				Slope	1.00		
				Depth to bedrock	1.00		
				Seepage	1.00		
M-W:							
Water, miscellaneous	100	Not rated		Not rated		Not rated	
MaD:							
Mailtrail	85	Very limited		Very limited		Very limited	
		Large stones	0.99	Depth to cemented pan	1.00	Depth to cemented pan	1.00
		Depth to thin cemented pan	0.50			Carbonate content	1.00
		Too clayey	0.50			Large stones	0.99
NoD:							
Noelke	50	Very limited		Very limited		Very limited	
		Depth to bedrock	1.00	Depth to cemented pan	1.00	Depth to cemented pan	1.00
		Depth to thin cemented pan	0.50	Depth to bedrock	1.00	Depth to bedrock	1.00
						Gravel content	0.95
Ector	35	Very limited		Very limited		Very limited	
		Depth to bedrock	1.00	Depth to bedrock	1.00	Depth to bedrock	1.00
		Large stones content	0.68			Carbonate content	1.00
		Too clayey	0.50			Gravel content	0.86
OaC:							
Ozona	45	Somewhat limited		Very limited		Very limited	
		Depth to thin cemented pan	0.50	Depth to cemented pan	1.00	Depth to cemented pan	1.00
		Too clayey	0.50			Too clayey	0.50
Tarrant	40	Very limited		Very limited		Very limited	
		Depth to bedrock	1.00	Depth to bedrock	1.00	Depth to bedrock	1.00
		Too clayey	1.00			Too clayey	1.00
		Large stones	1.00			Hard to compact	1.00
PaD:							
Paisano	80	Somewhat limited		Not limited		Very limited	
		Depth to thin cemented pan	0.50			Depth to cemented pan	1.00
						Gravel content	1.00
						Carbonate content	1.00

Table 14.—Landfills—Continued

Map symbol and soil name	Pct. of map unit	Trench sanitary landfill		Area sanitary landfill		Daily cover for landfill	
		Rating class and limiting features	Value	Rating class and limiting features	Value	Rating class and limiting features	Value
PdB:							
Pandale	80	Not limited		Not limited		Very limited	
						Carbonate content	1.00
						Gravel content	0.08
PoC:							
Pandale	65	Not limited		Not limited		Very limited	
						Carbonate content	1.00
						Gravel content	0.08
Upton	25	Somewhat limited		Not limited		Very limited	
		Depth to thin cemented pan	0.50			Depth to cemented pan	1.00
						Carbonate content	1.00
						Gravel content	0.10
RaB:							
Reagan	85	Not limited		Not limited		Not limited	
RdB:							
Rio Diablo	85	Somewhat limited		Somewhat limited		Very limited	
		Flooding	0.40	Flooding	0.40	Hard to compact	1.00
RoB:							
Rioconcho	85	Very limited		Very limited		Very limited	
		Flooding	1.00	Flooding	1.00	Hard to compact	1.00
		Too clayey	0.50			Too clayey	0.50
RVB:							
Riverwash	60	Very limited		Very limited		Very limited	
		Flooding	1.00	Flooding	1.00	Seepage	1.00
		Seepage, bottom layer	1.00	Seepage	1.00	Gravel content	1.00
		Large stones content	0.05			Large stones content	0.05
Dev	30	Very limited		Very limited		Very limited	
		Flooding	1.00	Flooding	1.00	Carbonate content	1.00
		Seepage, bottom layer	1.00	Seepage	1.00	Gravel content	0.91
						Seepage	0.50
SuD:							
Sanderson	50	Not limited		Not limited		Very limited	
						Gravel content	1.00
						Carbonate content	1.00
						Seepage	0.50
Upton	35	Somewhat limited		Not limited		Very limited	
		Depth to thin cemented pan	0.50			Depth to cemented pan	1.00
						Carbonate content	1.00
						Gravel content	0.10

Table 14.—Landfills—Continued

Map symbol and soil name	Pct. of map unit	Trench sanitary landfill		Area sanitary landfill		Daily cover for landfill	
		Rating class and limiting features	Value	Rating class and limiting features	Value	Rating class and limiting features	Value
ToB:							
Texon	50	Very limited		Not limited		Very limited	
		Too clayey	1.00			Too clayey	1.00
						Hard to compact	1.00
Ozona	35	Somewhat limited		Very limited		Very limited	
		Depth to thin cemented pan	0.50	Depth to cemented pan	1.00	Depth to cemented pan	1.00
		Too clayey	0.50			Too clayey	0.50
TRD:							
Tarrant	55	Very limited		Very limited		Very limited	
		Depth to bedrock	1.00	Depth to bedrock	1.00	Depth to bedrock	1.00
		Too clayey	1.00	Slope	0.01	Too clayey	1.00
		Large stones	1.00			Hard to compact	1.00
Rock outcrop	35	Not rated		Very limited		Not rated	
				Depth to bedrock	1.00		
				Seepage	1.00		
				Slope	0.01		
TRG:							
Tarrant	50	Very limited		Very limited		Very limited	
		Slope	1.00	Slope	1.00	Depth to bedrock	1.00
		Depth to bedrock	1.00	Depth to bedrock	1.00	Slope	1.00
		Too clayey	1.00			Too clayey	1.00
Rock outcrop	40	Not rated		Very limited		Not rated	
				Slope	1.00		
				Depth to bedrock	1.00		
				Seepage	1.00		
TsB:							
Tobosa	75	Not limited		Not limited		Very limited	
						Hard to compact	1.00
UpD:							
Upton	80	Somewhat limited		Not limited		Very limited	
		Depth to thin cemented pan	0.50			Depth to cemented pan	1.00
						Carbonate content	1.00
						Gravel content	0.10
W:							
Water	100	Not rated		Not rated		Not rated	
WkB:							
Wickett	80	Somewhat limited		Not limited		Very limited	
		Depth to thin cemented pan	0.50			Depth to cemented pan	1.00
						Seepage	0.50

Table 15.—Source of Gravel and Sand

(The information in this table indicates the dominant soil condition but does not eliminate the need for onsite investigation. The ratings given for the thickest layer are for the thickest layer above and excluding the bottom layer. The numbers in the value columns range from 0.00 to 0.99. The greater the value, the greater the likelihood that the bottom layer or thickest layer of the soil is a source of sand or gravel. See text for further explanation of ratings in this table.)

Map symbol and soil name	Pct. of map unit	Potential source of gravel		Potential source of sand	
		Rating class	Value	Rating class	Value
AnB:					
Angelo	80	Poor		Poor	
		Bottom layer	0.00	Bottom layer	0.00
		Thickest layer	0.00	Thickest layer	0.00
ANS:					
Area not surveyed	100	Not rated		Not rated	
BkB:					
Blakeney	85	Poor		Poor	
		Bottom layer	0.00	Bottom layer	0.00
		Thickest layer	0.00	Thickest layer	0.00
CoC:					
Conger	80	Poor		Poor	
		Bottom layer	0.00	Bottom layer	0.00
		Thickest layer	0.00	Thickest layer	0.00
DAM:					
Dams	100	Not rated		Not rated	
DvB:					
Dev	80	Fair		Poor	
		Bottom layer	0.00	Bottom layer	0.00
		Thickest layer	0.15	Thickest layer	0.00
ERD:					
Ector	65	Poor		Poor	
		Thickest layer	0.00	Bottom layer	0.00
		Bottom layer	0.00	Thickest layer	0.00
Rock outcrop	25	Not rated		Not rated	
ERG:					
Ector	70	Poor		Poor	
		Bottom layer	0.00	Bottom layer	0.00
		Thickest layer	0.00	Thickest layer	0.00
Rock outcrop	20	Not rated		Not rated	
HaB:					
Harkey	80	Poor		Poor	
		Bottom layer	0.00	Bottom layer	0.00
		Thickest layer	0.00	Thickest layer	0.00

Table 15.—Source of Gravel and Sand—Continued

Map symbol and soil name	Pct. of map unit	Potential source of gravel		Potential source of sand	
		Rating class	Value	Rating class	Value
HRA:					
Harkey	45	Poor		Poor	
		Bottom layer	0.00	Bottom layer	0.00
		Thickest layer	0.00	Thickest layer	0.00
Patrole	40	Poor		Poor	
		Bottom layer	0.00	Bottom layer	0.00
		Thickest layer	0.00	Thickest layer	0.00
IDB:					
Iraan	70	Poor		Poor	
		Bottom layer	0.00	Bottom layer	0.00
		Thickest layer	0.00	Thickest layer	0.00
Dev	20	Fair		Poor	
		Bottom layer	0.00	Bottom layer	0.00
		Thickest layer	0.15	Thickest layer	0.00
InB:					
Iraan	90	Poor		Poor	
		Bottom layer	0.00	Bottom layer	0.00
		Thickest layer	0.00	Thickest layer	0.00
IrA:					
Irion	90	Poor		Poor	
		Bottom layer	0.00	Bottom layer	0.00
		Thickest layer	0.00	Thickest layer	0.00
IsA:					
Irion	90	Poor		Poor	
		Bottom layer	0.00	Bottom layer	0.00
		Thickest layer	0.00	Thickest layer	0.00
KiB:					
Kinco	50	Poor		Poor	
		Bottom layer	0.00	Bottom layer	0.00
		Thickest layer	0.00	Thickest layer	0.00
Ima	35	Poor		Poor	
		Bottom layer	0.00	Bottom layer	0.00
		Thickest layer	0.00	Thickest layer	0.00
LRD:					
Lozier	55	Fair		Poor	
		Thickest layer	0.00	Bottom layer	0.00
		Bottom layer	0.12	Thickest layer	0.00
Rock outcrop	35	Not rated		Not rated	
LRG:					
Lozier	60	Poor		Poor	
		Thickest layer	0.00	Bottom layer	0.00
		Bottom layer	0.00	Thickest layer	0.00
Rock outcrop	30	Not rated		Not rated	

Table 15.—Source of Gravel and Sand—Continued

Map symbol and soil name	Pct. of map unit	Potential source of gravel		Potential source of sand	
		Rating class	Value	Rating class	Value
M-W:					
Water, miscellaneous	100	Not rated		Not rated	
MaD:					
Mailtrail	85	Poor		Poor	
		Thickest layer	0.00	Bottom layer	0.00
		Bottom layer	0.00	Thickest layer	0.00
NoD:					
Noelke	50	Poor		Poor	
		Bottom layer	0.00	Bottom layer	0.00
		Thickest layer	0.00	Thickest layer	0.00
Ector	35	Poor		Poor	
		Thickest layer	0.00	Bottom layer	0.00
		Bottom layer	0.00	Thickest layer	0.00
OaC:					
Ozona	45	Poor		Poor	
		Bottom layer	0.00	Bottom layer	0.00
		Thickest layer	0.00	Thickest layer	0.00
Tarrant	40	Poor		Poor	
		Bottom layer	0.00	Bottom layer	0.00
		Thickest layer	0.00	Thickest layer	0.00
PaD:					
Paisano	80	Poor		Poor	
		Bottom layer	0.00	Bottom layer	0.00
		Thickest layer	0.00	Thickest layer	0.00
PdB:					
Pandale	80	Poor		Poor	
		Bottom layer	0.00	Bottom layer	0.00
		Thickest layer	0.00	Thickest layer	0.00
PoC:					
Pandale	65	Poor		Poor	
		Bottom layer	0.00	Bottom layer	0.00
		Thickest layer	0.00	Thickest layer	0.00
Upton	25	Poor		Poor	
		Thickest layer	0.00	Bottom layer	0.00
		Bottom layer	0.00	Thickest layer	0.00
RaB:					
Reagan	85	Poor		Poor	
		Bottom layer	0.00	Bottom layer	0.00
		Thickest layer	0.00	Thickest layer	0.00
RdB:					
Rio Diablo	85	Poor		Poor	
		Bottom layer	0.00	Bottom layer	0.00
		Thickest layer	0.00	Thickest layer	0.00

Table 15.—Source of Gravel and Sand—Continued

Map symbol and soil name	Pct. of map unit	Potential source of gravel		Potential source of sand	
		Rating class	Value	Rating class	Value
RoB:					
Rioconcho	85	Poor		Poor	
		Bottom layer	0.00	Bottom layer	0.00
		Thickest layer	0.00	Thickest layer	0.00
RVB:					
Riverwash	60	Fair		Poor	
		Bottom layer	0.40	Bottom layer	0.00
		Thickest layer	0.40	Thickest layer	0.00
Dev	30	Fair		Poor	
		Bottom layer	0.00	Bottom layer	0.00
		Thickest layer	0.15	Thickest layer	0.00
SuD:					
Sanderson	50	Fair		Poor	
		Thickest layer	0.00	Bottom layer	0.00
		Bottom layer	0.15	Thickest layer	0.00
Upton	35	Poor		Poor	
		Thickest layer	0.00	Bottom layer	0.00
		Bottom layer	0.00	Thickest layer	0.00
ToB:					
Texon	50	Poor		Poor	
		Bottom layer	0.00	Bottom layer	0.00
		Thickest layer	0.00	Thickest layer	0.00
Ozona	35	Poor		Poor	
		Bottom layer	0.00	Bottom layer	0.00
		Thickest layer	0.00	Thickest layer	0.00
TRD:					
Tarrant	55	Poor		Poor	
		Bottom layer	0.00	Bottom layer	0.00
		Thickest layer	0.00	Thickest layer	0.00
Rock outcrop	35	Not rated		Not rated	
TRG:					
Tarrant	50	Poor		Poor	
		Bottom layer	0.00	Bottom layer	0.00
		Thickest layer	0.00	Thickest layer	0.00
Rock outcrop	40	Not rated		Not rated	
TsB:					
Tobosa	75	Poor		Poor	
		Bottom layer	0.00	Bottom layer	0.00
		Thickest layer	0.00	Thickest layer	0.00
UpD:					
Upton	80	Poor		Poor	
		Thickest layer	0.00	Bottom layer	0.00
		Bottom layer	0.00	Thickest layer	0.00

Table 15.—Source of Gravel and Sand—Continued

Map symbol and soil name	Pct. of map unit	Potential source of gravel		Potential source of sand	
		Rating class	Value	Rating class	Value
W:					
Water	100	Not rated		Not rated	
WkB:					
Wickett	80	Poor		Poor	
		Bottom layer	0.00	Bottom layer	0.00
		Thickest layer	0.00	Thickest layer	0.00

Table 16.—Source of Reclamation Material, Roadfill, and Topsoil

(The information in this table indicates the dominant soil condition but does not eliminate the need for onsite investigation. The numbers in the value columns range from 0.00 to 0.99. The smaller the value, the greater the limitation. See text for further explanation of ratings in this table.)

Map symbol and soil name	Pct. of map unit	Potential source of reclamation material		Potential source of roadfill		Potential source of topsoil	
		Rating class and limiting features	Value	Rating class and limiting features	Value	Rating class and limiting features	Value
AnB:							
Angelo	80	Fair		Poor		Fair	
		Carbonate content	0.01	Low strength	0.00	Too clayey	0.49
		Organic matter content low	0.24	Shrink-swell	0.87		
		Too clayey	0.50				
ANS:							
Area not surveyed	100	Not rated		Not rated		Not rated	
BkB:							
Blakeney	85	Poor		Poor		Poor	
		Droughty	0.00	Depth to cemented pan	0.00	Depth to cemented pan	0.00
		Depth to cemented pan	0.00			Rock fragments	0.88
		Carbonate content	0.00				
CoC:							
Conger	80	Poor		Poor		Poor	
		Droughty	0.00	Depth to cemented pan	0.00	Depth to cemented pan	0.00
		Carbonate content	0.00			Carbonate content	0.42
		Depth to cemented pan	0.00				
DAM:							
Dams	100	Not rated		Not rated		Not rated	
DvB:							
Dev	80	Poor		Fair		Poor	
		Carbonate content	0.00	Cobble content	0.77	Rock fragments	0.00
						Carbonate content	0.00
						Hard to reclaim (rock fragments)	0.02
ERD:							
Ector	65	Poor		Poor		Poor	
		Droughty	0.00	Depth to bedrock	0.00	Carbonate content	0.00
		Carbonate content	0.00			Rock fragments	0.00
		Depth to bedrock	0.00			Depth to bedrock	0.00
Rock outcrop	25	Not rated		Not rated		Not rated	
ERG:							
Ector	70	Poor		Poor		Poor	
		Droughty	0.00	Depth to bedrock	0.00	Slope	0.00
		Carbonate content	0.00	Slope	0.00	Carbonate content	0.00
		Depth to bedrock	0.00	Cobble content	0.01	Rock fragments	0.00
Rock outcrop	20	Not rated		Not rated		Not rated	

Table 16.—Source of Reclamation Material, Roadfill, and Topsoil—Continued

Map symbol and soil name	Pct. of map unit	Potential source of reclamation material		Potential source of roadfill		Potential source of topsoil	
		Rating class and limiting features	Value	Rating class and limiting features	Value	Rating class and limiting features	Value
HaB:							
Harkey	80	Fair		Good		Good	
		Water erosion	0.37				
		Organic matter content low	0.88				
HRA:							
Harkey	45	Poor		Good		Poor	
		Too alkaline	0.00			Salinity	0.00
		Organic matter content low	0.88				
		Salinity	0.88				
Patrole	40	Fair		Poor		Poor	
		Organic matter content low	0.18	Low strength	0.00	Salinity	0.00
		Salinity	0.88	Shrink-swell	0.71		
		Water erosion	0.90				
IDB:							
Iraan	70	Fair		Poor		Fair	
		Organic matter content low	0.88	Low strength	0.00	Carbonate content	0.97
		Carbonate content	0.97	Shrink-swell	0.87		
Dev	20	Poor		Fair		Poor	
		Carbonate content	0.00	Cobble content	0.99	Rock fragments	0.00
						Carbonate content	0.00
						Hard to reclaim (rock fragments)	0.02
InB:							
Iraan	90	Fair		Poor		Fair	
		Too clayey	0.76	Low strength	0.00	Too clayey	0.71
		Carbonate content	0.97	Shrink-swell	0.87	Rock fragments	0.97
IrA:							
Irion	90	Poor		Poor		Poor	
		Too clayey	0.00	Low strength	0.00	Too clayey	0.00
				Shrink-swell	0.12		
IsA:							
Irion	90	Poor		Poor		Poor	
		Too clayey	0.00	Low strength	0.00	Too clayey	0.00
				Shrink-swell	0.12	Rock fragments	0.97
KiB:							
Kinco	50	Good		Good		Good	
Ima	35	Fair		Good		Good	
		Organic matter content low	0.12				

Table 16.—Source of Reclamation Material, Roadfill, and Topsoil—Continued

Map symbol and soil name	Pct. of map unit	Potential source of reclamation material		Potential source of roadfill		Potential source of topsoil	
		Rating class and limiting features	Value	Rating class and limiting features	Value	Rating class and limiting features	Value
LRD:							
Lozier	55	Poor		Poor		Poor	
		Droughty	0.00	Depth to bedrock	0.00	Carbonate content	0.00
		Carbonate content	0.00			Rock fragments	0.00
		Depth to bedrock	0.00			Depth to bedrock	0.00
Rock outcrop	35	Not rated		Not rated		Not rated	
LRG:							
Lozier	60	Poor		Poor		Poor	
		Droughty	0.00	Depth to bedrock	0.00	Slope	0.00
		Carbonate content	0.00	Slope	0.00	Carbonate content	0.00
		Depth to bedrock	0.00	Stone content	0.75	Rock fragments	0.00
Rock outcrop	30	Not rated		Not rated		Not rated	
M-W:							
Water, miscellaneous	100	Not rated		Not rated		Not rated	
MaD:							
Mailtrail	85	Poor		Poor		Poor	
		Droughty	0.00	Depth to cemented pan	0.00	Rock fragments	0.00
		Carbonate content	0.00	Stone content	0.78	Depth to cemented pan	0.00
		Depth to cemented pan	0.00	Cobble content	0.94	Carbonate content	0.00
NoD:							
Noelke	50	Poor		Poor		Poor	
		Droughty	0.00	Depth to bedrock	0.00	Rock fragments	0.00
		Depth to cemented pan	0.00	Depth to cemented pan	0.00	Depth to bedrock	0.00
		Depth to bedrock	0.00			Depth to cemented pan	0.00
Ector	35	Poor		Poor		Poor	
		Droughty	0.00	Depth to bedrock	0.00	Carbonate content	0.00
		Carbonate content	0.00			Rock fragments	0.00
		Depth to bedrock	0.00			Depth to bedrock	0.00
OaC:							
Ozona	45	Poor		Poor		Poor	
		Depth to cemented pan	0.00	Depth to cemented pan	0.00	Depth to cemented pan	0.00
		Carbonate content	0.00	Low strength	0.00	Too clayey	0.12
		Droughty	0.02	Shrink-swell	0.87		
Tarrant	40	Poor		Poor		Poor	
		Too clayey	0.00	Depth to bedrock	0.00	Too clayey	0.00
		Droughty	0.00	Cobble content	0.00	Rock fragments	0.00
		Depth to bedrock	0.00	Low strength	0.00	Depth to bedrock	0.00

Table 16.—Source of Reclamation Material, Roadfill, and Topsoil—Continued

Map symbol and soil name	Pct. of map unit	Potential source of reclamation material		Potential source of roadfill		Potential source of topsoil	
		Rating class and limiting features	Value	Rating class and limiting features	Value	Rating class and limiting features	Value
PaD:							
Paisano	80	Poor		Poor		Poor	
		Droughty	0.00	Depth to cemented pan	0.00	Rock fragments	0.00
		Carbonate content	0.00			Depth to cemented pan	0.00
		Depth to cemented pan	0.00			Carbonate content	0.46
PdB:							
Pandale	80	Poor		Good		Poor	
		Carbonate content	0.00			Carbonate content	0.00
						Rock fragments	0.00
						Hard to reclaim (rock fragments)	0.92
PoC:							
Pandale	65	Poor		Good		Poor	
		Carbonate content	0.00			Carbonate content	0.00
						Rock fragments	0.00
						Hard to reclaim (rock fragments)	0.92
Upton	25	Poor		Poor		Poor	
		Droughty	0.00	Depth to cemented pan	0.00	Carbonate content	0.00
		Carbonate content	0.00			Depth to cemented pan	0.00
		Depth to cemented pan	0.00			Rock fragments	0.00
RaB:							
Reagan	85	Fair		Poor		Fair	
		Too clayey	0.50	Low strength	0.00	Too clayey	0.36
		Carbonate content	0.68	Shrink-swell	0.87	Sodium content	0.40
		Organic matter content low	0.88			Carbonate content	0.86
RdB:							
Rio Diablo	85	Fair		Poor		Fair	
		Too clayey	0.02	Low strength	0.00	Too clayey	0.02
		Carbonate content	0.92	Shrink-swell	0.12		
RoB:							
Rioconcho	85	Poor		Poor		Poor	
		Too clayey	0.00	Low strength	0.00	Too clayey	0.00
		Salinity	0.88	Shrink-swell	0.12	Salinity	0.00

Table 16.—Source of Reclamation Material, Roadfill, and Topsoil—Continued

Map symbol and soil name	Pct. of map unit	Potential source of reclamation material		Potential source of roadfill		Potential source of topsoil	
		Rating class and limiting features	Value	Rating class and limiting features	Value	Rating class and limiting features	Value
RVB:							
Riverwash	60	Poor		Fair		Poor	
		Droughty	0.00	Cobble content	0.82	Hard to reclaim (rock fragments)	0.00
		Organic matter content low	0.50	Stone content	0.82	Rock fragments	0.00
		Stone content	0.82				
Dev	30	Poor		Fair		Poor	
		Carbonate content	0.00	Cobble content	0.96	Rock fragments	0.00
		Organic matter content low	0.88			Carbonate content	0.00
						Hard to reclaim (rock fragments)	0.02
SuD:							
Sanderson	50	Poor		Good		Poor	
		Carbonate content	0.00			Carbonate content	0.00
		Organic matter content low	0.88			Rock fragments	0.00
						Hard to reclaim (rock fragments)	0.00
Upton	35	Poor		Poor		Poor	
		Droughty	0.00	Depth to cemented pan	0.00	Carbonate content	0.00
		Carbonate content	0.00			Depth to cemented pan	0.00
		Depth to cemented pan	0.00			Rock fragments	0.00
ToB:							
Texon	50	Poor		Poor		Poor	
		Too clayey	0.00	Low strength	0.00	Too clayey	0.00
		Water erosion	0.90	Shrink-swell	0.12	Rock fragments	0.97
		Salinity	0.97				
Ozona	35	Poor		Poor		Poor	
		Depth to cemented pan	0.00	Depth to cemented pan	0.00	Depth to cemented pan	0.00
		Carbonate content	0.00	Low strength	0.00	Too clayey	0.71
		Droughty	0.00	Shrink-swell	0.87	Rock fragments	0.97
TRD:							
Tarrant	55	Poor		Poor		Poor	
		Too clayey	0.00	Depth to bedrock	0.00	Too clayey	0.00
		Droughty	0.00	Low strength	0.00	Rock fragments	0.00
		Depth to bedrock	0.00			Depth to bedrock	0.00
Rock outcrop	35	Not rated		Not rated		Not rated	

Table 16.—Source of Reclamation Material, Roadfill, and Topsoil—Continued

Map symbol and soil name	Pct. of map unit	Potential source of reclamation material		Potential source of roadfill		Potential source of topsoil	
		Rating class and limiting features	Value	Rating class and limiting features	Value	Rating class and limiting features	Value
TRG:							
Tarrant	50	Poor		Poor		Poor	
		Too clayey	0.00	Depth to bedrock	0.00	Slope	0.00
		Droughty	0.00	Slope	0.00	Too clayey	0.00
		Depth to bedrock	0.00	Low strength	0.00	Rock fragments	0.00
Rock outcrop	40	Not rated		Not rated		Not rated	
TsB:							
Tobosa	75	Poor		Poor		Poor	
		Too clayey	0.00	Low strength	0.00	Too clayey	0.00
		Organic matter content low	0.18	Shrink-swell	0.00	Sodium content	0.98
		Carbonate content	0.74				
UpD:							
Upton	80	Poor		Poor		Poor	
		Droughty	0.00	Depth to cemented pan	0.00	Carbonate content	0.00
		Carbonate content	0.00			Depth to cemented pan	0.00
		Depth to cemented pan	0.00			Rock fragments	0.00
W:							
Water	100	Not rated		Not rated		Not rated	
WkB:							
Wickett	80	Poor		Poor		Fair	
		Wind erosion	0.00	Depth to cemented pan	0.00	Depth to cemented pan	0.65
		Droughty	0.09				
		Organic matter content low	0.12				

Table 17.—Ponds and Embankments

(The information in this table indicates the dominant soil condition but does not eliminate the need for onsite investigation. The numbers in the value columns range from 0.01 to 1.00. The larger the value, the greater the limitation. See text for further explanation of ratings in this table.)

Map symbol and soil name	Pct. of map unit	Pond reservoir areas		Embankments, dikes, and levees		Aquifer-fed excavated ponds	
		Rating class and limiting features	Value	Rating class and limiting features	Value	Rating class and limiting features	Value
AnB:							
Angelo	80	Somewhat limited		Not limited		Very limited	
		Seepage	0.70			Depth to water	1.00
ANS:							
Area not surveyed	100	Not rated		Not rated		Not rated	
BkB:							
Blakeney	85	Very limited		Very limited		Very limited	
		Seepage	1.00	Thin layer	1.00	Depth to water	1.00
		Depth to cemented pan	1.00	Seepage	0.01		
CoC:							
Conger	80	Very limited		Very limited		Very limited	
		Depth to cemented pan	1.00	Thin layer	1.00	Depth to water	1.00
		Seepage	0.70				
DAM:							
Dams	100	Not rated		Not rated		Not rated	
DvB:							
Dev	80	Very limited		Somewhat limited		Very limited	
		Seepage	1.00	Seepage	0.15	Depth to water	1.00
ERD:							
Ector	65	Very limited		Very limited		Very limited	
		Depth to bedrock	1.00	Thin layer	1.00	Depth to water	1.00
		Seepage	0.45	Large stones content	0.03		
Rock outcrop	25	Very limited		Not rated		Not rated	
		Depth to bedrock	1.00				
		Seepage	1.00				
ERG:							
Ector	70	Very limited		Very limited		Very limited	
		Depth to bedrock	1.00	Thin layer	1.00	Depth to water	1.00
		Seepage	0.45	Large stones content	1.00		
		Slope	0.41	Seepage	0.25		
Rock outcrop	20	Very limited		Not rated		Not rated	
		Depth to bedrock	1.00				
		Seepage	1.00				
		Slope	0.82				
HaB:							
Harkey	80	Somewhat limited		Very limited		Very limited	
		Seepage	0.70	Piping	1.00	Depth to water	1.00

Table 17.—Ponds and Embankments—Continued

Map symbol and soil name	Pct. of map unit	Pond reservoir areas		Embankments, dikes, and levees		Aquifer-fed excavated ponds	
		Rating class and limiting features	Value	Rating class and limiting features	Value	Rating class and limiting features	Value
HRA:							
Harkey	45	Somewhat limited		Very limited		Very limited	
		Seepage	0.70	Piping	1.00	Depth to water	1.00
				Salinity	0.12		
Patrole	40	Somewhat limited		Somewhat limited		Very limited	
		Seepage	0.03	Hard to pack	0.75	Depth to water	1.00
				Salinity	0.12		
IDB:							
Iraan	70	Somewhat limited		Somewhat limited		Very limited	
		Seepage	0.70	Piping	0.50	Depth to water	1.00
Dev	20	Very limited		Somewhat limited		Very limited	
		Seepage	1.00	Seepage	0.15	Depth to water	1.00
InB:							
Iraan	90	Somewhat limited		Not limited		Very limited	
		Seepage	0.03			Depth to water	1.00
IrA:							
Irion	90	Not limited		Very limited		Very limited	
				Ponding	1.00	Depth to water	1.00
				Hard to pack	0.68		
IsA:							
Irion	90	Not limited		Very limited		Very limited	
				Ponding	1.00	Depth to water	1.00
				Hard to pack	0.68		
KiB:							
Kinco	50	Very limited		Not limited		Very limited	
		Seepage	1.00			Depth to water	1.00
Ima	35	Very limited		Somewhat limited		Very limited	
		Seepage	1.00	Seepage	0.01	Depth to water	1.00
LRD:							
Lozier	55	Very limited		Very limited		Very limited	
		Depth to bedrock	1.00	Thin layer	1.00	Depth to water	1.00
		Seepage	0.45	Seepage	0.12		
Rock outcrop	35	Very limited		Not rated		Not rated	
		Depth to bedrock	1.00				
		Seepage	1.00				
LRG:							
Lozier	60	Very limited		Very limited		Very limited	
		Depth to bedrock	1.00	Thin layer	1.00	Depth to water	1.00
		Seepage	0.45	Large stones content	0.39		
		Slope	0.41				
Rock outcrop	30	Very limited		Not rated		Not rated	
		Depth to bedrock	1.00				
		Seepage	1.00				
		Slope	0.72				

Table 17.—Ponds and Embankments—Continued

Map symbol and soil name	Pct. of map unit	Pond reservoir areas		Embankments, dikes, and levees		Aquifer-fed excavated ponds	
		Rating class and limiting features	Value	Rating class and limiting features	Value	Rating class and limiting features	Value
M-W:							
Water, miscellaneous	100	Not rated		Not rated		Not rated	
MaD:							
Mailtrail	85	Very limited		Very limited		Very limited	
		Depth to cemented pan	1.00	Thin layer	1.00	Depth to water	1.00
		Seepage	0.53	Large stones content	0.99		
				Seepage	0.25		
NoD:							
Noelke	50	Very limited		Very limited		Very limited	
		Depth to cemented pan	1.00	Thin layer	1.00	Depth to water	1.00
		Depth to bedrock	1.00				
		Seepage	0.53				
Ector	35	Very limited		Very limited		Very limited	
		Depth to bedrock	1.00	Thin layer	1.00	Depth to water	1.00
		Seepage	0.45	Large stones content	0.68		
				Seepage	0.25		
OaC:							
Ozona	45	Very limited		Very limited		Very limited	
		Depth to cemented pan	1.00	Thin layer	1.00	Depth to water	1.00
		Seepage	0.70				
Tarrant	40	Very limited		Very limited		Very limited	
		Depth to bedrock	1.00	Thin layer	1.00	Depth to water	1.00
		Seepage	0.45	Large stones content	1.00		
				Hard to pack	0.85		
PaD:							
Paisano	80	Very limited		Very limited		Very limited	
		Seepage	1.00	Thin layer	1.00	Depth to water	1.00
		Depth to cemented pan	1.00				
PdB:							
Pandale	80	Somewhat limited		Not limited		Very limited	
		Seepage	0.70			Depth to water	1.00
PoC:							
Pandale	65	Somewhat limited		Not limited		Very limited	
		Seepage	0.70			Depth to water	1.00
Upton	25	Very limited		Very limited		Very limited	
		Depth to cemented pan	1.00	Thin layer	1.00	Depth to water	1.00
		Seepage	0.70				

Table 17.—Ponds and Embankments—Continued

Map symbol and soil name	Pct. of map unit	Pond reservoir areas		Embankments, dikes, and levees		Aquifer-fed excavated ponds	
		Rating class and limiting features	Value	Rating class and limiting features	Value	Rating class and limiting features	Value
RaB:							
Reagan	85	Somewhat limited		Somewhat limited		Very limited	
		Seepage	0.70	Piping	0.60	Depth to water	1.00
RdB:							
Rio Diablo	85	Not limited		Not limited		Very limited	
						Depth to water	1.00
RoB:							
Rioconcho	85	Not limited		Somewhat limited		Very limited	
				Piping	0.50	Depth to water	1.00
				Salinity	0.12		
RVB:							
Riverwash	60	Very limited		Very limited		Very limited	
		Seepage	1.00	Seepage	1.00	Depth to water	1.00
				Large stones content	0.05		
Dev	30	Very limited		Somewhat limited		Very limited	
		Seepage	1.00	Seepage	0.15	Depth to water	1.00
SuD:							
Sanderson	50	Very limited		Somewhat limited		Very limited	
		Seepage	1.00	Seepage	0.15	Depth to water	1.00
Upton	35	Very limited		Very limited		Very limited	
		Depth to cemented pan	1.00	Thin layer	1.00	Depth to water	1.00
		Seepage	0.70				
ToB:							
Texon	50	Somewhat limited		Somewhat limited		Very limited	
		Seepage	0.03	Hard to pack	0.66	Depth to water	1.00
				Salinity	0.03		
Ozona	35	Very limited		Very limited		Very limited	
		Depth to cemented pan	1.00	Thin layer	1.00	Depth to water	1.00
		Seepage	0.70				
TRD:							
Tarrant	55	Very limited		Very limited		Very limited	
		Depth to bedrock	1.00	Thin layer	1.00	Depth to water	1.00
		Seepage	0.45	Large stones content	1.00		
Rock outcrop	35	Very limited		Not rated		Not rated	
		Depth to bedrock	1.00				
		Seepage	1.00				

Table 17.—Ponds and Embankments—Continued

Map symbol and soil name	Pct. of map unit	Pond reservoir areas		Embankments, dikes, and levees		Aquifer-fed excavated ponds	
		Rating class and limiting features	Value	Rating class and limiting features	Value	Rating class and limiting features	Value
TRG:							
Tarrant	50	Very limited		Very limited		Very limited	
		Depth to bedrock	1.00	Thin layer	1.00	Depth to water	1.00
		Seepage	0.45	Large stones content	1.00		
		Slope	0.41	Hard to pack	0.85		
Rock outcrop	40	Very limited		Not rated		Not rated	
		Depth to bedrock	1.00				
		Seepage	1.00				
		Slope	0.41				
TsB:							
Tobosa	75	Not limited		Very limited		Very limited	
				Hard to pack	1.00	Depth to water	1.00
UpD:							
Upton	80	Very limited		Very limited		Very limited	
		Depth to cemented pan	1.00	Thin layer	1.00	Depth to water	1.00
		Seepage	0.70				
W:							
Water	100	Not rated		Not rated		Not rated	
WkB:							
Wickett	80	Very limited		Somewhat limited		Very limited	
		Seepage	1.00	Thin layer	0.83	Depth to water	1.00
		Depth to cemented pan	0.83	Seepage	0.01		

Table 18.—Engineering Index Properties

(Absence of an entry indicates that the data were not estimated.)

Map symbol and soil name	Depth	USDA texture	Classification		Fragments		Percentage passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO	>10 inches	3-10 inches	4	10	40	200		
	In				Pct	Pct					Pct	
AnB:												
Angelo	0-16	Silty clay loam	CL	A-6, A-7-6	0	0	90-100	90-100	85-100	60-90	37-50	18-30
	16-25	Silty clay loam, clay loam, silty clay	CL	A-6, A-7-6	0	0	60-100	60-100	60-100	50-90	30-49	15-30
	25-80	Silty clay loam, clay loam, silty clay	CL	A-6, A-7-6	0	0	60-100	60-100	60-100	50-90	30-49	15-30
ANS:												
Area not surveyed	---	---	---	---	---	---	---	---	---	---	---	---
BkB:												
Blakeney	0-16	Fine sandy loam	SC, SC-SM	A-2-4, A-4	0	0-5	80-95	75-95	60-80	30-50	18-27	4-10
	16-24	Cemented material			---	---	---	---	---	---	---	---
	24-80	Gravelly clay loam, loam, gravelly loam	CL, CL-ML, SC, SC-SM	A-4, A-6	0	5-15	80-95	75-90	60-85	45-70	20-40	5-22
CoC:												
Conger	0-6	Loam	CL, CL-ML, SC, SC-SM	A-4, A-6	0	0-5	90-100	90-100	75-95	40-65	20-35	5-15
	6-13	Very cobbly loam	CL, GC, SC	A-4, A-6	0-2	0-15	65-85	60-75	51-70	36-55	25-40	8-20
	13-21	Cemented material			---	---	---	---	---	---	---	---
	21-80	Gravelly clay loam, gravelly loam, loam	CL, CL-ML, SC, SC-SM	A-4, A-6	0	5-15	80-95	75-90	60-85	45-70	20-40	5-22
DAM:												
Dams	---	---	---	---	---	---	---	---	---	---	---	---
DvB:												
Dev	0-8	Very gravelly loam	GC, SC	A-2-4, A-2-6, A-6	0-5	0-25	40-80	30-75	20-65	15-45	28-47	9-25
	8-38	Extremely gravelly loam, extremely gravelly sandy loam, very gravelly loam	GC, GP-GC, SC, SP-SC	A-2-4, A-2-6, A-7	---	0-35	10-78	5-65	5-50	5-42	28-47	9-25
	38-80	Very gravelly loam, extremely gravelly loam	GC, SC	A-2-4, A-2-6, A-6	0-5	0-35	40-80	30-75	20-65	15-45	28-47	9-25

Table 18.—Engineering Index Properties—Continued

Map symbol and soil name	Depth	USDA texture	Classification		Fragments		Percentage passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO	>10 inches	3-10 inches	4	10	40	200		
	In				Pct	Pct					Pct	
ERD:												
Ector	0-5	Very cobbly clay loam	CL, GC, SC	A-2-6, A-2, A-6, A-7	3-15	20-55	40-75	40-65	35-60	30-55	30-44	11-22
	5-8	Extremely cobbly loam	GC, GC-GM, GP-GC	A-2-6, A-1-a, A-2, A-4, A-6	5-20	35-75	25-55	15-50	15-50	10-40	20-40	5-22
	8-30	Bedrock			---	---	---	---	---	---	---	---
Rock outcrop	0-80	Bedrock			---	---	---	---	---	---	---	---
ERG:												
Ector	0-18	Extremely cobbly loam	GC, GC-GM, GP-GC	A-2-6, A-1-a, A-2, A-4, A-6	5-20	35-75	25-55	15-50	15-50	10-40	20-40	5-22
	18-30	Bedrock			---	---	---	---	---	---	---	---
Rock outcrop	0-80	Bedrock			---	---	---	---	---	---	---	---
HaB:												
Harkey	0-6	Very fine sandy loam	CL-ML, ML	A-4	0	0	100	100	95-100	65-90	20-30	NP-10
	6-60	Very fine sandy loam, loam, silt loam	ML	A-4	0	0	100	100	95-100	75-90	20-25	NP-5
HRA:												
Harkey	0-14	Silt loam	ML	A-4	0	0	100	100	95-100	75-90	20-25	NP-5
	14-80	Silt loam, very fine sandy loam, loam	ML	A-4	0	0	100	100	95-100	75-90	20-25	NP-5
Patrole	0-28	Silt loam	CL	A-4, A-6	0	0	98-100	98-100	85-100	65-95	26-40	8-20
	28-80	Silty clay, clay, silty clay loam	CH	A-7	0	0	95-100	95-100	90-100	80-95	50-65	28-40

Table 18.—Engineering Index Properties—Continued

Map symbol and soil name	Depth	USDA texture	Classification		Fragments		Percentage passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO	>10 inches	3-10 inches	4	10	40	200		
	In				Pct	Pct					Pct	
IDB:												
Iraan	0-24	Clay loam	CL	A-4, A-6	0	0	100	95-100	85-100	55-85	25-40	8-22
	24-80	Clay loam, silty clay loam	CL	A-4, A-6	0	0	100	95-100	85-100	55-85	25-40	8-22
Dev	0-8	Very gravelly loam	GC, SC	A-2-4, A-2-6, A-6	0-5	0-25	40-80	30-75	20-65	15-45	28-47	9-25
	8-38	Extremely gravelly loam, very gravelly loam, extremely gravelly sandy loam	GC, GP-GC, SC, SP-SC	A-2-4, A-2-6, A-7	0-10	0-35	10-78	5-65	5-50	5-42	28-47	9-25
	38-80	Very gravelly loam, extremely gravelly loam	GC, SC	A-2-4, A-2-6, A-6	0-5	0-35	40-80	30-75	20-65	15-45	28-47	9-25
InB:												
Iraan	0-42	Silty clay loam	CL	A-6, A-7-6	0	0-3	95-100	75-100	70-99	55-80	35-50	18-30
	42-80	Silty clay loam, clay loam, silty clay	CL	A-6, A-7-6	0	0-8	90-100	75-100	70-98	55-95	35-50	18-30
IrA:												
Irion	0-14	Clay	CH	A-7-6	0	0-1	95-100	95-100	90-100	75-80	50-64	27-37
	14-54	Clay, silty clay	CH	A-7-6	0	0-1	95-100	95-100	90-100	75-90	50-64	27-37
	54-72	Clay, silty clay	CH	A-7-6	0-1	0-1	95-100	95-100	90-100	75-90	50-64	27-37
	72-80	Bedrock			0	0	---	---	---	---	---	---
IsA:												
Irion	0-14	Clay	CH	A-7-6	0	0-1	85-95	80-95	75-95	70-85	50-64	27-37
	14-63	Clay, silty clay	CH	A-7-6	0	0-1	85-95	80-95	75-95	70-85	50-64	27-37
	63-80	Bedrock			0	0	---	---	---	---	---	---

Table 18.—Engineering Index Properties—Continued

Map symbol and soil name	Depth	USDA texture	Classification		Fragments		Percentage passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO	>10 inches	3-10 inches	4	10	40	200		
	In				Pct	Pct					Pct	
KiB:												
Kinco	0-10	Fine sandy loam	CL-ML, ML, SC-SM, SM	A-2-4, A-4	0	0	98-100	95-100	80-98	25-55	18-25	2-7
	10-29	Fine sandy loam, loam	CL-ML, ML, SC-SM, SM	A-2-4, A-4	0	0	80-100	80-100	75-95	30-65	18-26	1-8
	29-80	Fine sandy loam, loam	CL-ML, ML, SC-SM, SM	A-2-4, A-4	0	0	90-100	90-100	80-98	30-65	18-28	1-9
Ima	0-18	Fine sandy loam	SC-SM, SM	A-4, A-2	0	0	90-100	85-100	75-100	25-50	15-25	NP-10
	18-50	Fine sandy loam, sandy loam	SC-SM	A-2, A-4	0	0	90-100	85-100	75-100	25-50	20-25	5-10
	50-80	Fine sandy loam, sandy loam, very fine sandy loam	CL-ML, SC-SM	A-2, A-4	0	0	90-100	85-100	75-100	20-55	20-25	5-10
LRD:												
Lozier	0-9	Very gravelly loam	GC	A-2, A-4, A-6, A-7	0	5-20	30-60	25-55	20-50	15-45	25-48	8-26
	9-35	Bedrock			---	---	---	---	---	---	---	---
Rock outcrop	0-80	Bedrock			---	---	---	---	---	---	---	---
LRG:												
Lozier	0-13	Very gravelly loam	CL, GC, SC	A-2, A-4, A-6, A-7-6	15-30	0-25	35-70	30-70	25-65	20-55	25-48	8-26
	13-35	Bedrock			---	---	---	---	---	---	---	---
Rock outcrop	0-80	Bedrock			---	---	---	---	---	---	---	---
M-W:												
Water, miscellaneous	---	---	---	---	---	---	---	---	---	---	---	---

Table 18.—Engineering Index Properties—Continued

Map symbol and soil name	Depth	USDA texture	Classification		Fragments		Percentage passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO	>10 inches	3-10 inches	4	10	40	200		
	In				Pct	Pct					Pct	
MaD:												
Mailtrail-------	0-5	Very gravelly clay loam	GC, GC-GM, SC, SC-SM	A-2-4, A-2-6, A-4	0-10	2-35	35-75	25-55	25-55	20-50	20-35	7-20
	5-12	Extremely cobbly clay loam, extremely gravelly silty clay loam, extremely cobbly loam, extremely gravelly clay loam	GC, GC-GM, GP-GC	A-2-4, A-2-6	0-60	30-80	20-60	15-40	10-30	10-25	20-35	7-20
	12-16	Cemented material			---	---	---	---	---	---	---	---
	16-80	Gravelly clay loam, loam, gravelly loam	CL, CL-ML, SC, SC-SM	A-4, A-6	0	5-15	80-95	75-90	60-85	45-70	20-40	5-22
NoD:												
Noelke----------	0-10	Very gravelly clay loam	GC, SC	A-2-6, A-2, A-6, A-7-6	0-10	0-30	45-80	30-60	25-50	15-40	30-50	13-25
	10-16	Cemented material			---	---	---	---	---	---	---	---
	16-80	Bedrock			---	---	---	---	---	---	---	---
Ector----------	0-11	Very cobbly clay loam	GC, GC-GM, GP-GC	A-2-4, A-2-6	0	30-50	20-60	15-40	10-30	10-25	20-35	7-20
	11-30	Bedrock			---	---	---	---	---	---	---	---
OaC:												
Ozona----------	0-18	Clay loam	CL	A-6, A-7-6	0	0-5	90-100	85-100	80-97	60-85	39-50	19-28
	18-24	Cemented material			---	---	---	---	---	---	---	---
	24-80	Gravelly clay loam, loam, gravelly loam	CL, CL-ML, SC, SC-SM	A-4, A-6	0	5-15	80-95	75-90	60-85	45-70	20-40	5-22
Tarrant---------	0-16	Cobbly clay	CH, GC, SC	A-7-5, A-7-6	0-5	33-77	55-100	51-100	48-99	36-95	51-75	25-44
	16-24	Bedrock			---	---	---	---	---	---	---	---
PaD:												
Paisano---------	0-3	Very gravelly loam	SM, SP-SM	A-1-a, A-1-b	0	0-7	60-80	25-50	20-35	10-20	20-27	NP-5
	3-8	Very gravelly loam	SM, SP-SM	A-1-a, A-1-b	5-20	5-15	60-80	20-40	20-35	10-20	20-27	NP-5
	8-17	Cemented material			---	---	---	---	---	---	---	---
	17-80	Gravelly loam, very gravelly sandy loam, very gravelly loam, very gravelly sandy clay loam	GC, GC-GM, GP-GC, SC	A-1-a, A-1-b, A-2	0	0-7	50-75	25-50	25-45	10-35	20-27	5-10

Table 18.—Engineering Index Properties—Continued

Map symbol and soil name	Depth	USDA texture	Classification		Fragments		Percentage passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO	>10 inches	3-10 inches	4	10	40	200		
	In				Pct	Pct					Pct	
PdB:												
Pandale	0-16	Gravelly loam	CL, GC, GC-GM, SC, SC-SM	A-2, A-4, A-6, A-1-b	0	0-1	65-85	60-85	58-66	41-52	22-40	5-20
	16-80	Gravelly clay loam, gravelly loam	CL, GC, GC-GM, SC, SC-SM	A-1-b, A-2, A-4, A-6	0	0	72-80	56-75	55-66	41-52	22-40	5-20
PoC:												
Pandale	0-6	Gravelly loam	CL, GC, GC-GM, SC, SC-SM	A-1-b, A-2, A-4, A-6	0	0-1	65-85	60-85	58-66	41-52	22-40	5-20
	6-80	Gravelly clay loam	CL, GC, GC-GM, SC, SC-SM	A-1-b, A-2, A-4, A-6	0	0	72-80	58-75	58-66	41-52	22-40	5-20
Upton	0-8	Gravelly loam	CL, GC, SC	A-4, A-6	0-10	0-2	65-85	60-75	51-70	36-55	25-40	8-20
	8-14	Cemented material			---	---	---	---	---	---	---	---
	14-80	Very gravelly loam, extremely gravelly loam	GC, GP-GC, SC, SP-SC	A-2-6, A-2, A-4, A-6	0-10	0-20	31-85	20-75	10-70	5-45	25-40	8-20
RaB:												
Reagan	0-8	Silty clay loam	CL	A-6, A-7-6	0	0	95-100	95-100	85-100	75-95	35-45	18-28
	8-20	Silt loam, silty clay, silty clay loam	CL	A-6, A-7-6	0	0	95-100	93-100	80-100	75-95	35-50	18-30
	20-80	Silt loam, silty clay, silty clay loam	CL	A-6, A-7-6	0	0	95-100	90-100	80-100	75-95	35-50	18-30
RdB:												
Rio Diablo	0-10	Silty clay loam	CH, CL	A-6, A-7-6	0	0-3	90-100	90-100	73-100	70-97	38-52	15-25
	10-33	Silty clay loam, silty clay	CH, CL	A-6, A-7-6	0	0-5	90-100	85-100	75-100	70-99	35-55	20-35
	33-80	Silty clay loam, silty clay	CH, CL	A-6, A-7-6	0	0-5	90-100	85-100	75-100	70-99	35-55	20-35
RoB:												
Rioconcho	0-24	Silty clay	CH	A-7-6, A-7	0	0	95-100	95-100	90-100	80-95	50-65	28-40
	24-80	Silty clay loam, silty clay, clay loam	CH, CL	A-6, A-7-6	0	0-5	90-100	85-100	75-100	70-99	35-55	20-35

Table 18.—Engineering Index Properties—Continued

Map symbol and soil name	Depth	USDA texture	Classification		Fragments		Percentage passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO	>10 inches	3-10 inches	4	10	40	200		
	In				Pct	Pct					Pct	
RVB:												
Riverwash	0-60	Extremely gravelly fragmental material	GP, GW	A-1-a	0-15	2-40	5-15	0-10	0-5	0-3	16-25	NP-3
Dev	0-7	Very gravelly loam	GC, SC	A-2-4, A-2-6, A-6	0-5	0-35	40-80	30-75	20-65	15-45	28-47	9-25
	7-47	Extremely gravelly loam, very gravelly loam, extremely gravelly silt loam	GC, GP-GC, SC, SP-SC	A-2-4, A-2-6, A-7	0-10	0-35	10-78	5-65	5-50	5-42	28-47	9-25
	47-80	Very gravelly loam, extremely gravelly loam, extremely gravelly silt loam	GC, SC	A-2-4, A-2-6, A-6	0-5	0-35	40-80	30-75	20-65	15-45	28-47	9-25
SuD:												
Sanderson	0-7	Gravelly loam	GC, GC-GM, SC, SC-SM	A-1-b, A-2-6, A-4, A-6	0	0-6	30-80	20-70	15-65	13-50	22-40	5-20
	7-80	Extremely gravelly loam, very gravelly clay loam, very gravelly loam	GC, GP-GC, SC, SP-SC	A-2-4, A-2-6, A-7	0	0-6	10-78	5-65	5-50	5-42	28-47	9-25
Upton	0-8	Gravelly loam	CL, GC, SC	A-4, A-6	0-10	0-2	65-85	60-75	51-70	36-55	25-40	8-20
	8-20	Cemented material			---	---	---	---	---	---	---	---
	20-80	Very gravelly loam, gravelly loam, extremely gravelly loam	GC, GP-GC, SC, SP-SC	A-2-6, A-2, A-4, A-6	0-10	0-20	31-85	20-75	10-70	5-45	25-40	8-20
ToB:												
Texon	0-2	Silt loam	ML, CL	A-4, A-6	0	0	98-100	98-100	85-100	65-95	26-40	8-20
	2-34	Silty clay, silty clay loam, clay	CH, CL	A-7-6	0	0	85-100	75-100	75-95	75-90	41-62	20-38
	34-80	Clay, silty clay loam, silty clay	CH	A-7-6	0	0	95-100	95-100	90-100	75-90	50-64	27-37
Ozona	0-16	Silty clay loam	CL	A-6, A-7-6	0	0-3	95-100	75-100	70-99	55-80	35-50	18-30
	16-24	Cemented material			---	---	---	---	---	---	---	---
	24-80	Gravelly clay loam, loam, gravelly loam	CL, CL-ML, SC, SC-SM	A-4, A-6	0	5-15	80-95	75-90	60-85	45-70	20-40	5-22

Table 18.—Engineering Index Properties—Continued

Map symbol and soil name	Depth	USDA texture	Classification		Fragments		Percentage passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO	>10 inches	3-10 inches	4	10	40	200		
	In				Pct	Pct					Pct	
TRD:												
Tarrant	0-8	Very cobbly silty clay	CH, GC, SC	A-7-5, A-7-6	0-5	33-77	55-100	51-100	48-99	36-95	51-75	25-44
	8-30	Bedrock			---	---	---	---	---	---	---	---
Rock outcrop	0-80	Bedrock			---	---	---	---	---	---	---	---
TRG:												
Tarrant	0-13	Very cobbly clay	CH, GC, SC	A-7-5, A-7-6	0-5	33-77	55-100	51-100	48-99	36-95	51-75	25-44
	13-80	Bedrock			---	---	---	---	---	---	---	---
Rock outcrop	0-80	Bedrock			---	---	---	---	---	---	---	---
TsB:												
Tobosa	0-15	Clay	CH	A-7-6	0	0-2	98-100	97-100	90-100	85-98	51-70	30-45
	15-48	Clay, silty clay	CH	A-7-6	0	0-3	95-100	95-100	85-100	70-95	51-72	30-45
	48-80	Clay, silty clay	CH, CL	A-7-6	0	0-2	96-100	95-100	90-100	80-95	45-65	30-45
UpD:												
Upton	0-14	Gravelly loam	CL, GC, SC	A-4, A-6	0-10	0-2	65-85	60-75	51-70	36-55	25-40	8-20
	14-20	Cemented material			---	---	---	---	---	---	---	---
	20-80	Gravelly clay loam, loam, gravelly loam	CL, CL-ML, SC, SC-SM	A-4, A-6	0	5-15	80-95	75-90	60-85	45-70	20-40	5-22
W:												
Water	---	---	---	---	---	---	---	---	---	---	---	---
WkB:												
Wickett	0-9	Loamy fine sand	SM, SP-SM	A-2-4	0	0	100	98-100	75-98	10-25	0-22	NP-4
	9-31	Fine sandy loam, loam	SC-SM, SM	A-2-4, A-4	0	0	100	98-100	80-98	13-40	15-22	2-7
	31-34	Cemented material			---	---	---	---	---	---	---	---
	34-80	Gravelly loam, fine sandy loam, loamy fine sand	GC-GM, GM, SC-SM, SM	A-4	0	0-5	70-100	50-100	45-90	35-65	15-22	2-7

Table 19.—Physical Soil Properties

(Entries under "Erosion factors--T" apply to the entire profile. Entries under "Wind erodibility group" and "Wind erodibility index" apply only to the surface layer. Absence of an entry indicates that data were not estimated.)

Map symbol and soil name	Depth	Clay	Moist bulk density	Permeability (Ksat)	Available water capacity	Linear extensibility	Organic matter	Erosion factors			Wind erodibility group	Wind erodibility index
								Kw	Kf	T		
	In	Pct	g/cc	In/hr	In/in	Pct	Pct					
AnB:												
Angelo	0-16	30-40	1.25-1.45	0.6-2	0.14-0.20	3.0-5.9	1.0-4.0	.32	.32	4	6	48
	16-25	30-45	1.40-1.60	0.2-0.6	0.14-0.20	3.0-5.9	0.2-0.5	.32	.32			
	25-80	30-45	1.40-1.60	0.6-2	0.14-0.20	3.0-5.9	0.2-0.5	.32	.32			
ANS:												
Area not surveyed	---	---	---	---	---	---	---	---	---	--	---	---
BkB:												
Blakeney	0-16	8-18	1.35-1.55	2-6	0.08-0.14	0.0-2.9	0.5-2.0	.24	.28	1	3	86
	16-24	---	---	0.06-0.6	---	---	---	---	---			
	24-80	20-35	1.35-1.55	0.6-2	0.06-0.10	0.0-2.9	0.2-0.5	.20	.32			
CoC:												
Conger	0-6	18-27	1.30-1.50	0.6-2	0.14-0.20	0.0-2.9	1.0-2.0	.37	.37	1	4L	86
	6-13	10-30	1.30-1.50	0.6-2	0.08-0.14	0.0-2.9	1.0-3.0	.10	.28			
	13-21	---	---	0.00-0.06	---	---	---	---	---			
	21-80	20-35	1.35-1.55	0.6-2	0.06-0.10	0.0-2.9	0.2-0.5	.20	.32			
DAM:												
Dams	---	---	---	---	---	---	---	---	---	--	---	---
DvB:												
Dev	0-8	18-35	1.10-1.50	2-6	0.05-0.13	0.0-2.9	1.0-7.0	.10	.32	5	8	0
	8-38	4-20	1.30-1.50	2-6	0.03-0.10	0.0-2.9	0.5-1.0	.10	.32			
	38-80	18-35	1.10-1.50	2-6	0.05-0.13	0.0-2.9	1.0-7.0	.10	.32			
ERD:												
Ector	0-5	20-35	1.30-1.45	0.6-2	0.05-0.10	0.0-2.9	1.0-3.0	.10	.32	1	8	0
	5-8	20-35	1.30-1.55	0.6-2	0.02-0.06	0.0-2.9	1.0-3.0	.10	.37			
	8-30	---	---	0.00-0.06	---	---	---	---	---			
Rock outcrop	0-80	---	---	0.06-20	---	---	---	---	---	--	---	---

Table 19.—Physical Soil Properties—Continued

Map symbol and soil name	Depth	Clay	Moist bulk density	Permeability (Ksat)	Available water capacity	Linear extensibility	Organic matter	Erosion factors			Wind erodibility group	Wind erodibility index
								Kw	Kf	T		
	In	Pct	g/cc	In/hr	In/in	Pct	Pct					
ERG:												
Ector	0-18	20-35	1.30-1.55	0.6-2	0.02-0.06	0.0-2.9	1.0-3.0	.10	.37	1	8	0
	18-30	---	---	0.00-0.06	---	---	---	---	---			
Rock outcrop	0-80	---	---	0.06-20	---	---	---	---	---	--	---	---
HaB:												
Harkey	0-6	15-27	1.40-1.50	0.6-2	0.13-0.19	0.0-2.9	0.7-1.0	.55	.55	5	4L	86
	6-60	5-18	1.40-1.50	0.6-2	0.13-0.19	0.0-2.9	0.5-1.0	.43	.43			
HRA:												
Harkey	0-14	10-18	1.40-1.50	0.6-2	0.07-0.13	0.0-2.9	0.7-0.9	.43	.43	5	4L	86
	14-80	10-18	1.40-1.50	0.6-2	0.07-0.13	0.0-2.9	0.5-0.9	.43	.43			
Patrole	0-28	18-30	1.25-1.40	0.2-0.6	0.04-0.15	0.0-2.9	0.5-1.0	.43	.43	3	3	86
	28-80	40-60	1.25-1.40	0.00-0.06	0.04-0.15	6.0-8.9	0.1-0.5	.28	.28			
IDB:												
Iraan	0-24	22-35	1.25-1.45	0.6-2	0.15-0.20	3.0-5.9	0.1-1.0	.32	.32	5	4L	86
	24-80	22-35	1.25-1.45	0.6-2	0.15-0.20	3.0-5.9	0.1-1.0	.32	.32			
Dev	0-8	18-35	1.10-1.50	2-6	0.05-0.13	0.0-2.9	1.0-7.0	.10	.32	5	8	0
	8-38	4-20	1.30-1.50	2-6	0.03-0.10	0.0-2.9	0.5-1.0	.10	.32			
	38-80	18-35	1.10-1.50	2-6	0.05-0.13	0.0-2.9	1.0-7.0	.10	.32			
InB:												
Iraan	0-42	27-40	1.15-1.25	0.2-0.6	0.15-0.22	3.0-5.9	1.0-3.0	.32	.32	5	4L	86
	42-80	30-45	1.20-1.35	0.2-0.6	0.14-0.22	3.0-5.9	0.5-1.0	.32	.32			
IrA:												
Irion	0-14	40-55	1.25-1.45	0.00-0.06	0.12-0.18	6.0-8.9	2.0-4.0	.32	.32	5	4	86
	14-54	40-55	1.30-1.55	0.00-0.06	0.12-0.18	6.0-8.9	1.0-3.0	.32	.32			
	54-72	40-55	1.30-1.55	0.00-0.06	0.12-0.18	6.0-8.9	0.5-1.0	.32	.32			
	72-80	---	---	0.00-0.06	---	---	---	---	---			
IsA:												
Irion	0-14	40-55	1.25-1.45	0.00-0.06	0.10-0.16	6.0-8.9	2.0-4.0	.17	.32	5	8	0
	14-63	40-55	1.30-1.55	0.00-0.06	0.10-0.16	6.0-8.9	1.0-3.0	.32	.32			
	63-80	---	---	0.00-0.06	---	---	---	---	---			

Table 19.—Physical Soil Properties—Continued

Map symbol and soil name	Depth	Clay	Moist bulk density	Permeability (Ksat)	Available water capacity	Linear extensibility	Organic matter	Erosion factors			Wind erodibility group	Wind erodibility index
								Kw	Kf	T		
	In	Pct	g/cc	In/hr	In/in	Pct	Pct					
KiB:												
Kinco	0-10	10-18	1.25-1.45	2-6	0.10-0.14	0.0-2.9	0.5-1.0	.24	.24	5	3	86
	10-29	10-18	1.25-1.45	2-6	0.08-0.12	0.0-2.9	0.1-5.0	.28	.28			
	29-80	10-18	1.25-1.45	2-6	0.08-0.14	0.0-2.9	0.1-5.0	.28	.28			
Ima	0-18	5-18	1.35-1.45	2-6	0.11-0.15	0.0-2.9	1.0-2.0	.28	.28	5	3	86
	18-50	8-18	1.45-1.55	2-6	0.11-0.15	0.0-2.9	0.0-0.5	.28	.32			
	50-80	8-18	1.20-1.30	0.6-2	0.11-0.16	0.0-2.9	0.0-0.5	.10	.10			
LRD:												
Lozier	0-9	15-35	1.30-1.50	0.6-2	0.05-0.10	0.0-2.9	1.0-4.0	.10	.37	1	8	0
	9-35	---	---	0.00-0.06	---	---	---	---	---			
Rock outcrop	0-80	---	---	0.06-20	---	---	---	---	---	--	---	---
LRG:												
Lozier	0-13	15-35	1.30-1.50	0.6-2	0.05-0.10	0.0-2.9	1.0-4.0	.10	.37	1	8	0
	13-35	---	---	0.00-0.06	---	---	---	---	---			
Rock outcrop	0-80	---	---	0.06-20	---	---	---	---	---	--	---	---
M-W:												
Water, miscellaneous	---	---	---	---	---	---	---	---	---	--	---	---
MaD:												
Mailtrail	0-5	22-40	0.80-1.20	0.6-2	0.05-0.10	0.0-2.9	3.0-10	.10	.15	1	8	0
	5-12	22-40	0.80-1.20	0.6-2	0.03-0.08	0.0-2.9	2.0-8.0	.10	.15			
	12-16	---	---	0.00-0.06	0.01-0.04	---	---	---	---			
	16-80	20-35	1.35-1.55	0.6-2	0.06-0.10	0.0-2.9	0.2-0.5	.20	.32			
NoD:												
Noelke	0-10	22-40	1.30-1.50	0.6-2	0.05-0.12	3.0-5.9	1.0-8.0	.10	.32	1	8	0
	10-16	---	---	0.00-0.06	---	---	---	---	---			
	16-80	---	---	0.00-0.06	---	---	---	---	---			
Ector	0-11	22-40	0.80-1.20	0.6-2	0.03-0.08	0.0-2.9	2.0-8.0	.10	.32	1	8	0
	11-30	---	---	0.00-0.06	---	---	---	---	---			

Table 19.—Physical Soil Properties—Continued

Map symbol and soil name	Depth	Clay	Moist bulk density	Permeability (Ksat)	Available water capacity	Linear extensibility	Organic matter	Erosion factors			Wind erodibility group	Wind erodibility index
								Kw	Kf	T		
	In	Pct	g/cc	In/hr	In/in	Pct	Pct					
OaC:												
Ozona	0-18	35-40	1.25-1.45	0.6-2	0.15-0.20	3.0-5.9	1.0-8.0	.32	.32	1	4	86
	18-24	---	---	0.00-0.06	---	---	---	---	---			
	24-80	20-35	1.35-1.55	0.6-2	0.06-0.10	0.0-2.9	0.2-0.5	.20	.32			
Tarrant	0-16	40-60	1.10-1.40	0.2-0.6	0.05-0.10	3.0-5.9	2.0-7.0	.15	.32	1	8	0
	16-24	---	---	0.00-0.06	---	---	---	---	---			
PaD:												
Paisano	0-3	12-20	1.45-1.60	2-6	0.05-0.11	0.0-2.9	1.0-3.0	.10	.28	1	8	0
	3-8	12-20	1.45-1.60	2-6	0.05-0.11	0.0-2.9	1.0-3.0	.10	.28			
	8-17	---	---	0.00-0.06	---	---	---	---	---			
	17-80	12-25	1.45-1.60	2-6	0.05-0.11	0.0-2.9	0.1-5.0	.10	.28			
PdB:												
Pandale	0-16	18-35	1.35-1.55	0.6-2	0.06-0.14	0.0-2.9	1.0-3.0	.10	.28	5	4L	86
	16-80	18-35	1.35-1.55	0.6-2	0.06-0.14	0.0-2.9	1.0-3.0	.10	.28			
PoC:												
Pandale	0-6	18-35	1.35-1.55	0.6-2	0.06-0.14	0.0-2.9	1.0-3.0	.10	.28	5	4L	86
	6-80	18-35	1.35-1.55	0.6-2	0.06-0.14	0.0-2.9	1.0-3.0	.10	.28			
Upton	0-8	10-30	1.30-1.50	0.6-2	0.08-0.14	0.0-2.9	1.0-3.0	.15	.28	2	8	0
	8-14	---	---	0.00-0.06	---	---	0.1-1.0	---	---			
	14-80	10-30	1.35-1.55	0.6-2	0.01-0.06	0.0-2.9	0.1-1.0	.15	.32			
RaB:												
Reagan	0-8	27-35	1.35-1.50	0.6-2	0.12-0.16	3.0-5.9	0.5-2.0	.32	.32	5	7	38
	8-20	20-45	1.35-1.50	0.6-2	0.10-0.16	3.0-5.9	0.5-1.0	.32	.32			
	20-80	25-45	1.45-1.65	0.6-2	0.10-0.16	3.0-5.9	0.5-1.0	.32	.32			
RdB:												
Rio Diablo	0-10	35-50	1.10-1.50	0.2-0.6	0.11-0.18	3.0-5.9	1.0-14	.32	.32	5	4	86
	10-33	35-45	1.30-1.50	0.2-0.6	0.15-0.20	6.0-8.9	1.0-5.0	.32	.32			
	33-80	35-45	1.30-1.50	0.2-0.6	0.15-0.20	6.0-8.9	1.0-5.0	.32	.32			
RoB:												
Rioconcho	0-24	40-60	1.25-1.40	0.06-0.2	0.04-0.15	6.0-8.9	0.1-0.5	.28	.28	5	4	86
	24-80	35-45	1.30-1.50	0.06-0.2	0.15-0.20	6.0-8.9	1.0-5.0	.32	.32			

Table 19.—Physical Soil Properties—Continued

Map symbol and soil name	Depth	Clay	Moist bulk density	Permeability (Ksat)	Available water capacity	Linear extensibility	Organic matter	Erosion factors			Wind erodibility group	Wind erodibility index
								Kw	Kf	T		
	In	Pct	g/cc	In/hr	In/in	Pct	Pct					
RVB:												
Riverwash	0-60	0-2	---	6-20	0.00-0.05	0.0-2.9	0.0-1.0	.02	.02	5	8	0
Dev	0-7	18-35	1.10-1.50	2-6	0.05-0.13	0.0-2.9	1.0-7.0	.10	.32	5	8	0
	7-47	4-20	1.30-1.50	2-6	0.03-0.10	0.0-2.9	0.5-1.0	.10	.32			
	47-80	18-35	1.10-1.50	2-6	0.05-0.13	0.0-2.9	1.0-7.0	.10	.32			
SuD:												
Sanderson	0-7	18-35	1.35-1.55	0.6-2	0.05-0.14	0.0-2.9	1.0-3.0	.10	.32	5	8	0
	7-80	4-20	1.30-1.50	2-6	0.03-0.10	0.0-2.9	0.5-1.0	.10	.32			
Upton	0-8	10-30	1.30-1.50	0.6-2	0.08-0.14	0.0-2.9	1.0-3.0	.15	.28	2	8	0
	8-20	---	---	0.00-0.06	---	---	0.1-1.0	---	---			
	20-80	10-30	1.35-1.55	0.6-2	0.01-0.06	0.0-2.9	0.1-1.0	.15	.32			
ToB:												
Texon	0-2	18-30	1.25-1.40	0.2-0.6	0.04-0.15	0.0-2.9	0.5-1.0	.43	.43	5	4	86
	2-34	40-55	1.25-1.40	0.2-0.6	0.15-0.20	6.0-8.9	1.0-5.0	.32	.32			
	34-80	40-55	1.30-1.55	0.06-0.2	0.12-0.18	6.0-8.9	1.0-3.0	.32	.32			
Ozona	0-16	18-40	1.15-1.25	0.2-0.6	0.15-0.22	3.0-5.9	1.0-3.0	.32	.32	1	4	86
	16-24	---	---	0.00-0.06	---	---	---	---	---			
	24-80	20-35	1.35-1.55	0.6-2	0.06-0.10	0.0-2.9	0.2-0.5	.20	.32			
TRD:												
Tarrant	0-8	40-60	1.10-1.40	0.2-0.6	0.05-0.10	3.0-5.9	2.0-7.0	.10	.32	1	8	0
	8-30	---	---	0.00-0.06	---	---	---	---	---			
Rock outcrop	0-80	---	---	0.06-20	---	---	---	---	---	--	---	---
TRG:												
Tarrant	0-13	40-60	1.10-1.40	0.2-0.6	0.05-0.10	3.0-5.9	2.0-7.0	.15	.32	1	8	0
	13-80	---	---	0.00-0.06	---	---	---	---	---			
Rock outcrop	0-80	---	---	0.06-20	---	---	---	---	---	--	---	---
TsB:												
Tobosa	0-15	40-60	1.35-1.40	0.00-0.06	0.12-0.18	9.0-25.0	1.0-4.0	.32	.32	5	4	86
	15-48	35-60	1.35-1.40	0.00-0.06	0.10-0.18	9.0-25.0	0.1-0.5	.32	.32			
	48-80	40-60	1.35-1.40	0.00-0.06	0.10-0.16	6.0-8.9	0.1-1.0	.32	.32			

Table 19.—Physical Soil Properties—Continued

Map symbol and soil name	Depth	Clay	Moist bulk density	Permeability (Ksat)	Available water capacity	Linear extensibility	Organic matter	Erosion factors			Wind erodibility group	Wind erodibility index
								Kw	Kf	T		
	In	Pct	g/cc	In/hr	In/in	Pct	Pct					
UpD:												
Upton	0-14	10-30	1.30-1.50	0.6-2	0.08-0.14	0.0-2.9	1.0-3.0	.15	.28	2	8	0
	14-20	---	---	0.00-0.06	---	---	0.1-1.0	---	---			
	20-80	20-35	1.35-1.55	0.6-2	0.06-0.10	0.0-2.9	0.2-0.5	.20	.32			
W:												
Water	---	---	---	---	---	---	---	---	---	--	---	---
WkB:												
Wickett	0-9	5-12	1.40-1.60	6-20	0.06-0.10	0.0-2.9	0.0-1.0	.17	.17	2	2	134
	9-31	8-18	1.35-1.65	2-6	0.10-0.15	0.0-2.9	0.0-0.5	.20	.20			
	31-34	---	---	0.00-0.06	---	---	---	---	---			
	34-80	5-18	1.40-1.80	2-6	0.02-0.05	0.0-2.9	0.1-0.5	.20	.20			

Table 20.—Chemical Soil Properties

(Absence of an entry indicates that data were not estimated.)

Map symbol and soil name	Depth	Cation exchange capacity	Soil reaction	Calcium carbonate	Gypsum	Salinity	Sodium adsorption ratio
	Inches	meq/100 g	pH	Pct	Pct	dS/m	
AnB:							
Angelo	0-16	25-55	7.9-8.4	5-10	0	0.0-2.0	0
	16-25	10-20	7.9-8.4	15-60	0	0.0-2.0	0
	25-80	10-20	7.9-8.4	15-60	0	0.0-2.0	0
ANS:							
Area not surveyed	---	---	---	---	---	---	---
BkB:							
Blakeney	0-16	5.0-20	7.9-8.4	5-20	0	0.0-2.0	0
	16-24	---	---	---	---	---	---
	24-80	5.0-15	7.9-8.4	35-70	0	0.0-2.0	0
CoC:							
Conger	0-6	10-20	7.9-8.4	5-20	0	0.0-2.0	0
	6-13	5.0-15	7.9-8.4	40-60	0	0	0
	13-21	---	---	---	---	---	---
	21-80	5.0-15	7.9-8.4	35-70	0	0.0-2.0	0
DAM:							
Dams	---	---	---	---	---	---	---
DvB:							
Dev	0-8	5.0-25	7.4-8.4	20-90	0	0	0
	8-38	2.0-15	7.4-8.4	40-90	0	0	0
	38-80	5.0-25	7.4-8.4	20-90	0	0	0
ERD:							
Ector	0-5	10-20	7.9-8.4	40-60	0	0	0
	5-8	10-20	7.9-8.4	40-60	0	0.0-2.0	0
	8-30	---	---	---	---	---	---
Rock outcrop	0-80	---	---	---	---	---	---
ERG:							
Ector	0-18	10-20	7.9-8.4	40-60	0	0.0-2.0	0
	18-30	---	---	---	---	---	---
Rock outcrop	0-80	---	---	---	---	---	---
HaB:							
Harkey	0-6	8.0-20	7.4-8.4	5-10	0	0.0-4.0	0-4
	6-60	6.0-15	7.4-8.4	10-15	0	0.0-4.0	0-4
HRA:							
Harkey	0-14	8.8-15	8.5-9.0	5-15	0	4.0-16.0	0
	14-80	8.6-15	8.5-9.0	10-20	0	4.0-16.0	0
Patrole	0-28	20-30	7.9-8.4	5-15	5-15	2.0-16.0	0
	28-80	25-35	7.9-8.4	10-20	10-20	4.0-16.0	0
IDB:							
Iraan	0-24	15-35	7.9-8.4	5-30	0	0.0-2.0	0
	24-80	15-35	7.9-8.4	5-30	0	0.0-2.0	0
Dev	0-8	5.0-25	7.4-8.4	20-90	0	0	0
	8-38	2.0-15	7.4-8.4	40-90	0	0	0
	38-80	5.0-25	7.4-8.4	20-90	0	0	0

Table 20.—Chemical Soil Properties—Continued

Map symbol and soil name	Depth	Cation exchange capacity	Soil reaction	Calcium carbonate	Gypsum	Salinity	Sodium adsorption ratio
	Inches	meq/100 g	pH	Pct	Pct	dS/m	
InB:							
Iraan	0-42	15-35	7.9-8.4	2-5	0	0.0-2.0	0
	42-80	15-35	7.9-8.4	5-30	0	0.0-2.0	0
IrA:							
Irion	0-14	30-50	6.6-8.4	1-10	0	0.0-2.0	0
	14-54	30-50	6.6-8.4	1-10	0	0.0-2.0	0
	54-72	30-50	7.4-8.4	2-15	0	0.0-2.0	0
	72-80	---	---	---	---	---	---
IsA:							
Irion	0-14	30-50	7.4-8.4	1-10	0	0.0-2.0	0
	14-63	30-50	7.4-8.4	1-10	0	0.0-2.0	0
	63-80	---	---	---	---	---	---
KiB:							
Kinco	0-10	10-25	7.9-8.4	5-15	0	0	0
	10-29	10-25	7.9-8.4	5-15	0	0	0
	29-80	10-25	7.9-8.4	5-15	0	0	0
Ima	0-18	5.0-10	7.4-7.8	2-10	0	0.0-1.0	0-4
	18-50	5.0-10	7.4-8.4	5-15	0	0.0-2.0	0-1
	50-80	5.0-10	7.4-9.0	5-15	0	0.0-1.0	0-4
LRD:							
Lozier	0-9	5.0-20	7.9-8.4	40-70	0	0.0-2.0	0
	9-35	---	---	---	---	---	---
Rock outcrop	0-80	---	---	---	---	---	---
LRG:							
Lozier	0-13	5.0-20	7.9-8.4	40-70	0	0	0
	13-35	---	---	---	---	---	---
Rock outcrop	0-80	---	---	---	---	---	---
M-W:							
Water, miscellaneous	---	---	---	---	---	---	---
MaD:							
Mailtrail	0-5	20-40	7.4-8.4	35-60	0	0.0-2.0	0
	5-12	20-40	7.4-8.4	40-60	0	0.0-2.0	0
	12-16	---	7.9-8.4	50-95	0	0	0
	16-80	5.0-15	7.9-8.4	35-70	0	0.0-2.0	0
NoD:							
Noelke	0-10	5.0-20	7.9-8.4	10-30	0	0.0-2.0	0
	10-16	---	---	---	---	---	---
	16-80	---	---	---	---	---	---
Ector	0-11	20-40	7.4-8.4	40-60	0	0.0-2.0	0
	11-30	---	---	---	---	---	---

Table 20.—Chemical Soil Properties—Continued

Map symbol and soil name	Depth	Cation exchange capacity	Soil reaction	Calcium carbonate	Gypsum	Salinity	Sodium adsorption ratio
	Inches	meq/100 g	pH	Pct	Pct	dS/m	
OaC:							
Ozona	0-18	20-40	7.9-8.4	5-15	0	0	0
	18-24	---	---	---	---	---	---
	24-80	5.0-15	7.9-8.4	35-70	0	0.0-2.0	0
Tarrant	0-16	32-60	7.4-8.4	10-40	0	0.0-2.0	0
	16-24	---	---	---	---	---	---
PaD:							
Paisano	0-3	5.0-15	7.9-8.4	15-40	0	0.0-2.0	0
	3-8	5.0-15	7.9-8.4	15-40	0	0.0-2.0	0
	8-17	---	---	---	---	---	---
	17-80	5.0-10	7.9-8.4	40-75	0	0.0-2.0	0-3
PdB:							
Pandale	0-16	10-20	7.9-8.4	40-60	0	0.0-4.0	0
	16-80	10-20	7.9-8.4	40-60	0	0.0-4.0	0
PoC:							
Pandale	0-6	10-20	7.9-8.4	40-60	0	0.0-4.0	0
	6-80	10-20	7.9-8.4	40-60	0	0.0-4.0	0
Upton	0-8	5.0-15	7.9-8.4	40-60	0	0	0
	8-14	---	---	---	---	---	---
	14-80	5.0-15	7.9-8.4	40-75	0	0	0
RaB:							
Reagan	0-8	10-20	7.9-8.4	15-25	0	0.0-2.0	0
	8-20	10-20	7.9-8.4	20-30	0	0.0-4.0	0-1
	20-80	5.0-15	7.9-8.4	15-35	0	0.0-4.0	1-15
RdB:							
Rio Diablo	0-10	12-35	7.4-8.4	10-30	0	0.0-2.0	0
	10-33	30-50	7.4-8.4	1-20	0	0.0-2.0	0
	33-80	30-50	7.4-8.4	1-20	0	0.0-2.0	0
RoB:							
Rioconcho	0-24	25-35	7.9-8.4	10-20	10-20	4.0-16.0	0
	24-80	30-50	7.4-8.4	1-20	0	0.0-2.0	0
RVB:							
Riverwash	0-60	0.0-0.0	7.9-8.4	0	0	0	0-2
Dev	0-7	5.0-25	7.4-8.4	20-90	0	0	0
	7-47	2.0-15	7.4-8.4	40-90	0	0	0
	47-80	5.0-25	7.4-8.4	20-90	0	0	0
SuD:							
Sanderson	0-7	10-20	7.9-8.4	40-60	0	0.0-4.0	0
	7-80	2.0-15	7.4-8.4	40-90	0	0	0
Upton	0-8	5.0-15	7.9-8.4	40-60	0	0	0
	8-20	---	---	---	---	---	---
	20-80	5.0-15	7.9-8.4	40-75	0	0	0

Table 20.—Chemical Soil Properties—Continued

Map symbol and soil name	Depth	Cation exchange capacity	Soil reaction	Calcium carbonate	Gypsum	Salinity	Sodium adsorption ratio
	Inches	meq/100 g	pH	Pct	Pct	dS/m	
ToB:							
Texon	0-2	20-30	7.9-8.4	5-15	5-15	2.0-16.0	0
	2-34	20-45	7.4-8.4	3-15	0	0.0-2.0	0
	34-80	30-50	6.6-8.4	1-10	0	0.0-2.0	0
Ozona	0-16	15-35	7.9-8.4	2-5	0	0.0-2.0	0
	16-24	---	---	---	---	---	---
	24-80	5.0-15	7.9-8.4	35-70	0	0.0-2.0	0
TRD:							
Tarrant	0-8	32-60	7.4-8.4	10-40	0	0.0-2.0	0
	8-30	---	---	---	---	---	---
Rock outcrop	0-80	---	---	---	---	---	---
TRG:							
Tarrant	0-13	32-60	7.4-8.4	10-40	0	0.0-2.0	0
	13-80	---	---	---	---	---	---
Rock outcrop	0-80	---	---	---	---	---	---
TsB:							
Tobosa	0-15	35-50	7.4-8.4	0-10	0	0.0-2.0	0-8
	15-48	30-50	7.9-8.4	2-15	0	0.0-2.0	0-10
	48-80	35-50	7.9-8.4	2-45	0	0.0-2.0	0-15
UpD:							
Upton	0-14	5.0-15	7.9-8.4	40-60	0	0	0
	14-20	---	---	---	---	---	---
	20-80	5.0-15	7.9-8.4	35-70	0	0.0-2.0	0
W:							
Water	---	---	---	---	---	---	---
WkB:							
Wickett	0-9	1.0-5.0	6.6-7.8	0	0	0.0-2.0	0
	9-31	2.0-10	7.4-8.4	0-5	0	0.0-2.0	0
	31-34	---	---	---	---	---	---
	34-80	2.0-10	7.9-8.4	40-85	0	0.0-2.0	0

Table 21.—Water Features

(Depths of layers are in feet. See text for definitions of terms used in this table. Estimates of the frequency of ponding and flooding apply to the whole year rather than to individual months. Absence of an entry indicates that the feature is not a concern or that data were not estimated.)

Map symbol and soil name	Hydrologic group	Surface runoff	Month	Water table		Ponding			Flooding	
				Upper limit	Lower limit	Surface water depth	Duration	Frequency	Duration	Frequency
				Ft	Ft	Ft				
AnB:										
Angelo	C	Low								
			Jan-Dec	---	---	---	---	None	---	None
ANS:										
Area not surveyed	---	---								
			Jan-Dec	---	---	---	---	None	---	---
BkB:										
Blakeney	C	Medium								
			Jan-Dec	---	---	---	---	None	---	None
CoC:										
Conger	D	---								
			Jan-Dec	---	---	---	---	None	---	None
DAM:										
Dams	---	---								
			Jan-Dec	---	---	---	---	None	---	---
DvB:										
Dev	A	---								
			April	---	---	---	---	None	Brief	Frequent
			May	---	---	---	---	None	Brief	Frequent
			June	---	---	---	---	None	Brief	Frequent
			July	---	---	---	---	None	Brief	Frequent
			August	---	---	---	---	None	Brief	Frequent
			September	---	---	---	---	None	Brief	Frequent
ERD:										
Ector	D	---								
			Jan-Dec	---	---	---	---	None	---	None
Rock outcrop	D	---								
			Jan-Dec	---	---	---	---	None	---	None

Table 21.—Water Features—Continued

Map symbol and soil name	Hydrologic group	Surface runoff	Month	Water table		Ponding			Flooding	
				Upper limit	Lower limit	Surface water depth	Duration	Frequency	Duration	Frequency
				Ft	Ft	Ft				
ERG:										
Ector	D	---								
			Jan-Dec	---	---	---	---	None	---	None
Rock outcrop	D	---								
			Jan-Dec	---	---	---	---	None	---	None
HaB:										
Harkey	B	---								
			Jan-Dec	---	---	---	---	None	---	Rare
HRA:										
Harkey	B	---								
			Jan-Dec	---	---	---	---	None	---	Rare
Patrole	C	---								
			Jan-Dec	---	---	---	---	None	---	Rare
IDB:										
Iraan	B	---								
			May	---	---	---	---	None	Very brief	Occasional
			June	---	---	---	---	None	Very brief	Occasional
			July	---	---	---	---	None	Very brief	Occasional
			August	---	---	---	---	None	Very brief	Occasional
			September	---	---	---	---	None	Very brief	Occasional
			October	---	---	---	---	None	Very brief	Occasional
Dev	A	---								
			April	---	---	---	---	None	Brief	Frequent
			May	---	---	---	---	None	Brief	Frequent
			June	---	---	---	---	None	Brief	Frequent
			July	---	---	---	---	None	Brief	Frequent
			August	---	---	---	---	None	Brief	Frequent
			September	---	---	---	---	None	Brief	Frequent

Table 21.—Water Features—Continued

Map symbol and soil name	Hydrologic group	Surface runoff	Month	Water table		Ponding			Flooding	
				Upper limit	Lower limit	Surface water depth	Duration	Frequency	Duration	Frequency
				Ft	Ft	Ft				
InB:										
Iraan	B	---								
			May	---	---	---	---	None	Very brief	Occasional
			June	---	---	---	---	None	Very brief	Occasional
			July	---	---	---	---	None	Very brief	Occasional
			August	---	---	---	---	None	Very brief	Occasional
			September	---	---	---	---	None	Very brief	Occasional
			October	---	---	---	---	None	Very brief	Occasional
IrA:										
Irion	D	---								
			Jan-Apr	---	---	---	---	None	---	None
			May-Nov	---	---	0.0-6.0	Long	Occasional	---	None
			December	---	---	---	---	None	---	None
IsA:										
Irion	D	---								
			Jan-Apr	---	---	---	---	None	---	None
			May-Nov	---	---	0.0-6.0	Long	Occasional	---	None
			December	---	---	---	---	None	---	None
KiB:										
Kinco	A	---								
			Jan-Dec	---	---	---	---	None	---	None
Ima	A	---								
			Jan-Dec	---	---	---	---	None	---	---
LRD:										
Lozier	D	---								
			Jan-Dec	---	---	---	---	None	---	None
Rock outcrop	D	---								
			Jan-Dec	---	---	---	---	None	---	None

Table 21.—Water Features—Continued

Map symbol and soil name	Hydrologic group	Surface runoff	Month	Water table		Ponding			Flooding	
				Upper limit	Lower limit	Surface water depth	Duration	Frequency	Duration	Frequency
				Ft	Ft	Ft				
LRG:										
Lozier	D	---	Jan-Dec	---	---	---	---	None	---	None
Rock outcrop	D	---	Jan-Dec	---	---	---	---	None	---	None
M-W:										
Water, miscellaneous	---	---	Jan-Dec	---	---	---	---	None	---	---
MaD:										
Mailtrail	C	---	Jan-Dec	---	---	---	---	None	---	None
NoD:										
Noelke	D	---	Jan-Dec	---	---	---	---	None	---	None
Ector	D	---	Jan-Dec	---	---	---	---	None	---	None
OaC:										
Ozona	D	---	Jan-Dec	---	---	---	---	None	---	None
Tarrant	D	---	Jan-Dec	---	---	---	---	None	---	None
PaD:										
Paisano	D	---	Jan-Dec	---	---	---	---	None	---	None
PdB:										
Pandale	B	---	Jan-Dec	---	---	---	---	None	---	None

Table 21.—Water Features—Continued

Map symbol and soil name	Hydrologic group	Surface runoff	Month	Water table		Ponding			Flooding	
				Upper limit	Lower limit	Surface water depth	Duration	Frequency	Duration	Frequency
				Ft	Ft	Ft				
PoC:										
Pandale	B	---								
			Jan-Dec	---	---	---	---	None	---	None
Upton	C	---								
			Jan-Dec	---	---	---	---	None	---	None
RaB:										
Reagan	B	---								
			Jan-Dec	---	---	---	---	None	---	None
RdB:										
Rio Diablo	C	---								
			Jan-Dec	---	---	---	---	None	---	Rare
RoB:										
Rioconcho	C	---								
			April	---	---	---	---	None	Brief	Occasional
			May	---	---	---	---	None	Brief	Occasional
			June	---	---	---	---	None	Brief	Occasional
RVB:										
Riverwash	A	---								
			May	---	---	---	---	None	Brief	Frequent
			June	---	---	---	---	None	Brief	Frequent
			July	---	---	---	---	None	Brief	Frequent
			August	---	---	---	---	None	Brief	Frequent
			September	---	---	---	---	None	Brief	Frequent
Dev	A	---								
			April	---	---	---	---	None	Brief	Frequent
			May	---	---	---	---	None	Brief	Frequent
			June	---	---	---	---	None	Brief	Frequent
			July	---	---	---	---	None	Brief	Frequent
			August	---	---	---	---	None	Brief	Frequent
			September	---	---	---	---	None	Brief	Frequent

Table 21.—Water Features—Continued

Map symbol and soil name	Hydrologic group	Surface runoff	Month	Water table		Ponding			Flooding	
				Upper limit	Lower limit	Surface water depth	Duration	Frequency	Duration	Frequency
				Ft	Ft	Ft				
SuD:										
Sanderson	B	---	Jan-Dec	---	---	---	---	None	---	None
Upton	C	---	Jan-Dec	---	---	---	---	None	---	None
ToB:										
Texon	C	---	Jan-Dec	---	---	---	---	None	---	None
Ozona	D	---	Jan-Dec	---	---	---	---	None	---	None
TRD:										
Tarrant	D	---	Jan-Dec	---	---	---	---	None	---	None
Rock outcrop	D	---	Jan-Dec	---	---	---	---	None	---	None
TRG:										
Tarrant	D	---	Jan-Dec	---	---	---	---	None	---	None
Rock outcrop	D	---	Jan-Dec	---	---	---	---	None	---	None
TsB:										
Tobosa	D	---	Jan-Dec	---	---	---	---	None	---	None
UpD:										
Upton	C	---	Jan-Dec	---	---	---	---	None	---	None

Table 21.—Water Features—Continued

Map symbol and soil name	Hydrologic group	Surface runoff	Month	Water table		Ponding			Flooding	
				Upper limit	Lower limit	Surface water depth	Duration	Frequency	Duration	Frequency
				Ft	Ft	Ft				
W:										
Water	---	---								
			Jan-Dec	---	---	---	---	None	---	---
WkB:										
Wickett	C	---								
			Jan-Dec	---	---	---	---	None	---	None

Table 22.—Soil Features

(See text for definitions of terms used in this table. Absence of an entry indicates that the feature is not a concern or that data were not estimated.)

Map symbol and soil name	Restrictive layer				Risk of corrosion	
	Kind	Depth to top	Thickness	Hardness	Uncoated steel	Concrete
		In	In			
AnB:						
Angelo	---	---	---	---	High	Low
ANS:						
Area not surveyed	---	---	---	---	---	---
BkB:						
Blakeney	Petrocalcic	6-20	4-9	Strongly cemented	Moderate	Low
CoC:						
Conger	Petrocalcic	8-20	3-10	Indurated	Moderate	Low
DAM:						
Dams	---	---	---	---	---	---
DvB:						
Dev	---	---	---	---	Moderate	Low
ERD:						
Ector	Lithic bedrock	6-20	---	Indurated	High	Low
Rock outcrop	Lithic bedrock	0-2	---	Indurated	High	Low
ERG:						
Ector	Lithic bedrock	6-20	---	Indurated	High	Low
Rock outcrop	Lithic bedrock	0-2	---	Indurated	High	Low
HaB:						
Harkey	---	---	---	---	High	Low
HRA:						
Harkey	---	---	---	---	High	Low
Patrole	---	---	---	---	High	Low
IDB:						
Iraan	---	---	---	---	High	Low
Dev	---	---	---	---	Moderate	Low
InB:						
Iraan	---	---	---	---	High	Low
IrA:						
Irion	Lithic bedrock	60-80	---	Indurated	Low	Low
IsA:						
Irion	Lithic bedrock	63-80	---	Indurated	Low	Low
KiB:						
Kinco	---	---	---	---	Moderate	Low
Ima	---	---	---	---	Moderate	Low

Table 22.—Soil Features—Continued

Map symbol and soil name	Restrictive layer				Risk of corrosion	
	Kind	Depth to top	Thickness	Hardness	Uncoated steel	Concrete
		In	In			
LRD:						
Lozier	Lithic bedrock	4-20	---	Indurated	High	Low
Rock outcrop	Lithic bedrock	0-2	---	Indurated	High	Low
LRG:						
Lozier	Lithic bedrock	4-20	---	Indurated	High	Low
Rock outcrop	Lithic bedrock	0-2	---	Indurated	High	Low
M-W:						
Water, miscellaneous	---	---	---	---	---	---
MaD:						
Mailtrail	Petrocalcic	4-20	4-15	Indurated	High	Low
NoD:						
Noelke	Petrocalcic	6-20	2-11	Strongly cemented	Moderate	Low
	Lithic bedrock	12-20	---	Indurated		
Ector	Lithic bedrock	4-20	---	Indurated	High	Low
OaC:						
Ozona	Petrocalcic	4-20	4-17	Indurated	High	Low
Tarrant	Lithic bedrock	6-20	---	Indurated	High	Low
PaD:						
Paisano	Petrocalcic	7-14	4-17	Indurated	Moderate	Low
PdB:						
Pandale	---	---	---	---	Moderate	Low
PoC:						
Pandale	---	---	---	---	High	Low
Upton	Petrocalcic	7-20	3-7	Strongly cemented	High	Low
RaB:						
Reagan	---	---	---	---	High	Low
RdB:						
Rio Diablo	---	---	---	---	High	Low
RoB:						
Rioconcho	---	---	---	---	High	Low
RVB:						
Riverwash	---	---	---	---	Low	Low
Dev	---	---	---	---	Moderate	Low
SuD:						
Sanderson	---	---	---	---	Moderate	Low
Upton	Petrocalcic	7-20	3-7	Indurated	High	Low

Table 22.—Soil Features—Continued

Map symbol and soil name	Restrictive layer				Risk of corrosion	
	Kind	Depth to top	Thickness	Hardness	Uncoated steel	Concrete
		In	In			
ToB:						
Texon	---	---	---	---	High	Low
Ozona	Petrocalcic	6-20	4-17	Indurated	High	Low
TRD:						
Tarrant	Lithic bedrock	4-20	---	Indurated	High	Low
Rock outcrop	Lithic bedrock	0-2	---	Indurated	High	Low
TRG:						
Tarrant	Lithic bedrock	4-20	---	Indurated	High	Low
Rock outcrop	Lithic bedrock	0-2	---	Indurated	High	Low
TsB:						
Tobosa	---	---	---	---	High	Low
UpD:						
Upton	Petrocalcic	7-20	3-7	Indurated	High	Low
W:						
Water	---	---	---	---	---	---
WkB:						
Wickett	Petrocalcic	20-40	3-7	Indurated	Low	Low

Table 23.—Physical Analyses of Selected Soils

(Dashes indicate that data were not available. TR means trace amounts)

Soil series and sample numbers	Depth	Horizon	Particle size distribution (Percent less than 2 mm)								COLE	Bulk Density (1/3 bar)	Water content	
			Sand						Silt (0.05 - 0.002)	Clay (<0.002)			1/3 bar	15 bar
			Very Coarse (2.0 - 1.0)	Coarse (1.0 - 0.5)	Medium (0.5 - 0.25)	Fine (0.25 - 0.10)	Very Fine (0.10 - 0.05)	Total (2.0 - 0.05)						
	in		Percent (wt)								Cm/cm	G/cc	Percent (wt)	
Ozona	0-2	A1	0.3	0.9	1.7	4.2	15.5	22.6	58.7	18.7	--	--	--	--
S96TX-105-001	2-10	A2	0.3	0.7	1.0	1.9	10.2	14.1	46.9	39.0	0.115	1.14	38.5	--
	10-16	Bk	0.5	0.5	0.7	1.5	7.4	10.6	42.4	47.0	0.113	1.13	41.8	--
	16-24	Bkm	6.1	7.7	7.2	7.4	6.7	35.1	33.1	31.8	0.008	1.70	18.6	--
	24-80	BCk	0.5	0.9	1.6	3.5	4.1	10.6	45.5	43.9	0.023	1.25	31.9	--
Pandale	0-5	A1	1.3	1.4	1.4	1.8	13.1	19.0	61.1	19.9	0.048	1.19	39.3	--
S96TX-105-003	5-14	A2	0.9	1.0	1.2	1.2	10.0	14.3	52.7	33.0	0.057	1.11	44.2	--
	14-21	Bw	1.2	0.9	0.8	0.9	9.1	12.9	50.9	36.2	0.054	1.06	39.9	--
	21-31	Bk1	1.2	0.9	0.7	1.0	9.0	12.8	48.3	38.9	0.065	1.11	28.9	--
	31-51	Bk2	1.2	0.6	0.7	1.0	9.8	13.3	47.6	39.1	0.051	1.17	34.4	--
	51-75	Bk3	0.7	0.7	0.6	1.0	11.2	14.2	48.8	37.0	0.056	1.12	35.1	--
	75-80	Bk4	1.1	0.9	1.0	1.1	9.2	13.3	47.6	39.1	0.062	1.11	33.2	--
Texon	0-2	A1	0.2	0.6	1.1	1.3	8.5	11.7	65.4	22.9	--	--	--	--
S96TX-105-002	2-9	A2	0.1	0.5	0.6	1.1	9.1	11.4	44.4	44.2	0.143	0.93	57.3	--
	9-18	Bss1	0.2	0.3	0.5	1.3	8.6	10.9	41.6	47.5	0.101	1.29	31.6	--
	18-24	Bss2	0.3	0.3	0.6	1.5	8.0	10.7	39.7	49.6	0.104	1.22	40.9	--
	24-34	Bkss	0.4	0.8	0.9	1.6	7.9	11.6	39.8	48.6	0.086	1.10	39.4	--
	34-46	Bk	1.0	0.6	0.8	1.9	8.1	12.4	39.5	48.1	--	--	--	--
	46-80	BCk	2.5	2.8	2.8	5.0	7.2	20.3	37.4	42.3	--	--	--	--
Tobosa	0-2	A1	0.0	0.3	0.9	0.4	3.3	4.9	64.0	31.1	0.098	1.02	41.1	--
S84TX-105-003	2-10	A2	0.1	0.1	0.1	0.4	1.8	2.5	35.7	61.8	0.118	1.16	37.4	--
	10-20	Bw1	0.0	0.1	0.1	0.2	1.1	1.5	35.2	63.3	0.131	1.21	38.5	--
	20-30	Bw2	0.0	0.1	0.1	0.3	1.9	2.4	34.1	63.5	0.130	1.20	37.1	--
	30-39	Bk1	0.1	0.1	0.1	0.3	2.2	2.8	34.4	62.8	0.133	1.17	38.5	--
	39-47	Bk2	0.2	0.1	0.1	0.3	2.3	3.0	32.1	64.9	0.129	1.16	40.4	--
	47+	R	--	--	--	--	--	--	--	--	--	--	--	--
Upton	0-7	A	4.4	3.8	7.8	22.8	17.2	56.0	32.9	11.1	--	--	--	7.7
S92TX-105-001	7-11	Bk	4.7	4.2	9.2	21.1	16.6	55.8	32.7	11.5	--	--	--	7.5

Table 24.--Chemical Analysis of Selected Samples

(Dashes indicate that data were not available. TR means trace amounts)

Soil name and sample number	Depth	Horizon	Extractable bases				Cation exchange capacity	Base saturation	Reaction 1:1 soil: water	Organic carbon	Electrical conductivity	Sodium absorption (SAR)
			Ca	Mg	K	Na						
	in		(milliequivalents per 100 grams of soil)					Percent	pH	Percent	mmhos/cm	
Ozona	0-2	A1	67.9	2.0	2.5	0.5	42.5	100	7.9	2.32	0.5	0
S96TX-105-001	2-10	A2	66.5	1.3	1.6	0.6	41.9	100	7.9	1.62	0.5	0
	10-16	Bk	67.0	0.9	0.9	0.7	39.7	100	8.1	1.26	0.3	0
	16-24	Bkm	43.2	0.5	0.4	0.5	15.5	100	8.4	0.67	--	--
	24-80	BCk	49.2	0.6	0.3	0.6	14.8	100	8.4	0.47	--	--
Pandale	0-5	A1	54.0	0.2	1.3	0.1	30.8	100	8.1	1.48	--	--
S96TX-105-003	5-14	A2	61.1	0.2	0.7	0.1	34.9	100	8.1	1.17	--	--
	14-21	Bw	60.7	0.2	0.6	0.1	32.4	100	8.1	1.25	--	--
	21-31	Bk1	65.0	0.2	0.5	0.2	29.1	100	8.1	0.69	0.4	1
	31-51	Bk2	60.1	0.2	0.5	0.3	29.3	100	8.0	0.49	1.1	1
	51-75	Bk3	62.4	0.3	0.5	0.3	29.1	100	8.1	0.49	0.7	1
	75-80	Bk4	55.7	0.3	0.5	0.3	26.3	100	8.2	0.31	0.4	1
Texon	0-2	A1	65.8	2.0	2.3	0.6	41.6	100	8.1	2.16	0.4	0
S96TX-105-002	2-9	A2	90.9	1.9	1.5	0.4	42.0	100	8.0	1.59	0.3	1
	9-18	Bss1	69.0	1.6	1.2	0.8	41.3	100	8.1	1.35	0.3	1
	18-24	Bss2	68.1	1.8	1.0	1.4	39.0	100	8.2	0.78	0.3	1
	24-34	Bkss	55.4	0.2	0.7	0.6	38.1	100	8.3	0.47	0.3	2
	34-46	Bk	55.2	0.2	0.6	0.9	35.2	100	8.3	0.47	0.5	2
	46-80	BCk	49.9	0.1	0.2	0.6	20.0	100	8.2	0.59	0.8	3
Tobosa	0-2	A1	34.7	2.1	4.6	0.1	44.5	93	7.4	3.20	--	--
S84TX-105-003	2-10	A2	44.2	1.4	3.2	0.3	43.1	100	7.7	1.44	--	--
	10-20	Bw1	41.0	1.7	1.7	1.6	44.4	100	7.9	1.01	--	--
	20-30	Bw2	43.3	1.9	1.7	2.5	42.4	100	8.0	0.93	0.5	6
	30-39	Bk1	45.9	1.6	1.8	3.3	41.3	100	7.9	0.72	0.7	10
	39-47	Bk2	59.0	1.5	1.6	3.2	41.8	100	7.9	0.53	0.9	10
	47+	R	--	--	--	--	--	--	--	--	--	--
Upton	0-7	A	--	--	--	--	--	--	8.0	1.03	--	--
S92TX-105-001	7-11	Bk	--	--	--	--	--	--	8.0	0.97	--	--

Table 25.--Clay Mineralogy of Selected Soils

(Dashes indicate none was detected)

Soil name and sample number	Depth (in)	Horizon	Percentage of Clay minerals X-ray diffraction (<2 microns)					
			Montmorillonite	Mica	Kaolinite	Quartz	Calcite	Vermiculite
Tobosa	0-2	A1	>50	10-50	10-50	10-50	--	--
S84TX-105-003	2-10	A2						
	10-20	Bw1	>50	10-50	10-50	10-50	--	--
	20-30	Bw2						
	30-39	Bk1						
	39-47	Bk2	>50	10-50	10-50	10-50	--	--
	47+	R						

Table 26.—Taxonomic Classification of the Soils

(An asterisk in the first column indicates a taxadjunct to the series. See text for a description of those characteristics that are outside the range of the series.)

Soil name	Family or higher taxonomic class
Angelo	Fine-silty, mixed, superactive, thermic Aridic Calciustolls
Blakeney	Loamy, mixed, superactive, thermic, shallow Ustic Petrocalcids
Conger	Loamy, mixed, superactive, thermic, shallow Ustic Petrocalcids
Dev	Loamy-skeletal, carbonatic, thermic Cumulic Haplustolls
Ector	Loamy-skeletal, carbonatic, thermic Lithic Calciustolls
Harkey	Coarse-silty, mixed, superactive, calcareous, thermic Typic Torrifluvents
Ima	Coarse-loamy, mixed, superactive, thermic Ustic Haplocambids
Iraan	Fine-silty, mixed, superactive, thermic Cumulic Haplustolls
Irion	Fine, smectitic, thermic Typic Haplusterts
Kinco	Coarse-loamy, mixed, superactive, thermic Ustic Haplocalcids
Lozier	Loamy-skeletal, carbonatic, thermic Lithic Haplocalcids
Mailtrail	Loamy-skeletal, carbonatic, thermic, shallow Petrocalcic Calciustolls
Noelke	Loamy-skeletal, mixed, superactive, thermic Lithic Petrocalcic Calciustolls
Ozona	Loamy, mixed, superactive, thermic, shallow Petrocalcic Calciustolls
Paisano	Loamy-skeletal, carbonatic, thermic, shallow Calcic Petrocalcids
Pandale	Fine-loamy, mixed, superactive, thermic Ustic Haplocalcids
Patrole	Fine-silty over clayey, mixed, superactive, calcareous, thermic Typic Torrifluvents
Reagan	Fine-silty, mixed, superactive, thermic Ustic Haplocalcids
Rio Diablo	Fine, mixed, superactive, thermic Aridic Haplustolls
Rioconcho	Fine, mixed, superactive, thermic Vertic Haplustolls
Sanderson	Loamy-skeletal, carbonatic, thermic Ustic Haplocambids
Tarrant	Clayey-skeletal, smectitic, thermic Lithic Calciustolls
Texon	Fine, smectitic, thermic Torrertic Calciustolls
Tobosa	Fine, smectitic, thermic Aridic Haplusterts
Upton	Loamy, carbonatic, thermic, shallow Calcic Petrocalcids
Wickett	Coarse-loamy, siliceous, superactive, thermic Ustalfic Petrocalcids

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