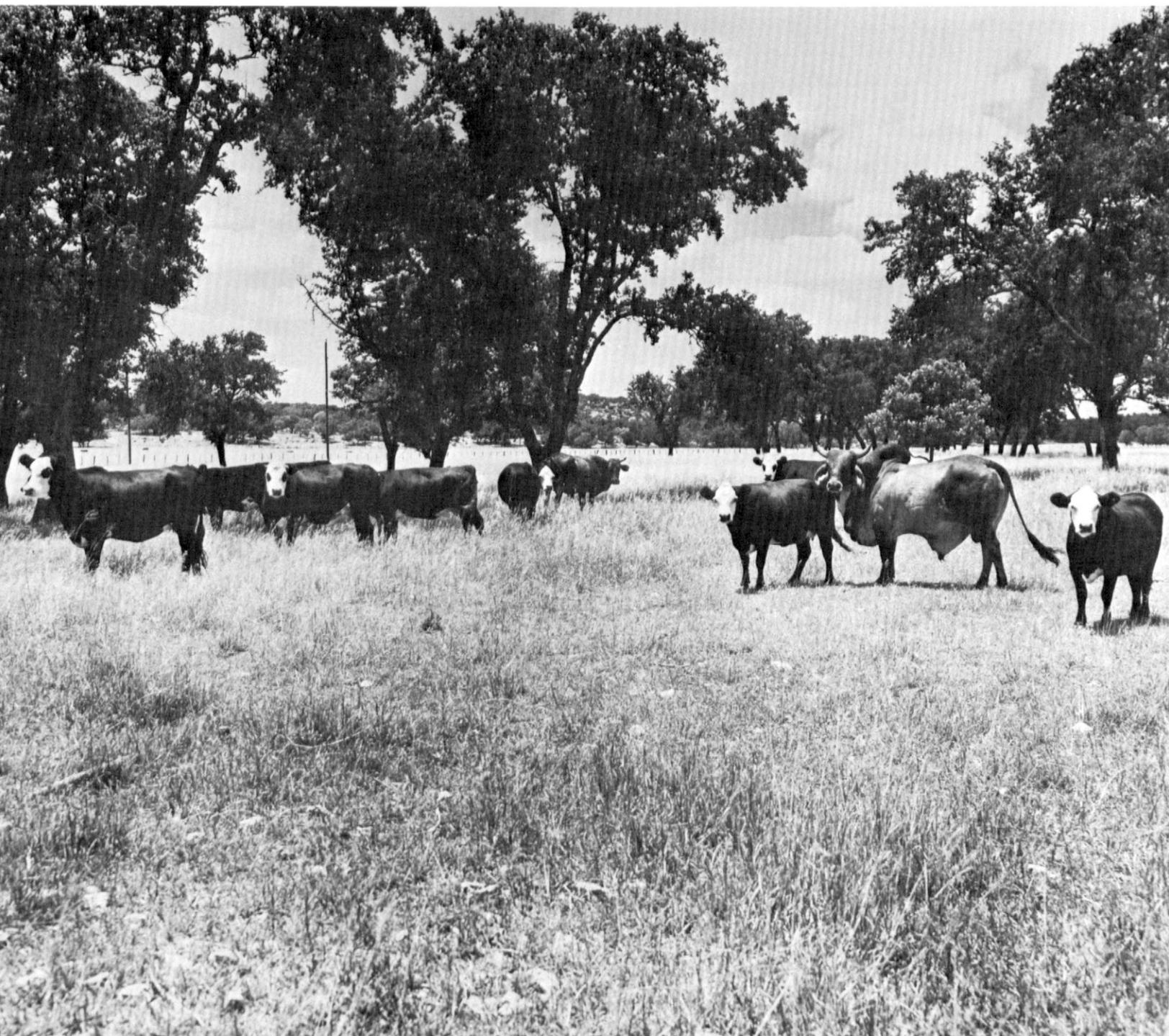


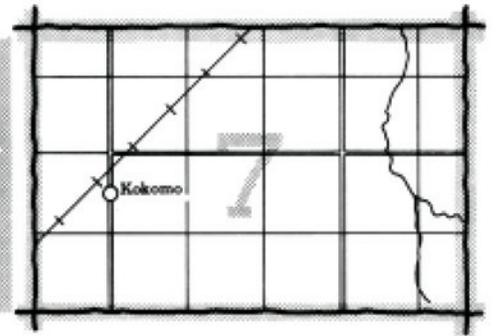
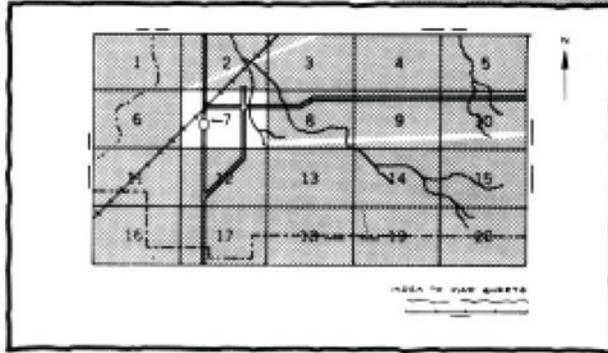
# **SOIL SURVEY OF SAN SABA COUNTY, TEXAS**

**United States Department of Agriculture  
Soil Conservation Service  
in cooperation with  
Texas Agricultural Experiment Station**



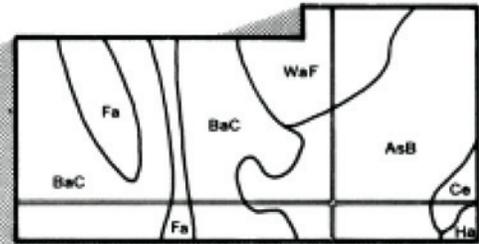
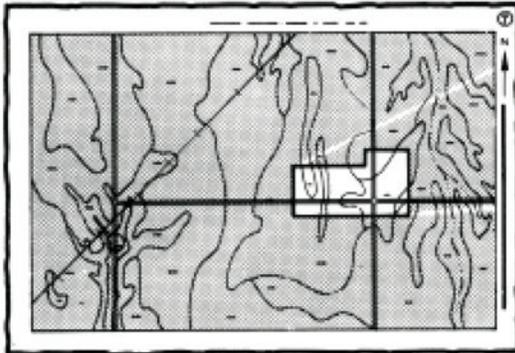
# HOW TO USE

1. Locate your area of interest on the "Index to Map Sheets"

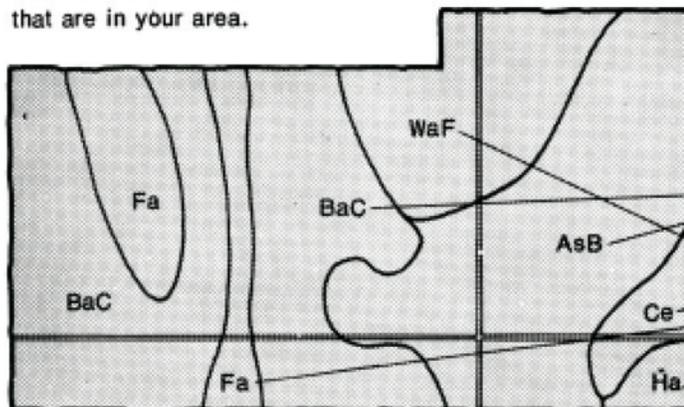


2. Note the number of the map sheet and turn to that sheet.

3. Locate your area of interest on the map sheet.



4. List the map unit symbols that are in your area.

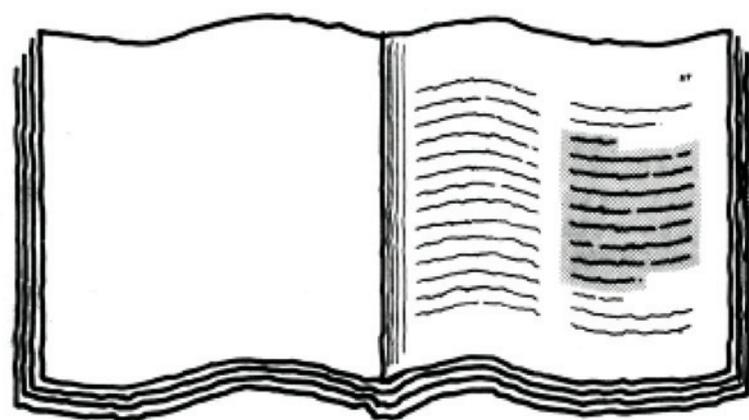


## Symbols

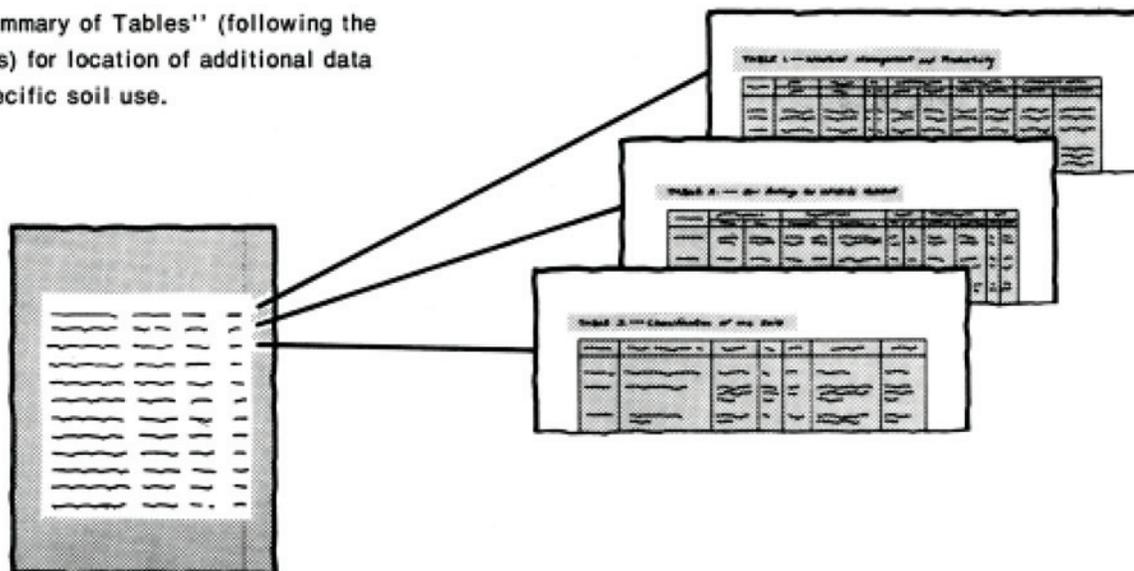
AsB  
BaC  
Ce  
Fa  
Ha  
WaF

# THIS SOIL SURVEY

5. Turn to "Index to Soil Map Units" which lists the name of each map unit and the page where that map unit is described.

A detailed illustration of a table with multiple columns and rows, representing the 'Index to Soil Map Units'. The table is organized into sections with bolded headers, and each row contains text and numbers, likely representing map unit names and their corresponding page numbers.

6. See "Summary of Tables" (following the Contents) for location of additional data on a specific soil use.



7. Consult "Contents" for parts of the publication that will meet your specific needs. This survey contains useful information for farmers or ranchers, foresters or agronomists; for planners, community decision makers, engineers, developers, builders, or homebuyers; for conservationists, recreationists, teachers, or students; to specialists in wildlife management, waste disposal, or pollution control.

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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 Soil Conservation Service has leadership for the federal part of the National Cooperative Soil Survey. In line with Department of Agriculture policies, benefits of this program are available to all, regardless of race, color, national origin, sex, religion, marital status, or age.

Major fieldwork for this soil survey was performed in the period 1973-1978. Soil names and descriptions were approved in 1979. Unless otherwise indicated, statements in this publication refer to conditions in the survey area in 1979. This survey was made cooperatively by the Soil Conservation Service and the Texas Agricultural Experiment Station. It is part of the technical assistance furnished to the San Saba-Brady 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: Cattle on kleingrass in an area of Sagerton clay loam.*

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# foreword

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

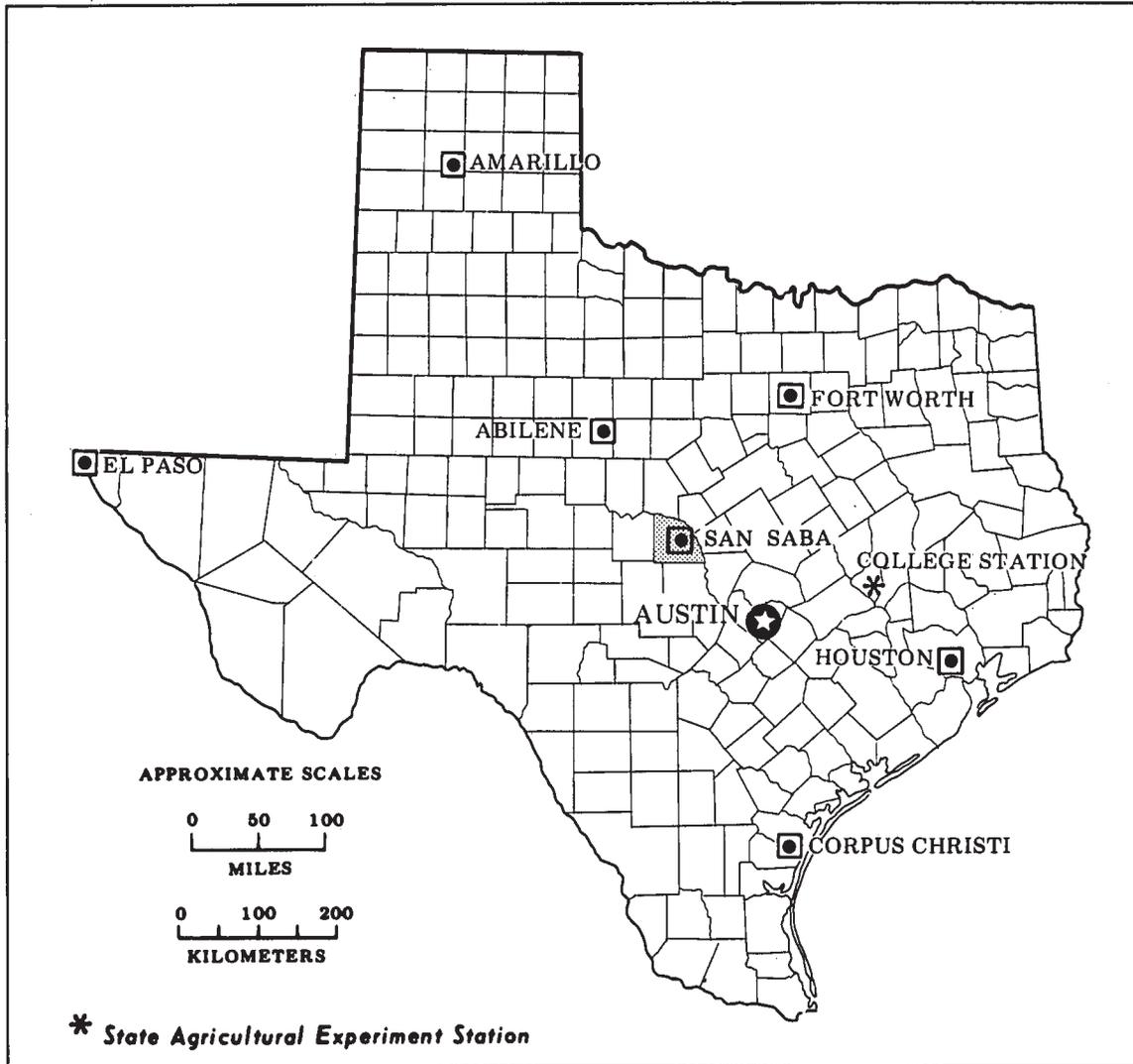
This soil survey is designed for many different users. Farmers, ranchers, foresters, and agronomists can use it to evaluate the potential of the soil and the management needed for maximum food and fiber production. Planners, community officials, engineers, developers, builders, and home buyers can use the survey to plan land use, select sites for construction, and identify special practices needed to insure 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.

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 Soil Conservation Service or the Cooperative Extension Service.



George C. Marks  
State Conservationist  
Soil Conservation Service



*Location of San Saba County in Texas.*

# soil survey of San Saba County, Texas

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By Otto W. Bynum, Soil Conservation Service

Fieldwork by Otto W. Bynum, Thomas E. Cyprian, and  
Frank E. Baker, Soil Conservation Service

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

SAN SABA COUNTY is in the central part of Texas. The county has an area of 718,080 acres, or 1,122 square miles. It is bordered on the north and east by the Colorado River and Brown, Mills, Lampasas, and Burnet Counties; on the south by Llano and Mason Counties; and on the west by McCulloch County. The county is roughly triangular.

San Saba County is mainly in the Edwards Plateau and Texas North Central Prairies Land Resource Areas. Some less extensive areas are in the Central Basin and the Rolling Red Plains Land Resource Areas. The soils formed under grass and post oak savannah. Those that formed under grass are dark and loamy or clayey, and those that formed under post oak are mainly light colored and loamy or sandy.

The topography is undulating to hilly and generally slopes to the southeast. Elevation mainly ranges from 1,100 to 1,800 feet. Average rainfall ranges from about 26 inches in the western part of the county to about 28 inches in the eastern part.

The soils in this county are mostly used as rangeland. About 88 percent is rangeland, 9 percent cropland, 1 percent pastureland, and 2 percent urban land, farmsteads, roads, or water (4). Raising beef cattle is the principal ranching enterprise. Wheat, oats, peanuts, forage, and grain sorghum are the main cultivated crops.

An older survey of San Saba County was published in 1916 (5). The present survey updates the earlier survey and provides additional information and larger maps that show the soils in greater detail.

Descriptions, names, and delineations of soils in this soil survey do not fully agree with those on soil maps for adjacent counties. Differences are the result of better knowledge of soils, modifications in series concepts,

intensity of mapping, or the extent of soils within the survey.

## general nature of the county

This section was prepared for those who want general information about San Saba County. It discusses briefly the climate, history, industry, transportation, and natural resources.

## climate

Prepared by the National Climatic Center, Asheville, North Carolina.

San Saba County has hot summers and fairly warm winters. Cold spells or snowfalls are rare. Rains are usually heaviest late in spring and early in fall. Rain in fall is often associated with a dissipating tropical storm. Total annual precipitation is usually adequate for range vegetation but, because of the high rate of evapotranspiration, often not adequate for cotton, small grains, and sorghum without supplemental irrigation.

Table 1 gives data on temperature and precipitation for the survey area as recorded at San Saba in the period 1963 to 1976. Table 2 shows probable dates of the first freeze in fall and the last freeze in spring. Table 3 provides data on length of the growing season.

In winter the average temperature is 48° F, and the average daily minimum temperature is 35°. The lowest temperature on record, which occurred at San Saba on January 12, 1973, is 0°. In summer the average temperature is 81°, and the average daily maximum temperature is 93°. The highest recorded temperature,

which occurred at San Saba on August 12, 1969, is 108°.

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° F). The normal monthly accumulation is used to schedule single or successive plantings of a crop between the last freeze in spring and the first freeze in fall.

The total annual precipitation is 27.55 inches. Of this, 17 inches, or 60 percent, usually falls in April through September, which includes the growing season for most crops. In 2 years out of 10, the rainfall in April through September is less than 15 inches. The heaviest 1-day rainfall during the period of record was 11.20 inches at San Saba on October 5, 1969. Thunderstorms occur on about 60 days each year, and most occur in spring.

Average seasonal snowfall is 1 inch. The greatest snow depth at any one time during the period of record was 4 inches. On an average of 1 day, at least 1 inch of snow is on the ground. The number of such days varies greatly from year to year.

The average relative humidity in midafternoon is about 60 percent. Humidity is higher at night, and the average at dawn is about 80 percent. The sun shines 70 percent of the time possible in summer and 50 percent in winter. The prevailing wind is from the south. Average windspeed is highest, 11 miles per hour, in spring.

## history

The first permanent settlement of San Saba County was in the early 1850's. The many springs and streams, favorable grazing conditions for cattle and sheep, and the favorable climate for plant growth attracted the settlers.

During the early period of settlement, ranching was the sole industry. Farming assumed considerable importance around 1880. For the most part, the county remained open range until the erection of wire fences began around 1887.

San Saba County was created and organized from Bexar County in 1856. It was named for the San Saba River which flows through the county. After the railroad was completed around 1910, San Saba became a shipping point for livestock and farm products.

## industry

The major livestock are beef cattle, sheep, and goats. Many ranchers engage in commercial leasing of their ranches for deer hunting. The main crops are grain sorghum, small grains, and improved pasture. Pecans are important commercially and are produced in native

groves and improved orchards, mostly along the Colorado River and San Saba River.

The main conservation objectives for farming and ranching are brush control, range seeding, erosion control, deferred grazing, providing water for livestock, crossfencing, and pollution control.

Some native rock is quarried and shipped elsewhere for building purposes. Many fishermen and campers are attracted to the rivers and streams of the county, particularly the area between the town of Bend and Lake Buchanan in the southeastern part of the county.

## transportation

San Saba County is served by U.S. Highway 190 from east to west and Texas Highway 16 from north to south. The railroad crosses the county in an east-west direction. Rural areas are served by more than 140 miles of paved roads.

## natural resources

Soil is the most important natural resource in the county. Most people earn their living from the land by producing forage for livestock or food and fiber for market and home uses.

Water is an important natural resource. The Colorado River and the San Saba River provide water for livestock and irrigation. Many flood retarding structures have been built, mainly in the central and northwestern parts of the county, to help prevent flood damage. Most of the lakes are used for recreation and livestock water.

Wildlife on the farms and ranches provide recreation and a source of income for many residents.

Other natural resources are limestone, sand, and gravel. Limestone is used as building material. Some is crushed for roadbed material.

## how this survey was made

Soil scientists made this survey to learn what soils are in the survey area, where they are, and how they can be used. They observed the steepness, length, and shape of slopes; the size of streams and the general pattern of drainage; the kinds of native plants or crops; and the kinds of rock. They dug many holes to study soil profiles. A profile is the sequence of natural layers, or horizons, in a soil. It extends from the surface down into the parent material, which has been changed very little by leaching or by plant roots.

The soil scientists recorded the characteristics of the profiles they studied and compared those profiles with others in nearby counties and in more distant places. They classified and named the soils according to nationwide uniform procedures. They drew the boundaries of the soils on aerial photographs. These photographs show trees, buildings, fields, roads, and

other details that help in drawing boundaries accurately. The soil maps at the back of this publication were prepared from aerial photographs.

The areas shown on a soil map are called map units. Most map units are made up of one kind of soil. Some are made up of two or more kinds. The map units in this survey area are described under "General soil map units" and "Detailed soil map units."

While a soil survey is in progress, samples of some soils are taken for laboratory measurements and for engineering tests. All soils are field tested to determine their characteristics. Interpretations of those characteristics may be modified during the survey. Data

are assembled from other sources, such as test results, records, field experience, and state and local specialists. For example, data on crop yields under defined management are assembled from farm records and from field or plot experiments on the same kinds of soil.

But only part of a soil survey is done when the soils have been named, described, interpreted, and delineated on aerial photographs and when the laboratory data and other data have been assembled. The mass of detailed information then needs to be organized so that it can be used by farmers, rangeland managers, engineers, planners, developers and builders, home buyers, and others.



# general soil map units

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The general soil map at the back of this publication shows broad areas that have a distinctive pattern of soils, relief, and drainage. Each map unit on the general soil map is a unique natural landscape. Typically, a map unit consists of one or more major soils and some minor soils. It is named for the major soils. The soils making up one unit can occur in other units 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.

Land area of the thirteen general soil map units in San Saba County makes up about 98 percent of the total acreage. The rest is water area.

## soils formed dominantly on limestone

The native grasses on these soils are mainly mid and tall grasses. Scrub live oak and cedar are typical woody vegetation on the stony soils, which make up about 70 percent of the mapped area. Catclaw acacia, scattered scrubby mesquite trees, and a few live oak mottes are supported on the cherty soils, which make up most of the remaining mapped area. These soils are used as rangeland.

### 1. Roughcreek-Eckrant

*Shallow and very shallow, gently sloping to rolling, very stony and stony soils*

The landscape consists of gently sloping Roughcreek soils and rolling Eckrant soils (fig. 1). Both soils are on limestone plateaus that are well dissected by drainageways. Slopes range from 1 to 16 percent.

This map unit makes up about 39 percent of the county. It is about 60 percent Roughcreek soils, 10 percent Eckrant soils, and 30 percent other soils.

Typically, the surface layer of the Roughcreek soils is neutral, brown very stony clay loam about 7 inches thick. The subsoil, to a depth of 18 inches, is neutral, reddish brown very stony clay. The underlying layer is indurated, fractured limestone.

Typically, the surface layer of the Eckrant soils is very dark grayish brown stony clay about 6 inches thick. Below that, to a depth of 14 inches, is dark brown stony clay that is underlain by hard, fractured limestone.

Other soils in this unit are Cho, Leeray, Rumble, Smithwick, Speck, and Tarpley soils. Cho soils are very shallow to shallow and nearly level to sloping. The deep, nearly level to gently sloping, clayey Leeray soils are in shallow valleys. The moderately deep, undulating to hilly, loamy Rumble soils are on dissected uplands. The clayey Smithwick soils are moderately deep and hilly. The shallow, nearly level to gently sloping, loamy Speck and Tarpley soils are on the smoother uplands.

The soils in this unit are used as rangeland and wildlife habitat. Good yields of mid grass and tall grass can be expected in favorable years. These soils are not suited to crops because of stoniness and slope. They are fairly suited to use as wildlife habitat. The main kinds of wildlife are deer, quail, and turkeys.

These soils are poorly suited to most urban and recreation uses. The limitations are stones on the surface and in the soil, high corrosivity to uncoated steel, the shallow and very shallow depths to bedrock, low strength affecting roads and streets, and the shrinking and swelling of the soil with change in moisture.

### 2. Rumble

*Moderately deep, undulating to hilly, cherty soils*

The landscape consists of broad areas of uplands that are well dissected by drainageways (fig. 2). It is characterized by low, rounded hills and knolls interconnected by weak saddles. Slopes range from 1 to 30 percent.

This map unit makes up about 16 percent of the county. It is about 85 percent Rumble soils, and the rest is other soils.

Typically, the surface layer of the Rumble soils is brown cherty clay loam about 6 inches thick. The subsoil, to a depth of 11 inches, is dark reddish gray cherty clay loam. To a depth of 27 inches, it is reddish brown very cherty clay. The underlying layer is indurated, coarsely fractured limestone.

Other soils in this unit consist of the deep, loamy Pebblepoint and Sagerton soils on uplands and the deep, clayey Leeray soils in shallow valleys. The shallow, loamy Roughcreek, Tarpley, and Speck soils are gently

sloping to sloping. The very shallow and shallow, loamy Cho and Corkstone soils are on ridgecrests.

The soils in this unit are used as rangeland and wildlife habitat. Good yields of mid grass and short grass are produced in favorable years. These soils are droughty and not suited to cultivation because of the high content of chert gravel.

These soils have a fair potential for wildlife habitat. Deer, quail, and turkeys are the main kinds of wildlife.

These soils are poorly suited to most urban and recreation uses. The main limitations are depth to bedrock, content of chert fragments, shrinking and swelling of the soils with changes in moisture content, and moderate corrosivity to uncoated steel.

### soils formed dominantly on sandstone and shale

These soils formed in alternating layers of sandstone and shale. Most of the soils over shale are gently sloping to hilly. Prominent scarps form rims around some hills.

The soils support mainly short grasses, mesquite trees, and beebrush.

Soils that formed from sandstone range from hilly to gently sloping soils in valleys. These soils support mid grass and tall grass with post oak, blackjack oak, hackberry, and elm trees. Most of the soils suited to crops formed from sandstone and are gently sloping. These soils are of minor extent in the area. The main crops are peanuts, oats, grain sorghum, and improved pasture.

### 3. Nocken-Callahan-Throck

*Moderately deep; gently sloping to hilly; very stony, loamy, and clayey soils*

The landscape consists of hilly and stony Nocken soils, gently sloping Callahan soils, and the sloping to hilly Throck soils (fig. 3). Nocken soils are on the sides of valleys and on ridgetops. Callahan soils typically are on broad, moderately smooth hills. Throck soils are on slopes between valley floors and higher-lying hills. This

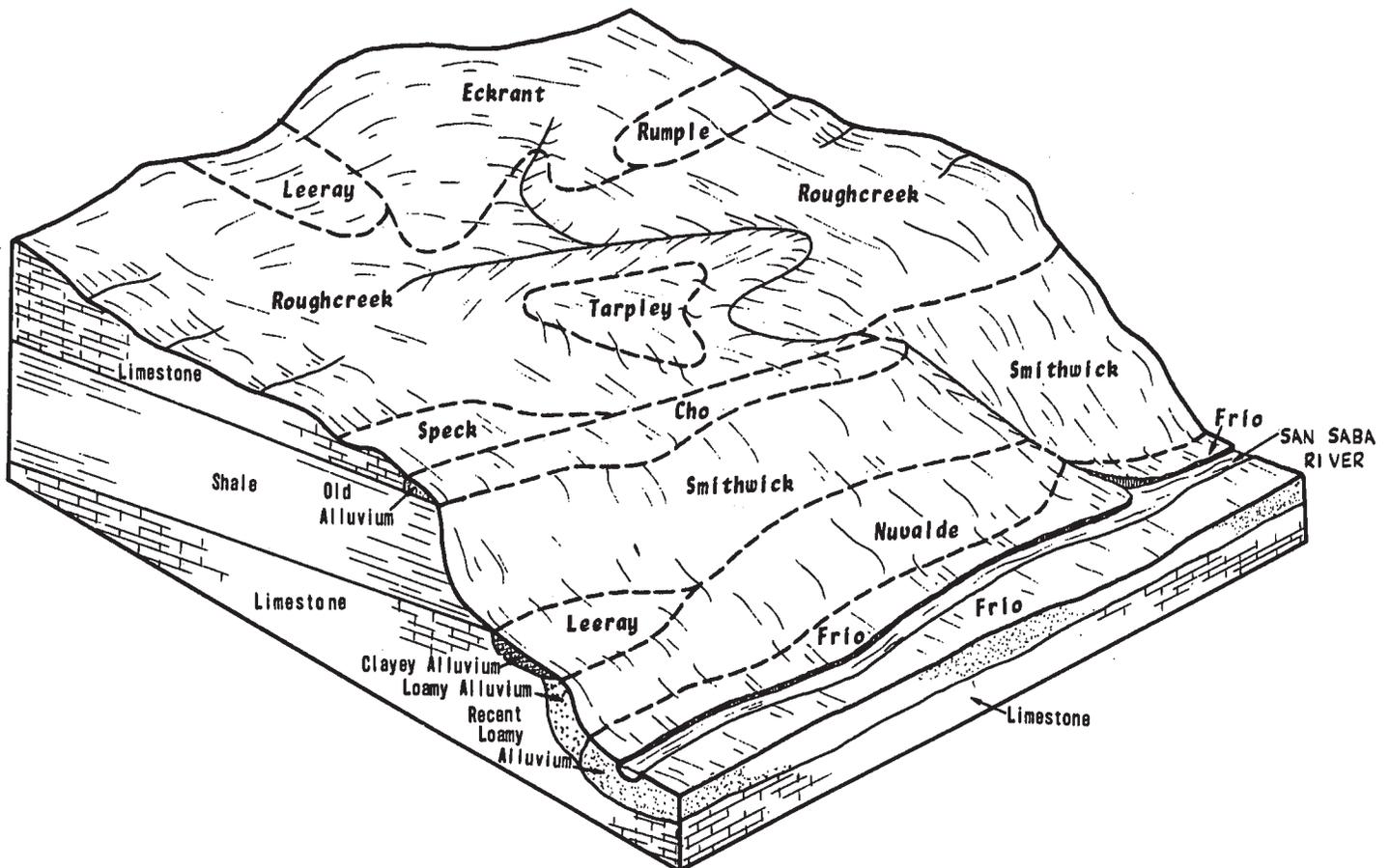


Figure 1.—Pattern of soils in the Roughcreek-Eckrant general soil map unit on the left and the Frio general soil map unit on flood plains on the right.

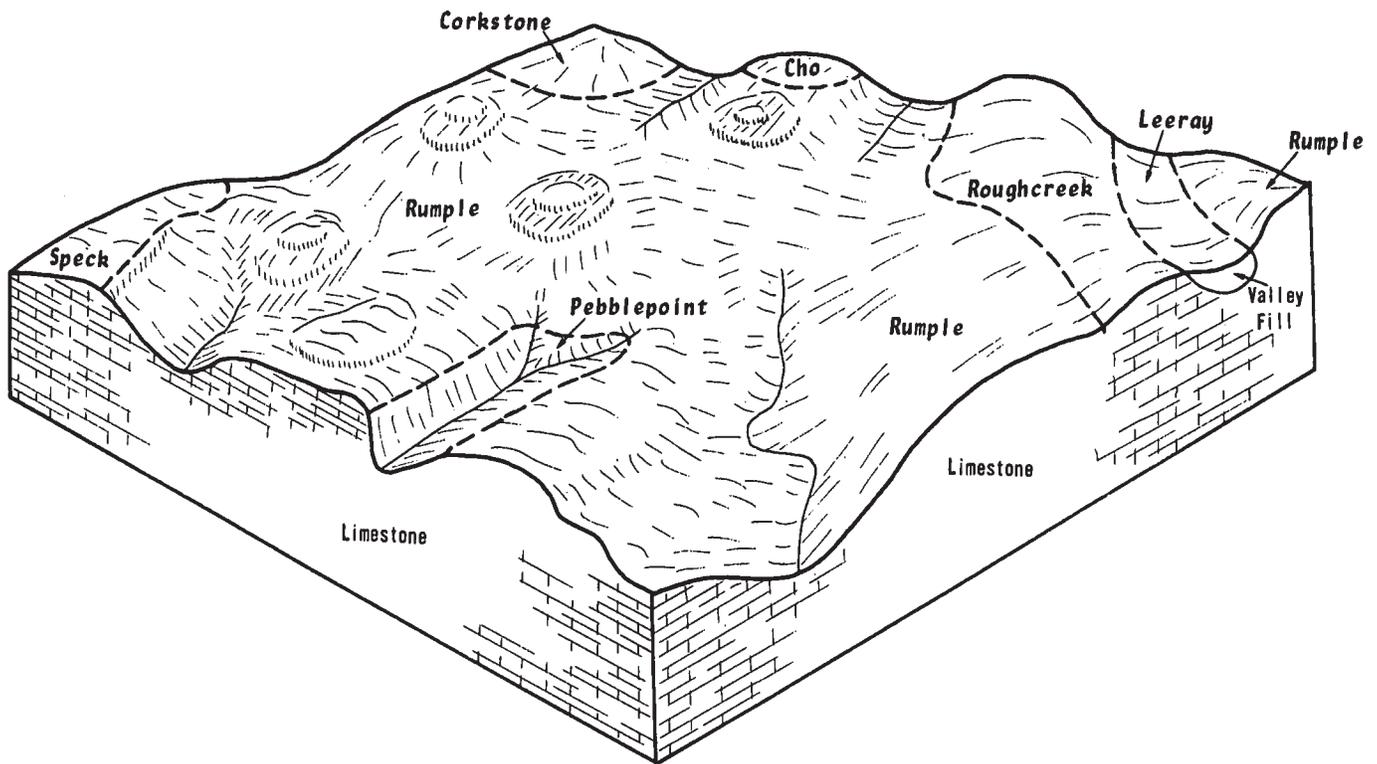


Figure 2.—Pattern of soils in the Rumple general soil map unit and the underlying material.

unit is well dissected by drainageways. Slopes range from 1 to 25 percent.

This map unit makes up about 15 percent of the county. It is about 40 percent Nocken soils, 30 percent Callahan soils, 15 percent Throck soils, and 15 percent other soils.

Typically, the surface layer of the Nocken soils is neutral to medium acid, brownish very stony fine sandy loam about 9 inches thick. The subsoil, to a depth of 38 inches, is medium acid, reddish very stony clay. The underlying layer is brownish sandstone with thin layers of shale.

Typically, the surface layer of the Callahan soils is brown loam about 6 inches thick. The upper part of the subsoil, to a depth of 17 inches, is reddish brown clay; the middle part, to a depth of 30 inches, is brown clay; and the lower part, to a depth of 34 inches, is brownish yellow clay. The underlying layer is light olive brown, interbedded shaly clay and sandstone. These soils are moderately alkaline throughout and calcareous in the lower part.

Typically, the surface layer of the Throck soils is moderately alkaline, brown clay about 4 inches thick. The subsoil, to a depth of 14 inches, is moderately alkaline, brown clay. To a depth of 28 inches, it is moderately alkaline, light yellowish brown clay containing

about 10 percent calcium carbonate concretions. The underlying layer is light olive brown shaly clay.

Other soils in this unit are Bonti, Bunyan, Cho, Miles, Nimrod, Rochelle, and Winters soils. The deep, loamy, nearly level Bunyan soils are on small valley floors, which are usually flooded each year. The shallow to very shallow, gently sloping to sloping, loamy Cho soils and the moderately deep, gently sloping, loamy Rochelle soils are on ridgecrests at the higher elevations. The deep, loamy Miles soils and the deep, sandy Nimrod soils are in upper areas of shallow valleys. The deep, loamy Winters soils are in shallow valleys and on remnants of upland plains.

The soils in this unit are mainly used as rangeland and wildlife habitat, but some areas of Callahan soils are cultivated. Good yields of mid grass and tall grass can be expected on Nocken soils and fair to low yields on Callahan and Throck soils. Most areas of Callahan soils are moderately well suited to use as cropland. The rest of the soils are not suited. The soils in this unit are fairly suited to use as wildlife habitat. Deer, quail, and turkeys are the main species.

These soils are poorly suited to most urban and recreation uses. The limitations are surface stones, moderate depth to bedrock, high shrinking and swelling properties, low strength affecting roads and streets, high corrosivity to uncoated steel, and slope.

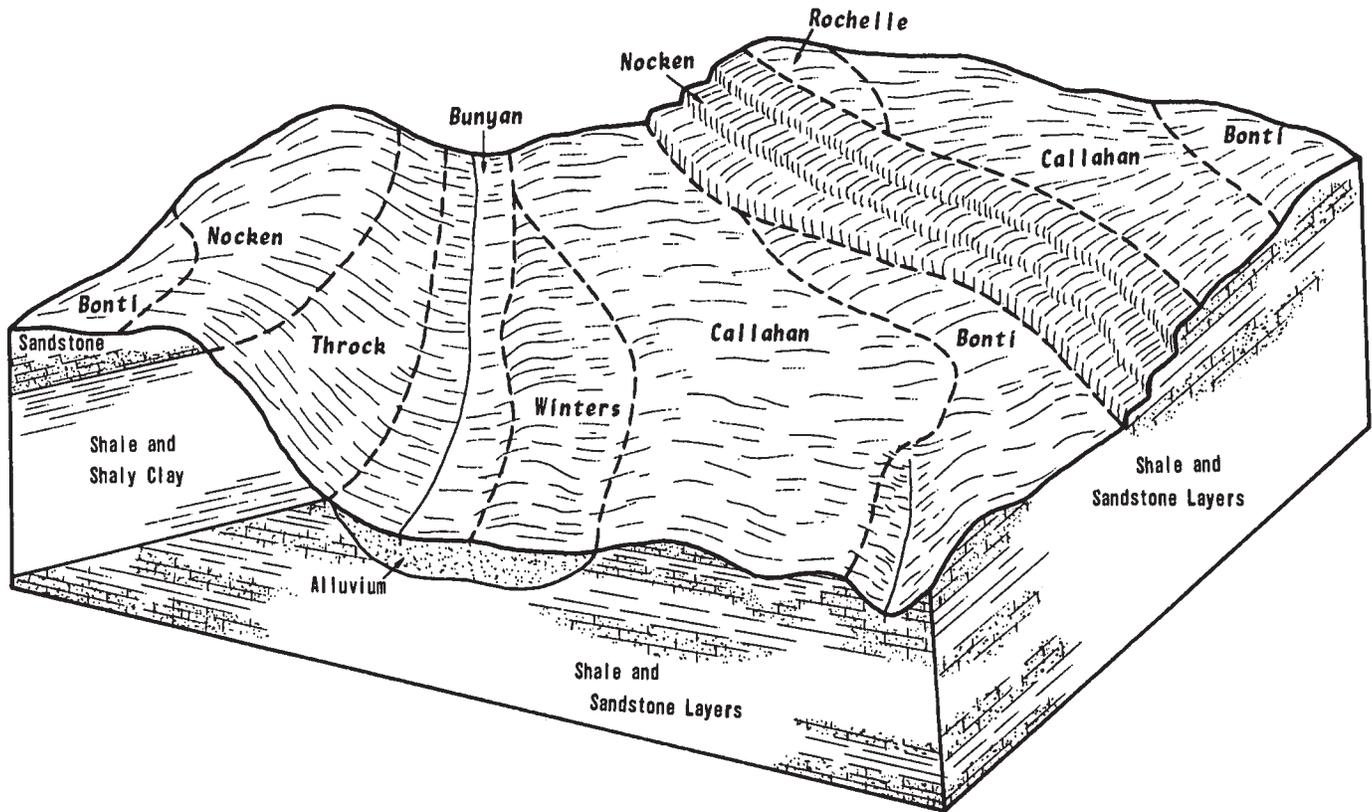


Figure 3.—Pattern of soils in the Nocken-Callahan-Throck general soil map unit and the relationship to the underlying material.

#### 4. Bonti-Nocken

*Moderately deep, gently sloping to hilly, loamy, and very stony soils*

The landscape consists of gently sloping Bonti soils on low oval ridges and side slopes of valleys and sloping to hilly Nocken soils on the upper sides of valleys and on ridgetops. This unit is well dissected by drainageways. Slopes range from 1 to 25 percent.

This map unit makes up about 6 percent of the county. It is about 72 percent Bonti soils, 8 percent Nocken soils, and 20 percent other soils.

Typically, the surface layer of the Bonti soils is slightly acid, brownish fine sandy loam about 9 inches thick. The upper part of the subsoil, to a depth of 20 inches, is medium acid, reddish yellow clay. The lower part of the subsoil, to a depth of 30 inches, is medium acid, yellowish red clay. The underlying material is brownish yellow sandstone.

Typically, the surface layer of the Nocken soils is very stony fine sandy loam about 17 inches thick. It is neutral and brown in the upper part and medium acid and light brown in the lower part. The subsoil, to a depth of 40 inches, is medium acid, reddish very stony clay. The underlying layer is yellowish sandstone.

Other soils in this unit are the Bastrop, Bunyan, Callahan, May, Nimrod, Sagerton, Throck, and Winters soils. The nearly level to gently sloping, loamy Bastrop, Sagerton, and Winters soils are on upland plains and high terraces. The deep, nearly level, and loamy Bunyan soils are on valley floors and are generally flooded each year. The moderately deep, loamy Callahan soils are gently sloping and on broad, low ridges that have smooth oval crests. The deep, nearly level, and loamy May soils and the deep, gently sloping, and sandy Nimrod soils are in the upper areas of valleys. The moderately deep, clayey, and sloping to steep Throck soils are on hillsides and escarpments.

The Nocken soils are used as rangeland and wildlife habitat. They are too stony to use as cropland. The Bonti soils are used as cropland, rangeland, and wildlife habitat. They are well suited to use as cropland. The main crops are peanuts, oats, grain sorghums, and improved pasture. The soils in this unit produce good yields of mid grass and tall grass during favorable years.

Bonti soils are well suited to use as wildlife habitat, and Nocken soils are fairly suited. Deer, quail, and turkeys are the main kinds of wildlife.

Bonti soils are moderately well suited to most urban and recreation uses. The main limitations are depth to

rock, low strength affecting roads and streets, and shrinking and swelling in the lower clayey layers with changes in moisture. Nocken soils are poorly suited to most urban and recreation uses. Large stones, depth to rock, and slopes are the main limitations.

### soils formed dominantly on outwash plains

These soils formed in calcareous, old alluvial sediment on upland plains. Most of these soils are deep and have a loamy or clayey surface layer. Areas of minor extent are shallow to very shallow and have a loamy surface layer. The soils in this group are mainly used as cropland. Oats, wheat, grain sorghum, and improved pasture are the main crops. The potential native vegetation on the deep soils is mostly mid grass and tall grass. The shallow and very shallow soils support mid grass and short grass.

#### 5. Sagerton-Winters-Leeray

*Deep, nearly level to gently sloping, loamy and clayey soils*

The landscape consists of Sagerton and Winters soils on high stream terraces and upland plains and Leeray soils in valley fill areas and on upland plains (fig. 4). Slopes range from 0 to 3 percent.

This map unit makes up about 13 percent of the county. It is about 30 percent Sagerton soils, 25 percent Winters soils, 20 percent Leeray soils, and 25 percent other soils.

Typically, the surface layer of the Sagerton soils is neutral, brown clay loam about 6 inches thick. The upper part of the subsoil, to a depth of 40 inches, is mildly alkaline, brownish clay. The lower part of the subsoil, to a depth of 80 inches, is moderately alkaline, reddish yellow clay loam that has about 25 to 30 percent calcium carbonate in the upper part and common soft masses in the lower part.

Typically, the surface layer of the Winters soils is brown fine sandy loam about 7 inches thick. The subsoil, to a depth of 58 inches, is sandy clay. It is reddish brown in the upper part and yellowish red in the lower part. Below that, to a depth of 72 inches, is yellowish red sandy clay loam that has about 15 percent calcium

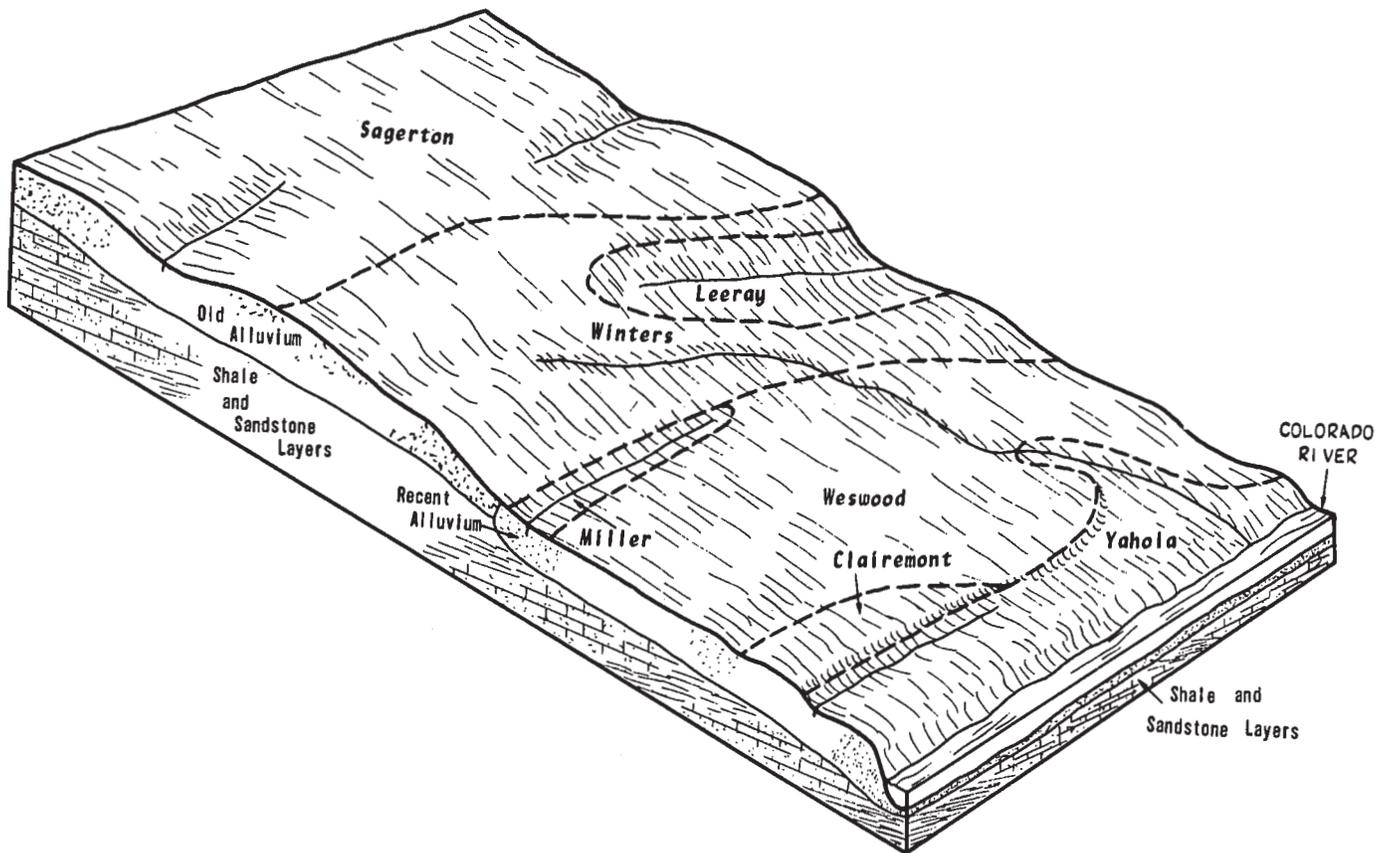


Figure 4.—Pattern of soils in the Sagerton-Winters-Leeray general soil map unit on the left and the Weswood-Yahola general soil map unit on the right and the relationship to the underlying material.

carbonate. Next to a depth of 80 inches is reddish yellow sandy clay loam with about 5 percent calcium carbonate. Reaction is neutral in the upper part of these soils and moderately alkaline in the lower part.

Typically, the surface layer of the calcareous Leeray soils is very dark grayish brown clay about 6 inches thick. Next, to a depth of 40 inches, is dark grayish brown and grayish brown clay. Below that, to a depth of 67 inches, is brown clay that has a few cemented calcium carbonate concretions. To a depth of 78 inches is pale brown clay that has films, threads, and concretions of calcium carbonate.

Other soils in this unit are Bastrop, Miles, Desan, Nimrod, and Callahan soils. The deep, gently sloping, and loamy Bastrop and Miles soils are on high upland terraces. The deep, gently sloping, and sandy Desan and Nimrod soils are on high terraces and uplands. The moderately deep, gently sloping Callahan soils are on uplands.

The soils in this map unit are mainly used as cropland. The crops are oats, wheat, grain sorghum, and tame pasture. These soils are well suited to use as cropland. Good yields of mid grass and tall grass can be expected in favorable years.

These soils are fairly suited to use as wildlife habitat. Quail and turkeys are the main kinds of wildlife.

The soils are moderately well suited to most urban uses. The clayey layers shrink and swell with changes in moisture. This action causes foundation problems for dwellings, streets, and low cost roads. The moderately slow and very slow permeability can cause septic tank systems to fail during rainy seasons. This soil is moderately well suited to recreation uses. The clayey surface layer, very slow permeability, and slope are limitations in places.

## 6. Cho-Mereta

*Very shallow and shallow, nearly level to sloping, loamy soils*

The landscape consists of gently sloping Mereta soils on smooth plains and nearly level to sloping Cho soils on side slopes and crests of ridges. Slopes range from 0 to 8 percent.

This map unit makes up about 1 percent of the county. It is about 60 percent Cho soils, 20 percent Mereta soils, and 20 percent other soils.

Typically, the surface layer of the Cho soils is calcareous, dark grayish brown loam about 10 inches thick. Below that is indurated, platy, pink caliche 4 inches thick. The underlying material to a depth of 60 inches is pink, limy loam earth that has more than 50 percent calcium carbonate.

Typically, the surface layer of the shallow Mereta soils is calcareous, dark brown clay loam about 18 inches thick. Below that is pinkish white, strongly cemented; platy caliche 5 inches thick. The underlying material to a

depth of 60 inches is pink loam that has common concretions and masses of calcium carbonate.

Other soils in the unit are Nuvalde, Rowena, Sagerton, Winters, Shep, and Miles soils. The moderately deep, loamy, and gently sloping Nuvalde and Rowena soils are on stream terraces and upland plains. The deep, loamy, and nearly level to gently sloping Sagerton, Miles, and Winters soils are on high stream terraces and upland plains. The moderately deep, gently sloping to moderately steep, and loamy Shep soils are on beveled edges of stream terraces and upland plains.

The soils in this unit are mainly used as rangeland and wildlife habitat. Some areas of Mereta soils are used as cropland and are moderately well suited to this use. Cho soils are not suited to use as cropland. Mereta soils produce good yields of mid grass and short grass during favorable years. Cho soils produce low yields of short grass during most years because soil depth is inadequate and because of the low moisture holding capacity. Mereta soils produce moderate yields of oats, wheat, and grain sorghum during favorable years.

These soils are fairly suited to use as wildlife habitat. Quail, turkeys, rabbits, skunks, and armadillos are the main kinds of wildlife.

The soils are mainly poorly suited to most urban uses. The main limitations are the thin surface layer, very shallow and shallow depths to a cemented pan, and high corrosivity to uncoated steel. These soils are moderately well suited to recreation uses.

## soils formed dominantly on schist, sandstone, and limestone

These soils are along the northern edge of the Texas Central Basin Land Resource Area.

The shallow and very shallow, loamy soils are undulating to steep, and some are on hills with scarps. The moderately deep and deep, gently sloping to rolling, loamy and sandy soils formed from schist, sandstone, and limestone and are in valleys and on broad plains.

The potential native vegetation on the shallow and very shallow soils are mostly mid and short grasses with live oak, post oak, elm, hackberry, and Texas persimmon. The potential vegetation on the moderately deep and deep soils is mostly mid and tall grasses with an open canopy of post oak and blackjack oak. The shallow and very shallow soils are nonarable. The crops on the moderately deep and deep soils are oats, grain sorghum, peanuts, and improved pasture.

## 7. Yates-Hye

*Very shallow to moderately deep, gently sloping to steep, very stony, and loamy soils*

The landscape consists of gently sloping Hye soils on lower slopes and undulating to steep Yates soils on the

higher slopes and escarpments (fig. 5). Slopes range from 1 to 40 percent.

This map unit makes up about 2 percent of the county. It is about 40 percent Yates soils, 30 percent Hye soils, and 30 percent other soils.

Typically, the Yates soils are neutral, reddish brown very stony loam about 6 inches thick. About 45 percent is flat-lying limestone fragments. The underlying layer is indurated, coarsely fractured limestone.

Typically, the surface layer of the Hye soils is neutral, reddish brown fine sandy loam about 8 inches thick. The upper part of the subsoil, to a depth of 14 inches, is neutral, reddish brown fine sandy loam. To a depth of 36 inches, it is slightly acid, yellowish red sandy clay loam. The underlying layer is sandstone bedrock.

Other soils in this unit are Bonti, Demona, Frio, Katemcy, Ligon, Nuvalde, Pedernales, and Sagerton soils. The moderately deep, loamy Bonti and Katemcy soils are on oval ridges. The deep, gently sloping, sandy Demona soils are on a wavy landscape. The deep, nearly level, loamy Frio soils are along natural drainageways. The deep, loamy Katemcy and Pedernales soils are on the upper slopes of shallow valleys. The shallow, loamy Ligon soils are on low,

rounded ridgecrests. The deep, nearly level to gently sloping, loamy Nuvalde soils are along the lower parts of side slopes adjacent to Frio soils. The nearly level to gently sloping, loamy Sagerton soils are on the floor of shallow valleys.

Hye soils are used as cropland and rangeland and for tame pasture. They are moderately well suited to these uses. Crops are oats, peanuts, and grain sorghum. The main pasture grass is coastal bermudagrass. Yates soils are only used as rangeland and wildlife habitat. During favorable years, moderate yields of mainly mid grass are expected on Hye soils, and low yields of mid grass and short grass are expected on Yates soils. The soils in this unit are fairly suited to use as wildlife habitat. The main kinds of wildlife are deer, quail, and turkeys.

These soils are poorly suited to most urban and recreation uses. The limitations are the moderate to very shallow depth to bedrock, stoniness, and moderate corrosivity to uncoated steel.

### 8. Yates-Stilskin

*Very shallow and shallow, undulating to steep, very stony and gravelly soils*

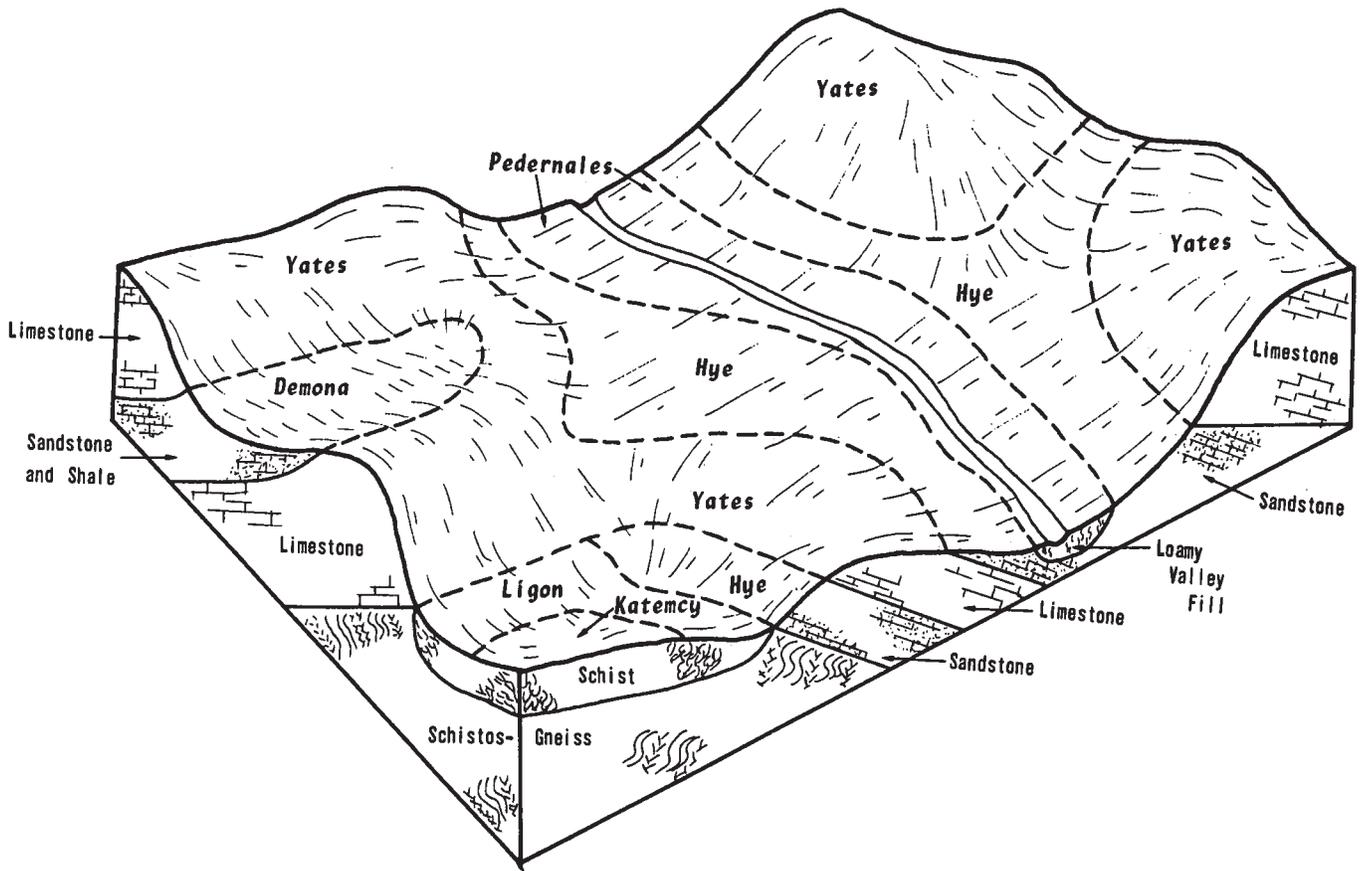


Figure 5.—Pattern of soils in the Yates-Hye general soil map unit and the relationship to the underlying material.

The landscape consists of undulating to steep Yates soils and strongly sloping to steep Stilskin soils (fig. 6). Yates soils are on crests and side slopes of ridges, and Stilskin soils are on hillsides and escarpments. Slopes range from 1 to 40 percent.

This map unit makes up about 1 percent of the county. It is about 60 percent Yates soils, 15 percent Stilskin soils, and 25 percent other soils.

Typically, the surface layer of the very shallow Yates soils is neutral, reddish brown very stony loam about 6 inches thick. It is about 45 percent by volume limestone fragments. The underlying layer is coarsely fractured, indurated sandstone.

Typically, the surface layer of the Stilskin soils is grayish brown, calcareous, gravelly loam about 6 inches thick. The subsoil is light yellowish brown, calcareous, very gravelly loam to a depth of 17 inches. The underlying material is calcareous, light yellowish brown, weakly cemented, platy sandstone.

Other soils in this unit are Oplin, Nocken, Pontotoc, Roughcreek, Nebgen, and Shep soils. The very shallow, loamy Oplin soils are intermingled with some areas of Yates soils. The moderately deep, stony Nocken soils are on ridges and side slopes. The deep, gently sloping, and loamy Pontotoc soils are in the smoother parts of small valleys below steep areas of mostly Stilskin soils. The shallow, stony Roughcreek soils are on limestone plateaus above Stilskin soils. The very shallow to

shallow, loamy Nebgen soils are on ridges and side slopes. The deep, loamy Shep soils are at the base of slopes below steep scarps.

The soils in this unit are only used as rangeland and wildlife habitat. These soils are not suited to use as cropland because of slopes and inadequate soil depth. Range forage yields are low.

These soils are generally poorly suited to use as wildlife habitat. Quail and songbirds are the main bird species. Turkeys are in a few areas. Deer and badgers are in places.

The soils are poorly suited to most urban and recreation uses. Low strength affecting roads and streets, very shallow and shallow depth to bedrock, stoniness, moderate corrosivity to uncoated steel, and slopes are limitations that are difficult and costly to overcome.

### 9. Hye-Pontotoc-Nebgen

*Moderately deep, deep, very shallow, and shallow; gently sloping to rolling; loamy and stony soils*

The landscape consists of gently sloping Hye and Pontotoc soils in valleys and on low, oval ridges and shallow, sloping to rolling Nebgen soils on ridges and side slopes of hills (fig. 6). Slopes range from 1 to 16 percent.

This map unit makes up about 1 percent of the county.

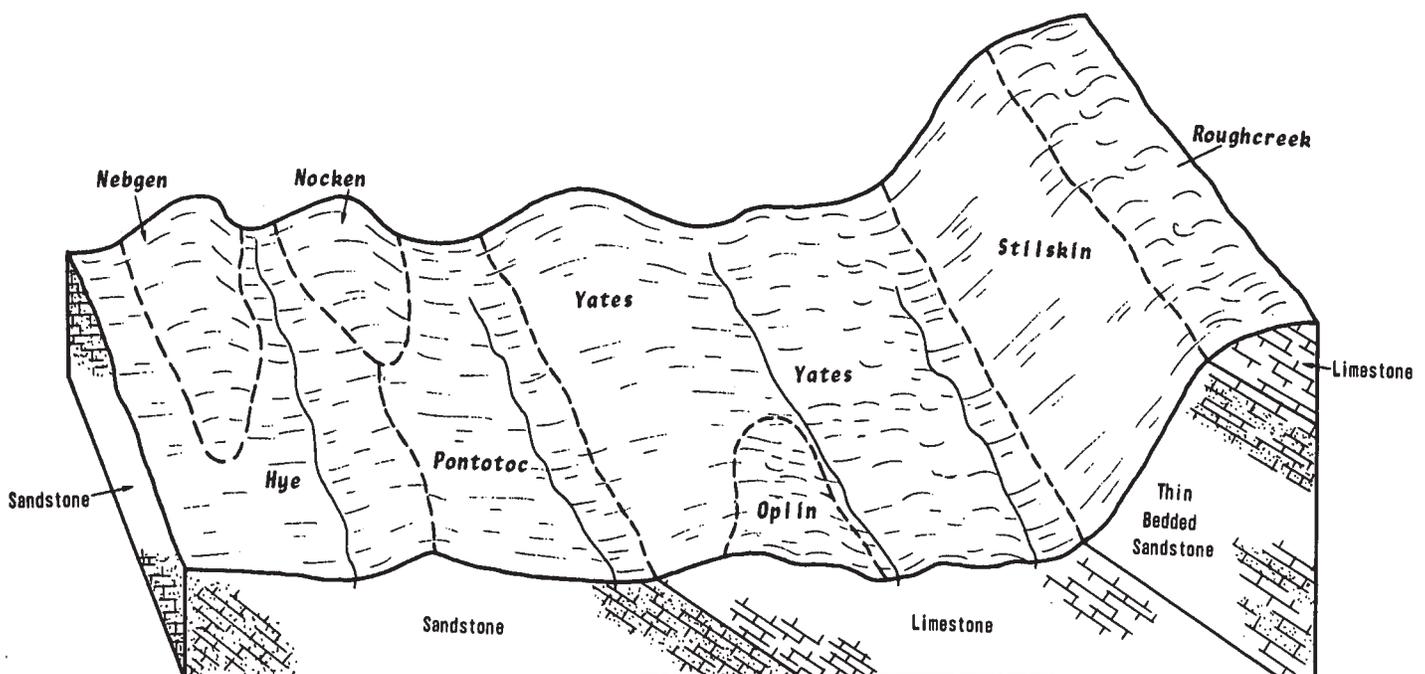


Figure 6.—Pattern of soils in the Hye-Pontotoc-Nebgen general soil map unit on the left and the Yates-Stilskin general soil map unit on the right and the relationship to the underlying material.

It is about 33 percent Hye soils, 20 percent Pontotoc soils, 17 percent Nebgen soils, and 30 percent other soils.

Typically, the surface layer of the Hye soils is neutral, reddish brown fine sandy loam about 8 inches thick. The upper part of the subsoil, to a depth of 14 inches, is neutral, reddish brown fine sandy loam. The lower part of the subsoil, to a depth of 36 inches, is slightly acid, yellowish red sandy clay loam. The underlying material is indurated sandstone bedrock.

Typically, the surface layer of the Pontotoc soils is neutral, reddish brown fine sandy loam about 10 inches thick. The upper part of the subsoil, to a depth of 33 inches, is neutral, reddish brown fine sandy loam. The lower part of the subsoil, to a depth of 70 inches, is neutral, red sandy clay loam. The underlying material is dark reddish brown weakly cemented sandstone.

Typically, the surface layer of the Nebgen soils is slightly acid, reddish brown stony fine sandy loam about 8 inches thick. Below that, to a depth of 12 inches, is partially weathered sandstone that has about 25 percent by volume reddish brown sandy loam in fractures. The underlying material is cemented, reddish brown sandstone.

Other soils in this unit are Nocken, Demona, Pedernales, Nuvalde, Sagerton, Oplin, and Yates soils. The moderately deep, loamy Nocken soils are on ridges and upper side slopes. The deep, sandy Demona soils and the deep, loamy Pedernales and Sagerton soils are in valleys. The moderately deep, loamy Nuvalde soils are in the narrow valleys adjacent to limestone prairies. The shallow to very shallow, loamy Oplin and Yates soils are on ridges and upper side slopes.

Hye and Pontotoc soils are used as rangeland, cropland, and wildlife habitat. The crops are peanuts, oats, grain sorghum, and tame pasture. Nebgen soils are mainly used as rangeland and wildlife habitat. Hye and Pontotoc soils support mid grass and tall grass, while Nebgen soils support mid grass and short grass.

Hye and Pontotoc soils are moderately well suited to use as cropland. The main crops are peanuts, oats, grain sorghum, and pasture. The Nebgen soils are not suited to crops because of slope, depth, and stoniness.

The soils in this unit are fairly suited to use as wildlife habitat. Deer, quail, and turkeys are the main kinds of wildlife.

These soils are mostly moderately well suited to urban development. The moderate depth to rock and slope are limitations in places. Low strength affecting roads and streets and corrosivity to uncoated steel are moderate limitations. These soils are well suited to recreation areas. Slope and stones in places are limitations.

#### **10. Katemcy-Demona-Ligon**

*Moderately deep, deep, and shallow; gently sloping to rolling; loamy and sandy soils*

The landscape consists of gently sloping Katemcy and Demona soils and gently sloping to rolling Ligon soils

(fig. 7). Katemcy and Demona soils are on lower slopes, and Ligon soils are on the higher side slopes and the crest of lower hills and ridges. Slopes range from 1 to 16 percent.

This map unit makes up about 1 percent of the county. It is about 38 percent Katemcy soils, 24 percent Demona soils, 11 percent Ligon soils, and 27 percent other soils.

Typically, the surface layer of the Katemcy soils is neutral, brown fine sandy loam about 9 inches thick. The subsoil, to a depth of 24 inches, is brown clay. To a depth of 36 inches, it is reddish yellow clay. The underlying material is olive yellow, weathered schist.

Typically, the Demona soils are neutral or slightly acid in the surface layer and become medium acid with increasing depth. The surface layer is brownish loamy fine sand about 24 inches thick. The upper part of the subsoil, to a depth of 48 inches, is light gray sandy clay and has reddish, brownish, and yellowish mottles. The lower part of the subsoil, to a depth of 58 inches, is sandy clay and has white, grayish, and yellowish mottles. The underlying material is yellowish brown sandstone.

Typically, the surface layer of the Ligon soils is neutral, reddish brown loam about 6 inches thick. The subsoil, to a depth of 17 inches, is neutral, reddish brown clay loam. The underlying material is partially weathered schist.

Other soils in this unit are Bonti, Nocken, Hye, Nebgen, Pedernales, Sagerton, and Yates soils. The moderately deep, loamy Bonti, Nocken, and Hye soils are on side slopes of valleys and low ridges. The very shallow to shallow, loamy Nebgen soils are on upper side slopes and the crest of ridges. The deep, loamy Pedernales and Sagerton soils are in the lower parts of shallow valleys. The very shallow to shallow, gently sloping to sloping, and loamy Yates soils are on ridgecrests and scarps.

Katemcy and Demona soils are mainly used for cultivated crops and tame pasture. They are well suited to these uses. The main crops are oats, peanuts, grain sorghums, and Coastal bermudagrass. Ligon soils are mainly used as rangeland and wildlife habitat. Good yields of mid grass and short grass can be expected during favorable years. These soils are not suited to use as cropland.

The soils in this unit are fairly suited to use as wildlife habitat. The main kinds of wildlife are deer, quail, and turkeys.

These soils are poorly suited to most urban and recreation uses. The main limitations are depth to rock, moderately slow and slow permeability, slope, corrosivity to uncoated steel, a sandy surface layer, and rock outcrops.

#### **soils formed on bottom lands**

These loamy soils are on the flood plains of creeks and rivers. Sediments along the San Saba River and its tributaries are from limestone prairies. Sediments along

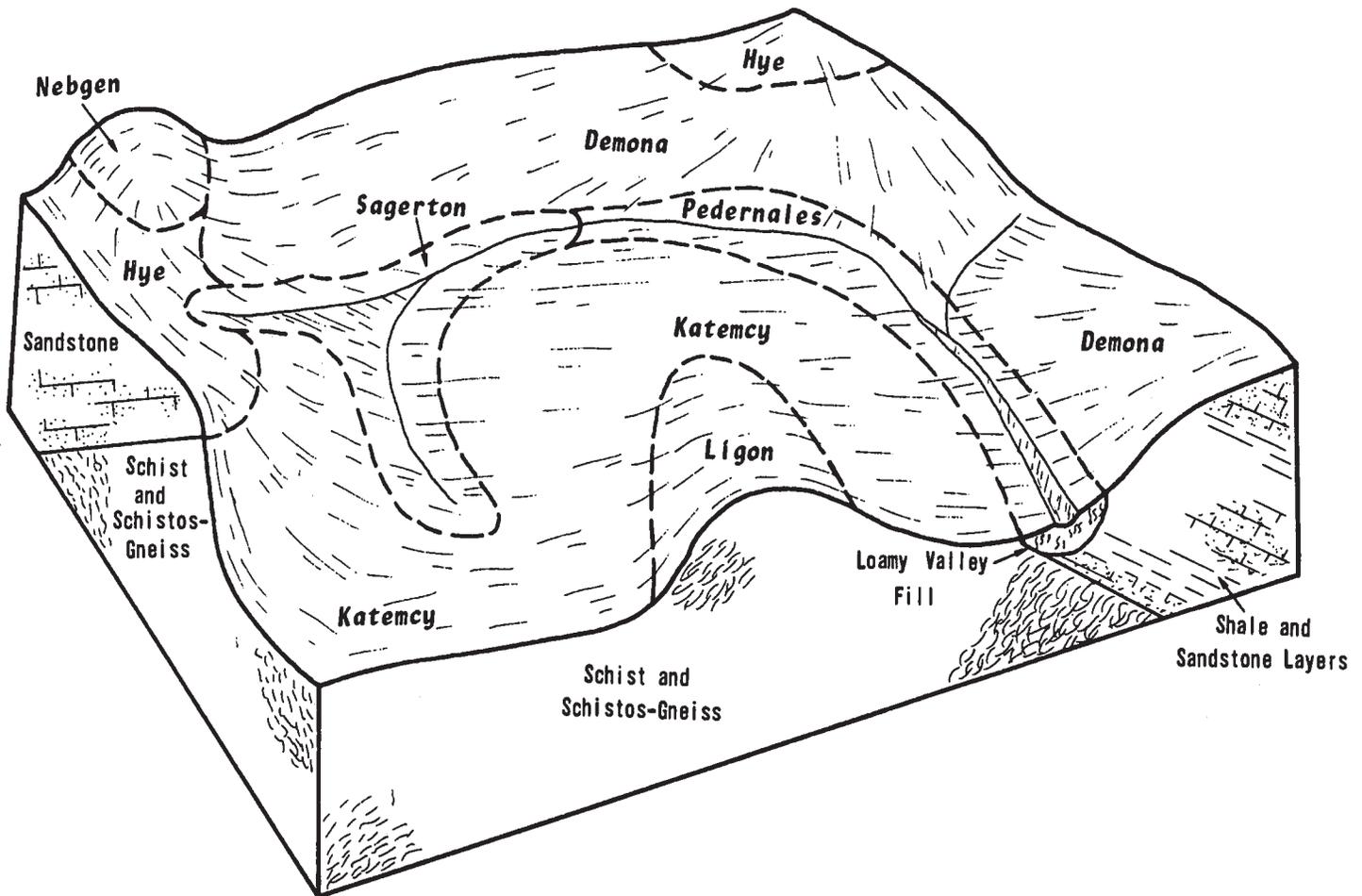


Figure 7.—Pattern of soils in the Katemcy-Demona-Ligon general soil map unit and the relationship to the underlying material.

the Colorado River and its tributaries are mostly of Rolling Plains origin from the Permian System that outcrops in counties west and northwest of the survey area. A few areas of sediments are from the local Pennsylvania System. These soils are mainly used as cropland and for pecan orchards and improved pasture. The main crops are oats, wheat, and grain sorghum.

#### 11. Frio

*Deep, nearly level to gently sloping, dark loamy soils*

The landscape consists of nearly level to gently sloping soils on flood plains of streams draining limestone prairies (fig. 1). The main area is along the San Saba River and its tributaries. Slopes range from 0 to 2 percent.

This map unit makes up about 3 percent of the county. It is about 75 percent Frio soils and 25 percent other soils.

Typically, the Frio soils are calcareous, silty clay loam

to a depth of more than 60 inches. In the upper 22 inches, they are dark grayish brown to very dark grayish brown. Below that, to a depth of 42 inches, they are dark brown and have common films and threads of calcium carbonate. The underlying material to a depth of 65 inches is brown. It has a few bedding planes and many films and threads of calcium carbonate.

Other soils consist of Nuvalde, Shep, and Sagerton soils and a soil similar to Frio soils but that is very gravelly throughout. The deep, nearly level to gently sloping, and loamy Nuvalde and Sagerton soils are on higher terraces. The moderately deep, gently sloping Shep soils are on beveled edges of terraces and upland plains.

The soils in this unit are mainly used as cropland and for pecan orchards and tame pasture. The soils are well suited to crops. The crops are oats, wheat, and grain sorghum. Coastal bermudagrass is the main pasture grass. High yields of mid grass and tall grass are expected in favorable years.

These soils are fairly suited to use as wildlife habitat. Deer, quail, and turkeys are common to this site.

The soils in this unit are not suited to urban uses. The main limitations are flooding, moderately slow permeability, clayey texture, low strength affecting roads and streets, and high corrosivity to uncoated steel. These soils are poorly suited to recreation uses.

## 12. Weswood-Yahola

*Deep, nearly level to gently sloping, light colored loamy soils*

The landscape consists of nearly level to gently sloping soils on bottom lands (fig. 4). Slopes range from 0 to 3 percent.

This map unit makes up about 2 percent of the county. It is about 50 percent Weswood soils, 30 percent Yahola soils, and 20 percent other soils.

Typically, the Weswood soils are calcareous silt loam to a depth of more than 80 inches. They are reddish brown to a depth of 50 inches. The underlying material to a depth of 80 inches is yellowish red. Bedding planes are below a depth of 30 inches.

Typically, the surface layer of the Yahola soils is calcareous, reddish brown fine sandy loam about 10 inches thick. To a depth of 30 inches is yellowish red, calcareous fine sandy loam. Below that, to a depth of 56 inches, is brown, calcareous loamy fine sand. The underlying layer to a depth of 65 inches is calcareous, yellowish red loam.

Other soils in this unit are Bastrop, Clairemont, Desan, Miller, and Winters soils. The deep, gently sloping, and loamy Winters and Bastrop soils are on adjoining higher terraces. The deep, loamy Clairemont soils and the deep, clayey Miller soils are intermingled with Weswood and Yahola soils. The deep, gently sloping, and sandy Desan soils are on upland terraces.

Weswood soils are mainly used as cropland and for pecan orchards and tame pasture. These soils are rarely flooded. Yahola soils are mainly used as rangeland and for native pecans. Flooding occurs once or more yearly.

The soils in this unit are fairly suited to use as wildlife habitat. Deer, turkeys, quail, squirrels, and raccoon inhabit this mapped area.

These soils are unsuited to urban uses because of the hazard of flooding. They are moderately well suited to most recreation uses.



## detailed soil map units

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

Each map unit on the detailed soil maps represents an area on the landscape and consists of one or more soils for which the unit is named.

A symbol identifying the soil precedes the map unit name in the soil descriptions. Each description includes general facts about the soil 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 or of the underlying material, 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 or of the underlying material. They also can differ in slope, stoniness, salinity, wetness, 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, Bonti fine sandy loam, 1 to 3 percent slopes is one of several phases in the Bonti series.

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

A *soil complex* consists of two or more soils in such an intricate pattern or in such small areas that they cannot be shown separately on the soil maps. The pattern and proportion of the soils are somewhat similar in all areas. Nuvalde-Shep complex, 1 to 5 percent slopes is an example.

A *soil association* is made up of two or more geographically associated soils that are shown as one unit on the maps. Because of present or anticipated soil uses in the survey area, it was not considered practical or necessary to map the soils separately. The pattern and relative proportion of the soils are somewhat similar. Katemcy-Ligon association, rolling is an example.

An *undifferentiated group* is made up of two or more soils that could be mapped individually but are mapped as one unit because similar interpretations can be made for use and management. The pattern and proportion of the soils in a mapped area are not uniform. An area can be made up of only one of the major soils, or it can be made up of all of them. There are no undifferentiated groups in this survey area.

Most map units include small scattered areas of soils other than those for which the map unit is named. Some of these included soils have properties that differ substantially from those of the major soil or soils. Such differences could significantly affect use and management of the soils in the map unit. The included soils are identified in each map unit description. Some small areas of strongly contrasting soils are identified by a special symbol on the soil maps.

Table 4 gives the acreage and proportionate extent of each map unit. Other tables (see "Summary of tables") give properties of the soils and the limitations, capabilities, and potentials for many uses. The Glossary defines many of the terms used in describing the soils.

Rangeland is the dominant land use in this survey area. Soils that support rangeland vegetation are assigned to a range site. The range site is stated for each appropriate detailed map unit. For a complete description of the range site, see the discussion of "Rangeland" in the section "Use and management of the soils."

**BaB—Bastrop fine sandy loam, 0 to 3 percent slopes.** This deep, nearly level to gently sloping soil is on uplands. Areas are oblong to irregular in shape and range from 15 to 300 acres.

Typically, the surface layer is slightly acid, dark yellowish brown fine sandy loam about 17 inches thick. The subsoil, to a depth of 76 inches, is neutral sandy clay loam. It is reddish brown in the upper part and yellowish red in the lower part. The underlying material to a depth of 80 inches is reddish yellow loam.

This soil is well drained. Surface runoff is medium. Permeability is moderate, and available water capacity is high. The root zone is deep and easily penetrated by plant roots.

Included with this soil in mapping are small areas of Winters, Sagerton, and Miller soils. A few areas of Bastrop loamy fine sand are included. Also included are a few eroded areas on slopes of more than 2 percent

where most of the surface layer has been removed. These included soils range from 1 acre to 5 acres and make up less than 15 percent of any mapped area.

This Bastrop soil is mainly used as cropland and rangeland. Some areas are in pasture. Grain sorghum, oats, and wheat are the main crops. This soil is well suited to crop production. Crop residue left on the surface helps to conserve moisture and prevent washing. Terraces and diversions help to control erosion in the more sloping areas.

This soil is well suited to use as wildlife habitat for deer and provides good nesting areas for quail, doves,

turkeys, and songbirds. The woody vegetation attracts furbearing animals to this site.

The Bastrop soil is well suited to most urban and recreation uses (fig. 8). Low strength affecting roads and streets and seepage are the main limitations, but they are easily overcome by good design and careful installation procedures. Slope restricts some playground uses.

This soil is in capability unit IIe and Sandy Loam range site.

**BaC—Bastrop fine sandy loam, 3 to 5 percent slopes.** This deep, gently sloping soil is on uplands.



*Figure 8.—Recreation area along spring-fed stream. The soil on either side is Bastrop fine sandy loam, 0 to 3 percent slopes.*

Areas are oblong to irregular in shape and range from 15 to 50 acres. Slopes average about 4 percent.

Typically, the surface layer is brown fine sandy loam about 16 inches thick. The upper part of the subsoil, to a depth of 34 inches, is yellowish red sandy clay loam. The lower part of the subsoil, to a depth of 78 inches, is reddish yellow sandy clay loam. The underlying material, to a depth of 90 inches, is reddish yellow sandy clay loam. This soil is neutral or slightly acid in the upper part and ranges from neutral to moderately alkaline and calcareous in the lower part.

This soil is well drained. Surface runoff is medium. Permeability is moderate, and available water capacity is medium. The root zone is deep and easily penetrated by plant roots.

Included with this soil in mapping are small areas of Winters, Desan, Sagerton, and Miller soils. A few areas of Bastrop loamy fine sand are included. Also included are a few eroded areas where most of the surface layer has been removed. These included soils range from 1 acre to 3 acres and make up less than 15 percent of any mapped area.

This Bastrop soil is mainly used as cropland and rangeland, but some areas are used as pastureland. The main crops are oats, wheat, and grain sorghum. This soil is moderately well suited to crop production. Crop residue left on the surface helps to conserve moisture and control erosion. Terraces and contour farming also help to control water erosion.

This soil is well suited to use as wildlife habitat for deer and provides good nesting areas for quail, doves, turkeys, and songbirds. The woody vegetation attracts furbearing animals to this site.

The Bastrop soil is well suited to most urban and recreation uses. Low strength affecting roads and streets, seepage, and slope are the main limitations, but they can be overcome by good design and careful installation procedures. Slope restricts some playground uses.

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

**BfB—Bontl fine sandy loam, 1 to 3 percent slopes.**

This moderately deep, gently sloping soil is on uplands. Areas of this soil are oblong to irregular in shape and range from 10 to more than 100 acres. Slopes average about 2 percent.

Typically, the surface layer is brown fine sandy loam about 4 inches thick. The subsurface layer, to a depth of 9 inches, is light brown fine sandy loam. The upper part of the subsoil, to a depth of 20 inches, is reddish yellow clay. The lower part of the subsoil to a depth of 30 inches is yellowish red clay. Below that is brownish yellow, strongly cemented, acid sandstone. Typically, this soil ranges from neutral to medium acid in the upper part and is medium acid or strongly acid in the lower part.

This soil is well drained. Runoff is rapid. Permeability and internal drainage are moderately slow. The root

zone is moderately deep, and root penetration is somewhat difficult in the lower part of the soil. The hazard of water erosion is slight, and the hazard of soil blowing is moderate (fig. 9). In most cultivated fields, the surface layer has been winnowed to a coarser texture.

Included with this soil in mapping are small areas of Callahan, Sagerton, Winters, Bastrop, Nimrod, May, Nocken, and Throck soils. A few areas of the Bontl soil on slopes of more than 3 percent are included. Also included are a few spots that are moderately severely eroded. The included soils mainly range from 1 acre to 3 acres and make up less than 15 percent of any mapped area.

This Bontl soil is used as cropland and rangeland. The main crops are grain sorghum, peanuts, oats, and improved pasture (fig. 10). This soil is well suited to crops. Crop residue left on the surface helps to conserve moisture and to control soil blowing. Along most field boundaries and fence rows there are accumulations of sand from past blowing. Terraces and contour farming help to control water erosion. Grassed waterways are needed in places as outlets for terraces.

This soil is well suited to use as wildlife habitat for deer and provides good nesting areas for quail, doves, turkeys, and songbirds. The woody vegetation attracts furbearing animals to this site.

The Bontl soil is moderately well suited to most urban and recreation uses. Depth to rock, low strength affecting roads and streets, and shrinking and swelling in the lower layers with changes in moisture are the main limitations. Slow permeability, depth to rock, and slope restrict some playground uses.

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

**BfC—Bontl fine sandy loam, 3 to 5 percent slopes.**

This moderately deep, gently sloping soil is on the sides of erosional upland valleys. Areas are irregular in shape and range from 10 to a few hundred acres. Slopes average about 4 percent.

Typically, the surface layer is brown fine sandy loam about 6 inches thick. The subsurface layer, to a depth of 13 inches, is light brown fine sandy loam. The upper part of the subsoil, to a depth of 20 inches, is reddish brown clay. The lower part of the subsoil, to a depth of 29 inches, is red clay. The underlying layer is brownish yellow, cemented, fractured sandstone. Typically, this soil is neutral in the surface layer and medium acid below.

This soil is well drained. Runoff is medium. Permeability and internal drainage are moderately slow. The available water capacity is low. The root zone is moderately deep. The hazard of water erosion is moderate, and the hazard of soil blowing is severe.

In most cultivated fields, the surface layer has been thinned by soil blowing and water erosion. Shallow gullies have formed in some of the drainageways. Some



Figure 9.—Soil blown from unprotected field in an area of Bonti fine sandy loam, 1 to 3 percent slopes.

sand has accumulated along fence rows of cultivated fields as a result of blowing.

Included with this soil in mapping are areas of Callahan, Nimrod, May, Winters, Nocken, and Bunyan soils that range from 1 acre to 5 acres. Small areas of the Bonti soil on slopes of less than 3 percent are included. Also included are a few eroded areas of the Bonti soil, ranging from 5 to 10 acres, where most of the surface layer has been removed. These included soils make up as much as 15 percent of most mapped areas.

This Bonti soil is used as cropland, pastureland, and rangeland. The main crops are peanuts, oats, grain sorghum, and improved pasture, such as Coastal bermudagrass. This soil is moderately well suited to crop production. Crop residue left on the surface helps to control erosion and to conserve moisture. Terraces and contour farming help to prevent water erosion. In most places grassed waterways are needed as outlets for terraces.

This soil is well suited to use as wildlife habitat for deer and provides good nesting areas for quail, doves, turkeys, and songbirds. The woody vegetation attracts furbearing animals to this site.

The Bonti soil is moderately well suited to most urban and recreation uses. Depth to rock, shrinking and swelling of the lower layers with changes in moisture, and corrosivity to concrete and uncoated steel are limitations. Depth to rock, slope, and moderately slow permeability restrict some playground uses.

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

**BfC2—Bonti fine sandy loam, 1 to 5 percent slopes, eroded.** This moderately deep, gently sloping soil is on uplands. Areas are oblong to irregular in shape and range from 20 to about 500 acres. Slopes are complex and average about 4 percent.

Typically, the surface layer is slightly acid, brown fine sandy loam about 7 inches thick. The subsoil, to a depth of about 34 inches, is firm, yellowish red sandy clay. The underlying material is pink sandstone. Typically, this soil is slightly acid in the surface layer and medium acid in the subsoil.

This soil is well drained. Runoff is rapid. Permeability and internal drainage are moderately slow. The root zone is moderately deep, but penetration by plant roots is somewhat difficult in the lower part of the soil. The hazard of water erosion is moderate, and the hazard of soil blowing is severe.

About one-half of the original surface layer has been removed by erosion over most of this mapped area. The present surface layer in most places is a mixture of the original surface layer and material from the subsoil. The subsoil is exposed in some shallow gullies, on low knolls, and on some plane surface areas. In places, sand has drifted and accumulated along fence rows.

Accumulations are as much as 4 feet deep and range from 10 to 30 feet wide.

Included with this soil in mapping are small areas of Callahan, Nocken, Nimrod, May, Winters, and Bunyan soils. The areas range from 1 acre to 3 acres and account for less than 20 percent of any mapped area.

About one-half of this Bonti soil is cultivated. The rest is idle land or used for improved pasture, such as Coastal bermudagrass or kleingrass. The less sloping areas of the Bonti soil are moderately well suited to crop production. The main crops are peanuts, grain sorghum, and oats. The main management concern is controlling further loss of soil from water erosion and soil blowing. Crop residue left on the surface helps to conserve moisture and to control erosion. Terraces and diversions may be needed to help control water erosion and runoff from adjacent slopes. Grassed waterways are needed as outlets for terraces.



Figure 10.—Stripcropping of peanuts and grain sorghum on Bonti fine sandy loam, 1 to 3 percent slopes.

This soil is fairly suited to use as wildlife habitat. The main limitation is the lack of cover.

The Bonti soil is moderately well suited to most urban and recreation uses. Depth to rock, low strength affecting roads and streets, and shrinking and swelling of the lower layers with changes in moisture are the main limitations. Moderately slow permeability and slope restrict some playground uses.

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

**By—Bunyan soils, frequently flooded.** These deep, nearly level soils are on flood plains of small streams and drainageways. Slope is dominantly less than 1 percent. Areas are elongated and range from 300 to 1,200 feet in width and from about 20 to more than 100 acres.

The composition of this map unit is about 75 percent Bunyan soils and closely similar soils and 25 percent other soils. The closely similar soils have a darker surface layer. They are neither uniform nor in a regular pattern. The surface layer is fine sandy loam, sandy clay loam, loam, or clay loam.

Typically, the upper part of the surface layer, to a depth of 10 inches, is brown loam. The lower part, to a depth of 16 inches, is dark grayish brown clay loam. Below that to a depth of 65 inches are brownish layers of sandy clay loam and clay loam with distinct bedding planes and stratifications of varied texture. Typically, these soils are neutral in the upper part and moderately alkaline in the lower part.

These soils are well drained. Surface runoff is slow to medium. Permeability is moderate. The available water capacity is high. The root zone is deep, and plant roots penetrate the soil easily.

The frequency of flooding ranges from once to 5 times yearly. The soils remain flooded for a period of 2 to 7 days. Floods mainly occur in spring and fall. Deposition and removal of small amounts of soil material occurs with each flood.

Included with these soils in mapping are a few very small areas of Nimrod and Bonti soils. Also included are a few areas of a soil that is fine sandy loam throughout.

These Bunyan soils are not suited to cultivation because of the hazard of flooding. They are mainly used as rangeland. A few areas have been planted to improved pasture grasses or pecan orchards. These soils are well suited to pasture production. Improved grasses, such as Coastal bermudagrass and kleingrass, are well suited. Pecans grow well on these soils.

These soils are fairly suited to use as wildlife habitat for deer, turkeys, raccoon, and squirrels. The trees, shrubs, and water are desirable to furbearing animals.

The Bunyan soils are not suited to urban uses. Flooding is the main limitation. It is also a limitation for most recreation uses, such as playgrounds and campsites.

These soils are in capability subclass Vw and the Loamy Bottomland range site.

**CaB—Callahan loam, 1 to 3 percent slopes.** This moderately deep, gently sloping soil is on uplands. Areas range from 10 to more than 100 acres and are oblong to irregular in shape. Slopes average about 2 percent.

Typically, the surface layer is moderately alkaline, brown loam about 6 inches thick. The subsoil, to a depth of 30 inches, is moderately alkaline clay. It is reddish brown in the upper part and brown in the lower part. Below that, to a depth of 34 inches, is very hard, moderately alkaline, brownish yellow clay that has about 5 to 10 percent shale fragments and a few calcium carbonate concretions. The underlying material is light olive brown shaly clay that is thinly bedded with brown sandstone and olive shale.

This soil is well drained. Surface runoff is medium. Permeability is very slow, and available water capacity is low. The root zone is moderately deep, and penetration by plant roots is difficult. The hazard of water erosion is moderate.

In most cultivated areas, the surface layer has been thinned by erosion, and all of the surface layer has been removed in some spots. A few washes and rills exist. They are mostly in areas where slope is more than 3 percent.

Included with this soil in mapping are small areas of Bonti, Sagerton, Throck, and Rochelle soils. Also included are a few areas of Callahan soils that have slopes of 3 to 5 percent. The included soils make up less than 15 percent of any mapped area.

This Callahan soil is mainly used as rangeland. Some areas are cultivated, but many formerly cultivated areas are presently idle land or have been planted to introduced pasture grasses, such as King Ranch bluestem or kleingrass. This soil is moderately well suited to use as cropland. Oats and grain sorghum are the main crops. Low moisture holding capacity and the hazard of water erosion are the main limitations. Crop residue left on the surface helps to control erosion. Contour farming and terraces are needed to help control erosion. Diversions and terraces may be needed to control runoff from higher slopes.

This soil is fairly suited to use as wildlife habitat, mainly because of the lack of cover. It provides nesting areas for doves and songbirds.

The Callahan soil is moderately well suited to most urban uses. The main limitations are very slow permeability, shrinking and swelling with changes in moisture, low strength affecting roads and streets, and corrosivity to uncoated steel. The soil is moderately well suited to recreation uses. Very slow permeability and a dusty surface are the main limitations.

This soil is in capability subclass IIIe and the Claypan Prairie range site.

**CaC2—Callahan loam, 1 to 5 percent slopes, eroded.** This moderately deep, gently sloping soil is on erosional uplands. The landscape ranges from plane to gently undulating. Areas of this soil are oblong to

irregular in shape and range from 10 to more than 100 acres. Slopes average about 3.5 percent.

Typically, the surface layer is neutral, brown loam about 2 inches thick. The subsoil, to a depth of 24 inches, is brown clay. It is neutral in the upper part and moderately alkaline in the lower part. To a depth of 30 inches, the subsoil is moderately alkaline, yellowish red clay and has accumulations of calcium carbonate. The underlying material is moderately alkaline, thin bedded, light yellowish brown sandstone and shale.

This soil is well drained. Runoff is medium. Permeability is very slow, and available water capacity is low. The root zone is moderately deep, and penetration by plant roots is difficult. The hazard of water erosion is severe.

The surface layer has been eroded by water across about 80 percent of the area. The present surface layer is mostly the remains of the original surface layer and material from the subsoil mixed in tillage. The subsoil is exposed in shallow gullies and on intergully areas that have undergone severe sheet erosion. Sediment from the eroded areas has accumulated at the base of most slopes.

Included with this soil in mapping are small areas of Bonti, Sagerton, Throck, Winters, and Rochelle soils. Also included are a few areas of Callahan loam that have little or no erosion. These included soils make up less than 10 percent of any mapped area.

This Callahan soil is poorly suited to use as cropland. Less than 10 percent of it is used for crops. The main crop is oats. A small acreage has been planted to improved pasture. The rest of this soil is mainly used as idle land. Crop residue left on the surface and terraces are needed to protect this soil from further erosion.

This soil is fairly suited to use as wildlife habitat mainly because of the lack of cover. It provides nesting areas for doves and songbirds.

The Callahan soil is poorly suited to most urban and recreation uses. The main limitations are very slow permeability, shrinking and swelling with changes in moisture, low strength affecting roads and streets, corrosivity to uncoated steel, and slope. Very slow permeability, a dusty surface, and slope in places are the main limitations for recreation uses.

This soil is in capability subclass IVe and the Claypan Prairie range site.

**ChC—Cho loam, 0 to 8 percent slopes.** This very shallow to shallow, nearly level to sloping soil is on uplands, generally at the higher elevations. Areas are oblong to irregular in shape and range from 10 to about 100 acres. Slopes are complex and range from 0 to 8 percent but average about 2.5 percent.

Typically, the surface layer is moderately alkaline dark grayish brown loam about 10 inches thick. It is underlain by indurated, platy, pink caliche about 4 inches thick. Below that to a depth of 60 inches is pink, limy earth

that is more than 50 percent by volume calcium carbonate. The texture is loam.

This soil is well drained. Runoff is medium. Permeability is moderate, but in the indurated caliche layer it is slow. The available water capacity is very low. The root zone is very shallow to shallow but is easily penetrated by plant roots. The hazard of water erosion is moderate.

Included with this soil in mapping are small areas of Karnes, Mereta, Nuvalde, Rowena, and Miles soils. Included soils make up less than 10 percent of any mapped area.

This Cho soil is used as rangeland. A few areas of minor extent are used as cropland with other adjoining more suitable soils; however, this soil generally is not suited to this use. The underlying caliche layer is suited to use as road base material.

This soil is poorly suited to use as wildlife habitat. It provides good nesting areas for quail and songbirds. Furbearing animals generally are slightly attracted to this site, but badgers are more attracted to it.

The Cho soil is poorly suited to most urban uses. The thin layer and the cemented pan are the main limitations. This soil is moderately well suited to most recreation uses. Small stones and slope restrict some playground uses.

This soil is in capability subclass VI and the Very Shallow range site.

**Cm—Clairemont silt loam, frequently flooded.** This deep, nearly level to gently sloping soil is on flood plains along the Colorado River. Slopes range from 0 to 3 percent but average about 1.5 percent. Microridges and depressions are across the flood plain. They are the result of scouring and deposition, and are 1 foot to 5 feet deep and parallel the stream flow. Areas are oblong to elongated in shape and range from 10 to about 200 acres.

Typically, the surface layer is reddish brown silt loam about 6 inches thick. The next layer, to a depth of 36 inches, is reddish brown silty clay loam that has thin strata of varied texture. Below that to a depth of 62 inches is yellowish red loam that has evidence of bedding planes. This soil is moderately alkaline and calcareous throughout.

This soil is well drained. Surface runoff is slow. Permeability is moderate, and available water capacity is high. The root zone is deep, and plant roots penetrate the soil easily. The hazard of water erosion is slight or moderate. The frequency of flooding ranges from about once a year to once every five years. The duration is usually less than 2 days.

Included with this soil in mapping are Weswood, Yahola, and Miller soils. These included soils make up as much as 20 percent of most mapped areas.

The Clairemont soil is not suited to cultivation because of the hazard of flooding. It is subject to scouring and deposition. It is mainly used as rangeland and

pastureland. A few areas are planted to pecan groves.

This soil is fairly suited to use as wildlife habitat for squirrels and deer, and it provides good nesting areas for doves, quail, turkeys, and songbirds. The trees, shrubs, and water attract furbearing animals to this site. Wildlife are generally attracted to the available mast, seed producing forbs, winter annuals, and cover.

The Clairemont soil is not suited to urban uses. Flooding is a severe limitation. This soil is poorly suited to most recreation uses. Flooding restricts the use of these soils for playgrounds and campsites.

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

**CrC—Corkstone clay loam, 1 to 5 percent slopes.**

This shallow, gently sloping soil is on remnants of high, gently sloping plateaus and forms the cap of hills with steep side slopes. Deeply cut erosional valleys and drainageways are between these hills. Areas are irregular in shape and range from 50 to 250 acres.

Typically, the surface layer is mildly alkaline, very dark grayish brown clay loam about 4 inches thick. The subsoil, to a depth of 18 inches, is neutral clay. It is brown in the upper part and reddish brown in the lower part. Next, to a depth of 36 inches, is platy, spiculite sponge residuum, or corkstone. Below that to a depth of 60 inches is gray, hard, fractured limestone.

This soil is well drained. Surface runoff and internal drainage are medium. Permeability is slow, and available water capacity is very low. The root zone is shallow and can be penetrated by plant roots without difficulty.

Included with this soil in mapping are small areas of Cho, Rumble, Roughcreek, Tarpley, and a soil similar to the Corkstone soil except that depth to spiculite is 10 inches or less. A few areas of Throck soils are on short, steep scarps along the outer edges of this mapped area. Also included are a few areas of Corkstone soils that have slopes of more than 5 percent. These included soils make up less than 20 percent of any mapped area.

This Corkstone soil is used as rangeland. Cultivation of this soil with modern farm equipment is not feasible because of irregular slopes, the small size of the areas, and their location in large areas of rangeland. The underlying spiculite sponge residuum is mined commercially for building stone.

This soil is fairly suited to use as wildlife habitat for deer, and it provides good nesting areas for doves, quail, turkeys, and songbirds. Furbearing animals also use this site.

The Corkstone soil is poorly suited to most urban uses. Shallow depth to bedrock and shrink-swell potential are the main limitations. This soil is poorly suited to recreation uses because of shallow depth and slow permeability.

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

**DmB—Demona loamy fine sand, 1 to 3 percent slopes.**

This deep, gently sloping soil is on uplands. Areas are irregular in shape and range from about 10 to more than 200 acres. Slopes average about 2 percent.

Typically, the surface layer is neutral, brown loamy fine sand about 4 inches thick. Next, to a depth of 24 inches, is slightly acid, pale brown loamy fine sand. The upper part of the subsoil, to a depth of 34 inches, is slightly acid, light gray sandy clay that has mottles in shades of brown, yellow, and red. To a depth of 48 inches, it is medium acid, light gray sandy clay and has mottles of yellow and reddish yellow. The lower part of the subsoil, to a depth of 58 inches, is medium acid, mottled sandy clay. The mottles are white, light gray, brownish yellow, and reddish yellow. Below that to a depth of 58 inches is yellowish brown sandstone.

This soil is moderately well drained. Runoff is slow. A temporary water table, perched on the clayey subsoil, is present following periods of heavy rainfall. Permeability is moderately slow. The available water capacity is medium. The root zone is deep. The hazard of water erosion is moderate, and the hazard of soil blowing is severe. In most cultivated fields, the surface layer has been winnowed by the wind. In some fields, soil blowing has removed most of the surface layer in spots and patches ranging from 1 acre to 3 acres. Most field boundaries and fence rows have accumulations of sand as much as 4 feet deep.

Included with this soil in mapping are small areas of Pedernales, Hye, Sagerton, Katemcy, and Ligon soils. A few areas that have slopes of more than 3 percent and a few gullied areas are included. The included soils make up less than 15 percent of any mapped area.

This Demona soil is mainly used as cropland and for improved pasture. The main crops are peanuts, grain sorghum, and oats. Improved pasture grasses include Coastal bermudagrass. This soil is well suited to watermelons, fruits, and vegetables. Rye and vetch are well adapted as winter cover crops. The sprinkler irrigation system works well. Crop residue left on the surface helps to conserve moisture and to control soil blowing.

This soil is well suited to use as wildlife habitat. The main kinds of wildlife are quail, doves, and songbirds. Deer and turkeys are in some areas.

The Demona soil is poorly suited to most urban and recreation uses. The main limitations are moderately slow permeability, seepage, wetness, and the loose sandy surface layer.

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

**DsC—Desan loamy fine sand, 1 to 5 percent slopes.**

This deep, gently sloping upland soil is on old, high terraces. The landscape is gently undulating. Slopes average about 2 percent. Areas are irregular in shape and range from 50 to 300 acres or more.

Typically, the surface layer is neutral, light yellowish brown loamy fine sand about 7 inches thick. The

subsurface layer, to a depth of 51 inches, is slightly acid, very pale brown loamy fine sand. The subsoil, to a depth of 80 inches, is slightly acid and medium acid, yellowish red sandy clay loam.

This soil is somewhat excessively drained. Little or no runoff occurs. Permeability is moderate, and available water capacity is low. The root zone is deep and easily penetrated by plant roots. The hazard of soil blowing is severe.

In most cultivated fields, the surface layer has been winnowed by wind. Soil blowing has also removed most of the surface layer in a few places in some fields. Some field boundaries and fence rows have accumulations of sand ranging from 10 to 30 feet in width and as much as 4 feet deep.

Included with this soil in mapping are small areas of Winters, Bastrop, and a soil similar to the Desan soil except that the surface layer ranges from 20 to 40 inches thick. Also included are a few soils similar to the Desan soil but that have yellowish and brownish mottles in the subsoil. These included soils make up less than 15 percent of any mapped area.

This Desan soil is mostly used for introduced pasture and cultivated crops. It is well suited to pasture, peanuts, pecans, cantelopes, watermelons, and fruits, including apples. Crop residue left on the surface helps to protect against soil blowing and to conserve moisture. Winter cover crops also help to control soil blowing. The sprinkler irrigation system works well on this soil.

This soil is well suited to use as wildlife habitat for deer and provides good nesting areas for doves, quail, turkeys, and songbirds. The woody plant cover attracts furbearing animals to this site.

The Desan soil is poorly suited to most urban uses. The sandy surface layer, seepage, and the tendency for cutbanks to cave are the main limitations. This soil is poorly suited to most recreation uses because of the sandy surface layer and the hazard of soil blowing.

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

#### **EcC—Eckrant stony clay, 1 to 8 percent slopes.**

This very shallow to shallow soil is on undulating uplands. Areas are irregular in shape and range from about 100 to several hundred acres.

Typically, this soil is 14 inches thick over bedrock. The upper 6 inches is moderately alkaline, very dark grayish brown stony clay. The lower 8 inches is moderately alkaline, dark brown stony clay. Coarse fragments, including limestone pebbles, stones, and cobbles, make up about 35 to 60 percent by volume. The underlying material is fractured limestone.

This soil is well drained. Runoff is rapid. Permeability is moderately slow, and available water capacity is low. The root zone is shallow.

Included with this soil in mapping are small areas of Tarpley, Rumble, Roughcreek, and Speck soils. These included soils make up less than 15 percent of any mapped area.

This Eckrant soil is not suited to cultivated crops. Shallow depth and high limestone fragment content restrict it to use as rangeland and wildlife habitat.

This soil is fairly suited to use as wildlife habitat for deer and provides good nesting areas for doves, quail, turkeys, and songbirds. The rough terrain attracts furbearing animals to this site.

The Eckrant soil is poorly suited to most urban and recreation uses. Shallow depth, clayey texture, and limestone cobbles on the surface and in the soil are the main limitations.

This soil is in capability subclass VIIs and the Low Stony Hills range site.

#### **ERE—Eckrant-Rock outcrop association, rolling.**

This association consists of very shallow, very stony soils and rock outcrops on rolling uplands. These soils are on ridges and side slopes of hills that generally have oval tops. Slopes are complex and are mainly 5 to 16 percent. Areas are irregular in shape, are generally several hundred acres, and are well dissected by drainageways.

The Eckrant soil makes up about 55 percent of this association but ranges from 40 to 60 percent. Rock outcrop makes up about 30 percent but ranges from 10 to 50 percent. Other soils make up about 15 percent of this association. Areas of this map unit are large, and the composition is variable; however, the detail is adequate for the expected uses.

Typically, the surface layer is moderately alkaline, very dark grayish brown, very stony clay about 8 inches thick. The underlying material consists of coarsely fractured, indurated, dolomitic limestone with fine earth in the interstices, or fractures.

Limestone outcrops consist of gray cobbles and boulders. The boulders range from 1 foot to 4 feet in thickness and 6 to 10 feet across the long axis. Some boulders are nearly level to the surface, but most are tilted at angles of 1° to about 45°. These boulders extend from about 2 inches to about 2 feet above the surface.

The soil in this association is well drained. Runoff is rapid. Permeability is moderately slow. The available water capacity is very low. The root zone is shallow to very shallow.

Included with the Eckrant soil in mapping are small areas of Cho, Roughcreek, Rumble, and Tarpley soils. Also included are small areas of the moderately steep Eckrant soils. These included soils make up about 15 percent of the mapped area.

This Eckrant soil is not suited to cultivation. Shallow depth to rock, Rock outcrop, stones on the surface, and slope restrict the use of this soil to use as rangeland and wildlife habitat.

The soil is fairly suited to use as wildlife habitat for deer and provides good nesting areas for doves, quail, turkeys, and songbirds. The rough terrain attracts furbearing animals to this site.

The Eckrant soil is poorly suited to most urban and recreation uses. The main limitations are slope, the very shallow depth to rock, coarse fragments, and surface stones.

This soil is in capability subclass VII<sub>s</sub>; Steep Rocky range site.

**Fr—Frio silty clay loam, occasionally flooded.** This deep, nearly level to gently sloping soil is mostly on the flood plains of the San Saba River and its tributaries. Slopes are dominantly less than 1 percent but range from 0 to 2 percent. Areas are oblong to irregular in shape and range from about 20 to more than 400 acres. A few scour channels, partially filled meander channels, and a few sloughs are present in this mapped area.

Typically, the surface layer is silty clay loam about 42 inches thick. It is dark grayish brown in the upper part, very dark grayish brown in the middle, and dark brown in the lower part. The underlying material to a depth of 65 inches is brown silty clay loam that has a few soft masses of calcium carbonate. This soil is moderately alkaline throughout.

This soil is well drained. Runoff is slow. Permeability is moderately slow, and available water capacity is high. The root zone is deep and is penetrated by plant roots without difficulty.

The frequency of flooding is once in about 5 to 12 years. The duration is a period of 2 to 4 days.

Included with this soil in mapping are areas of Nuvalde, Karnes, and Sagerton soils. Also included are stream channels and channel areas that have slopes of more than 2 percent. The included soils make up less than 15 percent of any mapped area.

The Frio soil is mainly used as cropland and for pecan orchards (fig. 11). Other areas are used for improved pasture and as rangeland.

This soil is well suited to crop production. The main crops are oats, wheat, and grain sorghums. Crop residue left on the surface helps to conserve moisture and maintain tilth and productivity. Level border irrigation is used in some areas. The Frio soil is also well suited to pasture production. Improved grasses, such as Coastal bermudagrass and kleingrass, are grown.

This soil is well suited to use as wildlife habitat for squirrels and deer and provides good nesting areas for doves, quail, turkeys, and songbirds. The trees, shrubs, and water attract furbearing animals to this site. Wildlife are also attracted to the mast, seed producing forbs, winter annuals, and cover.

The Frio soil is not suited to urban uses. Flooding, moderately slow permeability, and clayey texture are the main limitations. The soil is poorly suited to recreation uses.

This soil is in capability subclass II<sub>w</sub> and the Loamy Bottomland range site.

**Fs—Frio soils, frequently flooded.** These deep, nearly level to gently sloping soils are on the lower bottom lands along the San Saba River and along small streams draining limestone prairies. Areas are generally oblong or elongated and range from 10 to more than 100 acres. Slopes are complex and range from 0 to 2 percent.

Typically, the surface layer is moderately alkaline, silty clay loam about 36 inches thick. It is very dark grayish brown in the upper part. In the lower part it is dark grayish brown and has a few thin stratifications of loam or fine sandy loam. The underlying material to a depth of 60 inches is moderately alkaline, brown silty clay loam, stratified with finer and coarser materials.

These soils are well drained. Runoff is slow. Permeability is moderately slow, and available water capacity is high. The root zone is deep, and plant roots penetrate the soil without difficulty. When currents are swift during overflows, the hazard of water erosion is severe.

The frequency of flooding ranges from once every 2 years to twice or more each year. The duration is a period of 2 to 7 days. Scouring and deposition occur with each overflow. Gravel layers are common along some major channels and may extend onto the flood plain where the channel bends sharply. Texture of the surface is clay loam, silty clay loam, clay, or silty clay.

Included with these soils in mapping are a few areas of occasionally flooded Frio soils, Nuvalde soils, and a soil similar to the Frio soils but that has more than 35 percent gravel. Also included are small areas of soils along old meandering channels and steep banks that have slopes of more than 2 percent. The included soils make up less than 15 percent of a mapped area.

These Frio soils are used as rangeland, for improved pasture, and for pecan orchards. Plant cover is needed to prevent localized scouring during periods of flooding. These soils are not suited to crops. They are well suited to pasture production. Improved grasses, such as Coastal bermudagrass and kleingrass, are grown.

These soils are fairly suited to use as wildlife habitat for squirrels and deer and provide good nesting areas for doves, quail, turkeys, and songbirds. The trees, shrubs, and water attract furbearing animals to this site. Wildlife are also attracted by the mast, seed producing forbs, winter annuals, and cover.

The Frio soils are not suited to urban and recreation uses. The frequency of flooding and clayey texture are the main limitations.

These soils are in capability subclass V<sub>w</sub> and Loamy Bottomland range site.

**HrB—Harper stony clay, 0 to 3 percent slopes.** This shallow, nearly level to gently sloping soil is on uplands. Areas are oblong to elongated and range from 20 to more than 50 acres. Slopes are predominantly less than



Figure 11.—Pecan orchard on Frio silty clay loam, occasionally flooded.

1 percent. Limestone fragments on the surface are mostly 3 to 24 inches in diameter and from 25 to 100 feet apart.

Typically, this soil is moderately alkaline, very dark gray stony clay to a depth of about 7 inches, and moderately alkaline, very dark gray clay to a depth of 18 inches. Below that is indurated, dolomitic limestone bedrock.

This soil is well drained. Runoff is slow. Permeability is moderately slow, and available water capacity is low.

Included with this soil in mapping are small areas of Roughcreek very stony clay loam, Eckrant stony clay, and a soil similar to the Harper soil except that it is slightly more than 20 inches to limestone bedrock.

These included soils make up less than 15 percent of any mapped area.

This Harper soil is not suited to cultivated crops. Limestone fragments on the surface and shallow depth restrict it to use as rangeland.

This soil is poorly suited to use as wildlife habitat. A few deer, doves, quail, and turkeys are in some areas. Furbearing animals are not attracted to this site because of the nearly level to gently sloping terrain.

The Harper soil is poorly suited to most urban and recreation uses. The shallow depth to rock and the stony and clayey surface layer are the main limitations.

This soil is in capability subclass VI and the Stony Upland range site.

**HyC—Hye fine sandy loam, 1 to 5 percent slopes.** This moderately deep, gently sloping soil is on uplands. Slopes are complex and average about 3 percent. Areas are irregular in shape and range from 10 to more than 200 acres.

Typically, the surface layer is reddish brown fine sandy loam about 8 inches thick. The upper part of the subsoil, to a depth of 14 inches, is reddish brown fine sandy loam and contains slightly more clay than the surface layer. To a depth of 36 inches, the subsoil is yellowish red sandy clay loam and contains a few sandstone pebbles in the upper part and common pebbles in the lower part. Below that is indurated sandstone bedrock. Typically, this soil is neutral in the surface layer and the upper part of the subsoil and slightly acid below.

This soil is well drained. Runoff is medium. Permeability is moderate, and available water capacity is low. The root zone is moderately deep. The hazard of

soil blowing is moderate. Most cultivated areas have a slight to moderate hazard of water erosion.

Included with this soil in mapping are areas of Pontotoc, Pedernales, Yates, Sagerton, and Nuvalde soils. Also included are a few spots of the Hye soils where most of the surface layer has been removed by erosion. Included are some closely similar soils that have a subsoil base saturation of slightly more than 75 percent. The included soils make up less than 20 percent of any mapped area.

This Hye soil is mainly used as cropland, but some areas are used as rangeland. Peanuts, grain sorghums, and improved pasture are the main crops (fig. 12).

This soil is moderately well suited to nonirrigated and irrigated crops. Periodic low rainfall, slopes of more than 3 percent, low moisture holding capacity, and susceptibility to water erosion are the main limitations. Crop residue left on the surface helps to control erosion and to conserve moisture. Contour farming and terraces



*Figure 12.—Cattle grazing coastal bermudagrass in an area of Hye fine sandy loam, 1 to 5 percent slopes.*

help to control water erosion. Diversions and terraces may be needed to control runoff from higher slopes. Grassed waterways are needed as outlets for diversions and terrace systems. A sprinkler irrigation system is well suited to this soil.

The Hye soil is fairly suited to use as wildlife habitat. The lack of cover is the main limitation in most places. This soil is moderately well suited to most urban uses. The moderate depth to rock, thin layer, seepage, and moderate corrosivity to uncoated steel are the main limitations. The soil is well suited to recreation uses. Slope is a limitation in places for playgrounds.

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

**KfC—Katemcy fine sandy loam, 1 to 5 percent slopes.** This moderately deep, gently sloping soil is on slightly convex ridges and side slopes of shallow valleys in an undulating landscape. Areas are oblong to irregular in shape and range from about 10 to more than 100 acres. Slopes are complex and typically about 3 percent.

Typically, the surface layer is brown fine sandy loam about 9 inches thick. The upper part of the subsoil, to a depth of 24 inches, is brown clay. The lower part of the subsoil, to a depth of 36 inches, is reddish yellow clay. The underlying material, to a depth of 48 inches, is olive yellow, weakly to strongly cemented, laminated schist that is partially weathered along cleavage planes. Typically, this soil is neutral throughout.

This soil is well drained. Runoff is medium. Internal drainage and permeability are slow. The available water capacity is medium. The root zone is moderately deep and is easily penetrated by plant roots.

Included with this soil in mapping are small areas of Pedernales, Bonti, Nebgen, and Demona soils. An area southeast of the town of Cherokee consists of Katemcy clay loam. The included soils make up less than 15 percent of any mapped area.

This Katemcy soil is used as cropland and rangeland and for tame pasture. The crops are peanuts, grain sorghum, and oats. The underlying schist layer in this soil is suited to use as road base material.

This soil is well suited to crop production. Crop residue left on the surface helps to control erosion and to conserve moisture. Terraces, diversions, and contour farming help to control runoff and water erosion.

The Katemcy soil is fairly suited to use as wildlife habitat. Deer, doves, quail, turkeys, and songbirds are the main kinds of wildlife. The hollow trees attract furbearing animals.

This soil is moderately well suited to most urban uses. The moderate depth to rock, shrinking and swelling with changes in moisture, and high corrosivity to uncoated steel are the main limitations. The soil is well suited to most recreation uses. Slope is a limitation for playgrounds.

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

**KLE—Katemcy-Ligon association, rolling.** This association is on upper side slopes of ridges and hills. Areas are well dissected by drainageways. Slopes are complex and generally range from about 3 to 16 percent. The Katemcy soil is generally on the lower side slopes and foot slopes that are mainly 3 to 8 percent. The Ligon soil is on the middle and upper side slopes of ridges that are mainly 3 to 16 percent. Areas are irregular in shape and are several hundred acres.

This association is about 45 percent Katemcy soil and 30 percent Ligon soil. Other soils and rock outcrop make up about 25 percent. The composition of this association is more varied than most map units in the survey area; however, the detail is adequate for the expected use of the soils.

Typically, the surface layer of the Katemcy soil is medium acid, brown fine sandy loam about 9 inches thick. The subsoil is reddish brown clay to a depth of 28 inches and red clay to a depth of 40 inches. The underlying material is yellowish red partially weathered schist.

Typically, the surface layer of the Ligon soil is neutral, reddish brown loam about 6 inches thick. The subsoil, to a depth of 17 inches, is neutral, reddish brown clay loam. The underlying layer is partly weathered schist bedrock.

The soils in this association are well drained. Runoff is medium. Internal drainage and permeability are slow for the Katemcy soil. Internal drainage is medium for the Ligon soil, and permeability is moderately slow. The available water capacity is very low for the Ligon soil and medium for the Katemcy soil. The hazard of water erosion is moderate if there is no good plant cover.

Included with these soils in mapping are soils similar to the Ligon soils but that are browner in the lower layers. Also included are some outcrops of granite boulders that are mostly 1 acre to about 15 acres; however, one area of granite boulders near the county line, southeast of the town of Cherokee, is more than 100 acres. Other rock outcrops are schist and schistose gneiss. These rock outcrops and included soils are on slopes of about 10 to 20 percent. They make up an average of 25 percent of a mapped area.

The soils in this association are used as rangeland. These soils are not suited to cultivation with modern farm equipment because of the small size of arable areas, soil depth, slope, rock outcrops, and susceptibility to water erosion. The underlying schist bedrock is used as road building material.

These soils are fairly suited to use as wildlife habitat. The main kinds of wildlife are deer, doves, quail, turkeys, and songbirds.

The Katemcy and Ligon soils are poorly suited to most urban and recreation uses. Slope, depth to rock, rock outcrops, and stones on the surface are the main limitations.

The Katemcy soil is in capability subclass IVe, and the Ligon soil is in capability subclass VIe. The Katemcy and Ligon soils have been assigned to the Schist range site.

**LeA—Leeray clay, 0 to 1 percent slopes.** This deep, nearly level soil is on uplands on broad valleys and alluvial plains. Slopes are plane to slightly concave. They average about 0.5 percent. Areas are oblong to irregular in shape and range from 15 to more than 200 acres. Undisturbed areas in rangeland have low mounds and shallow depressions (gilgai microrelief).

Typically, the surface layer is clay about 34 inches thick that is dark grayish brown in the upper part, grading to brown in the lower part. Below that, to a depth of 66 inches, is brown clay. The underlying material to a depth of 75 inches is light yellowish brown clay that has some concretions of calcium carbonate. Typically, this soil is calcareous and moderately alkaline throughout. About 40 percent of the soils in this map unit are closely similar to the Leeray soil, by being grayish in the upper part. There is no difference in use and management, however.

This soil is well drained. Runoff is slow to medium. Permeability is very slow. When dry, this soil has wide, deep cracks that extend to the surface. Water enters rapidly when the soil is dry and cracked and very slowly when the soil is wet. The available water capacity is medium. The root zone is deep.

Included with this soil in mapping are small areas of Nuvalde, Sagerton, and Winters soils. Also included are small areas of the gently sloping Leeray soil. The included soils make up less than 20 percent of any mapped area.

This Leeray soil is used as cropland and rangeland. It is well suited to crops. The main crops are oats, wheat, grain sorghum, and improved pasture (fig. 13). The main limitations are droughtiness, low rainfall, and very slow permeability. Crop residue left on the surface helps to conserve moisture and to improve tilth. Diversions and terraces may be needed to control runoff from higher slopes. The sprinkler irrigation system or designed irrigation system are both suited to this soil.

This soil is fairly suited to use as wildlife habitat. The lack of food and cover are the main limitations.

The Leeray soil is poorly suited to most urban and recreation uses. The main limitations are shrinking and swelling with changes in moisture, clayey texture throughout, corrosivity to uncoated steel, and very slow permeability.

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

**LeB—Leeray clay, 1 to 3 percent slopes.** This deep, gently sloping soil is on uplands. Slopes are plane to convex. They average about 2 percent. Areas are oblong to irregular in shape and range from 15 to 300 acres. Some cultivated areas have been slightly eroded. Undisturbed rangeland areas have low mounds and shallow depressions (gilgai microrelief).

Typically, the surface layer is clay about 40 inches thick that is very dark grayish brown in the upper part, grading to grayish brown in the lower part. Below that, to a depth of 67 inches, is very firm, brown clay. The underlying material to a depth of 78 inches is firm, pale

brown clay that has films, threads, and concretions of calcium carbonate. Typically, this soil is moderately alkaline and calcareous throughout.

This soil is well drained. Runoff is slow to medium. Permeability is very slow. When dry, this soil has wide, deep cracks that extend to the surface. Water enters rapidly when the soil is dry and cracked and enters very slowly and seals the cracks when the soil is wet. The available water capacity is medium. The root zone is deep.

Included with this soil in mapping are small areas of Nuvalde, Sagerton, and Winters soils and closely similar soils that are grayish in the upper part of the profile. Some areas of nearly level Leeray clay are included. Included soils make up less than 15 percent of a mapped area.

This Leeray soil is used as cropland and rangeland. It is well suited to crops. The main crops are oats, wheat, grain sorghum, and improved pasture. The main limitations are droughtiness, low rainfall, and very slow permeability. Crop residue left on the surface helps to conserve moisture and improve tilth. Contour farming and terracing are needed in most areas to prevent water erosion. Diversions and terraces may be needed to control runoff from higher slopes. This soil can be irrigated by the sprinkler, border, or furrow irrigation system.

This soil is fairly suited to use as wildlife habitat. It provides nesting areas for doves, quail, and songbirds. The lack of woody plants and cover limit the use of this soil as wildlife habitat.

The Leeray soil is poorly suited to most urban and recreation uses. The main limitations are shrinking and swelling with changes in moisture, clayey texture throughout, corrosivity to uncoated steel, and very slow permeability.

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

**MaA—May fine sandy loam, 0 to 2 percent slopes.** This deep, well drained, nearly level to gently sloping soil is in shallow upland valleys. Slopes are plane to weakly concave and average about 1.5 percent. Areas are oblong to elongated and range from 5 to about 50 acres.

Typically, the surface layer is brown fine sandy loam about 13 inches thick. The upper part of the subsoil, to a depth of 37 inches, is clay loam that is dark grayish brown in the upper part and brown in the lower part. To a depth of 50 inches, it is yellowish brown sandy clay loam. The lower part of the subsoil, to a depth of 60 inches, is very pale brown loam that has films and threads of calcium carbonate. This soil typically is mildly alkaline in the upper part, grading to moderately alkaline and calcareous in the lower part.

This soil is well drained. Runoff is slow. Permeability is moderate, and the available water capacity is medium. The root zone is deep and is easily penetrated by plant roots.



*Figure 13.—Grain sorghum on Leeray clay, 0 to 1 percent slopes.*

Included in this soil in mapping are small areas of Bonti, Winters, Nimrod, and Sagerton soils. These included soils make up less than 15 percent of a mapped area.

This May soil is used as cropland, pastureland, and rangeland. It is well suited to crop production. Peanuts, oats, and grain sorghum are the main crops. Crop residue left on the surface helps to control erosion and conserve moisture. The sprinkler irrigation system is well suited to

this soil. Diversions and terraces may be needed to control water erosion in the more sloping areas.

This soil is well suited to use as wildlife habitat for deer and provides good nesting areas for quail, doves, turkeys, and songbirds. The woody vegetation attracts furbearing animals.

The May soil is moderately well suited to most urban uses. Moderate shrinking and swelling with changes in moisture content and corrosivity to uncoated steel are

the main limitations. These limitations can be overcome by good design and proper installation procedures. This soil is well suited to recreation uses.

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

**MeB—Mereta clay loam, 1 to 3 percent slopes.** This shallow, gently sloping soil is on uplands. Slopes are complex and average about 2 percent. Areas are irregular in shape and range from 10 to 400 acres.

Typically, the surface layer is moderately alkaline, dark brown clay loam about 18 inches thick. Abruptly below that is strongly cemented and platy, pinkish white caliche about 5 inches thick. The underlying material, to a depth of more than 60 inches, is friable, pink loam that has a large amount of calcium carbonate.

This soil is well drained. Surface runoff is slow. Permeability is moderately slow in the soil and slow to very slow in the underlying cemented caliche layer. The available water capacity is low, and the root zone is shallow. The hazard of water erosion is moderate.

Included with this soil in mapping are small areas of Cho, Nuvalde, Rowena, Sagerton, Winters, and Rochelle soils. Also included are small areas of the nearly level Mereta soil and eroded areas of the Mereta soil where most of the surface layer has been removed. The included soils make up less than 15 percent of any mapped area.

This Mereta soil is mainly used as cropland, but some areas are used as rangeland. The underlying caliche layer is used in places as base material for roads. This soil is moderately well suited to crops. The main crops are oats, wheat, and grain sorghum. Low rainfall and low moisture holding capacity are the main limitations. Crop residue left on the surface helps to control erosion and conserve moisture. Terraces and diversions may be needed to control water erosion.

This soil is fairly suited to use as wildlife habitat. It provides browse for deer and good nesting areas for doves, quail, turkeys, and songbirds. Furbearing animals also use this site.

The Mereta soil is moderately well suited to most urban and recreation uses. Depth to a cemented pan and shrinking and swelling with changes in moisture are the main limitations.

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

**MfB—Miles fine sandy loam, 1 to 3 percent slopes.** This deep, gently sloping soil is on high terraces and upland plains. Areas of this soil are irregular in shape and range from 10 to about 40 acres. Slopes are complex and average about 2 percent.

Typically, the surface layer is neutral, brown fine sandy loam about 5 inches thick. The subsoil is mildly alkaline, reddish brown sandy clay loam to a depth of about 10 inches. To a depth of 52 inches, it is yellowish red sandy clay loam. Below that to a depth of 70 inches is

moderately alkaline, reddish yellow sandy clay loam that contains concretions and soft masses of calcium carbonate.

The soil is well drained. Runoff is slow to moderate. Permeability is moderate. The available water capacity is medium. The root zone is deep, and the soil is easily penetrated by plant roots.

Included with this soil in mapping are Winters, Rochelle, and Sagerton soils. Also included is a soil similar to the Miles soil except that the subsoil extends to a depth of less than 60 inches and a soil that has a gravelly sandy clay loam subsoil. The included soils make up less than 15 percent of a mapped area.

This soil is used as cropland, rangeland, and wildlife habitat. It is well suited to crop production. The main crops are oats and grain sorghum. Crop residue left on the surface helps to control erosion and conserve moisture. Terraces and diversions may be needed to control water erosion.

This soil is well suited to use as wildlife habitat for deer and provides good nesting areas for quail, doves, turkeys, and songbirds. The woody vegetation attracts furbearing animals to this site.

The Miles soil is well suited to most urban uses. Seepage, low strength affecting roads and streets, and corrosivity to uncoated steel are limitations. The soil is well suited to recreation uses.

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

**Mr—Miller silty clay, occasionally flooded.** This deep, nearly level soil is on flood plains mainly along the Colorado River. Areas are elongated to irregular in shape and range from 10 to about 100 acres. Slopes average about 0.5 percent.

Typically, the surface layer is moderately alkaline, dark reddish gray silty clay about 20 inches thick. The subsoil, to a depth of 60 inches, is moderately alkaline, reddish brown silty clay.

This soil is moderately well drained. Runoff is slow. Permeability is very slow. The available water capacity is high. The root zone is deep. Areas flood about once every 3 to 12 years for periods of a day or 2 days.

Included with this soil in mapping are Yahola, Weswood, and Clairemont soils. The included soils make up less than 15 percent of a mapped area.

This Miller soil is mainly used for cultivation, but a few areas are used as rangeland. This soil is well suited to nonirrigated and irrigated crops. Oats, wheat, grain sorghum, and tame pasture are the main crops. Low rainfall is the main limitation. Crop residue left on the surface helps to conserve moisture, increase intake rates, and maintain tilth. Either the furrow or sprinkler irrigation system can be used on this soil.

This soil is poorly suited to use as wildlife habitat for squirrels and deer and provides fair nesting areas for doves, quail, turkeys, and songbirds. Furbearing animals use this site to some extent.

The Miller soil is not suited to urban uses. The limitations are flooding, high shrink-swell potential, and clayey texture. The soil is poorly suited to recreation uses.

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

**NaC—Nimrod loamy fine sand, 1 to 5 percent slopes.** This deep, gently sloping soil is on uplands. It is on side slopes of shallow valleys. Areas are irregular to elongated in shape and range from 10 to about 200 acres. Slopes are complex and average about 3.5 percent.

Typically, the surface layer is loose, light yellowish brown loamy fine sand about 10 inches thick. The subsurface layer, to a depth of 27 inches, is very pale brown loamy fine sand. The upper part of the subsoil, to a depth of 44 inches, is coarsely mottled light gray, reddish yellow, and brownish yellow sandy clay loam. To a depth of 62 inches, it is light gray sandy clay loam and has coarse mottles of yellow and reddish yellow. The lower part of the subsoil to a depth of 80 inches is light gray sandy clay loam and has yellowish and reddish mottles.

This soil is moderately well drained. Permeability is moderately slow. The available water capacity is medium. The surface layer rapidly absorbs rainfall. For short periods following heavy rainfall, the surface layer is saturated because of the presence of a perched water table. The root zone is deep. The hazard of soil blowing is moderate, and the hazard of water erosion is moderate where slopes are more than 3 percent. Most cultivated areas have been eroded by wind and water.

Included with this soil in mapping are small areas of Bonti, Bunyan, and May soils. A few small areas of the sloping Nimrod soil are included. Also included are eroded spots of the Nimrod soil, ranging from 1 acre to about 3 acres, where either most of the loamy sand surface layer has been removed or a few gullies exist that are uncrossable by farm machinery.

This Nimrod soil is mainly used as cropland, but a few areas are used as rangeland. The main crops are peanuts, oats, grain sorghums, pecans, and introduced pasture, such as Coastal bermudagrass. This soil is also well suited to watermelons, cantaloupes, pecans, and fruit trees including peaches, plums, and apples. Potential for nonirrigated and irrigated crops is high. Low rainfall, slope, and susceptibility to soil blowing and water erosion are the main limitations. Fertilizer is needed on cropland. Crop residue left on the surface helps to control water erosion and soil blowing and to conserve moisture. Contour farming is needed to help control water erosion. Diversions and terraces may be needed to control runoff from adjacent higher slopes. Grassed waterway outlets are needed for diversions and terraces. Stripcropping and winter cover crops are needed to control soil blowing. A sprinkler irrigation system is adapted to this soil.

This soil is well suited to use as wildlife habitat for deer and provides good nesting areas for doves, quail, turkeys, and songbirds. The woody plant cover attracts furbearing animals to this site.

The Nimrod soil is poorly suited to most urban uses. The main limitations are moderately slow permeability, seepage, corrosivity to uncoated steel, wetness, and sandy texture of the surface layer. This soil is poorly suited to recreation use. Sandy texture and soil blowing are the main limitations.

This soil is in capability subclass IIIe; Sandy range site.

**NBE—Nocken-Bonti association, rolling.** The soils in this association are on uplands. Slopes are convex and mostly range from 5 to about 20 percent, but in a few areas they are as little as 1 percent. Sandstone fragments are on or near the surface. Layered sandstone bedrock underlies these soils. Sandstone boulders outcrop along scarps and ledges within these areas. Areas are irregular in shape and range from about 100 to several hundred acres.

This association consists of about 50 percent Nocken soil, 25 percent Bonti soil, and 25 percent other soils. The sloping to moderately steep Nocken soil is on ridgetops and upper side slopes along scarps. The gently sloping Bonti soil is on ridgetops. Areas of this unit are large, and the composition is variable; however, the detail is adequate for the expected use of the soils.

Typically, the surface layer of the Nocken soil is neutral and medium acid, brownish very stony fine sandy loam about 17 inches thick. The subsoil, to a depth of 40 inches, is medium acid, very stony clay. It is red in the upper 11 inches and yellowish red below. The underlying material to a depth of 60 inches is reddish yellow, weakly cemented sandstone with thin, interbedded, pale olive shale.

Typically, the surface layer of the Bonti soil is neutral, brown fine sandy loam about 8 inches thick. Below that, to a depth of 14 inches, is slightly acid, light brown fine sandy loam. The subsoil, to a depth of 34 inches, is medium acid clay. It is reddish brown in the upper 8 inches and yellowish red below. The underlying material is pink, fractured sandstone.

Nocken and Bonti soils are well drained. Runoff is rapid. Permeability and internal drainage are moderately slow. The available water capacity is low.

Included with these soils in mapping are areas of the Callahan soil. Also included are areas of a soil that is similar to the Nocken soil but that is less than 20 inches deep to sandstone and a soil that is more than 40 inches deep to sandstone. These included soils make up about 25 percent of the mapped area.

Stoniness prevents the use of Nocken and Bonti soils as cropland. All areas are used as rangeland (fig. 14).

These soils are well suited to use as wildlife habitat for deer and provide good nesting areas for quail, doves, turkeys, and songbirds. The woody vegetation attracts furbearing animals and squirrels to this site.



*Figure 14.—An area of Nocken very stony fine sandy loam, which has been assigned to the Sandstone Hill range site.*

The Nocken and Bonti soils are poorly suited to most urban and recreation uses. Large sandstone fragments, depth to rock, and slope are the main limitations. Large stones on the surface limit travel by car or truck.

The Nocken soil is in capability subclass VIIc and the Sandstone Hill range site. The Bonti soil is in capability subclass IIIc and the Sandy Loam range site.

**NCF—Nocken-Callahan-Throck association, hilly.** This association consists of moderately deep, loamy and clayey soils on uplands. The areas are dissected by drainageways. These soils are on summits, side slopes, and along escarpments of low hills. Slopes are complex

and mainly range from 10 to 25 percent, but in a few areas they are as little as 5 percent. Areas are irregular in shape and range from about 50 to several hundred acres.

The association is comprised of about 40 percent Nocken soil, 25 percent Callahan soil, 20 percent Throck soil, and 15 percent other soils. The Nocken soil is on ridgetops and sloping to steep side slopes and along escarpments. The Callahan soil is on broad, sloping areas of convex, low ridges. The Throck soil is on sloping to steep scarps that range from 150 to 160 feet in width and 1/4 to 1 mile in length. Areas of this

association are large, and the composition variable; however, the detail is adequate for the expected uses of the soils.

Typically, the surface layer of the Nocken soil is neutral to medium acid, brownish very stony fine sandy loam about 9 inches thick. Sandstone boulders, stones, cobbles, and flags cover about 60 percent of the surface and make up about 60 percent of the surface layer. The subsoil, to a depth of about 38 inches, is medium acid, very stony clay that has about 60 percent by volume sandstone flags, stones, and cobbles. It is yellowish red in the upper 13 inches and light red below. The underlying material is very pale brown, weakly cemented sandstone that has thin layers of pale olive shale.

Typically, the surface layer of the Callahan soil is mildly alkaline, brown loam about 5 inches thick. The subsoil, to a depth of 23 inches, is moderately alkaline clay. It is reddish brown in the upper part and yellowish red below. To a depth of 31 inches, the subsoil is moderately alkaline, yellowish red clay. The underlying material is light olive brown shale.

Typically, the surface layer of the Throck soil is brown clay about 4 inches thick. The subsoil, to a depth of 28 inches, is clay that is brown in the upper 10 inches and light yellowish brown with accumulations of calcium carbonate below. The underlying material to a depth of 50 inches is light olive brown shaly clay. This soil is calcareous and moderately alkaline throughout.

The soils in this association are well drained. The root zone is moderately deep. The Nocken soil has rapid runoff and moderately slow permeability and internal drainage. The Callahan soil has medium runoff and very slow permeability. The Throck soil has rapid runoff and slow permeability. The hazard of water erosion is moderate for these soils unless good plant cover is maintained.

Included with these soils in mapping are small areas of Bonti, Cho, Rochelle, Winters, and other soils. Also included are a few areas of gently sloping Callahan loam. These soils make up about 15 percent of the mapped area.

The soils in this association are not suited to cultivation except for relatively small, irregularly shaped areas of the Callahan soil. Cultivation in most places is not feasible with modern farm machinery. Slopes, susceptibility to water erosion, and stoniness limit these soils mainly to use as rangeland and wildlife habitat. The material underlying the Throck soil has possible uses as brick and for pottery.

These soils are fairly suited to use as wildlife habitat. Deer, squirrels, turkeys, and furbearing animals are attracted to this site. These soils provide many nesting areas for quail, doves, and songbirds.

The soils in this association are poorly suited to most urban uses. Slope, depth to bedrock, surface stoniness, and shrink-swell potential are the main limitations. These soils are not suited to most recreation uses. Slope, surface stoniness, and surface texture are limitations.

The Nocken soil is in capability subclass VIIc, and the Callahan and Throck soils are in capability subclass VIe. The Nocken soil is in the Sandstone Hill range site; the Callahan soil is in the Claypan Prairie; and the Throck soil is in the Shallow Clay range site.

**NNE—Nocken-Nebgen association, rolling.** The landscape is low rolling hills and ridges with some sandstone rock outcrops along ledges and escarpments. Slopes are complex and range from 5 to about 16 percent. Areas are irregular in shape and range from about 25 to several hundred acres.

This association consists of about 45 percent Nocken soil, 35 percent Nebgen soil, and 20 percent other soils and rock outcrops. The Nocken soil is on hillsides and in shallow valleys. The Nebgen soil is on the crest of ridges and the upper side slopes of valleys. Areas are large, and the composition is variable; however, the detail is adequate for the expected use of the soils.

Typically, the surface layer of the Nocken soil is neutral, brownish very stony fine sandy loam about 15 inches thick. The subsoil is medium acid, very stony clay. It is reddish brown to a depth of 26 inches and yellowish red to a depth of 36 inches. The underlying material is reddish yellow sandstone.

This soil is well drained. Runoff is rapid. Permeability is moderately slow. The available water capacity is low. The root zone is moderately deep.

Typically, the surface layer of the Nebgen soil is slightly acid, reddish brown stony fine sandy loam about 8 inches thick. Below that, to a depth of 12 inches, is fractured, partially weathered, slightly acid sandstone that has about 25 percent reddish brown sandy loam in the fractures. The underlying material is reddish brown sandstone that is strongly cemented when dry and weakly cemented when moist.

This soil is well drained. Runoff is rapid. Permeability is moderately rapid. The available water capacity is low. The root zone is very shallow or shallow and is easily penetrated by plant roots.

Included with these soils in mapping are small areas of Roughcreek, Hye, Pontotoc, Yates, Stilskin, Katemcy, and Ligon soils and a soil similar to the Nebgen soil but that is yellowish brown throughout. Also included are sandstone rock outcrops. These soils and rock outcrops make up about 20 percent of the mapped area.

The soils in this association are not suited to cultivation. They are used as rangeland and wildlife habitat.

These soils are well suited to use as wildlife habitat for deer and provide good nesting areas for quail, doves, turkeys, and songbirds. The woody vegetation attracts furbearing animals and squirrels to this site.

The Nocken and Nebgen soils are poorly suited to urban or recreation uses. Depth to rock, stoniness, slope, and low strength affecting roads and streets are the main limitations. These limitations are difficult to overcome.

These soils are in capability subclass VIIs and the Sandstone Hill range site.

**NuA—Nuvalde clay loam, 0 to 1 percent slopes.**

This deep, nearly level soil is on uplands. Surfaces are plane to slightly concave. Areas are irregular in shape and range from 10 to more than 100 acres. Slopes average about 0.5 percent.

Typically, the surface layer is dark grayish brown clay loam about 12 inches thick. The subsoil, to a depth of 34 inches, is brown clay loam that has a few films and threads of calcium carbonate. The lower part of the subsoil contains about 20 percent by volume calcium carbonate in the form of soft masses, films and threads, and concretions. The underlying material to a depth of 65 inches is light brown clay loam containing about 30 percent concretions and soft masses of calcium carbonate. This soil is moderately alkaline and calcareous throughout.

This soil is well drained. Runoff is slow. Permeability is moderate, and available water capacity is medium. The root zone is moderately deep.

Included with this soil in mapping are small areas of Shep, Mereta, Rowena, Leeray, Sagerton, and Cho soils. Also included are small areas of the gently sloping Nuvalde soil. These included soils make up less than 15 percent of any mapped area.

This Nuvalde soil is mainly used as cropland, but some areas are used as rangeland. The main crops are oats, wheat, and grain sorghum. The soil is well suited to nonirrigated and irrigated oats, wheat, grain sorghum, and pecans. Low rainfall is the main limitation. Crop residue left on the surface helps to conserve moisture. Diversions and terraces may be needed to control water from higher slopes (fig. 15). A sprinkler or surface irrigation system may be used.

This soil is fairly suited to use as wildlife habitat. It provides nesting areas for doves, quail, and songbirds. The lack of woody plants and cover are the main limitations.

The Nuvalde soil is well suited to most urban uses. Low strength affecting streets and roads and moderate shrinking and swelling with changes in moisture are the main limitations. The soil is well suited to recreation uses.

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

**NuB—Nuvalde clay loam, 1 to 3 percent slopes.**

This deep, gently sloping soil is on uplands. Areas are irregular in shape and range from 10 to more than 100 acres. Slopes average about 2 percent.

Typically, the surface layer is dark grayish brown clay loam about 14 inches thick. The subsoil, to a depth of 32 inches, is brown clay loam. The underlying material to a depth of 50 inches is light yellowish brown clay loam that contains about 20 to 30 percent by volume concretions and soft masses of calcium carbonate. Below that, to a depth of 70 inches or more, is yellowish brown clay loam

containing less calcium carbonate than the layer above. This soil is moderately alkaline and calcareous throughout.

This soil is well drained. Runoff is slow. Permeability is moderate. The available water capacity is medium. The root zone is moderately deep, and penetration by plant roots is not difficult. The hazard of water erosion is moderate on soils that have slopes of more than 2 percent.

Included with this soil in mapping are Shep, Mereta, Cho, Rowena, Sagerton, Bastrop, and Winters soils. Also included are small areas of the nearly level Nuvalde soil. These included soils make up less than 15 percent of a mapped area.

This Nuvalde soil is mainly used for cultivation. Some areas are used as rangeland. The main crops are oats, wheat, and grain sorghum. This soil is well suited to nonirrigated and irrigated crops. The lack of rainfall is the main limitation. Crop residue left on the surface helps to control water erosion and to conserve moisture (fig. 16). Contour farming, terraces, and grassed waterways are needed to help control water erosion. A sprinkler or surface irrigation system can be used.

This soil is fairly suited to use as a nesting area for doves, quail, and songbirds. The lack of woody plants and cover is a limitation.

The Nuvalde soil is well suited to most urban uses. Low strength affecting streets and roads, moderate shrinking and swelling with changes in moisture, and seepage are the main limitations. The soil is moderately well suited to recreation uses. In places, slope is a limitation for playground uses.

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

**NxC—Nuvalde-Shep complex, 1 to 5 percent**

**slopes.** This complex is on gently sloping areas between terraces of different levels, and between terraces and bottom lands along major streams that drain limestone prairies. These soils are in elongated patterns ranging from 450 to 1,200 feet in width and to as much as 3 miles in length. Areas are mainly 20 to 250 acres. Slopes are complex and average about 3.5 percent.

The complex is about 50 percent Nuvalde soil, 40 percent Shep soil, and 10 percent other soils. The Nuvalde soil is along natural drains and in the lower one-half to two-thirds of the complex. The Shep soil is in oblong to elongated areas and ranges from 1 acre to about 10 acres. It is generally in the upper one-third to one-half of the complex. These soils are so intricately mixed, or the areas are so small that it was not practical to map them separately.

Typically, the surface layer of the Nuvalde soil is dark brown clay loam about 12 inches thick. The upper part of the subsoil, to a depth of 22 inches, is brown clay loam. The lower part of the subsoil, to a depth of 34 inches, is light brown clay loam containing about 15 percent by volume calcium carbonate. The underlying material, to a depth of 60 inches, is light brown clay loam containing



Figure 15.—Flood damage on Nuvalde clay loam, 0 to 1 percent slopes, prior to construction of flood control structures.

about 30 percent by volume calcium carbonate. This soil is moderately alkaline and calcareous throughout.

This soil is well drained. Runoff is slow. Permeability is moderate, and available water capacity is medium. The root zone is moderately deep. The hazard of water erosion is moderate.

Typically, the surface layer of the Shep soil is grayish brown loam about 8 inches thick. The subsoil, to a depth of 32 inches, is brown loam. The underlying material to a depth of 60 inches is very pale brown loam that has accumulations of calcium carbonate. This soil is calcareous and moderately alkaline throughout.

This soil is well drained. Runoff is medium. Permeability is moderate. The available water capacity is low. The root zone is moderately deep. The hazard of water erosion is moderate.

Included with these soils in mapping are small areas of Frio, Rowena, Sagerton, and Bastrop soils. Also included are a few gravelly knobs ranging from 1 acre to 3 acres and a few areas of sloping Nuvalde and Shep soils. These soils make up about 10 percent of the mapped area.

Less than one-half of the Nuvalde and Shep soils is cultivated. The rest is used as rangeland and idle



Figure 16.—Stubble mulch tillage on Nuvalde clay loam, 1 to 3 percent slopes.

cropland. These soils are moderately well suited to nonirrigated oats, grain sorghum, and wheat. Because of the slope, this soil is best suited to the sprinkler irrigation system. Crop residue left on the surface helps to control erosion and to conserve moisture. Contour farming and terracing are needed to help control erosion.

These soils are fairly suited to use as wildlife habitat for deer, and they provide good nesting areas for quail, doves, turkeys, and songbirds. Furbearing animals are not attracted to this site because of the lack of woody vegetation.

The Nuvalde and Shep soils are moderately well suited to most urban and recreation uses. Low strength affecting streets and roads, moderate shrink-swell potential, and seepage are the main limitations for urban

uses. In places, slope is a limitation for playgrounds.

The Nuvalde soil is in capability subclass IIIe and the Clay Loam range site. The Shep soil is in capability subclass IVe and the Mixedland Slopes range site.

**OYE—Oplln-Yates association, rolling.** This association consists of gravelly and stony, very shallow and shallow, and gently sloping to moderately steep soils on uplands. These soils are on side slopes and the summit of ridges and hills. Areas are well dissected by drainageways. Slopes are complex and mainly range from 5 to 16 percent. Some range to as much as 20 percent or as little as 3 percent. Areas are oblong to irregular in shape and are several hundred acres.

The association is about 55 percent Oplin soil, which ranges from 45 to 70 percent of a mapped area; 30 percent of Yates soil, which ranges from 20 to 40 percent of a mapped area; and 15 percent rock outcrops and other soils. The Oplin soil is mainly on the sides of the hills and ridges, and the Yates soil is mainly on the summit of hills and ridges. Areas of this association are large, and the composition is variable; however, the detail is adequate for the expected use of the soils.

Typically, the surface layer of the Oplin soil is about 17 inches thick. It is dark grayish brown gravelly loam in the upper part and brown gravelly loam in the lower part. The underlying layer is fractured, hard limestone to a depth of several feet.

Typically, the surface layer of the Yates soil is moderately alkaline, brown very stony loam about 7 inches thick. The underlying material is indurated, coarsely fractured limestone.

The soils in this association are well drained. Runoff ranges from medium to rapid. Permeability is moderate, and available water capacity is very low. The hazard of water erosion is moderate if there is not a good cover.

Included with these soils in mapping are small areas of Cho, Shep, Nuvalde, Stiiskin, and Tarpley soils and rock outcrops.

The Oplin soil and Yates soil are not suited to cultivation because of depth to rock, slope, gravel, and stones. Areas of this association are used as rangeland and wildlife habitat.

These soils are fairly suited to use as wildlife habitat for deer and provide good nesting areas for doves, quail, turkeys, and songbirds. The rough terrain of the steeper Oplin soil attracts furbearing animals.

The Oplin and Yates soils are poorly suited to most urban and recreation uses. Slopes, depth to rock, stones, and gravel are the main limitations.

These soils are in capability subclass VII. The Oplin soil is in the Steep Rocky range site, and the Yates soil is in the Very Shallow range site.

**PBF—Pebblepoint-Rumple association, hilly.** This association consists of deep and moderately deep, strongly sloping to steep soils on uplands. These soils are on hilltops, ridgetops, and the side slopes of hills and ridges. Slopes are complex and mainly range from 10 to 30 percent; a few are as little as 3 percent. Areas are irregular in shape and range from about 50 to several hundred acres.

The association is about 65 percent Pebblepoint soil, 20 percent Rumple soil, and 15 percent other soils. The sloping to steep Pebblepoint soil is on side slopes of hills and ridges. The gently sloping to sloping Rumple soil is on side slopes and weakly convex ridgetops. Areas of this unit are large, and the composition is variable; however, the detail is adequate for the expected use of the soils.

Typically, the surface layer of the Pebblepoint soil is neutral, dark grayish brown very gravelly fine sandy loam

about 4 inches thick. The subsurface layer, to a depth of 22 inches, is strongly acid, pink very gravelly silt loam. The subsoil, to a depth of 65 inches, is strongly acid, very gravelly clay. It is yellowish red in the upper 18 inches and red below. The underlying material is a weakly consolidated bed of chert gravel, cobbles, stones, and boulders.

This soil is well drained. A perched water table is above the subsoil for a few days after a heavy rainfall. Surface runoff is medium. Permeability is slow, and available water capacity is low.

Typically, the surface layer of the Rumple soil is neutral, dark brown cherty loam about 8 inches thick. The upper part of the subsoil is slightly acid, dark reddish gray cherty clay to a depth of about 13 inches. The lower part of the subsoil, to a depth of 36 inches, is reddish brown very cherty clay. The underlying material is light gray, indurated fractured limestone.

This soil is well drained, and surface runoff is medium. Permeability is moderately slow, and available water capacity is medium.

Included with these soils in mapping is a soil similar to the Pebblepoint soil on ridgetops but that contains many chert cobbles and boulders, is more than 35 percent chert gravel, and is less clayey. Also included are small areas of Tarpley soils.

The Pebblepoint and Rumple soils are used entirely as rangeland and wildlife habitat. They are not suited to use as cropland because of slope, soil depth, and gravel.

These soils are fairly suited to use as wildlife habitat for deer and provide good nesting areas for doves, quail, turkeys, and songbirds.

These soils are poorly suited to most urban and recreation uses. Gravel, depth to bedrock, slope, and corrosivity to underground steel pipelines are the main limitations.

These soils are in capability subclass VI. The Pebblepoint soil is in the Sandy Loam range site, and the Rumple soil is in the Gravelly Redland range site.

**PfB—Pedernales fine sandy loam, 1 to 3 percent slopes.** This deep, gently sloping soil is on uplands in shallow valleys with gentle side slopes. Slopes are plane to weakly concave and typically are about 1 to 2 percent. Areas are oblong to irregular in shape and range from 10 to about 100 acres.

Typically, the surface layer is slightly acid, brown fine sandy loam about 11 inches thick. The upper part of the subsoil is very firm, neutral, reddish brown clay to a depth of 34 inches. The lower part of the subsoil, to a depth of 45 inches, is calcareous, reddish yellow sandy clay loam. The underlying material to a depth of 60 inches is reddish yellow sandy clay loam containing accumulations of calcium carbonate.

This soil is well drained. Runoff is medium. Permeability is moderately slow, and available water

capacity is high. The root zone is deep. The hazard of water erosion is moderate.

Included with this soil in mapping are Hye, Sagerton, Frio, Katemcy, and Demona soils. These included soils make up less than 15 percent of any mapped area.

This Pedernales soil is used as cropland, rangeland, wildlife habitat, and for introduced pasture. The main crops are grain sorghum and oats. This soil is well suited to crop production. Crop residue left on the surface helps to control erosion and conserve moisture. This soil is well suited to sprinkler irrigation. Terraces and diversions may be needed to control water erosion.

This soil is well suited to use as wildlife habitat for deer and provides good nesting areas for doves, quail, turkeys, and songbirds. The hollow trees attract furbearing animals and squirrels to this site.

The Pedernales soil is moderately well suited to most urban uses. Shrinking and swelling with changes in moisture content, moderately slow permeability, and corrosivity to uncoated steel are limitations. The soil is well suited to most recreation uses. In places, slope restricts playground uses.

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

**PoC—Pontotoc fine sandy loam, 1 to 5 percent slopes.** This deep gently sloping soil is on uplands. Areas are oblong to irregular in shape and range from 10 to more than 100 acres. Slopes average about 3 percent.

Typically, the surface layer is neutral, reddish brown fine sandy loam about 10 inches thick. The upper part of the subsoil, to a depth of 33 inches, is neutral, reddish brown fine sandy loam. The lower part of the subsoil, to a depth of 70 inches, is neutral, red sandy clay loam. The underlying material is dark reddish brown weakly cemented sandstone.

This soil is well drained. Surface runoff is slow to medium. Permeability is moderate. The available water capacity is medium. The root zone is deep and easily penetrated by plant roots. The hazard of erosion is moderate.

Included with this soil in mapping are small areas of Pedernales, Hye, Yates, and Sagerton soils. These included soils make up less than 15 percent of any mapped area.

This Pontotoc soil is mainly used as cropland, but some areas are used as rangeland. The main crops are peanuts, oats, grain sorghum, and improved pasture. A small amount of cotton is grown. This soil is moderately well suited to nonirrigated crops and well suited to irrigated crops. Crop residue left on the surface helps to conserve moisture and control erosion. Contour farming, terraces, and grassed waterways are needed to help control water erosion. Sprinkler irrigation is adapted to this soil.

This soil is well suited to use as wildlife habitat. Deer,

quail, doves, turkeys, and songbirds are the main kinds of wildlife. The woody vegetation attracts furbearing animals and squirrels to this site.

The Pontotoc soil is moderately well suited to most urban uses. Low strength affecting streets and roads, and slope in places are the main limitations. This soil is well suited to recreation uses. Slopes of more than 2 percent restrict some playground uses.

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

**RfC—Rochelle fine sandy loam, 1 to 5 percent slopes.** This moderately deep, gently sloping soil is on uplands at the higher elevations, mainly on ridgetops and high terraces. Slopes are convex and average about 3 percent. Areas are irregular in shape and range from 10 to about 50 acres.

Typically, the surface layer is brown fine sandy loam about 6 inches thick. The upper part of the subsoil to a depth of 20 inches is reddish brown sandy clay loam that contains about 10 percent quartz pebbles. The lower part of the subsoil to a depth of 32 inches is reddish brown gravelly sandy clay loam that contains about 30 percent quartz pebbles. The underlying material, to a depth of 50 inches, is pink caliche that contains about 40 percent siliceous gravel. Below that to a depth of 65 inches is moderately alkaline, reddish yellow coarse sand and fine gravel. This soil is neutral or mildly alkaline to the caliche layer and moderately alkaline below.

This soil is well drained. Surface runoff and internal drainage are medium. Permeability is moderately slow, and the available water capacity is low. The root zone is deep.

Included with this soil in mapping are small areas of Miles, Winters, Callahan, Bonti, and Nocken soils and a soil similar to the Rochelle soil but that has a very gravelly clay subsoil. Also included are a few areas of nearly level Rochelle soil. Included soils make up 15 to 25 percent of most mapped areas.

This Rochelle soil is mainly used as rangeland. A few small areas are used as cropland. The areas are mainly intermingled in fields with large areas of other soils. The gravelly caliche underlying material is used in places as base material for roads.

This soil is well suited to use as wildlife habitat for deer and provides good nesting areas for quail, doves, turkeys, and songbirds. The woody vegetation attracts furbearing animals.

The Rochelle soil is moderately well suited to most urban uses. Seepage, gravel, and slope are the main limitations. This soil is moderately well suited to recreation uses. Gravel and slope are limitations for playgrounds.

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

**RgD—Roughcreek very stony clay loam, gently rolling.** This shallow, very stony soil is on uplands. It is

on the tops of ridges and side slopes of low hills on limestone plateaus. Slopes are complex and mainly range from 5 to 10 percent, but some are as little as 1 percent. Areas are irregular in shape and range from about 50 to several hundred acres.

Typically, the surface layer is neutral, brown, very stony clay loam about 7 inches thick. The subsoil is reddish brown, very stony clay that extends to a depth of 18 inches. Below that is hard, fractured limestone several feet thick.

This soil is well drained. Runoff is slow to medium. Permeability is slow, and available water capacity is very low. The root zone is shallow.

Included with this soil in mapping are areas of Cho, Leeray, Rumble, Speck, and Tarpley soils and a closely similar soil that is less than 10 inches deep to limestone. The included soils make up about 25 percent of most mapped areas.

This Roughcreek soil is not suited to cultivated crops because of the high content of stones. It is used as rangeland. Several flood control structures have been built on this soil to protect cropland downstream and for environmental improvement (fig. 17).

The underlying limestone is suited to use as crushing rock and building stone. Some of it is marble quality.



*Figure 17.—Clear, unpolluted water downstream from flood control structures and good hydrologic vegetative cover. Roughcreek very stony clay loam is on the valley side slopes. A hunter's deer stand is at the top of the hill.*

This soil is fairly suited to use as wildlife habitat for deer, and it provides good nesting areas for doves, quail, turkeys, and songbirds. Furbearing animals also inhabit this site.

The Roughcreek soil is poorly suited to most urban and recreation uses. Shallow depth to limestone bedrock and stoniness are the main limitations. Some areas, however, are scenic and have desirable esthetic qualities for homesites (fig. 18).

This soil is in capability subclass VI<sub>s</sub> and the Redland range site.

**RoB—Rowena clay loam, 1 to 3 percent slopes.**

This deep, gently sloping soil is on uplands. Areas are

irregular in shape and range from 10 to about 100 acres. Slopes average about 2 percent.

Typically, the surface layer is dark brown clay loam about 7 inches thick. The subsoil, to a depth of 34 inches, is clay. It is dark brown in the upper part and brown below. To a depth of 48 inches, the underlying material is pink clay that contains about 20 percent by volume calcium carbonate in the form of soft masses and concretions. Below that to a depth of 65 inches is yellowish red clay that contains about 10 percent by volume soft masses and concretions of calcium carbonate (fig. 19).

This soil is well drained. Surface runoff is slow.



*Figure 18.—A scenic area along the Colorado River. Roughcreek soils are in the background.*

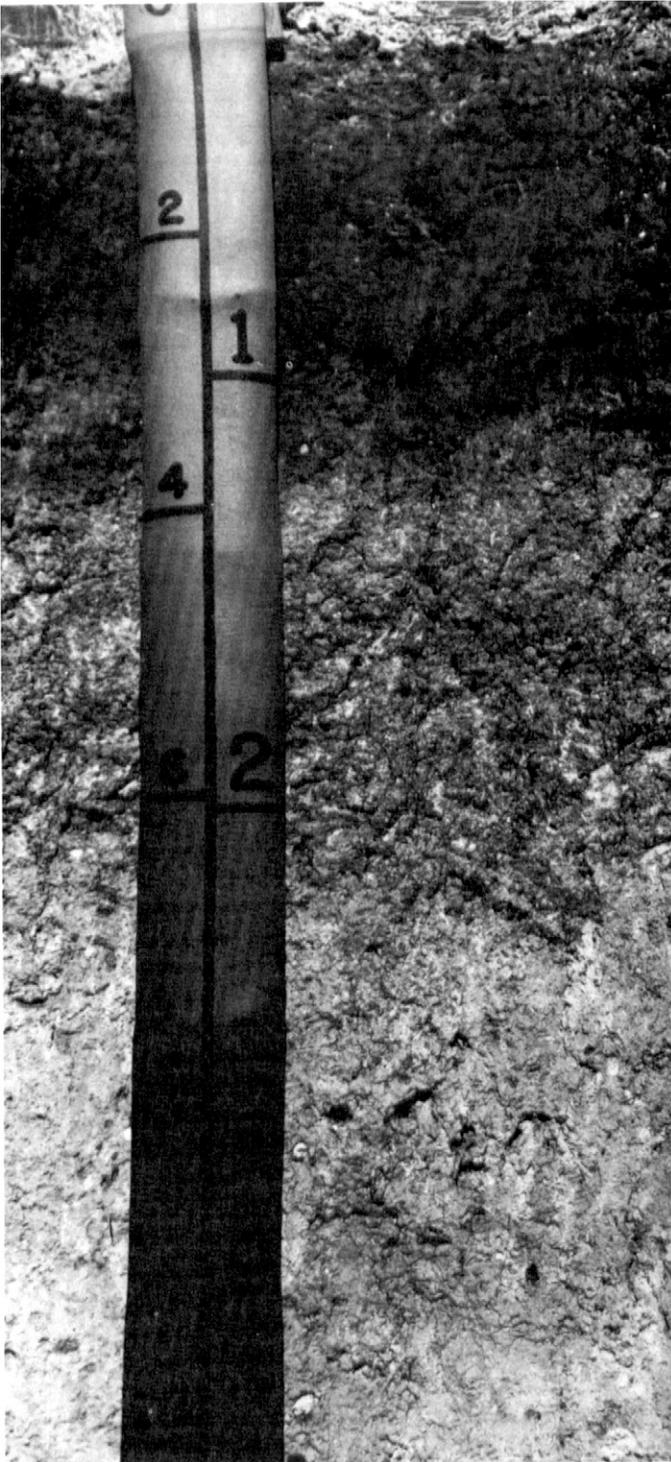


Figure 19.—Profile of Rowena clay loam, 1 to 3 percent slopes, showing the thick, dark surface layer and the accumulation of carbonates in the lower part. Multiply the figure on the left by 10 to determine the depth in centimeters. The figure on the right is in feet.

Permeability is moderately slow, and available water capacity is medium. The root zone is deep, and penetration by plant roots is not difficult. The hazard of water erosion is moderate on slopes of more than 2 percent.

Included with this soil in mapping are small areas of Sagerton, Cho, Nuvalde, and Mereta soils. Also included are small areas of the Rowena soil that have slopes of less than 1 percent. These included soils make up less than 15 percent of a mapped area.

This Rowena soil is mainly used as cropland but a few areas are used as rangeland. The main crops are wheat, oats, and grain sorghum. This soil is well suited to wheat, oats, and grain sorghum. Crop residue left on the surface helps to conserve moisture and control erosion. Contour farming, terraces, and grassed waterways are needed to help control water erosion.

This soil is fairly suited to use as wildlife habitat and provides nesting areas for doves, quail, and songbirds. The lack of cover and woody plants are limitations.

The Rowena soil is poorly suited to most urban uses. Shrinking and swelling with changes in moisture, low strength affecting roads and streets, and corrosivity to uncoated steel are the main limitations. Moderately slow permeability is the main limitation for recreation uses.

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

**RuC—Rumple cherty clay loam, undulating.** This moderately deep, well drained soil is on undulating uplands: The landscape is characterized by low, rounded hills that have innerconnecting saddles and shallow weakly concave valleys. Slopes are complex and range from 2 to 8 percent, but are mainly about 4 percent. Areas are irregular in shape and range from about 50 acres to more than 1,000 acres. A few outcrops of limestone are on some of the ridges and low, rounded hills.

Typically, the surface layer is brown cherty clay loam about 6 inches thick. The upper part of the subsoil, to a depth of 11 inches, is dark reddish gray cherty clay loam. The lower part of the subsoil, to a depth of 27 inches, is reddish brown very cherty clay. The underlying material is light gray, coarsely fractured, indurated limestone with red clay in the crevices. The soil is neutral or slightly acid throughout.

This soil is well drained. Surface runoff and internal drainage are medium. Permeability is moderately slow. The root zone is moderately deep.

Included with this soil in mapping are small areas of Tarpley, Sagerton, Cho, Nuvalde, Leeray, Frio, and Corkstone soils. Also included is a very shallow, very cherty, clayey soil over limestone. These included soils make up less than 15 percent of a mapped area.

This Rumple soil is not suited to cultivation. The underlying limestone is suited to use as roadbed material.

This soil is fairly suited to use as wildlife habitat for deer and provides good nesting areas for doves, quail, turkeys, and songbirds. This site is not very attractive to furbearing animals because of the lack of cover.

The soil is poorly suited to most urban uses. The main limitations are depth to bedrock, coarse fragments, shrinking and swelling with change in moisture content, and corrosivity to uncoated steel. Good design and proper installation procedures are necessary. This soil is poorly suited to recreation uses. Small stones on the

surface and moderately slow permeability are the main limitations.

This soil is in capability subclass VI<sub>1</sub> and the Gravelly Redland range site (fig. 20).

**SaA—Sagerton clay loam, 0 to 1 percent slopes.**

This deep, nearly level soil is on uplands. Areas are oblong to irregular in shape and range from 10 to more than 300 acres. Slopes average about 0.5 percent.

Typically, the surface layer is brown clay loam about 6 inches thick. The subsoil to a depth of 40 inches is clay.



Figure 20.—An area of Ruple cherty clay loam, undulating, in good condition. This soil has been assigned to the Gravelly Redland range site.

It is brown in the upper part and reddish brown in the lower part. To a depth of 58 inches, the subsoil is reddish yellow clay loam and contains about 25 to 30 percent calcium carbonate. To a depth of 80 inches, it is reddish yellow clay loam. This soil is neutral in the upper part, grading to moderately alkaline and calcareous in the lower part.

This soil is well drained. Runoff is slow. Permeability is moderately slow, and available water capacity is high. The root zone is deep.

Included with this soil in mapping are small areas of Winters, Bastrop, Leeray, and Callahan soils. Also included are small areas of gently sloping Sagerton soils. These included soils make up less than 15 percent of any mapped area.

This Sagerton soil is mainly used as cropland, but some areas are used as rangeland. The main crops are wheat, oats, and grain sorghum. This soil is well suited to nonirrigated and irrigated crops. Crop residue left on the surface helps to conserve moisture. If the soil is irrigated, a well designed irrigation system and proper application of water are essential. Fertilizer is needed when this soil is irrigated. A sprinkler or surface irrigation system can be used.

This soil is fairly suited to use as wildlife habitat. It provides nesting areas for doves, quail, and songbirds. Lack of woody plants and cover are limitations.

The Sagerton soil is moderately well suited to most urban and recreation uses. The main limitations are low strength affecting roads and streets, moderately slow permeability, corrosivity to uncoated steel, and shrinking and swelling with changes in moisture (fig. 21). These limitations can be overcome by good design and careful installation procedures. Moderately slow permeability is the main limitation for recreation uses.

This soil is in capability subclass IIc, nonirrigated and class I, irrigated and the Clay Loam range site.

#### **SaB—Sagerton clay loam, 1 to 3 percent slopes.**

This deep, gently sloping soil is on uplands. Surfaces are plain to weakly convex. Areas are irregular in shape and range from 10 to more than 200 acres. Slopes average about 2 percent.

Typically, the surface layer is neutral, brown clay loam about 6 inches thick. The upper part of the subsoil, to a depth of 12 inches, is neutral, dark reddish gray clay loam. The lower part of the subsoil, to a depth of 30 inches, is reddish brown clay. It is mildly alkaline in the upper part and moderately alkaline in the lower part. Below that to a depth of 80 inches is strongly alkaline, reddish yellow clay loam. The upper 20 inches contains about 25 percent by volume calcium carbonate.

This soil is well drained. Runoff is medium. Permeability is moderately slow, and available water capacity is high. The root zone is deep.

Included with this soil in mapping are small areas of Winters, Bastrop, Leeray, and Callahan soils. Also included are some areas of nearly level Sagerton soil

and a few areas of gently sloping Sagerton soil that have slopes of 3 to 5 percent. A few areas that have slopes of 2 percent or more have moderate sheet erosion. These included soils make up as much as 15 percent of any mapped area.

This Sagerton soil is mainly used as cropland, but some areas are used as rangeland. The main crops are wheat, oats, and grain sorghum. Upstream flood control structures give protection to prime farmland soils such as this one (fig. 22). This soil is well suited to nonirrigated and irrigated crops. Crop residue left on the surface helps to control erosion and conserve moisture. If the soil is irrigated, a well designed irrigation system and proper application of water are essential. Fertilizer is needed when this soil is irrigated. A sprinkler or surface irrigation system can be used.

This soil is fairly suited to use as wildlife habitat. Quail, doves, and songbirds are plentiful. The lack of cover in most places is a limitation.

The Sagerton soil is moderately well suited to most urban uses. Shrinking and swelling with changes in moisture, low strength affecting roads and streets, and corrosivity to uncoated steel are the main limitations. These limitations can be overcome by good design and careful installation procedures. This soil is moderately well suited to recreation uses. Moderately slow permeability and slopes in places are limitations.

This soil is in capability subclass IIe, nonirrigated and irrigated and the Clay Loam range site.

**SHE—Shep association, rolling.** These sloping to moderately steep soils are on elongated areas between nearly level upland alluvial terraces and plains and the lower-lying bottom lands. Areas range from 300 to 1,000 feet in width, 0.2 mile to 3 miles long, and 15 acres to more than 100 acres. Slopes are complex and range from 3 to 25 percent but dominantly range from 5 to 16 percent.

This association consists of about 55 percent Shep soil, 40 percent closely similar soils, and about 5 percent other soils. One of the closely similar soils is like the Shep soil but has a dark surface layer. It makes up about 25 percent of the unit. The other closely similar soil is gravelly loam throughout and makes up about 15 percent. The closely similar soils have the same use and management as the Shep soil. Composition of this unit is variable; however, the detail is adequate for the expected use of the soils.

Typically, the surface layer of the Shep soil is brown loam about 10 inches thick. The subsoil is light brown loam to a depth of about 32 inches. The underlying material to a depth of 65 inches is very pale brown loam with accumulations of calcium carbonate. This soil is calcareous and moderately alkaline throughout.

The Shep soil is well drained. Surface runoff is medium. Permeability is moderate, and available water capacity is high. The root zone is moderately deep. The

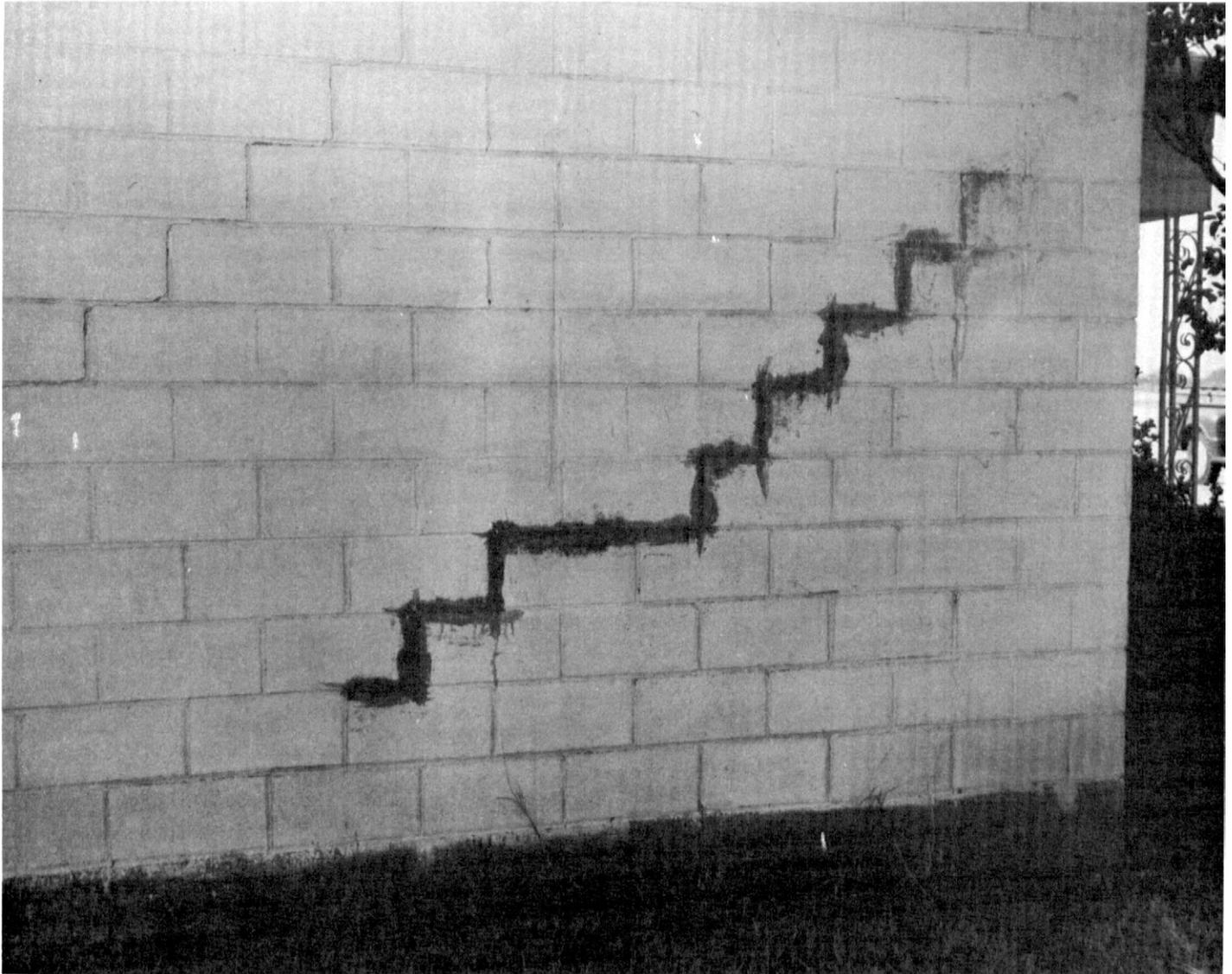


Figure 21.—Structural damage to a building on Sagerton clay loam, 0 to 1 percent slopes, caused by shrinking and swelling with changes in moisture.

hazard of water erosion is severe if good cover is lacking. The hazard of soil blowing is moderate if the surface lacks cover.

Included with this soil in mapping are small areas of Nuvalde, Throck, Bastrop, and Winters soils. Also included are a few areas of gently sloping Shep soils. These included soils make up about 5 percent of the mapped area.

The Shep soil is not suited to cultivation. It is used as rangeland. A few areas of this soil are mined for gravel for construction purposes.

This soil is fairly suited to use as wildlife habitat for deer and provides good nesting areas for quail, doves,

turkeys, and songbirds. Because of the lack of woody vegetation, furbearing animals are not attracted to this site.

The Shep soil is poorly suited to most urban and recreation uses. Slope, seepage, low strength affecting roads and streets, and corrosivity to uncoated steel are the main limitations.

This soil is in capability subclass Vle and the Mixedland Slopes range site.

**SmF—Smithwick clay, hilly.** This soil is on hilly areas between nearly level bottom lands and gently rolling limestone plateaus. It is dissected by drainageways,

some of which are deeply incised. Areas range from 40 to several hundred acres and are irregular in shape. Slopes mainly range from 10 to about 30 percent, but some range to as much as 45 percent. Slopes average about 20 percent.

Typically, the surface layer is moderately alkaline, grayish brown clay about 5 inches thick. The subsoil to a depth of 21 inches is moderately alkaline clay. It is light brownish gray in the upper 6 inches and light yellowish brown in the lower 10 inches. To a depth of 34 inches, the subsoil is moderately alkaline, light brownish gray clay. Below that, the underlying material is neutral, olive gray shale.

This soil is well drained. Runoff is medium to rapid. Permeability is very slow, and available water capacity is medium. The root zone is moderately deep. The hazard of water erosion is moderate to severe. Shale is exposed in a few places in the steeper areas as a result of sloughing.

Included with this soil in mapping are Leeray, Cho, Mereta, Nuvalde, Sagerton, and Frio soils. The included soils make up less than 20 percent of a mapped area.

This Smithwick soil is used as rangeland (fig. 23). It is not suited to use as cropland because of slope.

This soil is fairly suited to use as wildlife habitat for deer and provides good nesting areas for doves, turkeys,



Figure 22.—Aerial view of flood control structure protecting farmland. Most of the surrounding area is Sagerton clay loam, 1 to 3 percent slopes.



Figure 23.—An area of Smithwick clay, hilly. This soil has been assigned to the Shallow Clay range site.

quail, and songbirds. The rolling terrain attracts furbearing animals to this site.

The Smithwick soil is poorly suited to urban and recreation uses. The limitations are depth to shale, shrinking and swelling with changes in moisture, clayey texture, very slow permeability, and slope. These limitations can be overcome with proper design and construction.

This soil is in capability subclass VIIe and the Shallow Clay range site.

**SoC—Speck-Cho complex, 1 to 5 percent slopes.**  
This complex consists of shallow and very shallow,

loamy soils that are between the higher limestone prairies and the lower shallow valleys. Areas are elongated bands of several hundred acres that range from 1/4 to 1/2 mile in width, as much as several miles long, and oriented mainly in southwest-to-northeast directions.

This complex consists of about 40 percent Speck soil, 25 percent Cho soil, a soil closely similar to the Cho soil but that is clayey, 10 percent Oplin soil, and 25 percent other soils. Speck and Cho soils are in alternating bands that range from 10 to about 150 feet in width. They cannot be mapped separately. The Speck soil is on plane to weakly concave slopes of 1 to 3 percent. The

Cho soil is on weakly convex ridges and has slopes of 1 to 5 percent.

Typically, the surface layer of the Speck soil is dark grayish brown clay loam about 8 inches thick. The subsoil, to a depth of 15 inches, is brown clay. It has an abrupt boundary to a thick underlying layer of hard, fractured limestone. This soil is noncalcareous and mildly alkaline in the surface layer and moderately alkaline in the subsoil.

Typically, the surface layer of the Cho soil is calcareous, moderately alkaline, dark grayish brown loam about 8 inches thick. Directly below that is a layer of indurated caliche about 4 inches thick, which consists of plates 6 to 18 inches across and 1 to 2 inches thick. The underlying material is very pale brown to pale yellow, limy, loam.

The soils in this complex are well drained. The root zone is shallow to very shallow. Runoff is medium. Permeability is slow in the Speck soil and moderate in the Cho soil.

Included with these soils in mapping are areas of Eckrant, Roughcreek, and Tarpley. Also included are some small areas of nearly level Speck and Cho soils, a few sloping areas of these soils, and some limestone outcrops. These included soils make up about 25 percent of the mapped area.

The Speck and Cho soils are generally not used for cultivation. They are mainly used as rangeland and wildlife habitat. Depth to rock and stoniness generally preclude the growing of most crops except small grains. Crop yields are low. In places, the caliche underlying the Cho soil is mined and used as roadbed material.

The soils in this complex provide good nesting areas for quail and songbirds. Furbearing animals generally are slightly attracted to the site, but badgers prefer burrowing in the loamy Cho soil.

These soils are poorly suited to most urban and recreation uses. Depth to bedrock is the main limitation. The Speck soil shrinks and swells with changes in moisture.

These soils are in capability subclass VIs. The Speck soil is in the Redland range site, and the Cho soil is in the Very Shallow range site.

**StG—Stilskin gravelly loam, steep.** This soil is on foot slopes, hill slopes, and along scarps that border limestone plateaus and the upper rims of broad valleys. Slopes are complex and mainly range from 20 to about 40 percent but can be as little as 12 percent. Most areas range from 300 to 1,200 feet in width, 1/4 mile to several miles in length, and 20 to more than 100 acres.

Typically, the surface layer is moderately alkaline, grayish brown gravelly loam about 6 inches thick. The subsoil, to a depth of 17 inches, is light yellowish brown very gravelly loam that contains films and threads of calcium carbonate. The underlying material to a depth of

30 inches is light yellowish brown, weakly cemented, platy, calcareous sandstone.

This soil is well drained. Runoff is medium. Permeability is moderate, and available water capacity is very low. The root zone is shallow and is easily penetrated by plant roots. The hazard of water erosion is moderate to severe.

Included with this soil in mapping are small areas of Shep, Oplin, and Yates soils and areas of rock outcrop. Also included are areas of shallow, loamy, calcareous soils. These included soils make up less than 20 percent of any mapped area.

This Stilskin soil is only used as wildlife habitat and rangeland. It is not suited to crops because of slope, gravel, and soil depth. The underlying sandstone is suited to use as roadbase material.

This soil is fairly suited to use as wildlife habitat. Deer, turkeys, quail, doves, and songbirds are attracted to this site. Furbearing animals are also attracted.

The Stilskin soil is poorly suited to most urban and recreation uses. The shallow depth to rock and steep slope are the main limitations.

This soil is in capability subclass VIIs and the Steep Adobe range site.

**TpB—Tarpley clay loam, 1 to 3 percent slopes.**

This shallow, gently sloping soil is on low ridges, plateaus, and side slopes of shallow valleys. Slopes average about 1.5 to 2 percent. Areas are irregular in shape and range from 10 to more than 100 acres.

Typically, the surface layer is neutral, dark reddish gray clay loam about 7 inches thick. The subsoil, to a depth of 17 inches, is mildly alkaline, reddish brown clay. The underlying material is gray, indurated limestone several feet thick.

This soil is well drained. Runoff is slow to medium. Permeability is slow, and available water capacity is very low. The root zone is shallow.

Included with this soil in mapping are small areas of Eckrant, Roughcreek, Rumble, and Speck soils. These included soils make up less than 15 percent of any mapped area. Small areas of nearly level Tarpley soils make up as much as 20 percent of a few areas.

This Tarpley soil is moderately well suited to small grain and grain sorghum. A small acreage of this soil is cultivated. Most fields have been returned to range. Shallow depth, coarse fragments, very low available water capacity and the small acreage of the areas make this soil best suited to use as rangeland.

This soil is fairly suited to use as wildlife habitat for deer and provides good nesting areas for doves, quail, turkeys, and songbirds. Furbearing animals are also attracted to this site.

The Tarpley soil is poorly suited to most urban and recreation uses. Shallow depth to bedrock, clayey texture, and coarse fragments are the main limitations.

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

**We—Weswood silt loam.** This deep, nearly level to gently sloping soil is on the flood plains of the Colorado River. Slopes are dominantly less than 1 percent but range from 0 to 3 percent. Areas of this soil are oblong to elongated and 20 to more than 500 acres. This soil ranges from 30 to 50 feet above the normal stream flow.

Typically, the surface layer is reddish brown silt loam about 8 inches thick. The subsoil, to a depth of 50 inches, is reddish brown silt loam. It contains a few films and threads of calcium carbonate, that increase with depth. Thin bedding planes are in the lower part. The underlying material to a depth of 80 inches is yellowish red silt loam with stratifications of various textures. This soil is moderately alkaline and calcareous throughout.

This soil is well drained. Runoff is slow. Permeability is moderate, and available water capacity is high. Flooding in the past has been rare, averaging about once every 15 to 25 years. The soil has not flooded, however, since flood control structures were installed about 15 years ago.

Included with this soil in mapping are small areas of Miller, Clairemont, and Yahola soils. Some areas of Weswood soils that have short slopes of 3 to 5 percent are also included. The included soils make up less than 10 percent of a mapped area.

This Weswood soil is mainly used for cultivated crops and pecan orchards. Some areas are used as rangeland or for improved pasture. The native forage is mid and tall grasses. It is well suited to use as irrigated cropland.

This soil is fairly suited to use as wildlife habitat for squirrels and deer, and it provides good nesting areas for doves, quail, turkeys, and songbirds. The trees, shrubs, and water attract furbearing animals to this site. Wildlife are also attracted to the site because of the seed producing forbs, winter annuals, and cover.

The Weswood soil is not suited to urban uses. Flooding and low strength affecting roads and streets are the main limitations. This soil is well suited to most recreation uses. Flooding restricts the use of this soil for campsites during periods of heavy rainfall.

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

**WfA—Winters fine sandy loam, 0 to 1 percent slopes.** This deep, nearly level soil formed on upland plains and high terraces. Slopes are plane to slightly convex and average about 0.5 percent. Areas are irregular in shape and range from 10 to more than 300 acres.

Typically, the surface layer is brown fine sandy loam about 7 inches thick. The subsoil, to a depth of 26 inches, is sandy clay that is reddish brown in the upper part and red in the lower part. To a depth of 45 inches, it is reddish brown sandy clay; to a depth of 65 inches, it is yellowish red sandy clay and has about 15 percent calcium carbonate concretions; and to a depth of 75 inches, it is reddish yellow sandy clay loam. The soil

typically ranges from neutral to moderately alkaline above 45 inches, and it is moderately alkaline and calcareous below.

This soil is well drained. Surface runoff is medium. Permeability is moderately slow, and available water capacity is high. The root zone is deep, and penetration by plant roots is not difficult.

Included with this soil in mapping are Bastrop, Callahan, Desan, Leeray, and Sagerton soils. Some small areas of gently sloping Winters soil are included. The included soils make up less than 15 percent of a mapped area.

Most of the Winters soil is used for oats, wheat, grain sorghum, and improved pasture. This soil is well suited to crop production. Low rainfall is the main limitation. Crop residue left on the surface will help to prevent evaporation and water erosion.

This soil is well suited to use as wildlife habitat for deer, quail, doves, turkeys, and songbirds. The woody vegetation attracts furbearing animals to this site.

The Winters soil is moderately well suited to most urban development. The main limitations are high corrosivity to uncoated steel, moderately slow permeability, shrinking and swelling with changes in moisture, and low strength affecting roads and streets. This soil is well suited to most recreation uses.

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

**WfB—Winters fine sandy loam, 1 to 3 percent slopes.** This deep, gently sloping soil formed on upland plains and high terraces. Slopes are complex and average about 2 percent. Areas are irregular in shape and range from 10 to more than 400 acres.

Typically, the surface layer is neutral, brown fine sandy loam about 7 inches thick. The subsoil to a depth of 36 inches is reddish brown sandy clay; to a depth of 58 inches, it is yellowish red sandy clay; to a depth of 72 inches, it is yellowish red sandy clay loam that contains an estimated 15 percent calcium carbonate in soft masses and concretions; and to a depth of 80 inches, it is reddish yellow sandy clay loam. Typically, this soil is neutral to a depth of about 36 inches and moderately alkaline below.

This soil is well drained. Surface runoff is medium. Permeability is moderately slow, and available water capacity is high. The root zone is deep, and penetration by plant roots is not difficult.

Included with this soil in mapping are Bastrop, Callahan, Desan, Leeray, Nimrod, and Sagerton soils. Some areas of Winters soil that have slopes of less than 1 percent and some that have more than 3 percent are also included. The included soils make up less than 20 percent of a mapped area.

Most of the Winters soil is used for cultivation. The crops are oats, wheat, grain sorghum, and improved pasture. The rest of this soil is used as rangeland.

This soil is well suited to crops. The main limitation is low rainfall. Crop residue left on the surface helps to conserve moisture and maintain tilth. Terraces and contour farming are used to help control erosion. Diversions and terraces may be needed to control runoff from higher slopes. This soil can be irrigated by the sprinkler system or the surface system.

The Winters soil is well suited to use as wildlife habitat for deer and provides good nesting areas for quail, doves, turkeys, and songbirds. The woody vegetation attracts furbearing animals to this site.

This soil is moderately well suited to most urban uses. The main limitations are high corrosivity to uncoated steel, moderately slow permeability, shrinking and swelling of the soil with changes in moisture, and low strength affecting roads and streets. The Winters soil is well suited to most recreation uses.

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

**Ya—Yahola soils, frequently flooded.** These deep, nearly level to gently sloping soils are on bottom lands along river channels. Slopes range from 0 to 2 percent. Some bottom lands are dissected in places by river channels, gullies, and by small drainageways as much as 15 feet deep and a few feet to 250 feet apart. Other areas are smooth and nearly level. Most areas range from 300 to 1,200 feet in width, 1/4 mile to several miles in length, and 30 to several hundred acres. The areas form a nearly continuous, elongated band along the Colorado River and extend for short distances up major tributaries.

This map unit typically consists of about 60 percent Yahola soils, which have various textures in the surface layer. These textures are fine sandy loam, loam, clay loam, loamy fine sand, and silty clay loam. About 20 percent is the closely similar Clairemont soil that is silty clay loam throughout. The rest of the unit is made up of a soil similar to Yahola soils but that is clayey throughout and a soil that is silt loam throughout. These similar soils are in slightly higher positions on the flood plain. The soils in this unit are neither uniform nor in a regular pattern.

Typically, the surface layer is reddish brown fine sandy loam about 10 inches thick. Below that, to a depth of 30 inches, is yellowish red fine sandy loam. The next layer, to a depth of 56 inches, is brown loamy fine sand (fig. 24). The underlying layer to a depth of 65 inches is yellowish red loam that has strata in various textures. This soil is calcareous and moderately alkaline throughout.

These soils are well drained. They are flooded for very brief periods once or more annually. Scouring and deposition take place with each flood. Runoff is slow. Permeability is moderately rapid, and available water capacity is medium. The root zone is deep, and the soil is easily penetrated by plant roots.

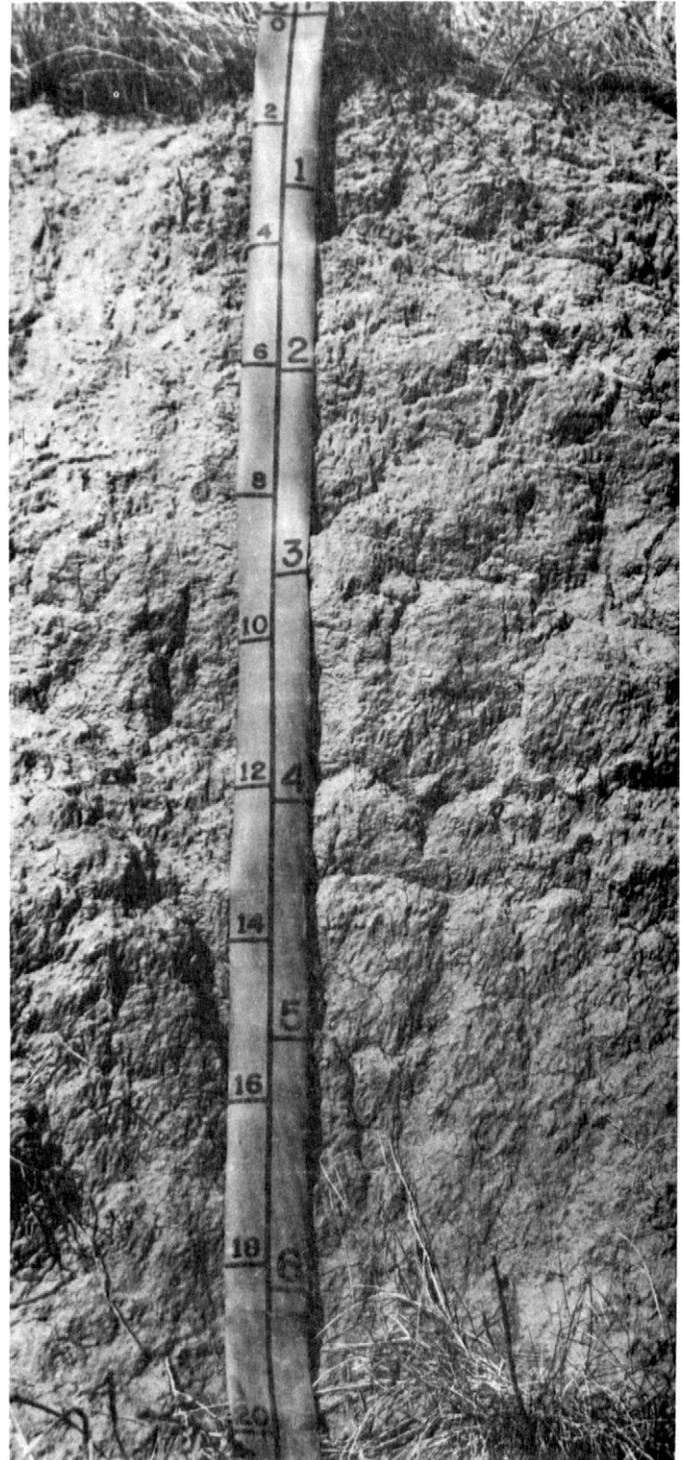


Figure 24.—Profile of Yahola fine sandy loam. This soil is stratified throughout. Distinct stratification is at a depth of about 4 feet. Multiply the figure on the left by 10 to determine the depth in centimeters. The figure on the right is in feet.

Flooding is a limitation to the use of these soils as rangeland. Some areas have an underlying layer of gravel that is suited to use as construction and roadbase materials.

The soils in this unit are fairly suited to use as wildlife habitat for squirrels and deer, and they provide good nesting areas for doves, quail, turkeys, and songbirds. The trees, shrubs, and water attract furbearing animals to this site. Wildlife are attracted to this site mainly because of the mast, seed producing forbs, winter annuals, and cover.

Flooding is a limitation for urban development. These Yahola soils are poorly suited to most recreation uses because of the hazard of flooding.

These soils are in capability subclass Vw and the Loamy Bottomland range site.

**YeC—Yates very stony loam, undulating.** This soil is on uplands. Slopes are complex and range from 1 to 8 percent. Areas are irregular in shape and range from 20 to more than 500 acres.

Typically, the surface layer is neutral, reddish brown very stony loam about 6 inches thick. Below that is indurated, coarsely fractured limestone.

This soil is well drained. Runoff ranges from medium to rapid. Permeability is moderate, and available water capacity is very low. The root zone ranges from very shallow to shallow. The hazard of erosion is moderate.

Included with this soil in mapping are small areas of Cho, Hye, Nebgen, Nuvalde, Pedernales, Pontotoc, Roughcreek, and Tarpley soils. Also included are areas of strongly sloping to moderately steep Yates soil. These included soils make up less than 15 percent of a mapped area.

This Yates soil is suited to use as rangeland and wildlife habitat. It produces low yields of range forage.

This soil is poorly suited to use as wildlife habitat. Quail and songbirds are common. Most furbearing animals are slightly attracted to this site. However, badgers are especially attracted to these areas.

This soil is poorly suited to most urban and recreation uses. The very shallow to shallow depth to rock, stones, and moderate corrosivity to uncoated steel are the main limitations.

This soil is in capability subclass Vlls and the Very Shallow range site.

**YRG—Yates-Rock outcrop association, steep.** This association consists of stony, very shallow and shallow

soils on uplands. The soils are on steep escarpments that are 100 to 300 feet in height between limestone plateaus above and broad valleys below. Slopes are complex and range from 10 to 40 percent. Areas are well dissected by deeply incised drainageways. Areas are elongated bands 600 to 2,700 feet wide, 1/2 mile to several miles long, and 30 to 500 acres in size.

This association consists of about 70 percent Yates soil and similar soils, 20 percent Rock outcrop, and 10 percent other soils. The Yates soil has slopes of about 10 to 20 percent and is on tops of ridges and faces of escarpments. Rock outcrop is on slopes of 15 to 40 percent and forms numerous ledges at various heights on the escarpments. The composition of this association is more variable than that of most of the other map units in the survey; however, the detail is adequate for the expected use of the soils.

Typically, the surface layer of the Yates soil is moderately alkaline, brown very stony loam about 6 inches thick. The underlying material is indurated, coarsely fractured limestone. The soils closely similar to the Yates soil differ by having a dark surface layer. These closely similar soils comprise about 30 percent of this association.

The Yates soil is well drained. Runoff is medium to rapid. Permeability is moderate, and available water capacity is very low. The root zone is very shallow to shallow. The hazard of erosion is severe if good cover is lacking.

Rock outcrop is indurated limestone. It is grayish and in ledges of 1 foot to about 8 feet thick.

Other soils included in this association are Nocken, Hye, Nebgen, Pontotoc, Roughcreek, and Stilskin soils. A few sandstone ledges are near the base of the escarpment in some areas. The included soils comprise about 10 percent of a mapped area.

The Yates soil is used as rangeland and wildlife habitat. It is not suited to cultivation because of slope, stoniness, and depth to bedrock. It is poorly suited to quail and songbirds. Most furbearing animals are only slightly attracted to this site; however, badgers are especially attracted to these areas.

The Yates soil is poorly suited to most urban and recreation uses. The slope, very shallow and shallow depth to rock, and large stones are the most restrictive features.

This soil is in capability subclass Vlls and the Very Shallow range site.

## prime farmland soils

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This section provides information about prime farmland soils in San Saba County. It defines and discusses requirements and lists the prime farmland soils.

Each year, thousands of acres of land throughout the United States are converted from agricultural to industrial, urban, and other uses. Some of this land includes prime farmland.

Prime farmland soils are one of several kinds of important farmland soils defined by the U.S. Department of Agriculture. They are of major importance in providing the Nation's short- and long-range needs for food and fiber. The supply of high quality farmland is limited. The U.S. Department of Agriculture recognizes that responsible levels of government, as well as individuals, must encourage and facilitate the use of our Nation's prime farmland soils with wisdom and foresight.

Prime farmland soils, as defined by the U.S. Department of Agriculture, are soils that are best suited to producing food, feed, forage, fiber, and oilseed crops. These soils have the quality, growing season, and moisture supply needed to economically produce a sustained high yield of crops if treated and managed using acceptable farming methods. Prime farmland soils produce the highest yields with minimal inputs of energy and economic resources, and farming results in the least damage to the environment.

Prime farmland soils include those currently being used for crops, pasture, or other purposes except urban and built-up land or water areas. The soils must either be used for producing food or fiber or be available for these uses.

Prime farmland soils generally have an adequate and dependable supply of moisture from precipitation or irrigation. They also have a favorable temperature and growing season and an acceptable level of acidity or alkalinity. These soils have few or no rocks and are permeable to water and air. Prime farmland soils are not excessively erosive or saturated with water for long periods and are not flooded during the growing season. Slope ranges mainly from 0 to 5 percent. For more detailed information regarding the criteria for prime farmland soils, consult the local staff of the Soil Conservation Service.

About 139,660 acres or nearly 19 percent of the acreage in San Saba County meets the requirements for prime farmland soils. Areas of these soils are scattered throughout the county, but general soil map unit 5 has the largest area of prime farmland soils. Map units 11

and 12 have substantial areas, while map units 7, 9, and 10 have small scattered areas.

Crops grown on these soils are mainly grain sorghum, oats, and wheat. Some pecans are produced on the bottom land soils, and fruit orchards are common on the sandier soils.

A recent trend in land use in some parts of the county has resulted in the loss of some prime farmland soils to urban and industrial uses. This loss puts demands on marginal lands, which generally are more erosive, droughty, difficult to cultivate, and less productive.

The detailed units of prime farmland soils in San Saba County are listed in this section. The list does not constitute a recommendation for a particular land use. The extent of each listed map unit is shown in Table 4. The location is shown on the detailed soil maps at the back of this survey. The soil qualities that affect use and management are described in the section "Detailed soil map units."

Inadequate rainfall is a limitation on some soils. These soils may qualify as prime farmland soils if this limitation is overcome by irrigation. Onsite evaluation is necessary to determine whether the corrective measures taken have been effective.

The soil map units in this list are prime farmland except where the use is urban or built-up<sup>1</sup> or they fail to meet the criteria indicated by footnote.

Bastrop fine sandy loam, 0 to 3 percent slopes  
 Bastrop fine sandy loam, 3 to 5 percent slopes  
 Demona loamy fine sand, 1 to 3 percent slopes<sup>2</sup>  
 Frio silty clay loam, occasionally flooded  
 Hye fine sandy loam, 1 to 5 percent slopes<sup>2</sup>  
 Katemcy fine sandy loam, 1 to 5 percent slopes<sup>2</sup>  
 Leeray clay, 0 to 1 percent slopes  
 Leeray clay, 1 to 3 percent slopes  
 May fine sandy loam, 0 to 2 percent slopes<sup>2</sup>  
 Miles fine sandy loam, 1 to 3 percent slopes<sup>2</sup>  
 Miller silty clay, occasionally flooded  
 Nuvalde clay loam, 0 to 1 percent slopes  
 Nuvalde clay loam, 1 to 3 percent slopes  
 Nuvalde-Shep complex, 1 to 5 percent slopes  
 Pedernales fine sandy loam, 1 to 3 percent slopes  
 Pontotoc fine sandy loam, 1 to 5 percent slopes<sup>2</sup>  
 Rowena clay loam, 1 to 3 percent slopes  
 Sagerton clay loam, 0 to 1 percent slopes  
 Sagerton clay loam, 1 to 3 percent slopes  
 Weswood silt loam

Winters fine sandy loam, 0 to 1 percent slopes  
Winters fine sandy loam, 1 to 3 percent slopes

<sup>1</sup> Urban and built-up is defined to be any contiguous unit of land 10 acres or more in size that is used for residences, industrial sites, commercial sites,

construction sites, institutional sites, public administrative sites, railroad yards, small parks, cemeteries, airports, golf courses, sanitary landfills, sewage treatment plants, water control structures and spillways, shooting ranges, and so forth.

<sup>2</sup> Where there is a developed irrigation water supply that is dependable and of adequate quality.

## use and management of the soils

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This soil survey is an inventory and evaluation of the soils in the survey area. It can be used to adjust land uses to the limitations and potentials of natural resources and the environment. Also, it can help avoid 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 behavior characteristics of the soils. They collect data on erosion, droughtiness, flooding, and other factors that affect various soil uses and management. Field experience and collected data on soil properties and performance are used as a basis in predicting soil behavior.

Information in this section can be used to plan the use and management of soils for crops and pasture; as rangeland and woodland; as sites for buildings, sanitary facilities, highways and other transportation systems, and parks and other recreation facilities; and for wildlife habitat. It can be used to identify the potentials and limitations of each soil for specific land uses and to help prevent construction failures caused by unfavorable soil properties.

Planners and others using soil survey information can evaluate the effect of specific land uses on productivity and on the environment in all or part of the survey area. The survey can help planners to maintain or create a land use pattern in harmony with the natural soil.

Contractors can use this survey to locate sources of sand and gravel, roadfill, and topsoil. They can use it to identify areas where bedrock, wetness, or very firm soil layers can cause difficulty in excavation.

Health officials, highway officials, engineers, and others may also find this survey useful. The survey can help them plan the safe disposal of wastes and locate sites for pavements, sidewalks, campgrounds, playgrounds, lawns, and trees and shrubs.

### crops and pasture

General management needed for crops and pasture is suggested in this section. The crops or pasture plants best suited to the soils, including some not commonly grown in the survey area, are identified; the system of land capability classification used by the Soil Conservation Service is explained; and the estimated yields of the main crops and hay and pasture plants are listed for each soil.

Planners of management systems for individual fields or farms should consider the detailed information given

in the description of each soil under "Detailed soil map units." Specific information can be obtained from the local office of the Soil Conservation Service or the Cooperative Extension Service.

According to the Texas Conservation needs inventory, 64,051 acres in the survey area was used for crops and pasture in 1967 (4). Of this total, 13,307 acres was used for row crops; 22,553 acres for close-growing crops, mainly oats and wheat; 5,412 acres for orchards; 7,444 acres for permanent pasture; and the rest was idle cropland or cropland for conservation use.

Potential of the soils in San Saba County is good for increased production of food products. Several thousand acres of potentially good cropland is currently being used as rangeland and pasture. In addition to the reserve productive capacity represented by this land, food production could also be increased considerably by extending the latest crop production technology to all cropland in the county. This soil survey can greatly facilitate the application of such technology.

Soil erosion is the major problem on nearly all of the cropland that has slope of more than 2 percent. Water erosion is a hazard on the Bastrop, Bonti, Callahan, Katemcy, Pedernales, and Pontotoc soils, for example, which have slope of as much as 5 percent.

Loss of the surface layer through erosion is damaging for two reasons. First, productivity is reduced as the surface layer is lost and part of the subsoil is incorporated into the plow layer. Loss of the surface layer is especially damaging on soils that have a clayey subsoil, such as the Callahan, Pedernales, and Winters soils; and on soils that have a layer of bedrock that limits the depth of the root zone. Shallow and moderately deep soils that are underlain by bedrock include the Bonti and Mereta soils. Erosion also reduces productivity on soils that tend to be droughty, such as Callahan loam. Second, soil erosion on farmland results in sediment entering streams. Controlling erosion minimizes the pollution of streams by sediment and improves the quality of water for municipal use, for recreation, and for fish and wildlife.

Erosion control practices provide protective surface cover, reduce runoff, and increase infiltration. A cropping system that keeps vegetative cover on the soil for extended periods can hold soil erosion losses to amounts that do not reduce the productive capacity of the soils.

Management of residue is an effective practice (fig. 16). A good litter of crop residue left on the surface of

the soil is protection against packing rains, reduces crusting, decreases runoff, and reduces evaporation of soil moisture. It shades the soil and thus reduces soil temperatures. In addition, it adds organic matter to the soil, improves the tilth of the surface soil, and reduces packing by farm machinery. Crop residue should be protected from grazing and burning. Tillage equipment that keeps residue on the surface should be used.

Minimum tillage for grain sorghum, which is common on an increasing acreage, is effective in reducing erosion on sloping land and can be adapted to most soils in the county.

Terraces farmed on the contour reduce the length of slope and reduce runoff and erosion. They are most practical on deep and moderately deep, clayey and loamy soils that have slopes of more than 1 percent.

Soil blowing is a hazard on the sandy Bonti, Demona, Desan, and Nimrod soils. It can damage these soils in a few hours if winds are strong and the soils are dry and bare of vegetation or surface mulch. Stripcropping, vegetative cover, or surface mulch minimizes soil blowing on these soils. Most crops provide adequate cover during the growing season, but do not leave enough residue for soil protection and improvement. Crops such as peanuts should be followed by a cover crop, such as rye or vetch.

Information regarding the design of erosion control practices for each kind of soil is contained in the Field Office Technical Guide, available in local office of the Soil Conservation Service.

Soil fertility is low to medium in most of the upland soils. Nitrogen and phosphorus are the most deficient minerals and a few sandy soils are also deficient in potash. The soils on flood plains, such as Weswood and Frio soils, are naturally higher in plant nutrients than most upland soils.

Soil tilth is an important factor in the germination of seeds and in the infiltration of water into the soil. Soils with good tilth are granular and porous.

Many of the soils used as cropland have a surface layer of fine sandy loam or loam that is light colored and low in content of organic matter. Generally, the structure of such soils is weak and intense rainfall causes the formation of a crust on the surface. Once the crust forms, it reduces infiltration and increases runoff. Regular additions of crop residue, manure, and other organic material can help to improve soil structure and reduce crust formation.

The dark Leeray soils are clayey, and often remain wet until late in spring. If they are wet when plowed, they tend to be very cloddy when dry and good seedbeds are difficult to prepare. Fall plowing generally results in good tilth in spring.

Field crops suited to the soils and climate of this county include some that are not now commonly grown. Grain sorghum and peanuts are the principal row crops grown (fig. 10). Cotton, corn, guar, soybeans, castor beans, sunflowers, and similar crops can be grown.

Wheat, oats, and forage sorghum are the common close-growing crops. Rye, barley, vetch, alfalfa, and millet are also grown. Grass seed can be produced from kleingrass, King Ranch bluestem, and weeping lovegrass.

Special crops grown commercially in the survey area are vegetables, small fruits, tree fruits, and nursery plants. A small acreage throughout the county is used for watermelons, cantaloupes, sweet potatoes, sweet corn, tomatoes, peppers, and other vegetables and small fruits. Other areas are adapted to other special crops, such as blackberries, grapes, and many kinds of vegetables. Pecans are the most important tree fruit grown in the county. A few apples and peaches are also grown.

Deep soils that have good natural drainage and that warm up early in spring are especially well suited to many vegetables and small fruits. Examples of these soils are Nuvalde, Pedernales, and Sagerton soils that have slopes of less than 3 percent. Timely irrigation for many years doubles the yields of most horticultural crops. Sprinkler irrigation works satisfactorily on gently sloping soils and is generally the only type suited to the sandier soils. Soils in low areas where frost is frequent and air drainage is poor, however, generally are poorly suited to early maturing vegetables, small fruits, and orchards.

The latest information and suggestions for special crops can be obtained from local offices of the Cooperative Extension Service and the Soil Conservation Service.

Pasture is important in San Saba County because raising livestock is the main farm enterprise. For the past several years, the trend has been to convert land from other uses to pasture and hay. Land used for pasture and hay usually is planted to introduced grasses that respond to good management. These grasses are mainly used to provide year-round grazing in combination with native range and supplemental pastures.

Among the important grasses are Coastal bermudagrass, kleingrass-75, weeping lovegrass, johnsongrass, indiagrass, switchgrass, King Ranch bluestem, and caucasian bluestem. Grasses, such as Coastal bermudagrass and kleingrass-75, are best suited to deep soils on bottom lands, such as Yahola and Frio soils. These two grasses, however, are adapted to most of the soils in the county if a good seedbed can be prepared. Weeping lovegrass is widely suited and provides good yields of forage on moderately coarse and coarse textured soils on uplands, such as Bonti, Demona, Desan, and Nimrod soils. King Ranch bluestem and caucasian bluestem are well suited to soils such as Callahan loam and Mereta clay loam.

Good management practices for pasture include fertilization, rotational grazing to maintain proper grazing heights of forage, weed and brush management, and an adequate water supply. Good management practices for hay include fertilization and cutting forage at the correct height and at the proper stage of growth.

### yields per acre

The average yields per acre that can be expected of the principal crops under a high level of management are shown in table 5. In any given year, yields may be higher or lower than those indicated in the table because of variations in rainfall and other climatic factors.

The yields are based mainly on the experience and records of farmers, conservationists, and extension agents. Available yield data from nearby counties and results of field trials and demonstrations are also considered.

The management needed to obtain the indicated yields of the various crops depends on the kind of soil and the crop. Management can include drainage, erosion control, and protection from flooding; the proper planting and seeding rates; suitable high-yielding crop varieties; appropriate and timely tillage; control of weeds, plant diseases, and harmful insects; favorable soil reaction and optimum levels of nitrogen, phosphorus, potassium, and trace elements for each crop; effective use of crop residue and green-manure crops; and harvesting that insures the smallest possible loss.

The estimated yields reflect the productive capacity of each soil for each of the principal crops. Yields are likely to increase as new production technology is developed. The productivity of a given soil compared with that of other soils, however, is not likely to change.

Crops other than those shown in table 5 are grown in the survey area, but estimated yields are not listed because the acreage of such crops is small. The local office of the Soil Conservation Service or of the Cooperative Extension Service can provide information about the management and productivity of the soils.

### 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 grouping does not take into account major and generally expensive landforming that would change slope, depth, or other characteristics of the soils, nor does it consider possible but unlikely major reclamation projects. Capability classification is not a substitute for interpretations designed to show suitability and limitations of groups of soils for rangeland and for engineering purposes.

In the capability system, soils are generally grouped at three levels: capability class, subclass, and unit. Only class and subclass are used in this survey. These levels are defined in the following paragraphs.

*Capability classes*, the broadest groups, are designated by Roman numerals I through VIII. The numerals indicate progressively greater limitations and narrower choices for practical use. The classes are defined as follows:

Class I soils have slight limitations that restrict their use.

Class II soils have moderate limitations that reduce the choice of plants or that require moderate conservation practices.

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

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

Class V soils are not likely to erode but have other limitations, impractical to remove, that limit their use.

Class VI soils have severe limitations that make them generally unsuitable for cultivation.

Class VII soils have very severe limitations that make them unsuitable for cultivation.

Class VIII soils and miscellaneous areas have limitations that nearly preclude their use for commercial crop production.

*Capability subclasses* are soil groups within one class. They are designated by adding a small letter, *e*, *w*, *s*, or *c*, to the class numeral, for example, IIe. The letter *e* shows that the main limitation is 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 too dry.

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

Capability units are soil groups within a subclass. The soils in a capability unit are enough alike to be suited to the same crops and pasture plants, to require similar management, and to have similar productivity. Capability units are generally designated by adding an Arabic numeral to the subclass symbol, for example, IIe-4 or IIIe-6. There are no capability units in this survey.

The acreage of soils in each capability class and subclass is shown in table 6. The capability classification of each map unit is given in the section "Detailed soil map units."

### rangeland

John A Wright, range conservationist, Soil Conservation Service, helped prepare this section.

About 88 percent (4) of San Saba County is rangeland. More than 85 percent of the agricultural income is derived from livestock. The main source of forage for livestock is rangeland. Income from hunting

leases and other recreational enterprises on rangeland is becoming increasingly important.

Most ranchers are managing for a cow-calf operation, though stocker steers and heifers and winter lambs make up a significant percentage of several herds. Several ranchers specialize in breeding and selling purebred or crossbred cattle.

On many ranches, forage produced on rangeland is supplemented by tame pasture, crop stubble, and small grain. In winter, the native forage is usually supplemented with protein concentrate. Creep feeding of calves and yearlings to increase market weight is practiced on some ranches.

The desirable native vegetation in many parts of the survey area has been mostly depleted by continued excessive use. Much of the acreage that was once open grassland is now covered with mesquite brush, weeds, and cactus. The amount of forage presently produced may be less than half of that originally produced. Productivity of the range can be increased by using management practices that are effective for specific kinds of soils and range sites.

Four distinct types of rangeland exist in the county. The most extensive type is loamy, stony, and cherty soils underlain by limestone. It occurs in the south and central parts of the county (general soil map units 1 and 2). The soils are generally sloping to hilly. These areas produce mid and tall grasses interspersed with a variety of forbs and shrubs and live oak trees. Potential productivity is low to medium.

Throughout the northern third of the county are tracts of rangeland that are generally a post oak savannah interspersed with areas of open prairie. These moderately deep soils are loamy and stony and formed on sandstone and shale (general soil map units 3 and 4). These soils support mid and tall grasses.

Scattered throughout the central part of the county are tracts of rangeland that are generally an open grassland prairie. The deep soils are loamy or clayey and formed in materials of valley fill and outwash plains (general soil map units 5 and 6). These soils support mainly mid and tall grasses. Potential productivity is medium to high. Mesquite has invaded most areas because brush management has not been practiced. Deep, loamy soils along the San Saba River and Colorado River are highly productive. These soils support mid and tall grasses and a variety of trees and shrubs (general soil map units 11 and 12).

In areas south of the town of Cherokee and in the southwest corner of the county, the rangeland is generally a post oak and live oak savannah. These areas are part of the Central Basin Land Resource Area. The soils are mainly loamy and stony and range from very shallow to deep (general soil map units 7, 8, 9, and 10). The underlying bedrocks are limestone, sandstone, and schist. The soils support post oak and live oak trees and mid and tall grasses. Potential productivity is low to medium.

In areas that have similar climate and topography, differences in the kind and amount of vegetation produced on rangeland are closely related to the kind of soil. Effective management is based on the relationship between the soils and vegetation and water.

Table 7 shows, for each soil, the range site; and the potential annual production of vegetation in favorable, average, and unfavorable years. Only those soils that are used as or are suited to rangeland are listed. Explanation of the column headings in table 7 follows.

A *range site* is a distinctive kind of rangeland that produces a characteristic natural plant community that differs from natural plant communities on other range sites in kind, amount, and proportion of range plants. The relationship between soils and vegetation was established during this survey; thus, range sites generally can be determined directly from the soil map. Soil properties that affect moisture supply and plant nutrients have the greatest influence on the productivity of range plants. Soil reaction, salt content, and a seasonal high water table are also important.

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

*Dry weight* is the total annual yield per acre reduced to a common percent of air-dry moisture.

Range management requires a knowledge of the kinds of soil and of the potential natural plant community. It also requires an evaluation of the present range condition. Range condition is determined by comparing the present plant community with the potential natural plant community on a particular range site. The more closely the existing community resembles the potential community, the better the range condition. Range condition is an ecological rating only. It does not have a specific meaning that pertains to the present plant community in a given use.

The objective in range management is to control grazing so that the plants growing on a site are about the same in kind and amount as the potential natural plant community for that site. Such management generally results in the optimum production of plants, reducing undesirable brush species, conserving water, and controlling erosion water and soil blowing. Sometimes, however, a range condition somewhat below

the potential meets grazing needs, provides wildlife habitat, and protects soil and water resources.

Controlling brush is also important. This can be done mechanically, chemically, or biologically. Seeding adapted grasses, such as little bluestem, sideoats grama, indiagrass, kleingrass, and King Ranch bluestem, in areas of inadequate vegetation prevents excessive runoff and erosion and furnishes desirable forage. If sound range management based on soil survey information and range inventories is applied, potential is good for increasing the productivity of rangeland in the area.

There are 21 range sites in the survey area. They are Clayey Bottomland, Clay Loam, Claypan Prairie, Deep Sand, Gravelly Redland, Loamy Bottomland, Low Stony Hills, Mixedland Slopes, Redland, Red Sandy Loam, Sandy, Sandy Loam, Sandstone Hill, Schist, Shallow, Shallow Clay, Steep Adobe, Steep Rocky, Stony Upland, Tight Sandy Loam, and Very Shallow.

#### range site descriptions

**Clayey Bottomland range site.** The Miller soil in map unit Mr is in this site. The potential plant community is a mid grass and tall grass prairie on flood plains. The species composition by weight is about 90 percent grasses, 5 percent forbs, and 5 percent woody plants.

The predominant plants are—

- vine-mesquite—20 percent
- white tridens—15 percent
- Texas needlegrass—15 percent
- Canada wildrye—10 percent
- Arizona cottontop—10 percent
- buffalograss, little bluestem, indiagrass, and switchgrass—5 percent each
- forbs, such as bundleflower, Maximilian sunflower, and Engelmann-daisy—5 percent
- woody plants, such as hackberry, elm, live oak, and pecan—5 percent.

Canada wildrye, little bluestem, switchgrass, and indiagrass are preferred plants; therefore, they are grazed out first if heavily grazed by cattle and sheep. These plants are replaced by buffalograss, Texas wintergrass, vine-mesquite, white tridens, silver bluestem, live oak, bumelia, hackberry, and elm. Continued overgrazing causes a decline in all of these plants except live oak, bumelia, and elm and causes an invasion of threeawns, fescue grass, and other annual grasses, weedy forbs, and mesquite trees. Further deterioration of the plant community causes mesquite to continue to increase along with tasajillo, pricklypear, bumelia, and lotebush.

**Clay Loam range site.** The Leeray, Nuvalde, Rowena, and Sagerton soils in map units LeA, LeB, NuA, NuB, NxC, RoB, SaA, and SaB are in this site (fig. 25). The potential plant community is dominantly a mid grass prairie with a species composition by weight of 85

percent grasses, 15 percent forbs, and traces of woody plants.

The predominant plants are—

- sideoats grama—15 percent
- vine-mesquite—10 percent
- silver bluestem—10 percent
- little bluestem—10 percent
- indiagrass—10 percent
- Texas wintergrass—10 percent
- big bluestem, tall dropseed, white tridens, and buffalograss—5 percent each
- forbs, such as Engelmann-daisy, heath aster, bundleflower, and catclaw sensitivebrier—about 15 percent
- woody plants, such as elm, live oak, and hackberry, are found in trace amounts.

Indiagrass, little bluestem, big bluestem, and sideoats grama are preferred plants; therefore, they are grazed out first if grazing is not controlled. These plants are replaced by buffalograss, silver bluestem, Texas needlegrass, and dropseeds. Continued overgrazing causes a decline in these plants except Texas needlegrass and buffalograss and causes an invasion of threeawns, hairy tridens, Texas grama, weedy forbs, mesquite, whitebrush, tasajillo, and pricklypear. Further deterioration of the plant community causes mesquite to continue to increase along with lotebush and pricklypear.

**Claypan Prairie range site.** The Callahan soil in map units CaB, CaC2, and NCF is in this site. The potential plant community is a mid grass and short grass prairie with a species composition by weight of about 90 percent grasses, 5 percent forbs, and 5 percent woody plants.

The predominant plants are—

- sideoats grama—15 percent
- silver bluestem—15 percent
- Texas wintergrass—15 percent
- Arizona cottontop—10 percent
- white tridens—10 percent
- buffalograss—10 percent
- vine-mesquite—10 percent
- other perennial grasses—5 percent
- forbs, such as heath aster, bundleflower, and Engelmann-daisy—5 percent
- woody plants, such as hackberry and lotebush—5 percent.

Sideoats grama, Arizona cottontop, and vine-mesquite are preferred plants; therefore, they are grazed out first if heavily grazed by cattle and sheep. These plants are replaced by buffalograss, silver bluestem, Texas wintergrass, and lotebush. Continued overgrazing causes a decline in all of these plants except lotebush and causes an invasion of threeawns, Texas grama, red grama, weedy forbs, tasajillo, pricklypear, and mesquite. Further deterioration of the plant community causes mesquite to continue to increase along with lotebush, pricklypear, tasajillo, and whitebrush.



Figure 25.—Cattle grazing on Sagerton clay loam. This soil has been assigned to the Clay Loam range site.

**Deep Sand range site.** The Desan soil in map unit DsC is in this site. The potential plant community is a mid grass, post oak and blackjack oak savannah. A few tall grasses are in scattered open areas. Species composition by weight is 45 percent grasses, 5 percent forbs, and 50 percent woody plants.

The predominant grasses are—

- sand lovegrass—25 percent
- indiagrass—5 percent
- switchgrass—5 percent
- purpletop tridens—5 percent
- red lovegrass—5 percent

- forbs, such as trailing wildbean and lespedeza—5 percent
- woody plants, such as post oak and blackjack oak—40 percent
- greenbrier and skunkbush sumac—10 percent.

Sand lovegrass, indiagrass, and switchgrass are preferred plants; therefore, they are grazed out first if heavily grazed by cattle. These plants are replaced by red lovegrass, Scribner panicum, dropseeds, greenbrier, and post oak. Continued overgrazing causes a decline in all of these plants except post oak, greenbrier, and

skunkbush sumac and causes an invasion of threeawns, low panicums, weedy forbs, and prickly ash. Further deterioration of the plant community causes post oak to continue to increase along with blackjack oak, bumelia, prickly ash, and greenbrier.

**Gravelly Redland range site.** The Rumble soil in map units PBF and RuC is in this site (fig. 20). The potential plant community is a mid grass and tall grass prairie with a species composition by weight of 90 percent grasses, 5 percent forbs, and 5 percent woody plants.

The predominant plants are—

- little bluestem—25 percent
- sideoats grama—20 percent
- Arizona cottontop—10 percent
- indiangrass, big bluestem, silver bluestem, Texas needlegrass, green sprangletop, buffalograss, and meadow dropseed—5 percent each
- forbs, such as orange zexmenia, Engelmann-daisy, and bushsunflower—5 percent
- woody plants, such as catclaw acacia and live oak—5 percent

Little bluestem, green sprangletop, indiangrass, and big bluestem are preferred plants; therefore, they are grazed out first if heavily grazed by cattle and sheep. These plants are replaced by meadow dropseed, silver bluestem, Texas needlegrass, slim tridens, buffalograss, vine-mesquite, and catclaw. Continued overgrazing causes a decline in these plants except catclaw and an invasion of threeawns, Texas grama, red grama, weedy forbs, and mesquite. Further deterioration of the plant community causes catclaw to continue to increase along with mesquite, tasajillo, and pricklypear.

**Loamy Bottomland range site.** The Bunyan, Clairemont, Frio, Weswood, and Yahola soils in map units By, Cm, Fr, Fs, We, and Ya are in this site. The potential plant community is a mid grass and tall grass, semi-wooded flood plain with a species composition by weight of 80 percent grasses, 5 percent forbs, and 15 percent woody plants.

The predominant plants are —

- indiangrass—15 percent
- little bluestem—10 percent
- switchgrass—10 percent
- big bluestem—10 percent
- vine-mesquite—10 percent
- eastern gamagrass, sideoats grama, Texas bluegrass, Canada wildrye, and meadow dropseed—5 percent each
- forbs, such as bushsunflower, Maximilian sunflower, and Engelmann-daisy—5 percent
- woody plants, such as hackberry, elm, live oak, and pecan—15 percent.

Big bluestem, indiangrass, and switchgrass are preferred plants; therefore, they are grazed out first if heavily grazed by cattle. These plants are replaced by sideoats grama, Texas needlegrass, vine-mesquite,

dropseeds, silver bluestem, live oak, bumelia, and pecan. Continued overgrazing causes a decline in all of these plants except live oak, bumelia, and pecan and causes an invasion of threeawns, buffalograss, red grama, annual grasses, weedy forbs, and mesquite. Further deterioration of the plant community causes mesquite to continue to increase along with western soapberry, black willow, and bumelia.

**Low Stony Hills range site.** The Eckrant soil in map unit EcC is in this site. The potential plant community is a mid grass, live oak savannah with a species composition by weight of 80 percent grasses, 10 percent forbs, and 10 percent woody plants.

The predominant plants are—

- sideoats grama—20 percent
- little bluestem—15 percent
- big bluestem, indiangrass, silver bluestem, Canada wildrye, fall witchgrass, green sprangletop, vine-mesquite, Texas wintergrass, and Wright threeawn—5 percent each
- forbs, such as Engelmann-daisy, bushsunflower, and dotted gayfeather—10 percent
- woody plants, such as live oak—5 percent
- catclaw acacia—5 percent.

Little bluestem, green sprangletop, big bluestem, and indiangrass are preferred plants; therefore, they are grazed out first if heavily grazed by cattle and sheep. These plants are replaced by Texas wintergrass, silver bluestem, buffalograss, slim tridens, Wright threeawn, and live oak. Continued overgrazing causes a decline in all of these plants except live oak and an invasion of red grama, Texas grama, hairy tridens, weedy forbs, and juniper and pricklypear. Further deterioration of the plant community causes live oak to continue to increase along with pricklypear, catclaw, juniper, and prickly ash.

**Mixedland Slopes range site.** The Shep soil in map units NxC and SHE is in this site. The potential plant community is a mid grass and tall grass, live oak savannah with a species composition by weight of about 85 percent grasses, 10 percent forbs, and 5 percent woody plants.

The predominant plants are—

- sideoats grama—25 percent
- little bluestem—20 percent
- silver bluestem—10 percent
- Texas cupgrass, silver bluestem, Arizona cottontop, Texas wintergrass, sand dropseed, and buffalograss—5 percent each
- forbs, such as prairie-clover, Engelmann-daisy, and dotted gayfeather—10 percent
- woody plants, such as live oak—5 percent.

Little bluestem, sideoats grama, and Texas cupgrass are preferred plants; therefore, they are grazed out first if heavily grazed by cattle and sheep. These plants are replaced by Texas wintergrass, silver bluestem, dropseeds, hooded windmillgrass, and live oak.

Continued overgrazing causes a decline in all of these plants except live oak and causes an invasion of threeawns, dropseeds, stinkgrass, weedy forbs, mesquite, tasajillo, agarito and lotebush. Further deterioration of the plant community causes live oak to continue to increase along with lotebush, agarito, pricklypear, and tasajillo.

**Redland range site.** The Corkstone, Roughcreek, Speck, and Tarpley soils in map units CrC, RgD, SoC, and TpB are in this site. The potential plant community is a mid grass and tall grass, live oak savannah with a species composition by weight of 85 percent grasses, 5 percent forbs, and 10 percent woody plants.

The predominant plants are—

- little bluestem—25 percent
- sideoats grama—15 percent
- Texas wintergrass—10 percent
- indiagrass, big bluestem, silver bluestem, Texas cupgrass, buffalograss, tall dropseed, and Canada wildrye—5 percent each
- forbs, such as prairie-clover, Engelmann-daisy, and bushsunflower—5 percent
- woody plants, such as live oak—5 percent
- hackberry and bumelia—5 percent.

Little bluestem, big bluestem, indiagrass, and Texas cupgrass are preferred plants; therefore, they are grazed out first if heavily grazed by cattle, sheep, and goats. These plants are replaced by tall dropseed, sideoats grama, silver bluestem, slim tridens, buffalograss, catclaw, and prickly ash. Continued overgrazing causes a decline in all of these plants except catclaw and prickly ash and causes an invasion of threeawns, Texas grama, weedy forbs, and mesquite. Further deterioration of the plant community causes prickly ash to continue to increase along with mesquite, tasajillo, pricklypear, and catclaw.

**Red Sandy Loam range site.** The Hye and Pontotoc soils in map units HyC and PoC are in this site. The potential plant community is a tall and mid grass, post oak savannah with a species composition by weight of 75 percent grasses, 10 percent forbs, and 15 percent woody plants.

The predominant plants are—

- little bluestem—30 percent
- sandhill lovegrass—10 percent
- sideoats grama—10 percent
- indiagrass, silver bluestem, Arizona cottontop, Texas wintergrass, and green sprangletop—5 percent each
- forbs, such as orange zexmenia, Engelmann-daisy, and Maximilian sunflower—10 percent
- woody plants, such as post oak, blackjack oak and live oak—15 percent.

Little bluestem, indiagrass, and green sprangletop are preferred plants; therefore, they are grazed out first if heavily grazed by cattle. These plants are replaced by

Texas wintergrass, sideoats grama, silver bluestem, Arizona cottontop, dropseeds, hooded windmillgrass, fall witchgrass, and post oak. Continued overgrazing causes a decline in all of these plants except post oak, greenbrier, and hooded windmillgrass and causes an invasion of threeawns, dropseeds, lovegrasses, weedy forbs, mesquite trees, and Texas persimmon. Further deterioration of the plant community causes post oak to continue to increase along with mesquite and greenbrier.

**Sandy range site.** The Demona and Nimrod soils in map units DmB and NaC are in this site. The potential plant community is a mid grass and tall grass, post oak and blackjack oak savannah with a species composition by weight of 80 percent grasses, 5 percent forbs, and 15 percent woody plants.

The predominant plants are—

- little bluestem—25 percent
- big bluestem—10 percent
- indiagrass—10 percent
- sand lovegrass, purpletop tridens, tall dropseed, switchgrass, silver bluestem, plains lovegrass, and Scribner panicum—5 percent each
- forbs, such as trailing wildbean, evening primrose, catclaw sensitivebrier, and dotted gayfeather—5 percent
- woody plants, such as post oak—10 percent
- blackjack oak—5 percent.

Little bluestem, switchgrass, indiagrass, and big bluestem are preferred plants; therefore, they are grazed out first if heavily grazed by cattle. These plants are replaced by silver bluestem, dropseeds, hooded windmillgrass, skunkbush sumac, and post oak. Continued overgrazing causes a decline in all of these plants except post oak and skunkbush sumac and causes an invasion of threeawns, low panicums, tumble lovegrass and red lovegrass, weedy forbs, and catclaw. Further deterioration of the plant community causes post oak to continue to increase along with prickly ash, blackjack oak, greenbrier, and skunkbush sumac.

**Sandy Loam range site.** The Bastrop, Bonti, May, Miles, Pebblepoint, Rochelle, and Winters soil in map units BaB, BaC, BfB, BfC, BfC2, NBE, MaA, MfB, PBF, RfC, WfA, and WfB are in this site. The potential plant community is a tall grass and mid grass, post oak savannah with a species composition by weight of 80 percent grasses, 10 percent forbs, and 10 percent woody plants.

The predominant plants are—

- little bluestem—30 percent
- big bluestem—10 percent
- indiagrass—10 percent
- sideoats grama—10 percent
- silver bluestem, Arizona cottontop, Texas wintergrass, and sand lovegrass—5 percent each
- forbs, such as prairie-clover, Engelmann-daisy, and Maximilian sunflower—10 percent

- woody plants, such as post oak, blackjack oak, and live oak—10 percent.

Little bluestem, indiagrass, and big bluestem are preferred plants; therefore, they are grazed out first if heavily grazed by cattle. These plants are replaced by Texas wintergrass, sideoats grama, silver bluestem, Arizona cottontop, dropseeds, hooded windmillgrass, catclaw, and post oak. Continued overgrazing causes a decline in all of these plants except post oak, catclaw, and skunkbush sumac and causes an invasion of threeawns, dropseeds, lovegrasses, weedy forbs, mesquite, tasajillo, and lotebush. Further deterioration of the plant community causes post oak to continue to increase along with catclaw, lotebush, greenbrier, whitebrush, skunkbush sumac, tasajillo, and pricklypear.

**Sandstone Hill range site.** The Nocken and Nebgen soils in map units NNE and NCF are in this site (fig. 15). The potential plant community is a tall grass and mid grass, post oak and blackjack oak savannah with a species composition by weight of about 80 percent grasses, 5 percent forbs, and 15 percent woody plants.

The predominant plants are—

- little bluestem—50 percent
- sideoats grama—10 percent
- indiagrass, big bluestem, silver bluestem, and sand lovegrass—5 percent each
- forbs, such as dotted gayfeather, Engelmann-daisy, and Mexican sagewort—5 percent
- woody plants, such as post oak, blackjack oak, elm, hackberry, and sumac—15 percent.

Little bluestem, indiagrass, sand lovegrass, and big bluestem are preferred plants; therefore, they are grazed out first if heavily grazed by cattle and sheep. These plants are replaced by Texas wintergrass, sideoats grama, silver bluestem, Arizona cottontop, dropseeds, hooded windmillgrass, and post oak. Continued overgrazing causes a decline in all of these plants except post oak and skunkbush sumac and causes an invasion of threeawns, dropseeds, lovegrasses, weedy forbs, tasajillo, and greenbrier. Further deterioration of the plant community causes post oak and blackjack oak to continue to increase along with catclaw, greenbrier, and skunkbush sumac.

**Schist range site.** The Katemcy and Ligon soils in map units KLE and KfC are in this site. The potential plant community is a mid grass, post oak and live oak savannah with a species composition by weight of 85 percent grasses, 5 percent forbs, and 10 percent woody plants.

The predominant plants are—

- sideoats grama—20 percent
- Arizona cottontop—10 percent
- little bluestem—10 percent
- pinehill bluestem and silver bluestem—10 percent
- Texas wintergrass, hooded windmillgrass, Canada wildrye, Texas tridens, vine-mesquite,

green sprangletop, and sand dropseed—5 percent each

- forbs, such as prairie-clover, Engelmann-daisy, and heath aster—5 percent
- woody plants, such as post oak and live oak—10 percent.

Little bluestem, green sprangletop, sideoats grama, and Canada wildrye are preferred plants; therefore, they are grazed out of the community if heavily grazed by cattle and sheep. These plants are replaced by silver bluestem, Arizona cottontop, Texas needlegrass, hooded windmillgrass, skunkbush sumac, and post oak. Continued overgrazing causes a decline in all of these plants except post oak and skunkbush sumac and causes an invasion of threeawns, low panicums, tumble lovegrass, red lovegrass, weedy forbs, mesquite, and whitebrush. Further deterioration of the plant community causes post oak to continue to increase along with greenbrier, mesquite, skunkbush sumac, pricklypear, and tasajillo.

**Shallow range site.** The Mereta soil in map unit MeB is in this site. The potential plant community is a mid grass and short grass prairie with a species composition by weight of 80 percent grass, 10 percent forbs, and 10 percent woody plants.

The predominant plants are—

- sideoats grama—25 percent
- buffalograss—15 percent
- little bluestem, Wright threeawn, reverchon panicum, cane bluestem, slim tridens, Arizona cottontop, green sprangletop, and Texas wintergrass—5 percent each
- forbs, such as dotted gayfeather, Engelmann-daisy, bushsunflower, and orange zexmania—10 percent
- woody plants, such as live oak and hackberry—5 percent each.

Sideoats grama, little bluestem, and green sprangletop are preferred plants; therefore, they are grazed out first if heavily grazed by cattle and sheep. These plants are replaced by Wright threeawn, buffalograss, Texas wintergrass, slim tridens, lotebush, and prickly ash. Continued overgrazing causes a decline in all of these plants except lotebush and catclaw and causes an invasion of threeawns, Texas grama, red grama, weedy forbs, mesquite trees, and lotebush. Further deterioration of the plant community causes mesquite to continue to increase along with prickly ash, pricklypear, white brush, and yucca.

**Shallow Clay range site.** The Throck and Smithwick soils in map units NCF and SmF are in this site (fig. 23). The potential plant community is a mid grass and short grass prairie with scattered woody plants and a species composition by weight of 85 percent grasses, 10 percent forbs, and 5 percent woody plants.

The predominant plants are—

- sideoats grama—20 percent
- buffalograss—15 percent
- Arizona cottontop—10 percent
- vine-mesquite—10 percent
- Texas wintergrass—10 percent
- silver bluestem, white tridens, hairy dropseed, and Texas cupgrass—5 percent each
- forbs, such as prairie-clover, dotted gayfeather, and catclaw sensitivebrier—10 percent
- woody plants, such as hackberry and elm—5 percent.

Sideoats grama, Arizona cottontop, and Texas cupgrass are preferred plants; therefore, they are grazed out first if heavily grazed by cattle and sheep. These plants are replaced by buffalograss, silver bluestem, white tridens, dropseeds, Texas needlegrass, and lotebush. Continued overgrazing causes a decline in all of these plants except lotebush and causes an invasion of threeawns, Texas grama, hairy tridens, weedy forbs, and mesquite. Further deterioration of the plant community causes lotebush to continue to increase along with tasajillo, mesquite, pricklypear, and whitebrush.

**Steep Adobe range site.** The Stilskin soil in map unit StG is in this site. The potential plant community is a mid grass and tall grass, oak savannah with a species composition by weight of 85 percent grasses, 5 percent forbs, and 10 percent woody plants.

The predominant plants are—

- sideoats grama—25 percent
- little bluestem—20 percent
- tall grama—10 percent
- silver bluestem, plains lovegrass, indiagrass, rough tridens, hairy grama, and tall dropseed—5 percent each
- forbs, such as wild alfalfa, dotted gayfeather, and trailing ratany—5 percent
- woody plants, such as Texas oak, live oak, and juniper—10 percent.

Little bluestem, sideoats grama, and indiagrass are preferred plants; therefore, they are grazed out first if heavily grazed by cattle and sheep. These plants are replaced by silver bluestem, tall dropseed, hairy grama, sideoats grama, queensdelight, and Texas oak. Continued overgrazing causes a decline in all of these plants except Texas oak and queensdelight and causes an invasion of red grama, threeawns, weedy forbs, agarito, and juniper.

**Steep Rocky range site.** The Eckrant and Oplin soils in map units ERE and OYE are in this site. The potential plant community is a mid grass and short grass, live oak and Texas oak savannah with a species composition by weight of 80 percent grasses, 10 percent forbs, and 10 percent woody plants.

The predominant plants are—

- sideoats grama—30 percent

- little bluestem—20 percent
- slim tridens and rough tridens—10 percent
- silver bluestem, Texas cupgrass, green sprangletop, and buffalograss—5 percent each
- forbs, such as bushsunflower, Engelmann-daisy, halfshrub sundrop—10 percent
- woody plants, such as live oak and Texas oak—5 percent each.

Little bluestem, sideoats grama, and indiagrass are preferred plants; therefore, they are grazed out first if heavily grazed by cattle and sheep. These plants are replaced by silver bluestem, plains lovegrass, slim tridens, rough tridens, dropseeds, and skunkbush sumac. Continued overgrazing causes a decline in all of these plants except skunkbush sumac and causes an invasion of threeawns, Texas wintergrass, red grama, hairy tridens, weedy forbs, prickly ash, and juniper. Further deterioration of the plant community causes live oak and Texas oak to continue to increase along with skunkbush sumac, juniper, and prickly ash.

**Stony Upland range site.** The Harper soil in map unit HrB is in this site. The potential plant community is a mid grass and short grass, live oak savannah with a species composition by weight of 80 percent grasses, 10 percent forbs, and 10 percent woody plants.

The predominant plants are—

- sideoats grama—25 percent
- little bluestem—20 percent
- Wright threeawn, tall dropseed, cane bluestem, silver bluestem, green sprangletop, buffalograss, and Texas wintergrass—5 percent each
- forbs, such as prairie-clover, Engelmann-daisy, and bushsunflower—10 percent
- woody plants, such as live oak—5 percent and hackberry and elm—5 percent.

Sideoats grama, little bluestem, and green sprangletop are preferred; therefore, they are grazed out first if heavily grazed by cattle and sheep. These plants are replaced by Wright threeawn, buffalograss, Texas wintergrass, silver bluestem, and vine-mesquite. Continued overgrazing causes a decline in all of these plants except Wright threeawn and buffalograss and causes an invasion of curly mesquite, Texas grama, red grama, fall witchgrass, weedy forbs, and pricklypear.

**Tight Sandy Loam range site.** The Pedernales soil in map unit PfB is in this site. The potential plant community is a mid grass and tall grass, post oak savannah with a species composition by weight of 75 percent grasses, 10 percent forbs, and 15 percent woody plants.

The predominant plants are—

- sideoats grama—15 percent
- little bluestem—10 percent
- vine mesquite—10 percent
- indiagrass, Texas wintergrass, Arizona cottontop, hooded windmillgrass, silver bluestem,

Canada wildrye, buffalograss, and sand dropseed—5 percent each

- forbs, such as prairie-clover, Engelmann-daisy, and heath aster—10 percent
- woody plants, such as post oak—10 percent and skunkbush sumac, elm, and hackberry—5 percent.

Little bluestem, indiagrass, and Canada wildrye are preferred plants; therefore, they are grazed out first if heavily grazed by cattle and sheep. These plants are replaced by sideoats grama, silver bluestem, Arizona cottontop, Texas wintergrass, hooded windmillgrass, skunkbush sumac, and post oak. Continued overgrazing causes a decline in all of these plants except post oak and skunkbush sumac and causes an invasion of threeawns, low panicums, tumble lovegrass, weedy forbs, fall witchgrass, and mesquite trees. Further deterioration of the plant community causes post oak to continue to increase along with greenbrier, elm, mesquite, and skunkbush sumac.

**Very Shallow range site.** The Cho and Yates soils in map units ChC, SoC, OYE, YeC, and YRG are in this site. The potential plant community is a mid grass and short grass prairie with scattered live oak and a species composition by weight of 90 percent grasses, 5 percent forbs, and 5 percent woody plants.

The predominant plants are—

- sideoats grama—30 percent
- slim tridens and rough tridens—15 percent
- buffalograss and curlymesquite—15 percent
- hairy dropseed—10 percent
- Texas wintergrass—10 percent
- silver bluestem—5 percent
- little bluestem—5 percent
- forbs, such as prairie-clover, dotted gayfeather, orange zexmenia, and Engelmann-daisy—5 percent
- woody plants, such as live oak—5 percent.

Little bluestem, sideoats grama, and slim tridens are preferred plants; therefore, they are grazed out first if heavily grazed by cattle and sheep. These plants are replaced by Texas wintergrass, silver bluestem, buffalograss, curly mesquite, and dropseeds. Continued overgrazing causes a decline in all of these plants and causes an invasion of threeawns, hairy tridens, fall witchgrass, red grama, pricklypear, tasajillo, yucca, and agarito.

## windbreaks and environmental plantings

Ed Holcombe, forester, Soil Conservation Service, assisted in writing this section.

Woody plants serve several purposes in San Saba County. Trees and shrubs reduce wind erosion on cropland and are used for farmstead protection. They screen dwellings for privacy and reduce noise pollution. These plants provide livestock and feedlot protection,

and they are used by wildlife for food and cover.

Esthetics is also a consideration. Woody plants can be used to beautify areas.

Field windbreaks are narrow plantings of one to five rows made at right angles to the prevailing winds and at specific intervals across the field. They protect crops from high winds, reduce soil blowing, and help to retain moisture in the soil. Wildlife use these plantings for food, cover, and as travelways.

Farmstead and feedlot windbreaks are designed to protect homes and other buildings and livestock from harsh winds both in winter and summer. Windbreaks have a definite effect on fuel savings. Woody plants are also used for noise abatement. Plantings made close to busy highways can reduce noise pollution for nearby dwellers.

Environmental plantings help to beautify and screen houses and other buildings. Evergreen trees and shrubs give year-long environmental protection and add color to the landscape during winter.

To insure survival, healthy planting stock should be used, planting should be made on a well prepared site, and the plants should be maintained in good condition. Water is essential to good survival during the first 2 or 3 years after establishment. Proper maintenance, including root plowing of field windbreaks, can increase the quality of all plantings.

Woody plants are essential to the needs of wildlife. Trees and shrubs provide food and cover for game birds, songbirds, and animals. The amount of wildlife almost always increases where trees and shrubs are planted. Species of woody plants should be selected to provide food and cover for wildlife as well as to provide other benefits.

Additional information regarding the use of woody plants, including planning, sources of supply, and planting and care can be obtained from the local offices of the Soil Conservation Service or the Cooperative Extension Service.

## recreation

The soils of the survey area are rated in table 8 according to limitations that affect their suitability for recreation. The ratings are based on restrictive soil features, such as wetness, slope, and texture of the surface layer. Susceptibility to flooding is considered. Not considered in the ratings, but important in evaluating a site, are the location and accessibility of the area, the size and shape of the area and its scenic quality, vegetation, access to water, potential water impoundment sites, and access to public sewerlines. The capacity of the soil to absorb septic tank effluent and the ability of the soil to support vegetation are also important. Soils subject to flooding are limited for recreation use by the duration and intensity of flooding and the season when flooding occurs. In planning recreation facilities, onsite assessment of the height, duration, intensity, and frequency of flooding is essential.

In table 8, the degree of soil limitation is expressed as slight, moderate, or severe. *Slight* means that soil properties are generally favorable and that limitations are minor and easily overcome. *Moderate* means that limitations can be overcome or alleviated by planning, design, or special maintenance. *Severe* means that soil properties are unfavorable and that limitations can be offset only by costly soil reclamation, special design, intensive maintenance, limited use, or by a combination of these measures.

The information in table 8 can be supplemented by other information in this survey, for example, interpretations for septic tank absorption fields in table 11 and interpretations for dwellings without basements and for local roads and streets in table 10.

*Camp areas* require site preparation such as shaping and leveling the tent and parking areas, stabilizing roads and intensively used areas, and installing sanitary facilities and utility lines. Camp areas are subject to heavy foot traffic and some vehicular traffic. The best soils have mild slopes and are not wet or subject to flooding during the period of use. The surface has few or no stones or boulders, absorbs rainfall readily but remains firm, and is not dusty when dry. Strong slopes and stones or boulders can greatly increase the cost of constructing campsites.

*Picnic areas* are subject to heavy foot traffic. Most vehicular traffic is confined to access roads and parking areas. The best soils for picnic areas are firm when wet, are not dusty when dry, are not subject to flooding during the period of use, and do not have slopes or stones or boulders that increase the cost of shaping sites or of building access roads and parking areas.

*Playgrounds* require soils that can withstand intensive foot traffic. The best soils are almost level and are not wet or subject to flooding during the season of use. The surface is free of stones and boulders, is firm after rains, and is not dusty when dry. If grading is needed, the depth of the soil over bedrock or a hardpan should be considered.

*Paths and trails* for hiking, horseback riding, and bicycling should require little or no cutting and filling. The best soils are not wet, are firm after rains, are not dusty when dry, and are not subject to flooding more than once a year during the period of use. They have moderate slopes and few or no stones or boulders on the surface.

*Golf fairways* are subject to heavy foot traffic and some light vehicular traffic. Cutting or filling may be required. The best soils for use as golf fairways are firm when wet, are not dusty when dry, and are not subject to prolonged flooding during the period of use. They have moderate slopes and no stones or boulders on the surface. The suitability of the soil for tees or greens is not considered in rating the soils.

## wildlife habitat

Frank Sprague, biologist, Soil Conservation Service, assisted in preparing this section.

San Saba County was mainly a savannah type plant community under pristine conditions. Woody species were in mottes on uplands and along streams. Draws, headers, steep slopes, and other areas protected from fires supported ashe juniper stands. Buffalo, antelope, and other prairie-dwelling wildlife ranged into the county. Deer, turkey, quail, and other kinds of wildlife were found along streams and other areas that provided suitable cover for the edge effect.

Deer, turkey, and other kinds of game were greatly reduced by commercial and subsistence hunting in the latter 1800's and early part of the 20th century. Wolves, mountain lions, and other large predators were virtually eliminated by hunting and trapping in order to protect domestic livestock. Overgrazing by livestock and control of wildfires contributed to the increase and spread of woody species of plants, such as mesquite and juniper.

Increased cover resulting from brush invasion coupled with restocking and management has had a significant effect on wildlife. San Saba County now has a high deer and turkey population.

Bobwhite quail, squirrel, and doves are also important kinds of game. Raccoon, ringtail, fox, opossum, and skunks are important furbearers. Coyotes and bobcats are the major predators.

Wading birds and waterfowl utilize farm ponds, flood prevention lakes, and local rivers (fig. 26). The Colorado River and San Saba River are noted for good populations of catfish, bass, and sunfish. Large numbers of white bass move into the Colorado River each year during the spring spawning season.

Numerous small mammals, nongame birds, reptiles, and amphibians inhabit San Saba County. The golden-cheeked warbler, a rare species, has been observed in the county.

Wildlife is economically important in San Saba County. Most rangeland has a secondary use as wildlife habitat and leasing hunting rights constitutes an important source of income for many landowners. Income derived from wildlife provides an economic stimulus for improved wildlife management by landowners.

The greatest opportunity for improving wildlife habitat is realized by improving the quality and quantity of browse and food available for wildlife. Plantings for wildlife, proper grazing, a planned grazing system, and brush management benefit wildlife if planned and applied properly. Adequate harvests of deer are needed to maintain population levels within carrying capacity.

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



Figure 26.—Egret nesting area near farm pond in an area of Bonti fine sandy loam, 1 to 3 percent slopes.

vegetation, by maintaining the existing plant cover, or by promoting the natural establishment of desirable plants.

In table 9, the soils in the survey area are rated according to their potential for providing habitat for various kinds of wildlife. This information can be used in planning parks, wildlife refuges, nature study areas, and other developments for wildlife; in selecting soils that are suitable for establishing, improving, or maintaining specific elements of wildlife habitat; and in determining the intensity of management needed for each element of the habitat.

The potential of the soil is rated good, fair, poor, or

very poor. A rating of *good* indicates that the element or kind of habitat is easily established, improved, or maintained. Few or no limitations affect management, and satisfactory results can be expected. A rating of *fair* indicates that the element or kind of habitat can be established, improved, or maintained in most places. Moderately intensive management is required for satisfactory results. A rating of *poor* indicates that limitations are severe for the designated element or kind of habitat. Habitat can be created, improved, or maintained in most places, but management is difficult and must be intensive. A rating of *very poor* indicates

that restrictions for the element or kind of habitat are very severe and that unsatisfactory results can be expected. Creating, improving, or maintaining habitat is impractical or impossible.

The elements of wildlife habitat are described in the following paragraphs.

*Grain and seed crops* are domestic grains and seed-producing herbaceous plants. Soil properties and features that affect the growth of grain and seed crops are depth of the root zone, texture of the surface layer, available water capacity, wetness, slope, surface stoniness, and flood hazard. Soil temperature and soil moisture are also considerations. Examples of grain and seed crops are grain sorghum, wheat, oats, and barley.

*Grasses and legumes* are domestic perennial grasses and herbaceous legumes. Soil properties and features that affect the growth of grasses and legumes are depth of the root zone, texture of the surface layer, available water capacity, wetness, surface stoniness, flood hazard, and slope. Soil temperature and soil moisture are also considerations. Examples of grasses and legumes are johnsongrass, lovegrass, kleingrass, clover, and alfalfa.

*Wild herbaceous plants* are native or naturally established grasses and forbs, including weeds. Soil properties and features that affect the growth of these plants are depth of the root zone, texture of the surface layer, available water capacity, wetness, surface stoniness, and flood hazard. Soil temperature and soil moisture are also considerations. Examples of wild herbaceous plants are bluestem, indiagrass, goldenrod, vine-mesquite grass, wheatgrass, and sunflowers.

*Shrubs* are bushy woody plants that produce fruit, buds, twigs, bark, and foliage. Soil properties and features that affect the growth of shrubs are depth of the root zone, available water capacity, salinity, and soil moisture. Examples of shrubs are skunkbush, plum, hackberry, shin oak, and elbowbush.

The habitat for various kinds of wildlife is described in the following paragraphs.

*Habitat for openland wildlife* consists of cropland, pasture, meadows, and areas that are overgrown with grasses, herbs, shrubs, and vines. These areas produce grain and seed crops, grasses and legumes, and wild herbaceous plants. The wildlife attracted to these areas include bobwhite quail, dove, meadowlark, field sparrow, cottontail, and red fox.

*Habitat for rangeland wildlife* consists of areas of shrubs and wild herbaceous plants. Wildlife attracted to rangeland include turkeys, deer, coyotes, jack rabbits, bobwhite quail, and songbirds.

## flood prevention

Uncontrolled flooding has caused extensive damage in San Saba County in past years (fig. 27). The 1938 flood inundated parts of the town of San Saba and caused considerable property loss. Flood damage and soil loss of similar proportions occurred along other streams and

tributaries throughout the county. Following this flood the San Saba-Brady Soil and Water Conservation District initiated plans for installing floodwater retarding structures at strategic locations in the county.

Twenty-five floodwater retarding structures have been built on upper tributaries of major watersheds (fig. 22). Prevention of flood damage is the chief purpose of these structures, but many of the resulting lakes are suited to use for recreation and livestock water. These structures also contribute to the abatement of pollution by preventing sediment from reaching the major lakes downstream (fig. 17). They also help to control scouring and to lessen deposits of infertile sediments on fertile farmland.

## 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. The ratings are given in the following tables: Building site development, Sanitary facilities, Construction materials, and Water management. The ratings are based on observed performance of the soils and on the estimated data and test data in the "Soil properties" section.

*Information in this section is intended for land use planning, for evaluating land use alternatives, and for planning site investigations prior to design and construction. The information, however, has limitations. For example, estimates and other data generally apply only to that part of the soil within a depth of 5 or 6 feet. Because of the map scale, small areas of different soils may be included within the mapped areas of a specific soil.*

*The information is not site specific and does not eliminate the need for onsite investigation of the soils or for testing and analysis by personnel experienced in the design and construction of engineering works.*

Government ordinances and regulations that restrict certain land uses or impose specific design criteria were not considered in preparing the information in this section. Local ordinances and regulations need to be considered in planning, in site selection, and in design.

Soil properties, site features, and observed performance were considered in determining the ratings in this section. During the fieldwork for this soil survey, determinations were made about grain-size distribution, liquid limit, plasticity index, soil reaction, depth to bedrock, hardness of bedrock within 5 to 6 feet of the surface, soil wetness, depth to a seasonal high water table, slope, likelihood of flooding, natural soil structure aggregation, and soil density. Data were collected about kinds of clay minerals, mineralogy of the sand and silt fractions, and the kind of adsorbed cations. Estimates were made for erodibility, permeability, corrosivity, shrink-swell potential, available water capacity, and other behavioral characteristics affecting engineering uses.

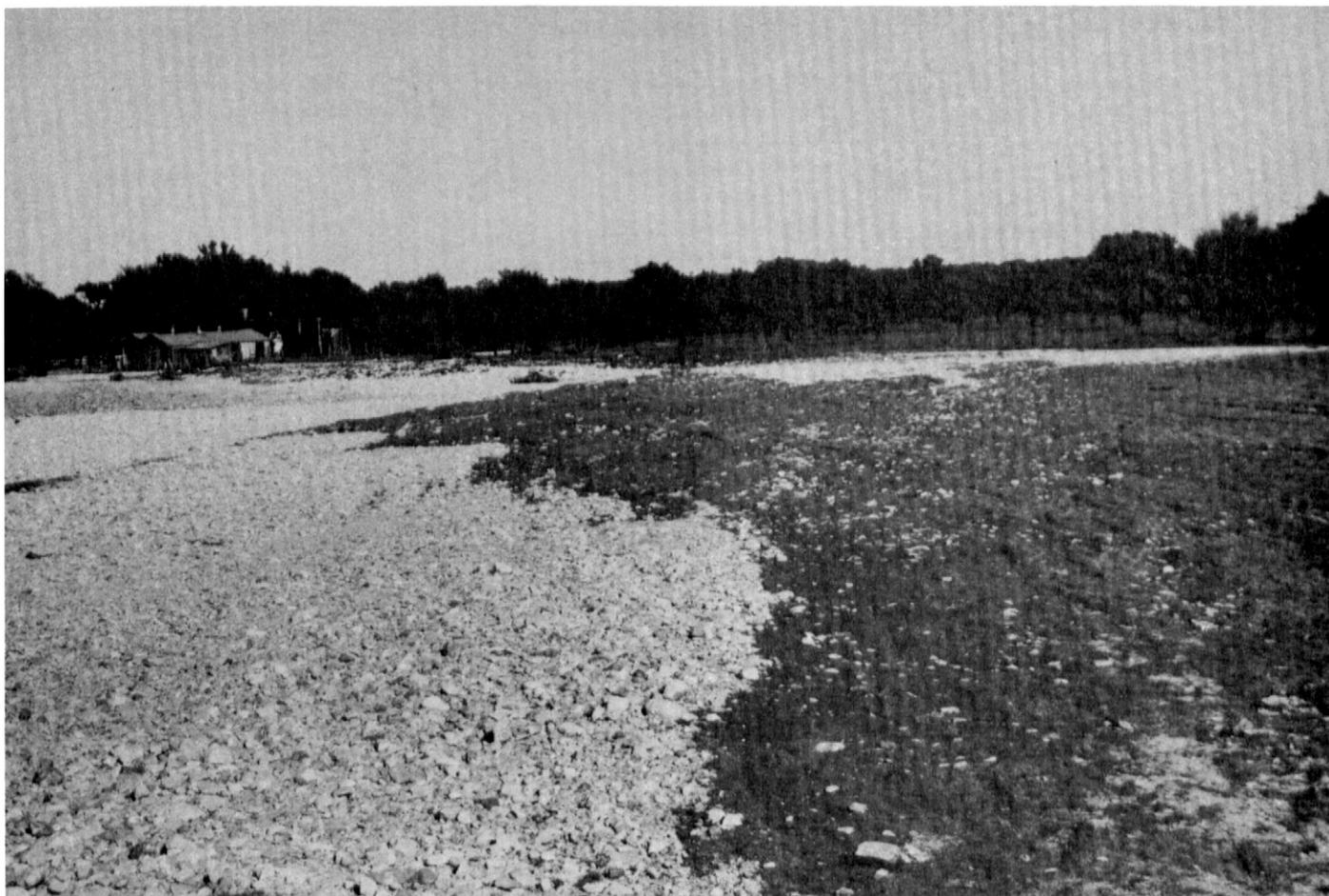


Figure 27.—Flood damage from scouring on Frio soils and deposition of gravel during flash flood prior to construction of flood control structures.

This information can be used to (1) evaluate the potential of areas for residential, commercial, industrial, and recreation uses; (2) make preliminary estimates of construction conditions; (3) evaluate alternative routes for roads, streets, highways, pipelines, and underground cables; (4) evaluate alternative sites for sanitary landfills, septic tank absorption fields, and sewage lagoons; (5) plan detailed onsite investigations of soils and geology; (6) locate potential sources of gravel, sand, earthfill, and topsoil; (7) plan drainage systems, irrigation systems, ponds, terraces, and other structures for soil and water conservation; and (8) predict performance of proposed small structures and pavements by comparing the performance of existing similar structures on the same or similar soils.

The information in the tables, along with the soil maps, the soil descriptions, and other data provided in this survey can be used to make additional interpretations.

Some of the terms used in this soil survey have a special meaning in soil science and are defined in the Glossary.

#### **building site development**

Table 10 shows the degree and kind of soil limitations that affect shallow excavations, dwellings with and without basements, small commercial buildings, local roads and streets, and lawns and landscaping. The limitations are considered *slight* if soil properties and site features are generally favorable for the indicated use and limitations are minor and easily overcome; *moderate* if soil properties or site features are not favorable for the indicated use and special planning, design, or maintenance is needed to overcome or minimize the limitations; and *severe* if soil properties or site features are so unfavorable or so difficult to overcome that special design, significant increases in construction

costs, and possibly increased maintenance are required. Special feasibility studies may be required where the soil limitations are severe.

*Shallow excavations* are trenches or holes dug to a maximum depth of 5 or 6 feet for basements, graves, utility lines, open ditches, and other purposes. The ratings are based on soil properties, site features, and observed performance of the soils. The ease of digging, filling, and compacting is affected by the depth to bedrock, a cemented pan, or a very firm dense layer; stone content; soil texture; and slope. The time of the year that excavations can be made is affected by the depth to a seasonal high water table and the susceptibility of the soil to flooding. The resistance of the excavation walls or banks to sloughing or caving is affected by soil texture and the depth to the water table.

*Dwellings and small commercial buildings* are structures built on shallow foundations on undisturbed soil. The load limit is the same as that for single-family dwellings no higher than three stories. Ratings are made for small commercial buildings without basements, for dwellings with basements, and for dwellings without basements. The ratings are based on soil properties, site features, and observed performance of the soils. A high water table, flooding, shrink-swell potential, and organic layers can cause the movement of footings. A high water table, depth to bedrock or to a cemented pan, large stones, and flooding affect the ease of excavation and construction. Landscaping and grading that require cuts and fills of more than 5 to 6 feet are not considered.

*Local roads and streets* have an all-weather surface and carry automobile and light truck traffic all year. They have a subgrade of cut or fill soil material, a base of gravel, crushed rock, or stabilized soil material, and a flexible or rigid surface. Cuts and fills are generally limited to less than 6 feet. The ratings are based on soil properties, site features, and observed performance of the soils. Depth to bedrock or to a cemented pan, a high water table, flooding, large stones, and slope affect the ease of excavating and grading. Soil strength (as inferred from the engineering classification of the soil), shrink-swell potential, frost action potential, and depth to a high water table affect the traffic supporting capacity.

*Lawns and landscaping* require soils on which turf and ornamental trees and shrubs can be established and maintained. The ratings are based on soil properties, site features, and observed performance of the soils. Soil reaction, a high water table, depth to bedrock or to a cemented pan, the available water capacity in the upper 40 inches, and the content of salts, sodium, and sulfidic materials affect plant growth. Flooding, wetness, slope, stoniness, and the amount of sand, clay, or organic matter in the surface layer affect trafficability after vegetation is established.

### sanitary facilities

Table 11 shows the degree and the kind of soil limitations that affect septic tank absorption fields,

sewage lagoons, and sanitary landfills. The limitations are considered *slight* if soil properties and site features are generally favorable for the indicated use and limitations are minor and easily overcome; *moderate* if soil properties or site features are not favorable for the indicated use and special planning, design, or maintenance is needed to overcome or minimize the limitations; and *severe* if soil properties or site features are so unfavorable or so difficult to overcome that special design, significant increases in construction costs, and possibly increased maintenance are required.

Table 11 also shows the suitability of the soils for use as daily cover for landfills. A rating of *good* indicates that soil properties and site features are favorable for the use and good performance and low maintenance can be expected; *fair* indicates that soil properties and site features are moderately favorable for the use and one or more soil properties or site features make the soil less desirable than the soils rated good; and *poor* indicates that one or more soil properties or site features are unfavorable for the use and overcoming the unfavorable properties requires special design, extra maintenance, or costly alteration.

*Septic tank absorption fields* are areas in which effluent from a septic tank is distributed into the soil through subsurface tiles or perforated pipe. Only that part of the soil between depths of 24 and 72 inches is evaluated. The ratings are based on soil properties, site features, and observed performance of the soils. Permeability, a high water table, depth to bedrock or to a cemented pan, and flooding affect absorption of the effluent. Large stones and bedrock or a cemented pan interfere with installation.

Unsatisfactory performance of septic tank absorption fields, including excessively slow absorption of effluent, surfacing of effluent, and hillside seepage, can affect public health. Ground water can be polluted if highly permeable sand and gravel or fractured bedrock is less than 4 feet below the base of the absorption field, if slope is excessive, or if the water table is near the surface. There must be unsaturated soil material beneath the absorption field to effectively filter the effluent. Many local ordinances require that this material be of a certain thickness.

*Sewage lagoons* are shallow ponds constructed to hold sewage while aerobic bacteria decompose the solid and liquid wastes. Lagoons should have a nearly level floor surrounded by cut slopes or embankments of compacted soil. Lagoons generally are designed to hold the sewage within a depth of 2 to 5 feet. Nearly impervious soil material for the lagoon floor and sides is required to minimize seepage and contamination of ground water.

Table 11 gives ratings for the natural soil that makes up the lagoon floor. The surface layer and, generally, 1 or 2 feet of soil material below the surface layer are excavated to provide material for the embankments. The ratings are based on soil properties, site features, and

observed performance of the soils. Considered in the ratings are slope, permeability, a high water table, depth to bedrock or to a cemented pan, flooding, large stones, and content of organic matter.

Excessive seepage due to rapid permeability of the soil or a water table that is high enough to raise the level of sewage in the lagoon causes a lagoon to function unsatisfactorily. Pollution results if seepage is excessive or if floodwater overtops the lagoon. A high content of organic matter is detrimental to proper functioning of the lagoon because it inhibits aerobic activity. Slope, bedrock, and cemented pans can cause construction problems, and large stones can hinder compaction of the lagoon floor.

*Sanitary landfills* are areas where solid waste is disposed of by burying it in soil. There are two types of landfill—trench and area. In a trench landfill, the waste is placed in a trench. It is spread, compacted, and covered daily with a thin layer of soil excavated at the site. In an area landfill, the waste is placed in successive layers on the surface of the soil. The waste is spread, compacted, and covered daily with a thin layer of soil from a source away from the site.

Both types of landfill must be able to bear heavy vehicular traffic. Both types involve a risk of ground water pollution. Ease of excavation and revegetation needs to be considered.

The ratings in table 11 are based on soil properties, site features, and observed performance of the soils. Permeability, depth to bedrock or to a cemented pan, a high water table, slope, and flooding affect both types of landfill. Texture, stones and boulders, highly organic layers, soil reaction, and content of salts and sodium affect trench type landfills. Unless otherwise stated, the ratings apply only to that part of the soil within a depth of about 6 feet. For deeper trenches, a limitation rated slight or moderate may not be valid. Onsite investigation is needed.

*Daily cover for landfill* is the soil material that is used to cover compacted solid waste in an area type sanitary landfill. The soil material is obtained offsite, transported to the landfill, and spread over the waste.

Soil texture, wetness, coarse fragments, and slope affect the ease of removing and spreading the material during wet and dry periods. Loamy or silty soils that are free of large stones or excess gravel are the best cover for a landfill. Clayey soils are sticky or cloddy and are difficult to spread; sandy soils are subject to soil blowing.

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 final cover for a landfill should be suitable for plants. The surface layer generally has the best workability, more organic matter, and the best potential for plants. Material from the surface layer should be stockpiled for use as the final cover.

### construction materials

Table 12 gives information about the soils as a source of roadfill, sand, gravel, and topsoil. The soils are rated *good*, *fair*, or *poor* as a source of roadfill and topsoil. They are rated as a probable or improbable source of sand and gravel. The ratings are based on soil properties and site features that affect the removal of the soil and its use as construction material. Normal compaction, minor processing, and other standard construction practices are assumed. Each soil is evaluated to a depth of 5 or 6 feet.

*Roadfill* is soil material that is excavated in one place and used in road embankments in another place. In this table, the soils are rated as a source of roadfill for low embankments, generally less than 6 feet high and less exacting in design than higher embankments.

The ratings are for the soil material below the surface layer to a depth of 5 or 6 feet. It is assumed that soil layers will be mixed during excavating and spreading. Many soils have layers of contrasting suitability within their profile. The table showing engineering index properties provides detailed information about each soil layer. This information can help determine the suitability of each layer for use as roadfill. The performance of soil after it is stabilized with lime or cement is not considered in the ratings.

The ratings are based on soil properties, site features, and observed performance of the soils. The thickness of suitable material is a major consideration. The ease of excavation is affected by large stones, a high water table, and slope. How well the soil performs in place after it has been compacted and drained is determined by its strength (as inferred from the engineering classification of the soil) and shrink-swell potential.

Soils rated *good* contain significant amounts of sand or gravel or both. They have at least 5 feet of suitable material, low shrink-swell potential, few cobbles and stones, and slopes of 15 percent or less. Depth to the water table is more than 3 feet. Soils rated *fair* are more than 35 percent silt- and clay-sized particles and have a plasticity index of less than 10. They have moderate shrink-swell potential, slopes of 15 to 25 percent, or many stones. Depth to the water table is 1 to 3 feet. Soils rated *poor* have a plasticity index of more than 10, a high shrink-swell potential, many stones, or slopes of more than 25 percent. They are wet, and the depth to the water table is less than 1 foot. They may have layers of suitable material, but the material is less than 3 feet thick.

*Sand and gravel* are natural aggregates suitable for commercial use with a minimum of processing. Sand and gravel are used in many kinds of construction. Specifications for each use vary widely. In table 12, only the probability of finding material in suitable quantity is evaluated. The suitability of the material for specific purposes is not evaluated, nor are factors that affect excavation of the material.

The properties used to evaluate the soil as a source of sand or gravel are gradation of grain sizes (as indicated by the engineering classification of the soil), the thickness of suitable material, and the content of rock fragments. Kinds of rock, acidity, and stratification are given in the soil series descriptions. Gradation of grain sizes is given in the table on engineering index properties.

A soil rated as a probable source has a layer of clean sand or gravel or a layer of sand or gravel that is up to 12 percent silty fines. This material must be at least 3 feet thick and less than 50 percent, by weight, large stones. All other soils are rated as an improbable source. Coarse fragments of soft bedrock, such as shale and siltstone, are not considered to be sand and gravel.

*Topsoil* is used to cover an area so that vegetation can be established and maintained. The upper 40 inches of a soil is evaluated for use as topsoil. Also evaluated is the reclamation potential of the borrow area.

Plant growth is affected by toxic material and by such properties as soil reaction, available water capacity, and fertility. The ease of excavating, loading, and spreading is affected by rock fragments, slope, a water table, soil texture, and thickness of suitable material. Reclamation of the borrow area is affected by slope, a water table, rock fragments, bedrock, and toxic material.

Soils rated *good* have friable loamy material to a depth of at least 40 inches. They are free of stones and cobbles, have little or no gravel, and have slopes of less than 8 percent. They are low in content of soluble salts, are naturally fertile or respond well to fertilizer, and are not so wet that excavation is difficult.

Soils rated *fair* are sandy soils, loamy soils that have a relatively high content of clay, soils that have only 20 to 40 inches of suitable material, soils that have an appreciable amount of gravel, stones, or soluble salts, or soils that have slopes of 8 to 15 percent. The soils are not so wet that excavation is difficult.

Soils rated *poor* are very sandy or clayey, have less than 20 inches of suitable material, have a large amount of gravel, stones, or soluble salts, have slopes of more than 15 percent, or have a seasonal water table at or near the surface.

The surface layer of most soils is generally preferred for topsoil because of its organic matter content. Organic matter greatly increases the absorption and retention of moisture and nutrients for plant growth.

### water management

Table 13 gives information on the soil properties and site features that affect water management. The degree and kind of soil limitations are given for pond reservoir areas and for embankments, dikes, and levees. The limitations are considered *slight* if soil properties and site features are generally favorable for the indicated use and limitations are minor and are easily overcome; *moderate* if soil properties or site features are not

favorable for the indicated use and special planning, design, or maintenance is needed to overcome or minimize the limitations; and *severe* if soil properties or site features are so unfavorable or so difficult to overcome that special design, significant increase in construction costs, and possibly increased maintenance are required.

This table also gives for each soil the restrictive features that affect drainage, irrigation, terraces and diversions, and grassed waterways.

*Pond reservoir areas* hold water behind a dam or embankment. Soils best suited to this use have low seepage potential in the upper 60 inches. The seepage potential is determined by the permeability of the soil and the depth to fractured bedrock or other permeable material. Excessive slope can affect the storage capacity of the reservoir area.

*Embankments, dikes, and levees* are raised structures of soil material, generally less than 20 feet high, constructed to impound water or to protect land against overflow. In this table, the soils are rated as a source of material for embankment fill. The ratings apply to the soil material below the surface layer to a depth of about 5 feet. It is assumed that soil layers will be uniformly mixed and compacted during construction.

The ratings do not indicate the ability of the natural soil to support an embankment. Soil properties to a depth even greater than the height of the embankment can affect performance and safety of the embankment. Generally, deeper onsite investigation is needed to determine these properties.

Soil material in embankments must be resistant to seepage, piping, and erosion and have favorable compaction characteristics. Unfavorable features include less than 5 feet of suitable material and a high content of stones or boulders, organic matter, or salts or sodium. A high water table affects the amount of usable material. It also affects trafficability.

*Irrigation* is the controlled application of water to supplement rainfall and support plant growth. The design and management of an irrigation system are affected by depth to the water table, the need for drainage, flooding, available water capacity, intake rate, permeability, erosion hazard, and slope. The construction of a system is affected by large stones and depth to bedrock or to a cemented pan. The performance of a system is affected by the depth of the root zone, the amount of salts or sodium, and soil reaction.

*Terraces and diversions* are embankments or a combination of channels and ridges constructed across a slope to reduce erosion and conserve moisture by intercepting runoff. Slope, wetness, large stones, and depth to bedrock or to a cemented pan affect the construction of terraces and diversions. A restricted rooting depth, a severe hazard of wind or water erosion, an excessively coarse texture, and restricted permeability adversely affect maintenance.

*Grassed waterways* are natural or constructed channels, generally broad and shallow, that conduct

surface water to outlets at a nonerosive velocity. Large stones, wetness, slope, and depth to bedrock or to a cemented pan affect the construction of grassed waterways. A hazard of wind erosion, low available water

capacity, restricted rooting depth, toxic substances such as salts or sodium, and restricted permeability adversely affect the growth and maintenance of the grass after construction.



# soil properties

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Data relating to soil properties are collected during the course of the soil survey. The data and the estimates of soil and water features, listed in tables, are explained on the following pages.

Soil properties are determined by field examination of the soils and by laboratory index testing of some benchmark soils. Established standard procedures are followed. During the survey, many shallow borings are made and examined to identify and classify the soils and to delineate them on the soil maps. Samples are taken from some typical profiles and tested in the laboratory to determine grain-size distribution, plasticity, and compaction characteristics. These results are reported in table 17.

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 characterize key soils.

The estimates of soil properties shown in the tables include the range of grain-size distribution and Atterberg limits, the engineering classifications, and the physical and chemical properties of the major layers of each soil. Pertinent soil and water features also are given.

## engineering index properties

Table 14 gives estimates of the engineering classification and of the range of index properties for the major layers of each soil in the survey area. Most soils have layers of contrasting properties within the upper 5 or 6 feet.

*Depth* to the upper and lower boundaries of each layer is indicated. The range in depth and information on other properties of each layer are given for each soil series under "Soil series and their morphology."

*Texture* is given in the standard terms used by the U.S. Department of Agriculture. These terms are defined according to percentages of sand, silt, and clay in the fraction of the soil that is less than 2 millimeters in diameter. "Loam," for example, is soil that is 7 to 27 percent clay, 28 to 50 percent silt, and less than 52 percent sand. If a soil contains particles coarser than sand, an appropriate modifier is added, for example, "gravelly." Textural terms are defined in the Glossary.

*Classification* of the soils is determined according to the Unified soil classification system (2) and the system

adopted by the American Association of State Highway and Transportation Officials (1).

The Unified system classifies soils according to properties that affect their use as construction material. Soils are classified according to grain-size distribution of the fraction less than 3 inches in diameter and according to plasticity index, liquid limit, and organic matter content. Sandy and gravelly soils are identified as GW, GP, GM, GC, SW, SP, SM, and SC; silty and clayey soils as ML, CL, OL, MH, CH, and OH; and highly organic soils as Pt. Soils exhibiting engineering properties of two groups can have a dual classification, for example, SP-SM.

The AASHTO system classifies soils according to those properties that affect roadway construction and maintenance. In this system, the fraction of a mineral soil that is less than 3 inches in diameter is classified in one of seven groups from A-1 through A-7 on the basis of grain-size distribution, liquid limit, and plasticity index. Soils in group A-1 are coarse grained and low in content of fines (silt and clay). At the other extreme, soils in group A-7 are fine grained. Highly organic soils are classified in group A-8 on the basis of visual inspection.

If laboratory data are available, the A-1, A-2, and A-7 groups are further classified as A-1-a, A-1-b, A-2-4, A-2-5, A-2-6, A-2-7, A-7-5, or A-7-6. As an additional refinement, the suitability of a soil as subgrade material can be indicated by a group index number. Group index numbers range from 0 for the best subgrade material to 20 or higher for the poorest. The AASHTO classification for soils tested, with group index numbers in parentheses, is given in table 17.

*Rock fragments* more than 3 inches in diameter are indicated as a percentage of the total soil on a dry-weight basis. The percentages are estimates determined mainly by converting volume percentage in the field to weight percentage.

*Percentage (of soil particles) passing designated sieves* is the percentage of the soil fraction less than 3 inches in diameter based on an oven-dry weight. The sieves, numbers 4, 10, 40, and 200 (USA Standard Series), have openings of 4.76, 2.00, 0.420, and 0.074 millimeters, respectively. Estimates are based on laboratory tests of soils sampled in the survey area and in nearby areas and on estimates made in the field.

*Liquid limit and plasticity index* (Atterberg limits) indicate the plasticity characteristics of a soil. The estimates are based on test data from the survey area or from nearby areas and on field examination.

The estimates of grain-size distribution, liquid limit, and plasticity index are rounded to the nearest 5 percent. Thus, if the ranges of gradation and Atterberg limits extend a marginal amount (1 or 2 percentage points) across classification boundaries, the classification in the marginal zone is omitted in the table.

## physical and chemical properties

Table 15 shows estimates of some characteristics and features that affect soil behavior. These estimates are given for the major layers of each soil in the survey area. The estimates are based on field observations and on test data for these and similar soils.

*Clay* as a soil separate consists of mineral soil particles that are less than 0.002 millimeter in diameter. In this table, the estimated clay content of each major soil layer is given as a percentage, by weight, of the soil material that is less than 2 millimeters in diameter.

The amount and kind of clay greatly affect the fertility and physical condition of the soil. They determine the ability of the soil to adsorb cations and to retain moisture. They influence shrink-swell potential, permeability, and plasticity, the ease of soil dispersion, and other soil properties. The amount and kind of clay in a soil also affect tillage and earth-moving operations.

*Permeability* refers to the ability of a soil to transmit water or air. The estimates indicate the rate of downward movement of water when the soil is saturated. They are based on soil characteristics observed in the field, particularly structure, porosity, and texture. Permeability is considered in the design of soil drainage systems, septic tank absorption fields, and construction where the rate of water movement under saturated conditions affects behavior.

*Available water capacity* refers to the quantity of water that the soil is capable of storing for use by plants. The capacity for water storage is given in inches of water per inch of soil for each major soil layer. The capacity varies, depending on soil properties that affect the retention of water and the depth of the root zone. The most important properties are the content of organic matter, soil texture, bulk density, and soil structure. Available water capacity is an important factor in the choice of plants or crops to be grown and in the design and management of irrigation systems. Available water capacity is not an estimate of the quantity of water actually available to plants at any given time.

*Soil reaction* is a measure of acidity or alkalinity and is expressed as a range in pH values. The range in pH of each major horizon is based on many field tests. For many soils, values have been verified by laboratory analyses. Soil reaction is important in selecting crops and other plants, in evaluating soil amendments for fertility and stabilization, and in determining the risk of corrosion.

*Shrink-swell potential* is the potential for volume change in a soil with a loss or gain in moisture. Volume

change occurs mainly because of the interaction of clay minerals with water and varies with the amount and type of clay minerals in the soil. The size of the load on the soil and the magnitude of the change in soil moisture content influence the amount of swelling of soils in place. Laboratory measurements of swelling of undisturbed clods were made for many soils. For others, swelling was estimated on the basis of the kind and amount of clay minerals in the soil and on measurements of similar soils.

If the shrink-swell potential is rated moderate to very high, shrinking and swelling can cause damage to buildings, roads, and other structures. Special design is often needed.

Shrink-swell potential classes are based on the change in length of an unconfined clod as moisture content is increased from air-dry to field capacity. The change is based on the soil fraction less than 2 millimeters in diameter. The classes are *low*, a change of less than 3 percent; *moderate*, 3 to 6 percent; and *high*, more than 6 percent. *Very high*, greater than 9 percent, is sometimes used.

*Erosion factor K* indicates the susceptibility of a soil to sheet and rill erosion by water. Factor K is one of six factors used in the Universal Soil Loss Equation (USLE) to predict the average annual rate of soil loss by sheet and rill erosion in tons per acre per year. The estimates are based primarily on percentage of silt, sand, and organic matter (up to 4 percent) and on soil structure and permeability. Values of K range from 0.05 to 0.69. The higher the value the more susceptible the soil is to sheet and rill erosion by water.

*Erosion factor T* is an estimate of the maximum average annual rate of soil erosion by wind or water that can occur without affecting crop productivity over a sustained period. The rate is in tons per acre per year.

*Wind erodibility groups* are made up of soils that have similar properties affecting their resistance to wind erosion in cultivated areas. The groups indicate the susceptibility of soil to wind erosion and the amount of soil lost. Soils are grouped according to the following distinctions:

1. Sands, coarse sands, fine sands, and very fine sands. These soils are generally not suitable for crops. They are extremely erodible, and vegetation is difficult to establish.
2. Loamy sands, loamy fine sands, and loamy very fine sands. These soils are very highly erodible. Crops can be grown if intensive measures to control wind erosion are used.
3. Sandy loams, coarse sandy loams, fine sandy loams, and very fine sandy loams. These soils are highly erodible. Crops can be grown if intensive measures to control wind erosion are used.
- 4L. Calcareous loamy soils that are less than 35 percent clay and more than 5 percent finely divided calcium carbonate. These soils are erodible. Crops can be grown if intensive measures to control wind erosion are used.

4. Clays, silty clays, clay loams, and silty clay loams that are more than 35 percent clay. These soils are moderately erodible. Crops can be grown if measures to control wind erosion are used.

5. Loamy soils that are less than 18 percent clay and less than 5 percent finely divided calcium carbonate and sandy clay loams and sandy clays that are less than 5 percent finely divided calcium carbonate. These soils are slightly erodible. Crops can be grown if measures to control wind erosion are used.

6. Loamy soils that are 18 to 35 percent clay and less than 5 percent finely divided calcium carbonate, except silty clay loams. These soils are very slightly erodible. Crops can easily be grown.

7. Silty clay loams that are less than 35 percent clay and less than 5 percent finely divided calcium carbonate. These soils are very slightly erodible. Crops can easily be grown.

8. Stony or gravelly soils and other soils not subject to wind erosion.

*Organic matter* is the plant and animal residue in the soil at various stages of decomposition.

In table 15, the estimated content of organic matter of the plow layer is expressed as a percentage, by weight, of the soil material that is less than 2 millimeters in diameter.

The content of organic matter of a soil can be maintained or increased by returning crop residue to the soil. Organic matter affects the available water capacity, infiltration rate, and tilth. It is a source of nitrogen and other nutrients for crops.

## soil and water features

Table 16 gives estimates of various soil and water features. The estimates are used in land use planning that involves engineering considerations.

*Hydrologic soil groups* are used to estimate runoff from precipitation. Soils not protected by vegetation are assigned to one of four groups. They are grouped according to the intake of water when the soils 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 permanent high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

*Flooding*, the temporary inundation of an area, is caused by overflowing streams, by runoff from adjacent slopes, or by tides. Water standing for short periods after rainfall or snowmelt and water in swamps and marshes are not considered flooding.

Table 16 gives the frequency and duration of flooding and the time of year when flooding is most likely.

Frequency, duration, and probable dates of occurrence are estimated. Frequency is expressed as none, rare, common, occasional, and frequent. *None* means that flooding is not probable; *rare* that it is unlikely but possible under unusual weather conditions; *common* that it is likely under normal conditions; *occasional* that it occurs on an average of once or less in 2 years; and *frequent* that it occurs on an average of more than once in 2 years. Duration is expressed as *very brief* if less than 2 days, *brief* if 2 to 7 days, and *long* if more than 7 days. Probable dates are expressed in months; November-May, for example, means that flooding can occur during the period November through May.

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 absence of distinctive horizons that form in soils that are not subject to flooding.

Also considered are local information about the extent and levels of flooding and the relation of each soil on the landscape to historic floods. Information on the extent of flooding based on soil data is less specific than that provided by detailed engineering surveys that delineate flood-prone areas at specific flood frequency levels.

*Depth to bedrock* is given if bedrock is within a depth of 5 feet. The depth is based on many soil borings and on observations during soil mapping. The rock is specified as either soft or hard. If the rock is soft or fractured, excavations can be made with trenching machines, backhoes, or small rippers. If the rock is hard or massive, blasting or special equipment generally is needed for excavation.

*Risk of corrosion* pertains to potential soil-induced

electrochemical or chemical action that dissolves or weakens uncoated steel or concrete. The rate of corrosion of uncoated steel is related to such factors as soil moisture, particle-size distribution, acidity, and electrical conductivity of the soil. The rate of corrosion of concrete is based mainly on the sulfate and sodium content, texture, moisture content, and acidity of the soil. Special site examination and design may be needed if the combination of factors creates a severe corrosion environment. The steel in installations that intersect soil boundaries or soil layers is more susceptible to corrosion than steel in installations that are entirely within one kind of soil or within one soil layer.

For uncoated steel, the risk of corrosion, expressed as *low*, *moderate*, or *high*, is based on soil drainage class, total acidity, electrical resistivity near field capacity, and electrical conductivity of the saturation extract.

For concrete, the risk of corrosion is also expressed as *low*, *moderate*, or *high*. It is based on soil texture, acidity, and amount of sulfates in the saturation extract.

## engineering index test data

Table 17 shows laboratory test data for several pedons sampled at carefully selected sites in the survey area. The pedons are typical of the series and are described in the section "Soil series and their morphology." The soil samples were tested by the Texas State Department of Highways and Public Transportation.

The testing methods generally are those of the American Association of State Highway and Transportation Officials (AASHTO) or the American Society for Testing and Materials (ASTM).

The tests and methods are: AASHTO classification—M 145 (AASHTO), D 3282 (ASTM); Unified classification—D 2487 (ASTM); Mechanical analysis—T 88 (AASHTO), D 2217 (ASTM); Liquid limit—T 89 (AASHTO), D 423 (ASTM); Plasticity index—T 100 (AASHTO), D 653 (ASTM); Specific gravity (particle index)—T 99 (AASHTO), D 698 (ASTM).

## classification of the soils

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The system of soil classification used by the National Cooperative Soil Survey has six categories (6). 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. In table 18, the soils of the survey area are classified according to the system. The categories are defined in the following paragraphs.

**ORDER.** Ten soil orders are recognized. The differences among orders reflect the dominant soil-forming processes and the degree of soil formation. Each order is identified by a word ending in *sol*. An example is Mollisol.

**SUBORDER.** Each order is divided into suborders primarily on the basis of properties that influence soil genesis and are important to plant growth or properties that reflect the most important variables within the orders. The last syllable in the name of a suborder indicates the order. An example is Ustoll (*Ust*, meaning dry, plus *oll*, from Mollisol).

**GREAT GROUP.** Each suborder is divided into great groups on the basis of close similarities in kind, arrangement, and degree of development of pedogenic horizons; soil moisture and temperature regimes; 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 Calciustolls (*Calci*, meaning calcareous, plus *ustolls*, the suborder of the Mollisols that have a dry moisture regime).

**SUBGROUP.** Each great group has a typic subgroup. Other subgroups are intergrades or extragrades. The typic 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 known kind of soil. 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 Calciustolls.

**FAMILY.** Families are established within a subgroup on the basis of physical and chemical properties and other characteristics that affect management. Mostly 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,

mineral content, temperature regime, depth of the root zone, consistence, moisture equivalent, slope, and permanent cracks. A family name consists of the name of a subgroup preceded by terms that indicate soil properties. An example is fine-silty, mixed, thermic Typic Calciustolls.

**SERIES.** The series consists of soils that have similar horizons in their profile. The horizons are similar in color, texture, structure, reaction, consistence, mineral and chemical composition, and arrangement in the profile. The texture of the surface layer or of the substratum can differ within a series.

### soil series and their morphology

In this section, each soil series recognized in the survey area is described. The descriptions are arranged in alphabetic order.

Characteristics of the soil and the material in which it formed are identified for each series. The soil is compared with similar soils and with nearby soils of other 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 (6). Many of the technical terms used in the descriptions are defined in Soil Taxonomy (7). Unless otherwise stated, colors in the descriptions are for dry soil. Following the pedon description is the range of important characteristics of the soils in the series.

The map units of each soil series are described in the section "Detailed soil map units."

### Bastrop series

The Bastrop series consists of deep, well drained, nearly level to gently sloping, loamy soils on uplands. These soils formed in thick beds of old alluvial sediments on high terraces. Slopes range from 0 to 5 percent.

A typical pedon in an area of Bastrop fine sandy loam, 0 to 3 percent slopes; from U.S. Highway 190 in San Saba, 9.9 miles north on Texas Highway 16, 1.1 miles east on county road, and 2,250 feet south in a cultivated field:

Ap—0 to 6 inches; dark yellowish brown (10YR 4/4) fine sandy loam, dark yellowish brown (10YR 3/4) moist;

very weak fine granular structure; hard; friable; many fine roots; slightly acid; abrupt smooth boundary.

- A1—6 to 17 inches; dark yellowish brown (10YR 4/4) fine sandy loam, dark yellowish brown (10YR 3/4) moist; weak fine granular structure; slightly hard, friable; few fine roots; many fine and medium pores; slightly acid; gradual smooth boundary.
- B21t—17 to 40 inches; reddish brown (5YR 5/4) sandy clay loam, reddish brown (5YR 4/4) moist; moderate coarse prismatic structure parting to medium and coarse blocky; hard, friable; few fine roots; common fine pores; few thin clay films on faces of peds and in pores; neutral; gradual smooth boundary.
- B22t—40 to 76 inches; yellowish red (5YR 5/6) sandy clay loam, yellowish red (5YR 4/6) moist; moderate coarse prismatic structure parting to moderate medium and coarse blocky; hard, friable; common fine and medium pores; few thin clay films on faces of peds; neutral; gradual smooth boundary.
- C—76 to 80 inches; reddish yellow (5YR 6/6) loam, yellowish red (5YR 5/6) moist; massive; slightly hard, friable; many fine and medium pores; few films and threads of calcium carbonate; weakly calcareous; moderately alkaline.

The solum ranges from 60 to 90 inches in thickness. A few pedons have secondary carbonates, mostly as films and threads, below a depth of 60 inches.

The A horizon ranges from 10 to 18 inches in thickness. It is brown, light brown, dark yellowish-brown, pale brown, or reddish brown.

The Bt horizon is sandy clay loam or clay loam. The B21t horizon is reddish brown, brown, yellowish red, or red. The B22t horizon is red, yellowish red, or reddish yellow.

The C horizon is reddish yellow or yellowish red loam, fine sandy loam, or sandy clay loam.

### Bonti series

The Bonti series consists of moderately deep, well drained, gently sloping, loamy soils on uplands. These soils formed in noncalcareous loamy and clayey residuum from weathered, strongly cemented sandstone. Slopes range from 1 to 5 percent.

A typical pedon in an area of Bonti fine sandy loam, 1 to 3 percent slopes; from the village of Holt, northwest of Richland Springs, about 0.4 mile north on Farm Road 502, 0.6 mile north on county road, 0.6 mile east along property line fence, and 100 feet south in rangeland:

- A1—0 to 4 inches; brown (10YR 5/3) fine sandy loam, brown (10YR 4/3) moist; weak fine subangular blocky structure; slightly hard, friable; many fine roots; many fine pores; few fragments of sandstone from 1/8 inch to 3 inches in diameter; slightly acid; clear smooth boundary.
- A2—4 to 9 inches; light brown (7.5YR 6/4) fine sandy loam, brown (7.5YR 4/4) moist; weak fine

subangular blocky structure; hard, friable; many fine roots; many fine and medium pores; few sandstone fragments 1/2 inch to 3 inches in diameter; slightly acid; clear smooth boundary.

- B21t—9 to 20 inches; reddish yellow (5YR 6/6) clay, yellowish red (5YR 5/6) moist; moderate very fine and fine blocky structure; very hard, firm; many fine roots; few fine pores; thin distinct continuous clay film on faces of peds; medium acid; gradual smooth boundary.
- B22t—20 to 30 inches; yellowish red (5YR 5/6) clay, yellowish red (5YR 4/6) moist; few fine distinct mottles of reddish yellow and reddish brown; moderate fine blocky structure; very hard, firm; few fine roots; few fine pores; thin distinct continuous clay film on faces of peds; few sandstone fragments 1/2 inch to 3 inches in diameter in the lower 4 inches; medium acid; abrupt smooth boundary.
- R—30 to 34 inches; brownish yellow, strongly cemented, acid sandstone.

Thickness of the solum and depth to bedrock range from 20 to 40 inches. Fragments of sandstone in the solum range from none to about 20 percent by volume and from about 1/2 inch to 20 inches in diameter.

The A1 horizon ranges from 2 to 6 inches in thickness. It is light brown, reddish yellow, or brown. The A2 horizon ranges from 2 to 6 inches in thickness. It is reddish yellow, brown, light yellowish brown, or light brown. Reaction ranges from neutral to medium acid.

The B2t horizon ranges from 16 to 30 inches in thickness. It is red, reddish brown, yellowish red, or reddish yellow. Texture is clay, sandy clay, or clay loam. Reaction ranges from medium acid to strongly acid.

The R layer is strongly cemented to indurated, fractured sandstone. It is pale brown, brownish yellow, yellow, reddish yellow, yellowish red, pink, or red.

### Bunyan series

The Bunyan series consists of deep, well drained, moderately permeable soils. These soils formed in noncalcareous, stratified, loamy alluvium of mixed origin on the flood plains of small streams. Slopes are dominantly less than 1 percent but range to as much as 3 percent.

A typical pedon of Bunyan loam in an area of Bunyan soils, frequently flooded; from intersection of U.S. Highway 190 and Farm Road 45 in Richland Springs, 9.3 miles north and 150 yards west in pasture along Wilbarger Creek:

- A11—0 to 10 inches; brown (10YR 5/3) loam, dark brown (10YR 4/3) moist; weak fine granular structure; hard, friable; many fine roots; many fine and medium pores; neutral; abrupt smooth boundary.
- A12—10 to 16 inches; dark grayish brown (10YR 4/2) clay loam, very dark grayish brown (10YR 3/2)

- moist; moderate fine subangular blocky structure; hard, firm; many fine roots; common fine and medium pores; neutral; abrupt smooth boundary.
- C1—16 to 34 inches; brown (10YR 5/3) clay loam, dark brown (10YR 4/3) moist; massive breaking to irregular fragments; thin strata of loam and fine sandy loam with bedding planes evident; hard, firm; few fine roots; mildly alkaline; abrupt smooth boundary.
- C2—34 to 42 inches; grayish brown (10YR 5/2) sandy clay loam, dark grayish brown (10YR 4/2) moist; massive, breaking to irregular fragments; strata of various textures with evident bedding planes; hard, firm; few fine roots; neutral; abrupt smooth boundary.
- C3—42 to 52 inches; brown (10YR 5/3) clay loam, dark brown (10YR 4/3) moist; massive; strata of loamy to sandy textures with evident bedding planes; hard, firm; moderately alkaline; clear smooth boundary.
- C4—52 to 65 inches; dark grayish brown (10YR 4/2) clay loam, very dark grayish brown (10YR 3/2) moist; massive; stratification of various loamy to sandy textures with thin bedding planes evident; hard, firm; moderately alkaline.

The 10- to 40-inch control section is fine sandy loam, loam, sandy clay loam, or clay loam, and clay content ranges from 18 to 35 percent.

The A horizon is 6 to 18 inches thick. It is brown, pale brown, light yellowish brown, yellowish brown, dark grayish brown, or grayish brown. Texture of the A11 horizon is fine sandy loam, loam, or clay loam. The A12 horizon is clay loam, fine sandy loam, loam, or sandy clay loam. Reaction of the A horizon is slightly acid or neutral.

The C horizon, to a depth of 65 inches or more, consists of strata of loamy to sandy material. Texture is clay loam, very fine sandy loam, fine sandy loam, loam, sandy clay loam, or loamy fine sand. This horizon is brown, grayish brown, dark grayish brown, light yellowish brown, brownish yellow, or pale brown. Reaction ranges from medium acid to neutral in the upper part and is moderately alkaline in the lower part. Some pedons are calcareous in the lower part.

### Callahan series

The Callahan series consists of moderately deep, well drained, loamy soils on uplands. These soils formed in noncalcareous, clayey residuum from the weathering of thin-bedded sandstone and shale. Slopes range from 1 to 25 percent, but they mainly range from 1 to 5 percent.

A typical pedon in an area of Callahan loam, 1 to 3 percent slopes; 6 miles north of Richland Springs on Farm Road 45, 6.4 miles west on Farm Road 502, 1 mile south on county road, 0.2 mile east, and 300 feet north in rangeland:

- A1—0 to 6 inches; brown (7.5YR 5/4) loam, dark brown (7.5YR 4/4) moist; weak fine granular structure; hard, firm; many fine roots; many fine and medium pores; hard surface crust 1/4 inch thick; noncalcareous; moderately alkaline; clear smooth boundary.
- B2t—6 to 17 inches; reddish brown (5YR 4/4) clay, dark reddish brown (5YR 3/4) moist; moderate medium blocky structure; very hard, very firm; few fine roots; few fine pores; thin clay films on faces of peds; few fine quartz pebbles; noncalcareous; moderately alkaline; clear smooth boundary.
- B2tca—17 to 30 inches; brown (7.5YR 5/4) clay, dark brown (7.5YR 4/4) moist; moderate fine and medium blocky structure; very hard; very firm; few fine roots; few fine pores; few thin clay films on faces of peds; few films and threads of calcium carbonate in lower part; noncalcareous; moderately alkaline; gradual wavy boundary.
- B3ca—30 to 34 inches; brownish yellow (10YR 6/6) clay, yellowish brown (10YR 5/6) moist; weak fine and medium blocky structure; very hard, firm; few thin clay films on faces of peds; about 5 to 10 percent by volume weathered shale fragments; few strongly and weakly cemented concretions of calcium carbonate; calcareous; moderately alkaline; gradual wavy boundary.
- Cr—34 to 40 inches; light olive brown (2.5Y 5/6) shaly clay, olive brown (2.5Y 4/6) moist; interbedded with thin-bedded, cemented, brown (7.5YR 5/4) sandstone, and olive (5Y 5/3) partially weathered shale; massive; few films, threads, and fine concretions of calcium carbonate; calcareous; moderately alkaline.

The solum ranges from 24 to 40 inches in thickness. Calcium carbonate in the form of films, threads, soft masses, and concretions is at a depth of 18 to 28 inches. Coarse fragments of siliceous pebbles, sandstone fragments, and concretions range from a few to about 10 percent by volume. Reaction ranges from neutral to moderately alkaline in the A horizon and the upper part of the B2t horizon and is mildly alkaline or moderately alkaline in the lower part of the solum.

The A horizon ranges from 4 to 7 inches in thickness. It is reddish brown or brown.

Texture of the Bt horizon is clay or clay loam. Clay content ranges from 35 to 50 percent. This horizon is reddish brown and brown. The B3ca horizon generally contains as much as 10 percent weathered olive shale fragments. It is reddish brown, reddish yellow, pink, brown, yellowish brown, brownish yellow, or yellowish red.

The Cr horizon consists of shaly clay, clays, and clay loams with thin strata of interbedded sandstone and weathered shale. It is light yellowish brown, light olive gray, olive gray, pale olive, olive, or light olive brown. The sandstone is reddish brown or very pale brown.

## Cho series

The Cho series consists of very shallow and shallow, well drained, loamy soils on uplands. These soils formed in calcareous, loamy old alluvium of plains outwash origin. Slopes range from 0 to 8 percent (fig. 28).

A typical pedon in an area of Cho loam, 0 to 8 percent slopes; from the San Saba-McCulloch County line marker on Farm Road 502 northwest of Holt, 1.1 miles east on Farm Road 502, 1.6 miles north on county road, 0.6 mile west, 0.8 mile north, and 150 feet east in rangeland:

A1—0 to 10 inches; dark grayish brown (10YR 4/2) loam, very dark grayish brown (10YR 3/2) moist; weak fine granular and medium subangular blocky structure; slightly hard, friable; many fine roots; common fine pores; about 5 percent of surface covered with caliche fragments, which also make up about 5 percent by volume; calcareous; moderately alkaline; abrupt wavy boundary.

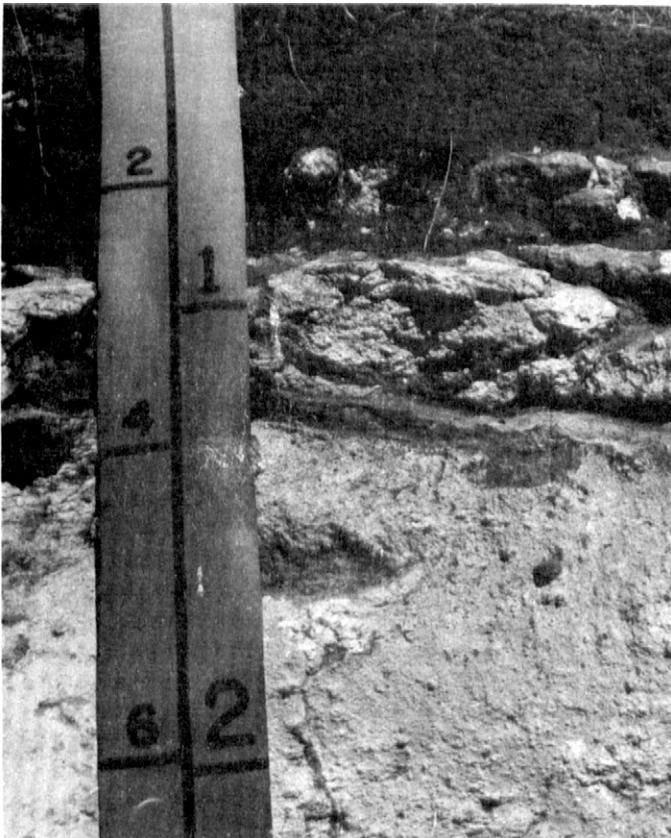


Figure 28.—Profile of Cho loam. This soil contains a few caliche fragments and is underlain by platy, cemented caliche at a depth of 7 to 20 inches. Multiply the figure on the left by 10 to determine the depth in centimeters. The figure on the right is in feet.

C1cam—10 to 14 inches, pink (7.5YR 8/4) indurated caliche in plates 6 to 16 inches across and 1 or 2 inches thick; laminar in upper part; about 5 percent or less of the volume is brown loam between the plates and in the solution channels; clear wavy boundary.

C2ca—14 to 60 inches; pink (7.5YR 8/4) limy, loamy earth; massive; hard, friable; about 50 percent by volume of calcium carbonate; 15 to 20 percent caliche fragments and concretions of calcium carbonate; few water worn gravel size fragments; calcareous; moderately alkaline.

The solum, or A1 horizon, ranges from 7 to 20 inches in thickness and corresponds with the depth to indurated caliche. Fragments of caliche make up 5 to 30 percent by volume. The A horizon is brown, grayish brown, dark grayish brown, or dark brown.

The C1cam horizon ranges from 2 to 10 inches in thickness. It is platy to massive and pink or pinkish white. The C2ca horizon ranges from a few inches to several feet in thickness. Texture is loam or clay loam. The calcium carbonate equivalent ranges from 40 to 70 percent. Siliceous and limestone pebbles comprise 2 to about 35 percent by volume. The C2ca horizon is pink, pinkish white, light brown, white, pale yellow, or very pale brown.

## Clairemont series

The Clairemont series consists of deep, well drained, loamy soils on flood plains. These soils formed in calcareous, loamy alluvium of Rolling Plains origin along the flood plain of the Colorado River. Slopes range from 0 to 3 percent but are dominantly 0.5 to 1 percent.

A typical pedon in an area of Clairemont silt loam, frequently flooded, from the intersection of Texas Highway 16 and U.S. Highway 190 in San Saba, 11.8 miles north on Texas Highway 16, 0.6 mile northeast on county road to cattle guard, 0.45 mile north and 1.4 miles east and northeast on private road to field fence in river bottom, and 570 feet north in field:

Ap—0 to 6 inches; reddish brown (5YR 5/3) silt loam, reddish brown (5YR 4/3) moist; weak subangular blocky structure; hard, friable; many fine roots; surface crust 1/8 inch thick crushes easily between fingers; calcareous; moderately alkaline; abrupt smooth boundary.

C1—6 to 36 inches; reddish brown (5YR 5/4) silty clay loam, reddish brown (5YR 4/4) moist; massive, breaking to subangular blocky fragments with dull faces; hard, friable; few fine roots; common fine pores; thin strata of loam and fine sandy loam with evident bedding planes; few films and threads of calcium carbonate; calcareous; moderately alkaline; diffuse smooth boundary.

C2—36 to 62 inches; yellowish red (5YR 5/6) loam, yellowish red (5YR 4/6) moist; massive, breaking to

granular fragments with dull faces; hard, friable; common fine pores; thin strata of loam and silty clay loam with evident bedding planes; calcareous; moderately alkaline.

Clay content of the 10- to 40-inch control section ranges from 18 to 35 percent (weighted average). This section is stratified with silty clay loam, silt loam, loam, clay loam, fine sandy loam, and loamy fine sand. These soils are calcareous and moderately alkaline throughout.

The A horizon ranges from 4 to 14 inches in thickness. It is reddish brown, brown, or light brown.

The C1 horizon is reddish brown, yellowish red, light reddish brown, or brown. The C2 horizon is reddish brown, light reddish brown, reddish yellow, yellowish red, brown, light brown, or pink.

### Corkstone series

The Corkstone series consists of shallow, well drained, loamy upland soils. These soils formed in calcareous, clayey sediments weathered from limestone. Slopes range from 1 to 5 percent.

A typical pedon in an area of Corkstone clay loam, 1 to 5 percent slopes; from the intersection of U.S. Highway 190 and Texas Highway 16 in San Saba, 4.5 miles west on U.S. Highway 190, 9.0 miles southwest on Farm Road 2732, 0.8 mile south on county road, and 180 feet west in rangeland:

- A1—0 to 4 inches; very dark grayish brown (10YR 3/2) clay loam, very dark brown (10YR 2/2) moist; moderate fine granular and very fine subangular blocky structure; hard, firm; many fine roots; common fine pores; few siliceous pebbles as much as 2 centimeters across; mildly alkaline; clear wavy boundary.
- B21t—4 to 8 inches; brown (7.5YR 4/2) clay, dark brown (7.5YR 3/2) moist; moderate very fine subangular blocky and blocky structure; hard, firm; few fine roots; few fine pores; thin clay films on faces of peds; few siliceous pebbles; neutral; clear wavy boundary.
- B22t—8 to 12 inches; reddish brown (5YR 4/4) clay, dark reddish brown (5YR 3/4) moist; moderate fine and medium blocky structure; very hard, firm; few fine roots; few fine pores; few seams of darker material between peds; few clay films on faces of peds; about 5 percent siliceous pebbles, including spiculite; neutral; clear wavy boundary.
- B23t—12 to 18 inches; reddish brown (2.5YR 4/4) very cobbly clay; dark reddish brown (2.5YR 3/4) moist; moderate fine and medium blocky structure; very hard, firm; few fine roots; few fine pores; few stains of darker material on some peds; few clay films on faces of peds; about 40 percent spiculite fragments as much as 5 centimeters thick and 10 centimeters across; few quartz pebbles; neutral; abrupt wavy boundary.

Cr—18 to 36 inches; pink (7.5YR 8/4) spiculite or porous sponge residuum, pink (7.5YR 7/4) moist; platy; plates mostly 5 to 15 centimeters thick and 30 to 90 centimeters across; hardness of less than 3, Mohs' scale; porous; about 10 percent by volume reddish brown clay between plates; neutral; gradual wavy boundary.

R—36 to 60 inches; gray, fractured limestone, hardness of more than 3, Mohs' scale.

Thickness of the solum and depth to spiculite, or sponge residuum from spiculous limestone (corkstone), range from 12 to 20 inches. The mollic epipedon ranges from 7 to 12 inches in thickness and extends into the B21t horizon. Depth to hard limestone (R horizon) ranges from 20 to 68 inches.

The A horizon ranges from 3 to 8 inches in thickness. It is dark grayish brown, very dark grayish brown, brown, dark brown, reddish brown, or dark reddish brown. Reaction is neutral or mildly alkaline.

The B21t horizon is brown, dark reddish gray, or reddish brown. The B22t horizon is reddish brown, red, or brown. The B23t horizon is reddish brown, red, or yellowish red. It contains 35 to about 65 percent spiculite fragments that range from 1 centimeter to 8 centimeters in thickness and 2 to 25 centimeters across the long axis. Reaction of the Bt horizon is neutral or mildly alkaline.

The Cr horizon ranges from 4 to 48 inches in thickness. It consists of platy to flaggy spiculite sponge residuum ranging from 2 to 20 centimeters in thickness and 1.5 meters across the long axis. This material is yellow, very pale brown, brownish yellow, reddish yellow, pink, or light brown. Hardness is 2 or 3, Mohs' scale. Fine earth in the interstices is generally less than 10 percent.

The R layer is grayish, hard, fractured limestone many feet thick.

### Demona series

The Demona series consists of deep, moderately well drained, sandy soils on uplands. These soils formed in noncalcareous, sandy and clayey sediments from sandstone and shale. Slopes range from 1 to 3 percent.

A typical pedon in an area of Demona loamy fine sand, 1 to 3 percent slopes; from the intersection of Texas Highway 16 and Ranch Road 501 in Cherokee, 2.3 miles south on Texas Highway 16, 1 mile east on private road, and 0.25 mile south in rangeland:

- A1—0 to 4 inches; brown (10YR 5/3) loamy fine sand, dark brown (10YR 4/3) moist; single grained; slightly hard, very friable; common fine roots; few siliceous pebbles; neutral; clear smooth boundary.
- A2—4 to 24 inches; pale brown (10YR 6/3) loamy fine sand, dark brown (10YR 4/3) moist; single grained; slightly hard, very friable; few fine roots; few small siliceous gravel; slightly acid; abrupt wavy boundary.

B21t—24 to 34 inches; light gray (10YR 7/2) sandy clay, light brownish gray (10YR 6/2) moist; common medium distinct mottles of brownish yellow (10YR 6/6), reddish yellow (7.5YR 6/6), and few medium, distinct mottles of red (2.5YR 4/6); moderate medium and coarse blocky structure; very hard, very firm; few fine roots; few fine pores; distinct continuous clay film on faces of peds; slightly acid; gradual wavy boundary.

B22t—34 to 48 inches; light gray (10YR 7/2) sandy clay, light brownish gray (10YR 6/2) moist; common medium distinct mottles of reddish yellow (7.5YR 6/6) and yellow (10YR 7/6); moderate medium blocky structure; very hard, very firm; few fine roots; few fine pores; thin continuous clay film on faces of peds; few black concretions; medium acid; gradual wavy boundary.

B23t—48 to 58 inches; mottled white (10YR 8/2), light gray (10YR 7/1), brownish yellow (10YR 6/6), and reddish yellow (7.5YR 6/6) sandy clay; weak medium blocky structure; hard, firm; thin clay film on faces of peds; medium acid; abrupt wavy boundary.

R—58 to 60 inches, yellowish brown sandstone, hardness of more than 3, Mohs' scale.

The solum ranges from 50 to more than 80 inches in thickness.

Thickness of the A horizon ranges from 20 to 40 inches. Texture is fine sand or loamy fine sand. The A1 horizon ranges from 2 to 6 inches in thickness. It is brown, grayish brown, pale brown, or yellowish brown. The A2 horizon ranges from 18 to 34 inches in thickness. It is pale brown, brown, light brown, or light yellowish brown. Reaction of the A horizon is neutral or mildly alkaline.

Reaction of the Bt horizon is slightly acid or medium acid throughout. The B21t horizon is sandy clay or clay. It is light gray, light brownish gray, or red with various amounts of gray, brown, yellow, and red mottles. The B22t horizon is sandy clay or clay. It is brownish yellow, light gray or reddish yellow with gray, yellow, brown, and red mottles. The B23t horizon is sandy clay loam or sandy clay. It is light gray, reddish yellow, or red with various amounts of red, gray, brown, olive, and yellow mottles.

The R horizon consists of thinly bedded brownish yellow, yellowish red, yellowish brown, or reddish yellow sandstone and olive shale.

The soils mapped as Demona soils in this survey are typically underlain by sandstone at a depth of 50 to 60 inches. They are considered taxadjuncts to the Demona series in this respect. There is no difference in use, management, or behavior.

### Desan series

The Desan series consists of deep, somewhat excessively drained, gently sloping sandy soils on

uplands. These soils formed in thick beds of noncalcareous, sandy and loamy material on high terraces. Slopes range from 1 to 5 percent.

A typical pedon in an area of Desan loamy fine sand, 1 to 5 percent slopes; from the intersection of U.S. Highway 190 and Texas Highway 16 in San Saba, 4.7 miles north on Texas Highway 16, 6.0 miles northeast on county road, and 0.3 mile southwest in pasture:

A1—0 to 7 inches; light yellowish brown (10YR 6/4) loamy fine sand, yellowish brown (10YR 5/4) moist; single grained; loose, very friable; many fine roots; neutral; clear smooth boundary.

A2—7 to 51 inches; very pale brown (10YR 8/3) loamy fine sand, very pale brown (10YR 7/3) moist; single grained; loose, very friable; few fine roots; slightly acid; clear wavy boundary.

B21t—51 to 61 inches; yellowish red (5YR 5/8) sandy clay loam, yellowish red (5YR 4/8) moist; moderate coarse prismatic structure parting to moderate medium and coarse blocky; very hard, firm; few fine roots; common fine and medium pores; nearly continuous clay film on faces of peds; slightly acid; clear wavy boundary.

B22t—61 to 80 inches; yellowish red (5YR 5/6) sandy clay loam, yellowish red (5YR 4/6) moist; moderate coarse prismatic structure parting to coarse blocky; very hard, firm; few fine roots; common fine and medium pores; few thin clay films on faces of peds; medium acid.

The solum ranges from 65 to more than 120 inches in thickness.

The A1 horizon ranges from 6 to 18 inches in thickness. It is very pale brown, brown, pale brown, light yellowish brown, yellowish brown, or reddish yellow. The A2 horizon ranges from 34 to 60 inches in thickness. It is very pale brown, yellow, brownish yellow, pink, reddish yellow, or light brown. Reaction of the A horizon is neutral or slightly acid.

The B2t horizon is sandy clay loam or fine sandy loam, and clay content ranges from 18 to 35 percent. Reaction is slightly acid or medium acid. This horizon is strong brown, reddish yellow, yellowish red, red, or light red. The B3 horizon is reddish yellow, yellowish red, or red. Texture is sandy clay loam, sandy loam, or loam. Reaction of the B3 horizon is slightly acid or medium acid.

The C horizon, if present, is red, reddish yellow, yellowish red, light brown, very pale brown, or light yellowish brown. Texture is sandy clay loam, loam, sandy loam, loamy sand, or loamy fine sand.

### Eckrant series

The Eckrant series consists of very shallow to shallow, well drained, clayey stony soils on uplands. These soils formed in calcareous, stony and clayey sediments from

weathered dolomitic limestone. Slopes mainly range from 1 to 8 percent but can range to as much as 16 percent.

A typical pedon in an area of Eckrant stony clay, 1 to 8 percent slopes; from the intersection of Range Road 501 and Texas Highway 16 in Cherokee, 5.9 miles west on Ranch Road 501 to cattle guard, 2.5 miles northwest along ranch trail to windmill, 0.5 mile north, and 1,050 feet east in rangeland:

A11—0 to 6 inches; very dark grayish brown (10YR 3/2) stony clay, very dark brown (10YR 2/2) moist; moderate fine and very fine subangular blocky structure; very hard, firm; common fine roots; common fine pores; limestone cobbles and stones cover about 40 percent of the surface and make up about 40 percent of the soil; noncalcareous; moderately alkaline; clear irregular boundary.

A12—6 to 14 inches; dark brown (7.5YR 4/2) stony clay, dark brown (7.5YR 3/2) moist; moderate fine and very fine subangular blocky structure; very hard, firm; common fine roots; common fine pores; few small pressure faces; about 50 percent by volume limestone cobbles and stones; noncalcareous; moderately alkaline; abrupt wavy boundary.

R—14 to 16 inches; light gray, fractured, hard limestone bedrock.

The solum, or depth to bedrock, ranges from 5 to 20 inches in thickness. Limestone cobbles cover about 30 to 85 percent of the surface. Coarse fragments in the form of subrounded to angular limestone pebbles, cobbles, and stones comprise 35 to about 80 percent by volume of the pedon and increase with depth. Reaction ranges from neutral to moderately alkaline.

The A horizon ranges from 5 to 20 inches in thickness. It is dark grayish brown, very dark grayish brown, very dark gray, or dark brown. The browner shades are generally in the A12 horizon.

The R horizon consists of fractured limestone several feet thick. Secondary calcium carbonate coats some of the limestone along fractures.

### Frio series

The Frio series consists of deep, well drained, nearly level to gently sloping, loamy soils on bottom lands. These soils formed in calcareous, recent loamy alluvial sediments along major streams that drain limestone plateaus. Slopes range from 0 to 2 percent.

A typical pedon in an area of Frio silty clay loam, occasionally flooded; from the intersection of U.S. Highway 190 and Texas Highway 16 in San Saba, 4.7 miles west on U.S. Highway 190, and 300 feet north in cultivated field:

Ap—0 to 6 inches; dark grayish brown (10YR 4/2) silty clay loam, very dark grayish brown (10YR 3/2) moist; weak fine granular structure; hard, firm; many

fine roots; surface crust crushes easily; calcareous; moderately alkaline; abrupt smooth boundary.

A11—6 to 22 inches; very dark grayish brown (10YR 3/2) silty clay loam; very dark brown (10YR 2/2) moist; moderate very fine subangular blocky structure; hard, firm; many fine roots; common fine and medium pores; few shell fragments; calcareous; moderately alkaline; gradual smooth boundary.

A12—22 to 42 inches; dark brown (10YR 4/3) silty clay loam, dark brown (10YR 3/3) moist; moderate fine and very fine subangular blocky structure; hard, firm; few fine roots; common fine and medium pores; few shell fragments; common films and threads of calcium carbonate; calcareous; moderately alkaline; gradual smooth boundary.

Cca—42 to 65 inches; brown (10YR 5/3) silty clay loam, dark brown (10YR 4/3) moist; massive; hard, firm; few thin bedding planes; many films and threads and few soft masses of calcium carbonate; calcareous; moderately alkaline.

Depth to gravel, sand, or limestone ranges from 6 to 30 feet. Texture of the 10- to 40-inch control section is silty clay loam, clay loam, or silty clay. Clay content ranges from 35 to 45 percent. The calcium carbonate equivalent of the control section ranges from 10 to 40 percent.

The A horizon is dark grayish brown, very dark grayish brown, or dark brown. The A11 horizon ranges from 16 to 24 inches in thickness. The A12 horizon ranges from 10 to 22 inches in thickness.

The Cca horizon is silty clay loam, silty clay, and clay loam. It is dark grayish brown, dark brown, grayish brown, brown, or pale brown. A few bedding planes of various textures are below a depth of 50 inches. Siliceous pebbles range from few to about 10 percent by volume.

### Harper series

The Harper series consists of shallow, well drained, stony, nearly level to gently sloping, clayey soils on uplands. These soils formed in calcareous clayey materials over limestone bedrock. Slopes range from 0 to 3 percent.

A typical pedon in an area of Harper stony clay, 0 to 3 percent slopes; from the intersection of Ranch Road 501 and Texas Highway 16 in Cherokee, 7.1 miles west on Ranch Road 501 to gate, and 1.7 miles southwest in rangeland:

A11—0 to 7 inches; very dark gray (10YR 3/1) stony clay, black (10YR 2/1) moist; moderate fine and medium subangular blocky and granular structure; hard, firm; common fine roots; few rounded quartz and chert pebbles 2 to 8 millimeters in diameter; about 25 percent of surface covered with limestone cobbles and stones; moderately alkaline; gradual smooth boundary.

A12—7 to 18 inches; very dark gray (10YR 3/1) clay, black (10YR 2/1) moist; moderate fine and medium angular blocky structure; very hard, very firm; common fine roots; few shiny pressure faces; few limestone fragments ranging to as much as 8 millimeters in diameter; few rounded quartz and chert pebbles; moderately alkaline; abrupt wavy boundary.

R—18 to 20 inches; indurated, dolomitic limestone bedrock.

The solum, or depth to limestone bedrock, ranges from 10 to 20 inches in thickness. Stones and cobbles cover about 25 to 70 percent of the surface. When dry, these soils have cracks 1 centimeter or more wide in the upper part of the subsoil.

The A horizon is very dark grayish brown, very dark gray, or black. Clay content ranges from 40 to 60 percent.

The R layer is indurated, coarsely fractured, dolomitic limestone several feet thick.

### Hye series

The Hye series consists of moderately deep, well drained, gently sloping, loamy soils on uplands. These soils formed in noncalcareous loamy, reddish sediments of the Hickory sandstone member of the upper Cambrian age. Slopes range from 1 to 5 percent.

A typical pedon in an area of Hye fine sandy loam, 1 to 5 percent slopes; 17.1 miles west from Cherokee on Ranch Road 501 to cattle guard, west 6.8 miles, north 0.7 mile on county road, and 330 feet east from center of road, about 70 feet north-northeast of a live oak motte:

A1—0 to 8 inches; reddish brown (5YR 4/4) fine sandy loam, dark reddish brown (5YR 3/4) moist; weak fine subangular blocky structure; slightly hard, friable; common fine roots; many fine and medium pores; few black concretions; neutral; abrupt smooth boundary.

B1—8 to 14 inches; reddish brown (5YR 4/4) fine sandy loam, dark reddish brown (5YR 3/4) moist; weak medium subangular blocky structure; hard, friable; slightly sticky; common fine roots; common fine and medium pores; neutral; clear smooth boundary.

B21t—14 to 22 inches; yellowish red (5YR 5/6) sandy clay loam, yellowish red (5YR 4/6) moist; moderate medium prismatic structure breaking to moderate medium and coarse blocky; very hard, firm; few fine roots; common fine pores; few thin clay film on faces of peds; few sandstone fragments; slightly acid; gradual smooth boundary.

B22t—22 to 36 inches; yellowish red (5YR 5/6) sandy clay loam, yellowish red (5YR 4/6) moist; moderate medium and coarse blocky structure; very hard, firm; few fine roots; common fine pores; few thin clay

films on faces of peds; few sandstone pebbles in upper part increasing to common in the lower two inches; slightly acid; clear smooth boundary.

R—36 to 40 inches; indurated, coarsely fractured sandstone bedrock.

The solum ranges from 20 to 40 inches in thickness. Reaction is neutral or slightly acid throughout. Base saturation of the B2t horizon is less than 75 percent.

The A1 horizon ranges from 5 to 11 inches in thickness. It is reddish brown, brown, or yellowish red. Clay content ranges from about 10 to 18 percent.

The B1 horizon is brown or reddish brown. It is absent in some pedons. The B2t horizon is brown, reddish brown, red, yellowish red, or reddish yellow. It is sandy clay loam or fine sandy loam. Clay content ranges from 18 to about 32 percent.

### Katemcy series

The Katemcy series consists of moderately deep, well drained, slowly permeable, loamy soils on uplands. These soils formed in noncalcareous, clayey residuum weathered from schist. They are in valleys and side slope positions on undulating to hilly landscapes. Slopes range from 1 to 16 percent.

A typical pedon in an area of Katemcy fine sandy loam, 1 to 5 percent slopes; from intersection of Texas Highway 16 and Ranch Road 501 in Cherokee, 0.4 mile south on Texas Highway 16, 2.8 miles south on county road, 0.7 mile southwest on private road to cattle guard, and 240 feet southwest in rangeland:

A1—0 to 9 inches; brown (7.5YR 4/2) fine sandy loam, dark brown (7.5YR 3/2) moist; weak granular structure; slightly hard, friable; many fine roots; common fine pores; common quartz gravel 1/2 inch to 2 inches in diameter; neutral; clear smooth boundary.

B21t—9 to 24 inches; brown (7.5YR 5/4) clay, brown (7.5YR 4/4) moist; moderate medium and coarse blocky structure; very hard, firm; common fine roots; few fine pores; continuous clay films on faces of peds; few fine mica flakes; neutral; clear smooth boundary.

B22t—24 to 36 inches; reddish yellow (7.5YR 6/6) clay, strong brown (7.5YR 5/6) moist; moderate fine and medium blocky structure; very hard, firm; few fine roots; few fine pores; few thin clay films on faces of peds; common soft weathered schist fragments in the lower few inches; neutral; clear smooth boundary.

Cr—36 to 48 inches; olive yellow (2.5Y 6/6) weathered schist; neutral; tilted at about 30 degrees from horizontal.

The solum ranges from 20 to 40 inches in thickness. Coarse fragments of quartz, feldspar, and schist range

from a few to about 15 percent by volume. Reaction is slightly acid or mildly alkaline throughout.

The A1 horizon ranges from 5 to 9 inches in thickness. It is brown or reddish brown.

The Bt horizon is clay, sandy clay, or clay loam. Clay content ranges from 35 to 50 percent. It is reddish yellow, brown, yellowish red, reddish brown, or red.

The Cr horizon is layered, weakly cemented to indurated schist and schistose gneiss that tilts from 10 to 60 degrees. It is in shades of brown to gray, olive, yellow, green, and red.

### Leeray series

The Leeray series consists of deep, well drained, clayey soils on uplands. These soils formed in calcareous, clayey alluvial sediments and residuum from weathered limestone and shale. Slopes range from 0 to 3 percent.

A typical pedon in an area of Leeray clay, 1 to 3 percent slopes; from junction of U.S. Highway 190 and Texas Highway 16 in San Saba, 4.3 miles west on U.S. Highway 190, 4.4 miles southwest on Farm Road 2732, 520 feet south along fence, and 75 feet west in rangeland:

- A11—0 to 6 inches; very dark grayish brown (10YR 3/2) clay, very dark brown (10YR 2/2) moist; moderate fine and very fine subangular blocky structure; very hard, very firm; many fine roots; few rounded siliceous pebbles; calcareous; moderately alkaline; clear wavy boundary.
- A12—6 to 17 inches; dark grayish brown (10YR 4/2) clay, very dark grayish brown (10YR 3/2), moist; moderate fine and medium angular blocky structure; extremely hard, very firm; few fine roots; few pressure faces in lower part; few very fine calcium carbonate concretions; few siliceous pebbles; calcareous; moderately alkaline; gradual wavy boundary.
- A13—17 to 40 inches; grayish brown (10YR 5/2) clay, dark grayish brown (10YR 4/2) moist; moderate medium angular blocky structure; extremely hard, very firm; few fine roots; prominent grooved slickensides that intersect; few very fine concretions of calcium carbonate; few siliceous pebbles; calcareous; moderately alkaline; gradual wavy boundary.
- AC—40 to 67 inches; brown (10YR 5/3) clay, brown (10YR 4/3) moist; moderate medium angular blocky structure; extremely hard, very firm; few fine roots; common grooved slickensides; few films and threads and concretions of calcium carbonate; few siliceous pebbles; calcareous; moderately alkaline; gradual wavy boundary.
- Cca—67 to 78 inches; pale brown (10YR 6/3) clay, brown (10YR 5/3) moist; few fine distinct reddish yellow (7.5YR 7/6) mottles; massive; very hard, firm;

common films, threads, and concretions of calcium carbonate; few black concretions.

The solum ranges from 40 to more than 80 inches in thickness. When dry, these soils have cracks as much as 1 inch wide that extend from the surface to a depth of more than 20 inches. Intersecting slickensides begin at a depth of 16 to 24 inches. Clay content ranges from 40 to about 60 percent throughout the control section. Texture is clay or silty clay throughout. In undisturbed areas there is gilgai microrelief. The microknolls range from 4 to 12 inches higher than the microdepressions.

The A horizon is very dark grayish brown, dark grayish brown, or dark brown. In some pedons, this horizon is grayish brown in the lower part.

The AC horizon is brown, light brown, light yellowish brown, dark yellowish brown, brownish yellow, pale brown, grayish brown, or light olive brown.

The Cca horizon, if present, is pale brown, light yellowish brown, very pale brown, brownish yellow, light olive brown, olive brown, or grayish brown. In some pedons, this horizon is underlain by shale or limestone.

### Ligon series

The Ligon series consists of shallow, well drained, gently to strongly sloping, loamy soils on uplands. These soils formed in noncalcareous, loamy residuum weathered from hornblende schist and schistose gneiss. Slopes range from 3 to about 16 percent.

A typical pedon of Ligon loam in an area of Katemcy-Ligon association, rolling: from Cherokee, 3.1 miles east on Ranch Road 501 to cattle guard, 3.6 miles south on county road, and 30 feet east in rangeland:

- A1—0 to 6 inches; reddish brown (5YR 4/4) loam, dark reddish brown (5YR 3/4) moist; weak fine granular structure; hard, friable; many fine roots; many fine and medium pores; common pebbles of quartz; neutral; clear smooth boundary.
- B2t—6 to 17 inches; reddish brown (2.5YR 4/4) clay loam, dark reddish brown (2.5YR 3/4) moist; moderate fine and very fine blocky structure; very hard, firm; many fine roots; few fine pores; few thin clay films; common pebbles of quartz; neutral; gradual wavy boundary.
- C—17 to 26 inches; light olive brown and reddish partly weathered schist; platy; plates coated with iron oxide; red soil fines in pockets and along cleavage planes; few roots in fractures and seams; mildly alkaline; diffuse irregular boundary.
- Cr—26 to 40 inches; beds of weakly cemented to strongly cemented, gray and light reddish brown schist tilted at about 30 degrees from horizontal.

The solum ranges from 12 to 20 inches in thickness. Reaction ranges from neutral to medium acid throughout. Coarse fragments of mostly quartz and some schist range from a few to about 25 percent by volume.

The A horizon ranges from 4 to 9 inches in thickness. It is grayish brown, dark brown, reddish brown, or dark reddish brown.

The Bt horizon is reddish brown, red, or dark red. Clay content ranges from 30 to 35 percent.

The Cr layer is mostly weathered hornblende schist but includes schistose gneiss tilted at 30 degrees to more than 60 degrees from the horizontal.

### May series

The May series consists of deep, well drained, nearly level to gently sloping, loamy soils on uplands. These soils formed in calcareous loamy alluvium in shallow upland valleys having plane to concave slopes. Slopes are 0 to 2 percent.

A typical pedon in an area of May fine sandy loam, 0 to 2 percent slopes; 6 miles north of Richland Springs on Farm Road 45 to its intersection with Farm Road 502, 8.5 miles northwest on Farm Road 502, and 0.5 mile west-northwest in rangeland:

- A1—0 to 13 inches; brown (10YR 5/3) fine sandy loam, dark brown (10YR 4/3) moist; weak granular structure; slightly hard, friable; many fine roots; surface crust crushes easily; mildly alkaline; clear smooth boundary.
- B21t—13 to 25 inches; dark grayish brown (10YR 4/2) clay loam, very dark grayish brown (10YR 3/2) moist; weak to moderate fine subangular blocky structure; hard, firm; common fine roots; many fine and medium pores; thin clay films on faces of peds; neutral; gradual smooth boundary.
- B22t—25 to 37 inches; brown (10YR 4/3) clay loam, dark brown (10YR 3/3) moist; weak to moderate fine subangular blocky structure; hard, firm; few fine roots; common fine and medium pores; thin clay films on faces of peds; neutral; clear wavy boundary.
- B3—37 to 50 inches; yellowish brown (10YR 5/4) sandy clay loam, dark yellowish brown (10YR 4/4) moist; weak very fine subangular blocky structure; hard, friable; few fine roots; common fine and medium pores; thin clay film on faces of peds; neutral; gradual smooth boundary.
- Cca—50 to 80 inches; very pale brown (10YR 8/4) loam, very pale brown (10YR 7/4) moist; few fine distinct brownish yellow (10YR 6/6) mottles; massive; slightly hard, friable; many medium pores; few earthworm casts; many films and threads and few concretions of calcium carbonate; few black concretions; few snail fragments; moderately alkaline.

The solum ranges from 40 to 60 inches in thickness. Reaction ranges from neutral to moderately alkaline.

The A horizon ranges from 8 to 16 inches in thickness. It is brown, grayish brown, yellowish brown, dark grayish brown, or very pale brown. Content of organic matter is less than 1 percent.

The B21t horizon is dark grayish brown, grayish brown, or brown. Texture is clay loam or sandy clay loam. The B22t horizon is brown, yellowish brown, dark yellowish brown, dark grayish brown, or yellow. Texture is clay loam or sandy clay loam. The B3 horizon is grayish brown, brown, yellowish brown, or dark yellowish brown. Texture is loam or sandy clay loam.

The Cca horizon is very pale brown, light yellowish brown, reddish yellow, or light brownish gray with some yellowish and brownish mottles.

### Mereta series

The Mereta series consists of shallow, well drained, loamy soils on uplands. These soils formed in calcareous, loamy, old alluvium outwash plains. Slopes range from 1 to 3 percent.

A typical pedon in an area of Mereta clay loam, 1 to 3 percent slopes; 1.85 miles west of Algerita on U.S. Highway 190, 1.3 miles north on county road, 0.5 mile east, and 365 feet north of county road in a cultivated field:

- Ap—0 to 5 inches; dark brown (7.5YR 4/2) clay loam, dark brown (7.5YR 3/2), moist; weak fine granular structure; hard, friable; many fine roots; few small caliche fragments; few fine siliceous pebbles; few worm casts; calcareous; moderately alkaline; abrupt smooth boundary.
- A11—5 to 10 inches; dark brown (7.5YR 4/2) clay loam, dark brown (7.5YR 3/2), moist; weak fine granular structure; hard, friable; many fine roots; few small caliche fragments; few fine siliceous pebbles; few worm casts; calcareous; moderately alkaline; gradual smooth boundary.
- A12—10 to 18 inches; dark brown (7.5YR 4/2) clay loam; dark brown (7.5YR 3/2), moist; moderate fine subangular blocky structure; hard, firm; few fine roots; common fine pores; few caliche fragments; few fine siliceous pebbles; few worm casts; calcareous; moderately alkaline; abrupt wavy boundary.
- C1cam—18 to 23 inches; pinkish white (7.5YR 8/2) caliche; strongly cemented and platy; massive; about 1 percent by volume fine earth between plates; common roots between plates; clear wavy boundary.
- C2ca—23 to 42 inches; pink (7.5YR 8/4) loam, pink (7.5YR 7/4) moist; massive; soft, friable; about 50 percent by volume finely disseminated particles, soft masses, and concretions of calcium carbonate; few fine distinct reddish brown iron oxide stains; moderately alkaline; gradual smooth boundary.
- C3ca—42 to 62 inches; pink (7.5YR 8/4) loam; light brown moist; massive; friable and crumbly; about 15 to 20 percent by volume soft masses and concretions of calcium carbonate; few reddish yellow iron oxide stains; moderately alkaline.

Thickness of the solum and depth to cemented caliche range from 14 to 20 inches. Clay content ranges from 35 to 45 percent. Coarse fragments are generally few, but some pedons contain as much as 10 percent by volume hard angular caliche fragments.

The A11 horizon ranges from 7 to 14 inches in thickness. It is dark brown or dark grayish brown. The A12 horizon is brown, dark brown, or reddish brown.

The C1cam is strongly cemented to indurated, massive to platy caliche that is pinkish white or pink. It ranges from 3 to 5 inches in thickness. The Cca horizon is loamy, calcareous earth that is mainly more than 50 percent calcium carbonate. It is pink or light brown.

### Miles series

The Miles series consists of deep, well drained, gently sloping, loamy soils on uplands. These soils formed in calcareous, loamy alluvium on old high terraces and upland plains. Slopes range from 1 to 3 percent.

A typical pedon in an area of Miles fine sandy loam, 1 to 3 percent slopes; 12.4 miles north on Farm Road 45 from its intersection with U.S. Highway 190 in Richland Springs, and 200 feet east of field fence:

Ap—0 to 5 inches; brown (7.5YR 5/4) fine sandy loam, dark brown (7.5YR 4/4) moist; weak granular structure; slightly hard, very friable; many fine roots; surface crust crushes easily; few fine siliceous pebbles; neutral; abrupt smooth boundary.

B1—5 to 10 inches; reddish brown (5YR 5/4) sandy clay loam, reddish brown (5YR 4/4) moist; weak coarse prismatic structure parting to weak fine subangular blocky; hard, friable; few fine roots; few fine pores; few siliceous pebbles; mildly alkaline; gradual smooth boundary.

B21t—10 to 25 inches; yellowish red (5YR 5/6) sandy clay loam, yellowish red (5YR 4/6) moist; coarse prismatic structure parting to moderate medium subangular blocky; very hard, friable; few fine roots; common fine and medium pores; thin clay films on faces of pedis; few siliceous pebbles; mildly alkaline; gradual smooth boundary.

B22t—25 to 40 inches; yellowish red (5YR 5/6) sandy clay loam, yellowish red (5YR 4/6) moist; moderate coarse prismatic structure parting to weak medium subangular blocky; very hard, friable; few fine roots; common fine and medium pores; few clay films on faces of pedis; moderately alkaline; gradual smooth boundary.

B23t—40 to 52 inches; yellowish red (5YR 5/6) sandy clay loam, yellowish red (5YR 4/6) moist; weak medium subangular blocky structure; very hard, friable; common fine and medium pores; few clay films on faces of pedis; few films and threads of calcium carbonate; few siliceous pebbles; calcareous; moderately alkaline; gradual smooth boundary.

B24tca—52 to 62 inches; reddish yellow (7.5YR 7/6) sandy clay loam, reddish yellow (7.5YR 6/6) moist; weak coarse prismatic structure; hard, friable; many medium pores; many films and threads of calcium carbonate; about 15 percent by volume soft masses and concretions of calcium carbonate; calcareous; moderately alkaline; diffuse wavy boundary.

B3ca—62 to 70 inches; reddish yellow (7.5YR 7/6) sandy clay loam, reddish yellow (7.5YR 6/6) moist; weak coarse prismatic structure; hard, friable; common films, threads, and soft masses of calcium carbonate; calcareous; moderately alkaline.

The solum ranges from 60 to 80 inches in thickness. Depth to secondary calcium carbonates as films and threads is 36 inches or more. The A1 horizon ranges from 5 to 7 inches in thickness. It is brown, dark brown, light brown, or reddish brown.

The B1 horizon ranges to as much as 8 inches in thickness. Texture is clay loam or sandy clay loam. It is reddish brown. This horizon is not present in some pedons. The B2t horizon is clay loam or sandy clay loam. In some pedons, the lower part of this horizon is gravelly clay loam. In some pedons, few to common siliceous pebbles are in this horizon. This horizon is yellowish red, reddish brown, or red. The B3ca horizon is loam, fine sandy loam, or sandy clay loam. It is reddish yellow, pink, or very pale brown.

The C horizon, if present, is yellow, reddish yellow, or light reddish brown loam or fine sandy loam.

The Miles soils in this survey are considered taxadjuncts to the Miles series. The morphology is similar except that a calcic horizon typically is at a depth of slightly less than 60 inches. This does not affect use, management, or behavior of these soils.

### Miller series

The Miller series consists of deep, moderately well drained, nearly level, clayey soils on bottom lands. These soils formed on the flood plains of the Colorado River in calcareous, clayey sediments of Rolling Plains origin. Slopes range from 0 to 1 percent.

A typical pedon in an area of Miller silty clay, occasionally flooded; 12.8 miles north on Farm Road 45 from U.S. Highway 190 in Richland Springs, and 225 feet west in cultivated field:

Ap—0 to 7 inches; dark reddish gray (5YR 4/2) silty clay, dark reddish brown (5YR 3/2) moist; weak granular structure; very hard, firm; many fine roots; very thin crust on surface when dry; calcareous; moderately alkaline; abrupt smooth boundary.

A12—7 to 20 inches; dark reddish gray (5YR 4/2) silty clay, dark reddish brown (5YR 3/2) moist; moderate fine and medium blocky structure; very hard, firm; common fine roots; few fine pores; few pressure faces; calcareous; moderately alkaline; clear smooth boundary.

**B2**—20 to 60 inches; reddish brown (5YR 4/4) silty clay, dark reddish brown (5YR 3/4) moist; moderate medium blocky structure; very hard, firm; few fine roots; few fine pores; common pressure faces which do not intersect; cracks of more than 1 centimeter are below a depth of 20 inches; roots pass through peds; films and threads of calcium carbonate throughout and increase with depth; calcareous; moderately alkaline.

The solum ranges from 48 to more than 60 inches in thickness. Cracks more than 1 centimeter wide extend to a depth of about 30 inches during dry periods in most years. Pressure faces and slickensides range from few to common but do not intersect.

The A horizon is dark reddish gray, dark brown, or reddish brown.

The B2 horizon is reddish brown, dark reddish brown, brown, or yellowish red.

The C horizon, if present, is reddish brown or dark brown. Thin, lighter colored strata of silt loam or loam are in some pedons.

### **Nebgen series**

The Nebgen series consists of very shallow to shallow, well drained, gently sloping to moderately steep, stony loamy soils on uplands. These soils formed in noncalcareous loamy residuum weathered from sandstone. Slopes range from 5 to 16 percent.

A typical pedon of Nebgen stony fine sandy loam in an area of Nocken-Nebgen association, rolling; 16.0 miles south of San Saba on Texas Highway 16, 21 miles west and south on Ranch Road 501, 6.2 miles west on Texas Highway 71, 0.1 mile south on county road, and 100 feet west in rangeland:

**A1**—0 to 8 inches; reddish brown (5YR 4/4) stony fine sandy loam, dark reddish brown (5YR 3/4) moist; weak fine subangular blocky structure; soft, very friable; many fine and medium roots; many medium pores; slightly acid; clear irregular boundary.

**Cr**—8 to 12 inches; reddish brown (5YR 4/4) partially weathered, weakly cemented, fractured sandstone; an estimated 25 percent reddish brown (5YR 4/4) sandy loam in fractures and in pockets; slightly acid; abrupt wavy boundary.

**R**—12 to 18 inches; reddish brown sandstone; strongly cemented when dry; weakly cemented moist.

The solum ranges from 5 to 14 inches in thickness. Reaction is slightly acid or neutral throughout.

The A horizon is reddish brown, light reddish brown, brown, or dark brown. Texture is stony loam or stony fine sandy loam. Sandstone cobbles and stones cover about 10 to 25 percent of the surface and are 10 to 25 percent by volume.

The Cr horizon is as much as 5 inches thick. It consists of partially weathered, weakly cemented reddish

sandstone. It contains about 10 to 25 percent by volume sandy loam material in cracks and fissures.

The R horizon consists of reddish or brownish sandstone that is strongly cemented when dry. It is easily broken or crushed when moist.

### **Nimrod series**

The Nimrod series consists of deep, moderately well drained, gently sloping, sandy soils on uplands. These soils formed in sandy and loamy residual material on old, high level, loamy alluvial remnants of terraces that have been reworked by wind and water. Slopes range from 1 to 5 percent.

A typical pedon in an area of Nimrod loamy fine sand, 1 to 5 percent slopes; 1.5 miles west of Algerita on U.S. Highway 190, 5.5 miles north on county road, 0.1 mile west, and 100 feet north in cropland:

**Ap**—0 to 6 inches; light yellowish brown (10YR 6/4), loamy fine sand, yellowish brown (10YR 5/4) moist; single grained; loose; many fine roots; neutral; abrupt smooth boundary.

**A11**—6 to 10 inches; light yellowish brown (10YR 6/4) loamy fine sand, yellowish brown (10YR 5/4) moist; single grained; loose; few fine roots; slightly acid; clear wavy boundary.

**A2**—10 to 27 inches; very pale brown (10YR 7/4) loamy fine sand, light yellowish brown (10YR 6/4) moist; single grained; loose; very friable; few fine roots; slightly acid; abrupt wavy boundary.

**B21t**—27 to 44 inches; coarsely mottled light gray (10YR 7/2), reddish yellow (7.5YR 6/6), and brownish yellow (10YR 6/6) sandy clay loam; coarse prismatic structure parting to moderate medium and coarse blocky; extremely hard, very firm; distinct clay films and coatings of light gray on vertical faces of peds; medium acid; gradual wavy boundary.

**B22t**—44 to 62 inches; light gray (10YR 7/2) sandy clay loam, light brownish gray (10YR 6/2) moist; common coarse mottles of reddish yellow (7.5YR 7/6) and yellow (10YR 7/6) moist; prismatic structure parting to moderate medium blocky; extremely hard, very firm; clay films and gray coatings (10YR 6/1) on faces of peds; medium acid; gradual wavy boundary.

**B3**—62 to 72 inches; light gray (10YR 7/2) sandy clay loam, light brownish gray (10YR 6/2) moist; few fine distinct yellow mottles; coarse prismatic structure; hard, firm; clean sand grains on peds; medium acid; gradual wavy boundary.

**C**—72 to 80 inches; coarsely mottled, light gray (10YR 7/1), brownish yellow (10YR 6/6), reddish yellow (7.5YR 6/8), and yellowish red (5YR 5/8), sandy clay loam; massive; very hard, firm; slightly acid.

The solum ranges from 60 to 80 inches in thickness. The A horizon is fine sand or loamy fine sand and

ranges from 20 to 40 inches in thickness. Reaction of the A horizon ranges from neutral to medium acid. Clay content of the Bt horizon ranges from 20 to 35 percent, and reaction is strongly acid or medium acid.

The A1 horizon is brown, yellowish brown, light yellowish brown, grayish brown, light brown, or pale brown. The A2 horizon is very pale brown, light yellowish brown, yellowish brown, or pale brown.

The B2t and B3 horizons are mottled and are brownish, grayish, and yellowish with or without reddish mottles. The dominant colors are light gray, light brownish gray, brownish yellow, yellow, and reddish yellow. Reaction of the B horizon is slightly acid or medium acid.

The C horizon, if present, is coarsely mottled in shades of gray, yellow, brownish yellow, reddish yellow, yellowish red, and red. Reaction is slightly acid or medium acid.

### Nocken series

The Nocken series consists of moderately deep, well drained, very stony, loamy upland soils. These soils formed in noncalcareous, loamy and clayey residuum from weathered sandstone and shale. Slopes range from 5 to 25 percent but mainly range from 8 to 15 percent.

A typical pedon of Nocken very stony fine sandy loam is in an area of Nocken-Bonti association, rolling; from the junction of U.S. Highway 190 and Farm Road 45 in Richland Springs, 7.4 miles north on Farm Road 45, and 150 feet east in rangeland that is 0.4 mile south of the junction of Farm Road 45 and Farm Road 500:

A11—0 to 5 inches; brown (10YR 5/3) very stony fine sandy loam, dark brown (10YR 4/3) moist; weak subangular blocky structure; slightly hard, friable; many fine roots; about 60 percent by volume coarse sandstone fragments of which about 1/4 is gravel and 3/4 is cobbles, stones, and a few boulders; coarse fragments cover about 60 percent of the surface; neutral; clear wavy boundary.

A12—5 to 17 inches; light brown (7.5YR 6/4) very stony fine sandy loam, brown (7.5YR 5/4) moist; weak subangular blocky structure; slightly hard, friable; common fine roots; about 60 percent by volume coarse sandstone fragments of which about 1/4 is gravel and 3/4 is cobbles, stones, and boulders; medium acid; clear wavy boundary.

B21t—17 to 28 inches; red (2.5YR 5/6) very stony clay, red (2.5YR 4/6) moist; moderate medium and fine blocky structure; very hard, firm; few fine roots; thin distinct continuous clay films on faces of peds; about 60 percent by volume fractured sandstone, mostly in layers 3 to 11 inches thick; medium acid; gradual smooth boundary.

B22t—28 to 40 inches; yellowish red (5YR 5/6) very stony clay, yellowish red (5YR 4/6) moist; moderate fine blocky structure; very hard, firm; few fine roots;

thin distinct continuous clay films on faces of peds; fractured sandstone layers 6 to 12 inches thick are 50 to 80 percent by volume; medium acid; abrupt smooth boundary.

Cr—40 to 60 inches; reddish yellow, weakly cemented sandstone with thin, interbedded, massive, pale olive shale.

The solum ranges from 20 to about 40 inches in thickness. Sandstone pebbles, cobbles, stone, flags, and boulders comprise 35 to 85 percent by volume of the solum. Coarse fragments are mostly of cobble and stone size. The fine earths are in cracks, layers, and other spaces between the sandstone fragments and layers.

The A11 horizon is brown, yellowish brown, or dark yellowish brown. The A12 horizon is yellowish brown, light yellowish brown, dark yellowish brown, pale brown, very pale brown, strong brown, pink, brown, light brown, or reddish yellow. Texture of the fine earth fraction in the A horizon is fine sandy loam or loam. Reaction ranges from medium acid to neutral. Combined thickness of the A11 and A12 horizons is less than 20 inches.

The B21t horizon is red, yellowish red, reddish brown, reddish yellow, brown, or strong brown. The B22t horizon is light red, red, reddish yellow, or yellowish red. The fine earth fraction of the B2t horizon is clay or sandy clay. Clay content ranges from 40 to 65 percent. Reaction is medium acid or strongly acid.

The thick underlying sandstone is weakly cemented. Some pedons have layered sandstone with interbedded, massive shale, shaly clay, or loamy earths.

### Nuvalde series

The Nuvalde series consists of deep, well drained, nearly level to gently sloping, loamy soils on uplands. These soils formed in calcareous, old alluvial sediments on high terraces, in shallow valleys, and on old outwash plains. Slopes range from 0 to 5 percent.

A typical pedon in an area of Nuvalde clay loam, 1 to 3 percent slopes; 1.6 miles west of Harkeyville, on U.S. Highway 190, 0.1 mile north on county road, and 100 feet east in cultivated field:

Ap—0 to 6 inches; dark grayish brown (10YR 4/2) clay loam, very dark grayish brown (10YR 3/2) moist; weak granular structure; hard, friable; thin surface crust that crushes easily; calcareous; moderately alkaline; abrupt smooth boundary.

A1—6 to 14 inches; dark grayish brown (10YR 4/2) clay loam, very dark grayish brown (10YR 3/2) moist; moderate very fine subangular blocky structure; hard, firm; common fine roots; common fine and medium pores; few films and threads of calcium carbonate; calcareous; moderately alkaline; clear smooth boundary.

B2—14 to 22 inches; brown (10YR 5/3) clay loam, dark brown (10YR 4/3) moist; moderate fine and very

fine subangular blocky structure; hard, firm; few fine roots; common fine and medium pores; common films and threads and few weakly cemented concretions of calcium carbonate; calcareous; moderately alkaline; clear wavy boundary.

B2ca—22 to 32 inches; brown (10YR 5/3) clay loam, dark brown (10YR 4/3) moist; moderate very fine subangular blocky structure; hard, firm; few fine roots; common fine and medium pores; common concretions, threads, and soft masses of calcium carbonate; about 18 percent calcium carbonate equivalent; calcareous; moderately alkaline; gradual wavy boundary.

C1ca—32 to 50 inches; light yellowish brown (10YR 6/4) clay loam; yellowish brown (10YR 5/4) moist; massive; hard, friable; about 20 to 30 percent by volume soft masses, films, threads, and concretions of calcium carbonate; calcareous; moderately alkaline; gradual wavy boundary.

C2ca—50 to 70 inches; yellowish brown (10YR 5/4) clay loam, dark yellowish brown (10YR 4/4) moist; massive; hard, friable; about 15 percent concretions of calcium carbonate 1/4 to 1/2 inch in diameter; calcareous; moderately alkaline.

The solum ranges from 20 to 40 inches in thickness. Total clay content of the 10- to 40-inch control section ranges from 35 to 45 percent, with silicate clay content ranging from 25 to 35 percent. The soil is calcareous and moderately alkaline throughout.

The A horizon ranges from 10 to 18 inches in thickness. It is brown, dark brown, or dark grayish brown.

The B2 horizon is brown, grayish brown, or yellowish brown. The B2ca horizon ranges from 8 to 14 inches in thickness. It is brown, pale brown, light yellowish brown, or light brown.

The Cca horizon has 40 to 80 percent calcium carbonate equivalent and 5 percent or more calcium carbonate than the B2 horizon. The Cca horizon is very pale brown, light yellowish brown, yellowish brown, light brown, or pink.

### Oplin series

The Oplin series consists of very shallow to shallow, well drained, gently sloping to moderately steep, gravelly loamy soils on uplands. The soils formed in calcareous, gravelly and loamy residuum from weathered limestone. Slopes range from 5 to 16 percent.

A typical pedon of Oplin gravelly loam in an area of Oplin-Yates association, rolling; from intersection of Texas Highway 16 and Ranch Road 501 in Cherokee, 11.3 miles west on Ranch Road 501 to Old Pontotoc Road, and 0.5 mile southeast in rangeland:

A1—0 to 6 inches; dark grayish brown (10YR 4/2) gravelly loam, very dark grayish brown (10YR 3/2) moist; moderate fine granular and subangular blocky

structure; slightly hard, friable; common fine roots; many fine and medium pores; few soft masses of calcium carbonate; about 30 percent by volume limestone gravel and cobbles; calcareous; moderately alkaline; abrupt wavy boundary.

A1ca—6 to 17 inches; brown (10YR 5/3) very gravelly loam, brown (10YR 4/3) moist; weak granular structure; common fine roots; about 65 percent by volume limestone fragments with pendants of calcium carbonate; many soft masses and concretions of calcium carbonate; calcareous; abrupt smooth boundary.

R—17 to 24 inches; fractured indurated limestone with secondary calcium carbonate coatings on rocks and in fractures in upper 4 inches.

The solum, or depth to bedrock, ranges from 7 to 20 inches in thickness. The solum has 35 to 80 percent coarse limestone fragments, consisting of pebbles, cobbles, and a few stones. The calcium carbonate equivalent exceeds 40 percent.

The A1 horizon is grayish brown, dark grayish brown, or brown. Texture of the fine earth fraction is clay loam or loam. This horizon contains 15 to 65 percent limestone gravel and cobbles. The A1ca horizon is brown, pale brown, very pale brown, white, light brown, or light olive brown. Calcium carbonate coatings are on the surface of limestone fragments. Concretions and soft masses of calcium carbonate comprise 10 to 30 percent by volume. Coarse limestone fragments range from 20 to 85 percent by volume.

The R layer is fractured, hard limestone several feet thick. Secondary calcium carbonate coats some of the limestone along fractures in the upper 4 inches.

These soils have developed in older, grayish glauconitic limestones of Cambrian age. In this respect, these soils are considered taxadjuncts to the Oplin series. Use, management, and behavior are similar.

### Pebblepoint series

The Pebblepoint series consists of deep, well drained, very gravelly loamy soils on uplands. These soils formed in noncalcareous, gravelly, loamy, and clayey residuum from weathered cherty dolomitic limestone. Slopes range from about 10 to 30 percent.

A typical pedon of Pebblepoint very gravelly fine sandy loam in an area of Pebblepoint-Rumple association, hilly; from the intersection of U.S. Highway 190 and Texas Highway 16 in San Saba, 5 miles east on U.S. Highway 190, 0.2 mile south along trail to gate and corral, 0.6 mile southeast, 0.2 mile northward along fence, and 600 feet east in rangeland:

A1—0 to 4 inches; dark grayish brown (10YR 4/2) very gravelly fine sandy loam, very dark grayish brown (10YR 3/2) moist; weak fine granular structure; slightly hard; very friable; many fine roots; about 40

percent of surface covered with chert pebbles, mostly 1 centimeter to 2 centimeters across, and about 40 percent by volume in the soil; few chert cobbles; neutral; clear wavy boundary.

- A2—4 to 22 inches; pink (7.5YR 7/4) very gravelly silt loam, brown (7.5YR 5/4) moist; weak fine granular structure; slightly hard, very friable; few fine and medium roots; about 75 percent angular chert pebbles 1 centimeter to 4 centimeters across; few chert cobbles; strongly acid; clear wavy boundary.
- B21t—22 to 40 inches; yellowish red (5YR 5/6) very gravelly clay, yellowish red (5YR 4/6) moist; moderate fine and very fine blocky structure; very hard, very firm; few very fine to medium roots; few fine pores; continuous clay films on faces of peds; about 65 percent angular chert pebbles 1 centimeter to 7 centimeters across; about 5 percent chert cobbles; strongly acid; gradual wavy boundary.
- B22t—40 to 65 inches; red (2.5YR 4/6) very gravelly clay, dark red (2.5YR 3/6) moist; moderate very fine blocky structure; very hard, very firm; few very fine roots; continuous clay film on faces of peds; about 80 percent angular chert pebbles 1 centimeter to 7 centimeters across; about 5 percent chert cobbles; strongly acid; gradual wavy boundary.
- R—65 to 75 inches; weakly consolidated bed of chert gravel, cobbles, stones, and boulders; red clay in the interstices makes up about 5 percent by volume.

The solum ranges from 40 to about 70 inches in thickness and is underlain by a mass of fine and coarse chert fragments and boulders. Angular chert gravel and fragments make up 35 to about 85 percent by volume of the solum.

The A1 horizon is 2 to 10 inches thick. It is dark grayish brown, grayish brown, brown, or very dark grayish brown. Texture of the fine earth fraction is fine sandy loam, loam, or very fine sandy loam. Fine and coarse chert fragments cover 35 to 60 percent of the surface and make up 35 to 60 percent of the soil by volume. Reaction ranges from slightly acid to moderately alkaline.

The A2 horizon is pink, brown, reddish yellow, light brown, very pale brown, or pale brown. Texture of the fine earth fraction is fine sandy loam, loam, or silt loam. Coarse fragments make up 40 to about 85 percent by volume. Reaction ranges from strongly acid to neutral.

The B2t horizon is yellowish red, reddish brown, reddish yellow, red, light red, light brown, or brown. Texture of the fine earth fraction is clay or sandy clay. Clay content ranges from 37 to 60 percent. Content of coarse fragments range from 40 to about 90 percent. The fragments are mostly gravel size, and 5 to 20 percent are larger than 75 millimeters (3 inches). Reaction is strongly acid or medium acid.

The R layer is weakly consolidated chert gravel, cobbles, stones, and boulders and cherty dolomite that is weathered and fractured in the upper part and solid below.

## Pedernales series

The Pedernales series consist of deep, well drained, soils on uplands. These soils formed in loamy and clayey calcareous material of the Lower Cretaceous Age. Slopes range from 1 to 3 percent.

A typical pedon in an area of Pedernales fine sandy loam, 1 to 3 percent slopes; 0.2 mile south of intersection of Texas Highway 16 and Ranch Road 501 in Cherokee, 0.6 mile west on county road, 0.9 mile south, 1.0 mile west, 0.4 mile south, and 300 feet east:

- A1—0 to 11 inches; brown (7.5YR 4/4) fine sandy loam, dark brown (7.5YR 3/4) moist; weak fine granular structure; slightly hard, friable; many fine roots; many fine and medium pores; slightly acid; clear smooth boundary.
- B21t—11 to 21 inches; reddish brown (5YR 4/4) clay, dark reddish brown (5YR 3/4) moist; moderate medium prismatic structure parting to moderate medium and coarse blocky; very hard, very firm; common fine roots; few fine pores; common clay films of faces of peds; neutral; gradual smooth boundary.
- B22t—21 to 34 inches; reddish brown (5YR 4/4) clay, dark reddish brown (5YR 3/4) moist; moderate fine and medium blocky structure; very hard, very firm; few fine roots; few fine pores; common clay films on faces of peds; neutral; gradual smooth boundary.
- B3ca—34 to 45 inches; reddish yellow (7.5YR 6/6) sandy clay loam, strong brown (7.5YR 5/6) moist; moderate fine and medium blocky structure; hard, firm; few fine roots; few fine pores; few black concretions; about 5 to 10 percent concretions and soft masses of calcium carbonate; calcareous; moderately alkaline; clear smooth boundary.
- Cca—45 to 60 inches; reddish yellow (7.5YR 7/6) sandy clay loam, reddish yellow (7.5YR 6/6) moist; massive; hard, firm; estimated 20 to 25 percent concretions and soft masses of calcium carbonate; calcareous; moderately alkaline.

The solum ranges from 35 to 60 inches in thickness. Secondary carbonates are at a depth of 28 to 50 inches. The A1 horizon ranges from 6 to 15 inches thick. It is brown or pale brown.

The B2t and B3ca horizons are clay or sandy clay. They are brown, yellowish red, reddish brown, red, reddish yellow, or strong brown.

The Cca horizon is sandy clay loam or clay loam. It is reddish yellow, light reddish brown, or reddish brown.

## Pontotoc series

The Pontotoc series consists of deep, well drained, gently sloping, loamy soils on uplands. These soils formed in noncalcareous, loamy material weathered from sandstone of the Upper Hickory member of the Riley Formation. Slopes range from 1 to 5 percent.

A typical pedon in an area of Pontotoc fine sandy loam, 1 to 5 percent slopes; from intersection of Ranch Road 501 and Texas Highway 16 in Cherokee, 17.1 miles west on Ranch Road 501 to cattle guard, 4.7 miles west on county road, 0.4 mile south, and 330 feet east in rangeland:

- A1—0 to 10 inches; reddish brown (2.5YR 4/4) fine sandy loam, dark reddish brown (2.5YR 3/4) moist; weak fine granular structure; slightly hard, very friable; many fine roots; many fine and medium pores; neutral; abrupt smooth boundary.
- B1—10 to 22 inches; reddish brown (2.5YR 4/4) fine sandy loam, dark reddish brown (2.5YR 3/4) moist; weak fine granular and subangular blocky structure; slightly hard, very friable; many fine roots; common fine and medium pores; neutral; diffuse smooth boundary.
- B21t—22 to 33 inches; reddish brown (2.5YR 4/4) fine sandy loam, dark reddish brown (2.5YR 3/4) moist; weak fine subangular blocky structure; hard, friable; few fine roots; common fine and medium pores; clay films in pores; neutral; diffuse smooth boundary.
- B22t—33 to 70 inches; red (2.5YR 4/6) sandy clay loam, dark red (2.5YR 3/6) moist; weak fine subangular blocky structure; hard, friable; few fine roots; common fine pores; clay film in pores; neutral; clear irregular boundary.
- Cr—70 to 80 inches; dark reddish brown weakly cemented sandstone bedrock with a hardness of 2 to 3 on Mohs' scale.

The solum ranges from 60 to more than 80 inches in thickness over sandstone. Reaction is neutral or slightly acid throughout.

The A1 horizon ranges from 7 to 14 inches in thickness. The B1 horizon ranges from 5 to 14 inches in thickness. The A1 and B1 horizons are red, reddish brown, or dark reddish brown.

The B21t horizon is fine sandy loam. Clay content ranges from 12 to 18 percent. The B22t horizon is sandy clay loam, fine sandy loam, or clay loam. Clay content ranges from 18 to 30 percent. These horizons are red, dark red, reddish brown, or dark reddish brown.

The Cr horizon is weakly cemented red sandstone.

### Rochelle series

The Rochelle series consists of moderately deep, well drained, gently sloping, loamy soils on uplands. These soils formed in calcareous, old loamy and gravelly sediments on remnants of high terraces at the higher elevations. Slopes range from 1 to 5 percent.

A typical pedon in an area of Rochelle fine sandy loam, 1 to 5 percent slopes; from intersection of Texas Highway 16 and Farm Road 500 north of San Saba, 16.1 miles northwest on Farm Road 500, 0.2 mile north on county road, and 300 feet east in rangeland:

- A1—0 to 6 inches; brown (7.5YR 5/4) fine sandy loam, dark brown (7.5YR 4/4) moist; weak fine subangular blocky structure; hard, friable; many fine roots; many fine and medium pores; common pebbles of quartz; mildly alkaline; abrupt smooth boundary.
- B21t—6 to 20 inches; reddish brown (5YR 5/4) sandy clay loam, reddish brown (5YR 4/4) moist; moderate coarse prismatic structure parting to moderate medium subangular blocky; very hard, firm; common fine roots; many fine pores; few thin clay films on faces of peds; about 10 percent quartz pebbles; neutral; clear wavy boundary.
- B22t—20 to 32 inches; reddish brown (5YR 5/4) gravelly sandy clay loam, reddish brown (5YR 4/4) moist; moderate coarse prismatic structure parting to moderate fine subangular blocky; very hard; firm; few fine roots; common fine pores; few thin clay films on faces of peds; about 30 percent gravel size quartz fragments; neutral; clear wavy boundary.
- IIC1ca—32 to 50 inches; pink (7.5YR 7/4) gravelly caliche, light brown (7.5YR 6/4) moist; hard, friable; about 40 percent siliceous gravel; hard crust in upper 1 inch; calcareous; moderately alkaline; diffuse wavy boundary.
- IIC2ca—50 to 65 inches; reddish yellow (5YR 6/6) coarse sand and fine gravel, yellowish red (5YR 5/6) moist; slightly hard, very friable; caliche pendants on lower side of gravel; calcareous; moderately alkaline.

The solum ranges from 28 to 40 inches in thickness. Reaction is neutral or mildly alkaline throughout. Clay content of the upper 20 inches of the argillic horizon ranges from 25 to 35 percent and may exceed 35 percent below a depth of 20 inches. Secondary carbonates are within 36 inches.

The A horizon is 3 to 7 inches thick. It is reddish brown, brown, yellowish brown, or dark yellowish brown.

The B21t horizon is brown, dark brown, reddish brown, or red. The B22t horizon is reddish brown or red. The fine earth fraction is sandy clay loam, clay loam, or sandy clay. Gravel content ranges from 15 to 35 percent.

The Cca horizon is reddish yellow, pink, or brownish yellow. It is very gravelly sand, stratified gravelly sandy clay loam, coarse sand, or gravelly pink caliche. Some pedons are underlain by shale, sandstone, conglomerate, gravel, or alluvial sand.

### Roughcreek series

The Roughcreek series consists of shallow, well drained, very stony soils on uplands. These soils formed in calcareous stony and clayey residuum from dolomitic limestone. Slopes range from 5 to 10 percent.

A typical pedon in an area of Roughcreek very stony clay loam, gently rolling; from the intersection of U.S. Highway 190 and Texas Highway 16 in San Saba, 2.0

miles west on U.S. Highway 190, 1.4 miles south and 50 feet east in rangeland, about 0.4 mile south-southwest of a stock tank:

A1—0 to 7 inches; brown (7.5YR 4/2) very stony clay loam, dark brown (7.5YR 3/2) moist; weak fine subangular blocky structure parting to moderate fine granular; very hard, firm; many fine roots; few chert pebbles; limestone boulders 1 foot to 3 feet thick and 1 foot to 20 feet across the long axis cover about 50 percent of the surface and occupy about 45 percent of the soil; neutral; clear smooth boundary.

B2t—7 to 18 inches; reddish brown (5YR 4/4) very stony clay, dark reddish brown (5YR 3/4) moist; moderate fine and medium blocky structure; very hard, very firm; few fine roots; few fine pores; continuous very thin clay films on faces of pedis; few vertical streaks of darker soil from above; about 60 percent by volume of limestone boulders and flags; neutral; abrupt wavy boundary.

R—18 to 24 inches; gray, coarsely fractured indurated dolomitic limestone; a few soil fines in interstices.

Thickness of the solum and depth to bedrock range from 10 to 20 inches. The solum contains 35 to 80 percent by volume coarse fragments. Coarse fragments are dominantly limestone, but some pedons contain chert gravel and cobbles. Fragments more than 3 inches in diameter comprise 25 to 70 percent of the soil. They are 1 foot to 4 feet thick, 1 foot to 25 feet across, and are tilted 1 degree to 45 degrees from the horizontal. Fragments less than 3 inches in diameter comprise from 10 to 20 percent of the volume. Reaction ranges from slightly acid to mildly alkaline. Moist value and chroma of 3 or less extend to a depth of 7 inches or more.

The A horizon ranges from 4 to 10 inches in thickness. It is dark grayish brown, very dark grayish brown, brown, dark reddish gray, or dark reddish brown. The B2t horizon ranges from 6 to 15 inches in thickness. It is reddish brown, red, or brown.

The R horizon is dolomitic limestone with a hardness of 4 to 5 on the Mohs' scale.

### Rowena series

The Rowena series consists of deep, well drained, gently sloping, loamy soils on uplands. These soils formed in calcareous, clayey old alluvium of outwash plains origin. Slopes range from 1 to 3 percent (fig. 19).

A typical pedon in an area of Rowena clay loam, 1 to 3 percent slopes; from intersection of U.S. Highway 190 and Farm Road 45 in Richland Springs, 6.0 miles north on Farm Road 45 to intersection with Farm Road 502, 10.1 miles west on Farm Road 502, and 0.2 mile south in a cultivated field:

Ap—0 to 7 inches; dark brown (7.5YR 4/2) clay loam, dark brown (7.5YR 3/2) moist; weak granular

structure; hard, friable; common fine roots; calcareous; moderately alkaline; abrupt smooth boundary.

B21—7 to 24 inches; dark brown (7.5YR 4/2) clay, dark brown (7.5YR 3/2) moist; moderate fine and medium blocky structure; very hard, firm; few fine roots; few fine pores; shiny pressure faces in lower part; few concretions of calcium carbonate as much as 3 millimeters in diameter; calcareous; moderately alkaline; gradual wavy boundary.

B22—24 to 34 inches; brown (7.5YR 5/2) clay, dark brown (7.5YR 4/2) moist; organic stains of dark brown (7.5YR 3/2) on some pedis; moderate fine and medium blocky structure; very hard, firm; few fine roots; common fine pores; shiny pressure faces; few soft masses and concretions of calcium carbonate; calcareous; moderately alkaline; gradual wavy boundary.

C1ca—34 to 48 inches; pink (7.5YR 8/4) clay, pink (7.5YR 7/4) moist; massive; hard; firm; about 20 percent by volume soft masses and concretions of calcium carbonate; moderately alkaline; gradual wavy boundary.

C2ca—48 to 65 inches; yellowish red (5YR 5/6) clay; yellowish red (5YR 4/6) moist; massive; hard; firm; about 10 percent by volume soft masses and concretions of calcium carbonate; moderately alkaline.

The solum ranges from 22 to 48 inches in thickness. When dry, cracks 1 centimeter to 3 centimeters wide extend from the surface to a depth of 20 to 30 inches. Clay content of the control section ranges from 35 to 50 percent. The solum is moderately alkaline and calcareous throughout.

The A horizon ranges from 5 to 10 inches in thickness. It is dark grayish brown, very dark grayish brown, or dark brown.

The B21 horizon is dark grayish brown, very dark grayish brown, or dark brown. The B22 horizon is brown, grayish brown, dark brown, or reddish brown.

The Cca horizon is clay, clay loam, or silty clay loam. It is pink, light reddish brown, light brown, reddish yellow, or yellowish red.

### Rumple series

The Rumple series consists of moderately deep, well drained, loamy, cherty soils on uplands. These soils formed in calcareous, cherty, and clayey residuum weathered from limestone and chert. Slopes range from 1 to 30 percent.

A typical pedon in an area of Rumple cherty clay loam, undulating; from the intersection of U.S. Highway 190 and Farm Road 45 in Richland Springs, 1.2 miles west on U.S. Highway 190 to intersection with county road, 13.5 miles south on county road, 0.9 mile west from stock pens to large live oak tree, and 0.1 mile south in rangeland:

- A1—0 to 6 inches; brown (7.5YR 4/2) cherty clay loam, dark brown (7.5YR 3/2) moist; moderate very fine subangular blocky structure; very hard, firm; many fine roots; about 25 percent angular and subrounded chert gravel mostly 1/4 to 1 inch in diameter; neutral; clear smooth boundary.
- B21t—6 to 11 inches; dark reddish gray (5YR 4/2) cherty clay loam, dark reddish brown (5YR 3/2) moist; moderate fine subangular blocky structure; very hard, firm; common fine roots; few thin clay films on faces of peds; about 15 percent angular and subrounded chert gravel less than 2 inches in diameter; neutral; clear wavy boundary.
- B22t—11 to 27 inches; reddish brown (2.5YR 4/4) very cherty clay, dark reddish brown (2.5YR 3/4) moist; moderate fine and very fine angular blocky structure; very hard, firm; few fine roots; clay films on faces of peds; about 65 percent angular and subrounded chert gravel 1/4 inch to 3 inches in diameter; few small cobbles; neutral; abrupt wavy boundary.
- R—27 to 40 inches; light gray indurated limestone, coarsely fractured; red clay in crevices.

Thickness of the solum and depth to limestone range from 20 to 40 inches. Chert fragments that are mainly less than 3 inches in diameter range from 15 to 35 percent in the A horizon and upper part of the B horizon. Coarse fragments in the Bt horizon range from 35 to 85 percent and consist of angular and subrounded chert and limestone. Chert cobbles on the surface range from 5 to about 50 percent. Reaction ranges from slightly acid to mildly alkaline throughout. The mollic epipedon ranges from 7 to 18 inches in thickness. Clay content of the Bt horizon ranges from 40 to 55 percent.

The A1 horizon ranges from 4 to 10 inches in thickness. It is brown, dark brown, reddish brown, dark reddish gray, dark reddish brown, or dark grayish brown.

The B21t horizon is dark reddish gray, reddish brown, dark reddish brown, weak red, or red.

### Sagerton series

The Sagerton series consists of deep, well drained, nearly level to gently sloping, loamy soils on uplands. These soils formed in calcareous, clayey sediments on upland plains and high terraces. Slopes range from 0 to 3 percent.

A typical pedon in an area of Sagerton clay loam, 0 to 1 percent slopes; from Algerita store on U.S. Highway 190, 0.3 mile east, and 0.2 mile north in cultivated field:

- Ap—0 to 6 inches; brown (7.5YR 4/2) clay loam, dark brown (7.5YR 3/2) moist; weak fine granular structure; slightly hard, friable; few fine roots; few fine quartz pebbles; neutral; abrupt smooth boundary.
- B21t—6 to 14 inches; brown (7.5YR 4/2) clay, dark brown (7.5YR 3/2) moist; moderate fine blocky

structure; very hard, firm; few fine roots; few fine pores; thin continuous clay films on faces of peds; few rounded quartz pebbles; mildly alkaline; gradual smooth boundary.

- B22t—14 to 24 inches; reddish brown (5YR 4/4) clay, dark reddish brown (5YR 3/4) moist; moderate medium blocky structure; very hard, very firm; few fine roots; few fine pores; thin continuous clay films on faces of peds; few very fine concretions of calcium carbonate in lower 3 inches; mildly alkaline; gradual smooth boundary.

- B23t—24 to 40 inches; reddish brown (5YR 4/4) clay, dark reddish brown (5YR 3/4) moist; moderate medium blocky structure; very hard, very firm; few clay films on faces of peds; few films and threads and very fine concretions of calcium carbonate; calcareous; moderately alkaline; gradual smooth boundary.

- B24tca—40 to 58 inches; reddish yellow (7.5YR 6/6) clay loam, strong brown (7.5YR 5/6) moist; moderate fine and very fine blocky structure; hard, firm; few clay films on faces of peds; about 30 percent by volume very fine to medium soft masses and concretions of calcium carbonate; calcareous; moderately alkaline; clear smooth boundary.

- B25tca—58 to 80 inches; reddish yellow (7.5YR 6/6) clay loam, strong brown (7.5YR 5/6) moist; moderate very fine blocky and subangular blocky structure; hard, friable; few clay films on faces of peds; contains about 5 percent very fine concretions of calcium carbonate; calcareous; moderately alkaline.

The solum ranges from 60 to more than 80 inches in thickness. Secondary carbonates are at a depth of 20 to 28 inches. The calcic horizon is at a depth of 30 to 60 inches. The Bt horizon is clay or clay loam throughout. Clay content in the upper 20 inches ranges from 35 to 45 percent.

The A horizon ranges from 5 to 8 inches in thickness. Reaction is neutral or mildly alkaline. This horizon is brown, dark brown, grayish brown, dark grayish brown, reddish brown, reddish gray, or dark reddish gray.

The Bt horizon is clay or clay loam throughout. The B21t horizon is brown, dark brown, dark grayish brown, reddish brown, or dark reddish gray. The B22t and B23t horizons are reddish brown, brown, reddish yellow, or yellowish red.

The B24tca horizon is reddish yellow, strong brown, yellowish red, or light reddish brown. Content of calcium carbonate ranges from 20 to about 40 percent. The lower part of the Btca horizon is similar in color, but it has lower amounts of carbonates.

### Shep series

The Shep series consists of moderately deep, well drained, gently sloping to moderately steep, loamy soils

on uplands. These soils formed in calcareous, loamy old alluvium. They are on fringe areas of old alluvial plains and beveled edges of terraces along major streams draining limestone prairies. Slopes range from 5 to 16 percent.

A typical pedon of Shep loam in an area of Nuvalde-Shep complex, 1 to 5 percent slopes; from intersection of Farm Road 45 and Old Brady Highway in Richland Springs, 1.15 miles east on Old Brady Highway, 0.25 mile north on a pasture trail, and 50 feet east in rangeland:

A1—0 to 8 inches; grayish brown (10YR 5/2) loam, dark grayish brown (10YR 4/2) moist; moderate very fine subangular blocky and granular structure; hard, friable; common fine roots; common fine and medium pores; many worm casts; few siliceous and limestone pebbles as much as 5 centimeters in diameter; calcareous; moderately alkaline; gradual wavy boundary.

B2—8 to 32 inches; brown (10YR 5/3) loam, brown (10YR 4/3) moist; moderate fine subangular blocky structure; hard, friable; common fine roots; many fine and medium pores; many worm casts; few siliceous and limestone pebbles as much as 5 centimeters in diameter; common films and threads and a few very fine soft masses of calcium carbonate; calcareous; moderately alkaline; gradual smooth boundary.

C1ca—32 to 60 inches; very pale brown (10YR 7/4) loam, light yellowish brown (10YR 6/4) moist; massive; hard, friable; common fine and medium pores; many films and threads and a few fine to coarse soft masses and concretions of calcium carbonate; calcareous; moderately alkaline.

The solum ranges from 20 to 40 inches in thickness. In some pedons, content of quartz and limestone gravel is as much as 15 percent.

The A horizon ranges from 5 to 15 inches in thickness. It is brown, pale brown, light yellowish brown, yellowish brown, dark yellowish brown, grayish brown, or light brown.

The B2 horizon is brown, pale brown, light yellowish brown, light brown, yellowish brown, or reddish yellow. Clay content ranges from 18 to 35 percent. Texture is loam, clay loam, or sandy clay loam.

The Cca horizon is very pale brown, light yellowish brown, reddish yellow, or light brown. Texture is loam, fine sandy loam, sandy clay loam, or clay loam.

### Smithwick series

The Smithwick series consists of moderately deep, well drained, clayey soils on uplands. These soils formed in calcareous, clayey material from shales of the Pennsylvanian System. Slopes range from 10 to 45 percent.

A typical pedon in an area of Smithwick clay, hilly; from intersection of U.S. Highway 190 and Texas Highway 16 in San Saba, 4.5 miles west on U.S. Highway 190, 5.3 miles southwest on Farm Road 2732, 0.5 mile south on private road, 0.5 mile northwest along a trail, and 330 feet south in rangeland:

A1—0 to 5 inches; grayish brown (2.5Y 5/2) clay, dark grayish brown (2.5Y 4/2) moist; moderate very fine subangular blocky structure; hard, firm; many fine and very fine roots; about 5 percent siliceous pebbles; about 10 percent of surface covered with chert, limestone, and quartz pebbles and cobbles; calcareous; moderately alkaline; clear wavy boundary.

B21—5 to 11 inches; light brownish gray (2.5Y 6/2) clay, grayish brown (2.5Y 5/2) moist; moderate medium and coarse blocky structure parting to moderate very fine blocky; very hard, very firm; few very fine roots; few pressure faces; few siliceous pebbles; calcareous; moderately alkaline; gradual wavy boundary.

B22—11 to 21 inches; light yellowish brown (2.5Y 6/4) clay, light olive brown (2.5Y 5/4) moist; moderate fine and medium blocky structure; very hard, very firm; few very fine roots; common pressure faces; few very fine concretions of calcium carbonate; gradual wavy boundary.

B3—21 to 34 inches; light brownish gray (2.5Y 6/2) clay, light olive brown (2.5Y 5/4) moist; common medium distinct yellow mottles; pale olive (5Y 6/3) stains on faces of peds; moderate fine blocky and platy structure; very hard, very firm; few very fine roots; few concretions of calcium carbonate; calcareous; moderately alkaline; gradual smooth boundary.

Cr—34 to 65 inches; olive gray (5Y 5/2) shale, olive gray (5Y 4/2) moist; neutral.

The solum ranges from 24 to 40 inches in thickness. When dry, these soils have cracks 1 centimeter to 3.5 centimeters wide that extend from the surface to a depth of more than 20 inches. Clay content of the control section ranges from 60 to 80 percent. Siliceous pebbles and cobbles cover as much as 15 percent of the surface. Siliceous pebbles make up more than 50 percent of the coarse fragments.

The A horizon is dark grayish brown, grayish brown, light yellowish brown, light olive brown, olive brown, dark brown, yellowish brown, or dark yellowish brown. Clay content ranges from 55 to 75 percent.

The B2 and B3 horizons are light brownish gray, grayish brown, light yellowish brown, pale olive, olive gray, light olive brown, light olive gray, olive, or pale yellow. Some pedons have a few concretions and masses of carbonates in the lower part of the B2 horizon.

The Cr horizon is weathered shale, very shaly clay, or shaly clay. It is gray, dark gray, light brownish gray, light

yellowish brown, grayish brown, light olive brown, light olive gray, pale olive, olive gray, or olive.

### Speck series

The Speck series consists of shallow, well drained, gently sloping, loamy soils on uplands. These soils formed in calcareous, loamy and clayey residuum from weathered dolomitic limestone. Slopes range from 1 to 5 percent.

A typical pedon of Speck clay loam in an area of Speck-Cho complex, 1 to 5 percent slopes; from intersection of Texas Highway 16 and Ranch Road 501 in Cherokee, 2.1 miles north on Texas Highway 16, 0.8 mile west on private road, 0.8 mile south along pasture trail that is about 500 feet southwest of windmill:

- A1—0 to 8 inches; dark grayish brown (10YR 4/2) clay loam, very dark grayish brown (10YR 3/2) moist; moderate fine and very fine subangular blocky structure; hard, firm; many fine roots; common fine pores; few limestone fragments; mildly alkaline; noncalcareous; clear wavy boundary.
- B2t—8 to 15 inches; brown (7.5YR 4/4) clay, dark brown (7.5YR 3/4) moist; moderate medium and fine blocky structure; very hard, very firm; few fine roots; few fine pores; few earthworm casts; clay films on faces of peds; few fine concretions of calcium carbonate; few fine siliceous pebbles; moderately alkaline; noncalcareous; abrupt wavy boundary.
- R—15 to 18 inches; limestone bedrock; fractured; hardness of more than 3 on Mohs' scale; few coatings of calcium carbonate in fractures.

Depth to limestone bedrock ranges from 14 to 20 inches. Reaction ranges from neutral to moderately alkaline. The mollic epipedon is 7 inches or more thick and, in some pedons extends to bedrock. Coarse fragments of limestone, and chert cover as much as 15 percent of the surface and make up as much as 15 percent of the soil volume.

The A horizon is dark grayish brown, very dark grayish brown, brown, or reddish brown.

The B2t horizon is brown or reddish brown. Texture is clay loam or clay. Clay content ranges from 35 to 60 percent. Secondary carbonates are in the lower few inches in the form of concretions or coatings on limestone fragments.

The R layer is limestone bedrock or limestone conglomerate with a hardness of more than 3 on Mohs' scale. Secondary carbonates accumulate in fractures.

### Stilskin series

The Stilskin series consists of shallow, well drained, gravelly, loamy upland soils. These soils formed in calcareous, loamy and gravelly material weathered from thin-bedded calcareous sandstone. Slopes range from 12 to 40 percent.

A typical pedon of Stilskin gravelly loam, steep; 12.9 miles west of Cherokee on Ranch Road 501 and 450 feet north of pavement in rangeland:

- A1—0 to 6 inches; grayish brown (10YR 5/2) gravelly loam, dark grayish brown (10YR 4/2) moist; moderate fine and very fine subangular blocky structure; hard, friable; many fine roots; many fine pores; few worm casts; about 20 percent platy sandstone fragments 0.5 centimeter to 2 centimeters thick and 1 centimeter to 15 centimeters across; few limestone fragments; about 75 percent surface covering of sandstone and limestone fragments that are as much as 7 centimeters across; moderately alkaline; clear wavy boundary.
- B2ca—6 to 17 inches; light yellowish brown (10YR 6/4) very gravelly loam, yellowish brown (10YR 5/4) moist; moderate fine and very fine subangular blocky structure; hard, friable; few fine roots; common fine and medium pores; few worm casts; about 55 percent platy sandstone fragments 0.5 centimeter to 3 centimeters thick and 1 centimeter to 15 centimeters across; common films, threads, and soft masses of calcium carbonate; about 48 percent calcium carbonate equivalent; moderately alkaline; clear wavy boundary.
- Cr—17 to 30 inches; light yellowish brown (10YR 6/4) weakly cemented, platy, calcareous sandstone; plates are 1 centimeter to 5 centimeters thick and 5 to 15 centimeters across; about 5 percent calcareous fine earth with films and threads of calcium carbonate between plates.

The solum and depth to sandstone range from 12 to 20 inches in thickness. The calcium carbonate equivalent is more than 40 percent below a depth of 4 to 8 inches.

The A horizon ranges from 4 to 9 inches in thickness. It is brown, yellowish brown, pale brown, light brown, pinkish gray, grayish brown, or light brownish gray. Sandstone and limestone fragments cover 35 to 85 percent of the surface.

The B2ca horizon is very pale brown, pale brown, light yellowish brown, pink, reddish yellow, yellow, or pale yellow. Texture of the fine earth fraction is fine sandy loam, loam, or silt loam. Films and threads of calcium carbonate are common to many. Platy sandstone fragments 0.5 centimeter to 10 centimeters thick and 1 centimeter to 15 centimeters across comprise 35 to 85 percent by volume.

The Cr horizon is light yellowish brown, very pale brown, pink, reddish yellow, pale yellow, or yellow.

### Tarpley series

The Tarpley series consists of shallow, well drained, nearly level to gently sloping, loamy soils on uplands. These soils formed in residuum from weathered limestone. Slopes range from 1 to 3 percent.

A typical pedon in an area of Tarpley clay loam, 1 to 3 percent slopes; from the intersection of U.S. Highway 190 and Farm Road 45 in Richland Springs, 6.7 miles west on U.S. Highway 190, 1.7 miles north on Farm Road 2997; 0.6 mile east on county road, and 600 feet south in rangeland:

- A1—0 to 7 inches; dark reddish gray (5YR 4/2) clay loam, dark reddish brown (5YR 3/2) moist; moderate fine and very fine subangular blocky and fine granular structure; very hard, firm; many fine roots; common fine pores; about 10 percent angular and subrounded chert gravel on the surface and in the soil; few cobbles on the surface; noncalcareous; neutral; clear smooth boundary.
- B2t—7 to 17 inches; reddish brown (2.5YR 4/4) clay, dark reddish brown (2.5YR 3/4) moist; moderate fine and medium blocky structure; extremely hard, very firm; few fine roots; few fine pores; thin continuous clay films on faces of pedis; about 10 percent chert gravel; noncalcareous; mildly alkaline; abrupt wavy boundary.
- R—17 to 20 inches; gray, indurated, fractured, limestone bedrock.

The solum and depth to limestone bedrock range from 14 to 20 inches. Coarse fragments of chert and limestone gravels and cobbles range from a few to about 20 percent on the surface and in the soil. When dry, this soil has vertical cracks 1 centimeter to 2 centimeters wide that extend to bedrock. The mollic epipedon is 7 inches or more thick.

The A horizon ranges from 5 to 8 inches in thickness. It is very dark grayish brown, dark brown, or dark reddish gray. Reaction ranges from slightly acid to mildly alkaline.

The B2t horizon is dark brown, reddish brown, dark reddish brown, or dark reddish gray. Reaction is neutral or mildly alkaline. The R layer is several feet thick.

### Throck series

The Throck series consists of moderately deep, well drained, sloping to steep, clayey soils on uplands. These soils formed in calcareous, clayey residuum from weathered shale. Slopes range from 5 to 25 percent.

A typical pedon of Throck clay in an area of Nocken-Callahan-Throck association, hilly; from intersection of Texas Highway 16 and U.S. Highway 190 in San Saba, 10.2 miles north on Texas Highway 16, 0.6 mile east-northeast, 0.5 mile south, and 525 feet west in rangeland:

- A1—0 to 4 inches; brown (10YR 5/3) clay, dark brown (10YR 4/3) moist; moderate very fine subangular blocky structure; hard, firm; many fine roots; common earthworm casts and pores; calcareous; moderately alkaline; clear wavy boundary.

B21—4 to 14 inches; brown (10YR 5/3) clay, dark brown (10YR 4/3) moist; moderate fine and medium blocky structure; very hard, firm; common fine roots; common pores; few pressure faces; few concretions of calcium carbonate; calcareous; moderately alkaline; clear wavy boundary.

B22ca—14 to 28 inches; light yellowish brown (10YR 6/4) clay, yellowish brown (10YR 5/4) moist; moderate fine and medium blocky structure; extremely hard, very firm; few roots; shiny pressure faces; about 10 percent by volume concretions of calcium carbonate; calcareous; moderately alkaline; clear wavy boundary.

Cr—28 to 50 inches; light olive brown (2.5Y 5/4) shaly clay, olive brown (2.5Y 4/4) moist; massive; hard, firm; few gray, weathered shale fragments; common concretions and soft masses of calcium carbonate; calcareous; moderately alkaline.

The solum ranges from 20 to 40 inches in thickness. Clay content ranges from 35 to 45 percent.

The A1 horizon is 3 to 8 inches thick. It is dark brown, grayish brown, brown, or yellowish brown.

The B21 horizon is clay or silty clay. It is brown, yellowish brown, light yellowish brown, or light brownish gray. The B22ca horizon is light yellowish brown, brown, light olive brown, or olive yellow. Content of calcium carbonates, mostly in the form of concretions and soft masses, ranges from 15 to about 30 percent.

The Cr horizon is shaly clay or weathered shale. It is light brownish gray, light gray, light yellowish brown, light olive brown, olive yellow, olive gray, light olive gray, or pale olive. Content of calcium carbonates in the Cr horizon ranges from less than 5 percent to about 10 percent.

### Weswood series

The Weswood series consists of deep, well drained, nearly level to gently sloping, loamy soils on bottom lands. These soils are in the flood plain of the Colorado River. They formed in calcareous, loamy sediments of Rolling Plains origin. Slopes range from 0 to 3 percent.

A typical pedon in an area of Weswood silt loam, 12.9 miles north on Farm Road 45 from U.S. Highway 190 in Richland Springs and 260 feet west in cultivated field:

Ap—0 to 8 inches; reddish brown (5YR 4/4) silt loam, dark reddish brown (5YR 3/4) moist; weak fine granular structure; slightly hard, friable; many fine roots; common fine pores; calcareous; moderately alkaline; abrupt smooth boundary.

B21—8 to 18 inches; reddish brown (5YR 4/4) silt loam, dark reddish brown (5YR 3/4) moist; weak medium granular and subangular blocky structure; slightly hard, friable; common fine roots; many fine pores; few films and threads of calcium carbonate; calcareous; moderately alkaline; clear smooth boundary.

B22—18 to 32 inches; reddish brown (5YR 5/4) silt loam, reddish brown (5YR 4/4) moist; weak medium subangular blocky structure; slightly hard, friable; few fine roots; many fine pores; common films and threads of calcium carbonate; calcareous; moderately alkaline; clear smooth boundary.

B23—32 to 50 inches; reddish brown (5YR 5/4) silt loam, reddish brown (5YR 4/4) moist; weak fine subangular blocky structure; slightly hard, friable; few fine roots; many fine pores; common films and threads of calcium carbonate; remnants of thin bedding planes altered by earthworm activity; calcareous; moderately alkaline; gradual smooth boundary.

C—50 to 80 inches; yellowish red (5YR 5/6) silt loam, yellowish red (5YR 4/6) moist; massive; slightly hard, friable; common thin stratifications of very fine sandy loam and silty clay loam breaking to weak platy fragments; calcareous; moderately alkaline.

The solum ranges from 30 to 50 inches in thickness. The 10- to 40-inch control section is clay loam, silt loam, or silty clay loam. Clay content ranges from 20 to 35 percent. Thin stratifications of various textures are common below a depth of 20 inches.

The A1 horizon ranges from 6 to 12 inches in thickness. It is reddish brown or brown. The A horizon is less than 10 inches thick if value and chroma is less than 3.5.

The B2 horizon is mainly layers of silt loam or silty clay loam but range to clay loam. It is reddish brown or brown.

The C horizon is stratified with various combinations of loam, silt loam, silty clay loam, clay loam, or fine sandy loam. It is yellowish red, reddish yellow, strong brown, or reddish brown.

### Winters series

The Winters series consists of deep, well drained, nearly level to gently sloping, loamy soils on uplands. These soils formed in calcareous, loamy and clayey sediments on alluvial plains and high terraces. Slopes range from 0 to 3 percent.

A representative pedon of Winters fine sandy loam, 1 to 3 percent slopes; from intersection of Texas Highway 16 and U.S Highway 190 in San Saba, 9.9 miles north on Texas Highway 16, 0.7 mile east on county road, and 800 feet east from field fence:

A1—0 to 7 inches; brown (7.5YR 5/4) fine sandy loam, light brown (7.5YR 6/4) moist; weak granular structure; slightly hard, friable; many fine roots; neutral; clear smooth boundary.

B21t—7 to 16 inches; reddish brown (5YR 4/4) sandy clay, dark reddish brown (5YR 3/4) moist; moderate medium and coarse blocky structure; very hard, firm; few fine roots; few pores; few thin clay films on faces of peds; neutral; clear smooth boundary.

B22t—16 to 36 inches; reddish brown (5YR 5/4) sandy clay, reddish brown (5YR 4/4) moist; moderate medium blocky structure; very hard, very firm; few fine roots; thin clay films on faces of peds; neutral; gradual smooth boundary.

B23t—36 to 58 inches; yellowish red (5YR 5/6) sandy clay, yellowish red (5YR 4/6) moist; moderate medium blocky structure; very hard, very firm; few fine roots; thin clay film on faces of peds; few concretions of calcium carbonate below 40 inches; matrix is noncalcareous; mildly alkaline; clear wavy boundary.

B24tca—58 to 72 inches; yellowish red (5YR 5/6) sandy clay loam, yellowish red (5YR 4/6) moist; moderate fine and medium blocky structure parting to subangular blocky; hard, firm; contains about 15 percent fine soft masses and concretions of calcium carbonate; few thin clay films on faces of peds; calcareous; moderately alkaline; gradual wavy boundary.

B25t—72 to 80 inches; reddish yellow (5YR 6/6) sandy clay loam; yellowish red (5YR 5/6) moist; moderate fine blocky structure; hard, firm; about 5 percent is soft masses and concretions of calcium carbonate; few thin clay films on faces of peds; calcareous; moderately alkaline.

The solum is more than 60 inches thick. Depth to calcareous material ranges from 30 to 50 inches, and depth to a calcic horizon is more than 40 inches. Reaction of the A horizon ranges from slightly acid to mildly alkaline. Reaction of the B2t horizon ranges from neutral to moderately alkaline.

The A horizon is brown or reddish brown. The B2t horizon is reddish brown, red, yellowish red, reddish yellow, or light reddish brown. It is sandy clay, sandy clay loam, clay loam, or clay. Clay content ranges from 35 to 45 percent. Content of calcium carbonate in the B2tca horizon ranges from 10 to 35 percent.

### Yahola series

The Yahola series consists of deep, well drained, loamy soils on flood plains bordered by deeply cut channels. Permeability is moderately rapid. These soils formed in loamy, calcareous alluvial deposits of Rolling Plains origin. Slopes range from 0 to 2 percent (fig. 24).

A typical pedon in an area of Yahola soils, frequently flooded; from intersection of Texas Highway 16 and U.S. Highway 190 in San Saba, 11.8 miles north on Texas Highway 16, 0.2 mile east, 0.4 mile north, and 0.2 mile northwest on private road, and 30 feet west in rangeland:

A1—0 to 10 inches; reddish brown (5YR 4/4) fine sandy loam, dark reddish brown (5YR 3/4) moist; weak fine granular structure; slightly hard, very friable; common fine roots; many medium pores;

calcareous; moderately alkaline; gradual smooth boundary.

- C1—10 to 30 inches; yellowish red (5YR 5/6) fine sandy loam, yellowish red (5YR 4/6) moist; massive; slightly hard, very friable; common thin strata of silt loam and fine sand; few fine roots; many fine pores; calcareous; moderately alkaline; gradual smooth boundary.
- C2—30 to 56 inches; brown (7.5YR 5/4) loamy fine sand, dark brown (7.5YR 4/4) moist; single grained; soft, very friable; common thin strata of fine sandy loam and silt loam; calcareous; moderately alkaline; gradual smooth boundary.
- C3—56 to 65 inches; yellowish red (5YR 5/6) loam, yellowish red (5YR 4/6) moist; single grained; slightly hard, very friable; common thin strata of silt loam and loamy fine sand; calcareous; moderately alkaline.

The A horizon ranges from 6 to 20 inches in thickness. It is brown, dark brown, light brown, light reddish brown, or reddish brown. Texture is loam, fine sandy loam, clay loam, silty clay loam, and loamy fine sand.

The C horizon is yellowish red, reddish yellow, light brown, pink, brown, reddish brown, or light reddish brown. Texture is loam or fine sandy loam. Clay content of the 10- to 40-inch section ranges from 5 to 18 percent. Below a depth of 40 inches is fine sandy loam, loam, or loamy fine sand.

### Yates series

The Yates series consists of very shallow to shallow, well drained, gently sloping to steep, stony soils on uplands. These soils formed in noncalcareous loamy material over hard siliceous limestone. Slopes are 1 to 40 percent.

A typical pedon in an area of Yates very stony loam, undulating; 14.4 miles west on Ranch Road 501 from Cherokee, 2.3 miles south on Old Pontotoc Road, 0.4 mile east, and 0.6 mile northeast in rangeland:

- A1—0 to 6 inches; reddish brown (5YR 4/4) very stony loam, dark reddish brown (5YR 3/4) moist; weak fine granular structure; hard, friable; few fine roots; few fine pores; estimated 45 percent by volume of flat limestone fragments 3 inches to 3 feet across the long axis and 20 percent of volume is fragments less than 3 inches in diameter; neutral; abrupt smooth boundary.
- R—6 to 12 inches; indurated, coarsely fractured limestone.

Thickness of the solum and depth to limestone ranges from 4 to 14 inches. Flat-lying limestone flags and gravel and cobble size fragments comprise 35 to 80 percent of the soil by volume and cover 10 to 75 percent of the surface. The soil is reddish brown, brown, strong brown, yellowish red, or red. Reaction ranges from neutral to moderately alkaline.

The R horizon is indurated, coarsely fractured limestone.



# formation of the soils

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In this section the factors of soil formation are discussed and related to the soils in the survey area. The characteristics of the soil at any given point are determined by the physical and mineral composition of the parent material; the climate under which the parent material accumulated and has existed since accumulation; the plant and animal life on and in the soil; the relief, or lay of the land; and the length of time the forces of soil formation have acted on the soil material. All five of these factors influence the present characteristics of every soil, but the significance of each factor varies from one place to another. In one area one factor may dominate the formation of a soil, and in another area a different factor may be more important.

The interrelationship among these five factors is complex, and the effects of any one factor cannot be isolated and completely evaluated. Each factor is discussed separately as well as the probable effects of each.

## climate

This survey area has a subhumid, temperate, continental climate. This type of climate has promoted moderately rapid soil development. The climate is uniform throughout the survey area, although its effect has been modified locally by relief and runoff.

## living organisms

Plants, micro-organisms, earthworms, and other forms of animal life are important in the formation of soils. Grasses, trees, and brush have affected soil formation in the survey area more than other living organisms. Soils that generally are low in organic matter, such as Desan and Demona soils, formed under a hardwood type of woody vegetation. Soils that generally are high in organic matter, such as Leeray, Nuvalde, and Sagerton soils, formed under grasses.

## parent material

Parent material is the unconsolidated soil material from which soil is formed. It determines the limits of the chemical and mineralogical composition of the soil. In San Saba County, the soils formed in material from four different geological systems. These are the Pennsylvanian, Ordovician, Cambrian, and Quarternary, and Permian systems (3, 8).

Pennsylvanian materials are mainly alternating layers of sandstone and shale of the Strawn Group. An area of minor extent consists of limestone and shale of the Marble Falls Series. The Pennsylvanian System covers about the northern half of the county. A few outlying areas are in the southeastern part of the county. The Bonti and Nocken soils formed in material weathered from acid sandstone, and the Callahan and Throck soils formed in material weathered from shale. Roughcreek soils formed in material weathered from limestone, and Smithwick soils formed in material weathered from shale of the Marble Falls Series.

The Ordovician System consists of coarsely fractured dolomitic limestone, some of which has a surface covering of chert. The limestone covers most of the southern half of the county. Roughcreek and Eckrant soils formed in material weathered from limestone, and Rumble soils formed in material weathered from chert and limestone.

The Cambrian System mainly consists of limestone, sandstone, and schist which outcrop in the southern extremity of the county. Yates soils formed in material weathered from coarsely fractured limestone. Pontotoc soils developed in material weathered from reddish sandstone. The Katemcy and Ligon soils formed over schist.

Loamy and clayey materials of Quarternary Age were deposited in valleys, on high terraces, and on upland plains. Soils that formed in these sediments are Leeray, Sagerton, Nuvalde, Winters, Mereta, Cho, and Rowena soils.

The parent material of soils in the flood plain of the Colorado River is from sediments that are mainly of the Permian Redbeds further to the west and northwest. These soils are Weswood, Clairemont, Yahola, and Miller soils. Frio soils along the San Saba River developed in sediments from limestone prairies.

## topography

Topography, or relief, affects soil formation through its influence on drainage, runoff, erosion, plant cover, and soil temperature. The topography of San Saba County ranges from nearly level plains to broad, dissected interstream divides with sloping to steep soils. Soils that formed in gently sloping areas, such as Demona and Pedernales soils, are deeper and have more distinct horizons than soils that formed on hillsides and ridges,

such as Smithwick and Throck soils. The soils in lower positions on the landscape are deeper and have more distinct horizons because they receive extra water, have less runoff, and are subject to less erosion.

### **time**

Generally, a long time is required for the formation of soils that have distinct horizons. The differences in length of time that parent material has been in place, therefore, are commonly reflective in the degree of development of the soil profile.

The soils in the survey area range from young to mature. The young soils have very little profile development, and the mature soils have well expressed horizons. Clairemont soils on flood plains are an example of young soils that have little development. Except for a slight accumulation of organic matter and darkening of their surface layer, Clairemont soils retain most of the characteristics of their loamy parent material. Pedernales soils on uplands are an example of mature soils that have well developed horizons. They have developed a distinct surface layer and subsoil that bear little resemblance to the original parent material.

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# glossary

**Aeration, soil.** The exchange of air in soil with air from the atmosphere. The air in a well aerated soil is similar to that in the atmosphere; the air in a poorly aerated soil is considerably higher in carbon dioxide and lower in oxygen.

**Aggregate, soil.** Many fine particles held in a single mass or cluster. Natural soil aggregates, such as granules, blocks, or prisms, are called peds. Clods are aggregates produced by tillage or logging.

**Alluvium.** Material, such as sand, silt, or clay, deposited on land by streams.

**Association, soil.** A group of soils 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—

	<i>Inches</i>
Very low.....	0 to 3
Low.....	3 to 6
Moderate.....	6 to 9
High.....	9 to 12
Very high.....	More than 12

**Base saturation.** The degree to which material having cation exchange properties is saturated with exchangeable bases (sum of Ca, Mg, Na, K), expressed as a percentage of the total cation exchange capacity.

**Bedding planes.** Fine stratifications, less than 5 millimeters thick, in unconsolidated alluvial, eolian, lacustrine, or marine sediments.

**Bedrock.** The solid rock that underlies the soil and other unconsolidated material or that is exposed at the surface.

**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.

**Bottom land.** The normal flood plain of a stream, subject to flooding.

**Boulders.** Rock fragments larger than 2 feet (60 centimeters) in diameter.

**Calcareous soil.** A soil containing enough calcium carbonate (commonly combined with magnesium carbonate) to effervesce visibly when treated with cold, dilute hydrochloric acid.

**Caliche.** A more or less cemented deposit of calcium carbonate in soils of warm-temperate, subhumid to arid areas. Caliche occurs as soft, thin layers in the soil or as hard, thick beds just beneath the solum, or it is exposed at the surface by erosion.

**Cation.** An ion carrying a positive charge of electricity. The common soil cations are calcium, potassium, magnesium, sodium, and hydrogen.

**Cation-exchange capacity.** The total amount of exchangeable cations that can be held by the soil, expressed in terms of milliequivalents per 100 grams of soil at neutrality (pH 7.0) or at some other stated pH value. The term, as applied to soils, is synonymous with base-exchange capacity, but is more precise in meaning.

**Cement rock.** Shaly limestone used in the manufacture of cement.

**Clay.** As a soil separate, the mineral soil particles less than 0.002 millimeter in diameter. As a soil textural class, soil material that is 40 percent or more clay, less than 45 percent sand, and less than 40 percent silt.

**Clay film.** A thin coating of oriented clay on the surface of a soil aggregate or lining pores or root channels. Synonyms: clay coating, clay skin.

**Climax vegetation.** The stabilized plant community on a particular site. The plant cover reproduces itself and does not change so long as the environment remains the same.

**Coarse fragments.** If round, mineral or rock particles 2 millimeters to 25 centimeters (10 inches) in diameter; if flat, mineral or rock particles (flagstone) 15.2 to 38.1 centimeters (6 to 15 inches) long.

**Coarse textured soil.** Sand or loamy sand.

**Cobblestone (or cobble).** A rounded or partly rounded fragment of rock 3 to 10 inches (7.5 to 25 centimeters) in diameter.

**Colluvium.** Soil material, rock fragments, or both moved by creep, slide, or local wash and deposited at the base of steep slopes.

**Complex slope.** Irregular or variable slope. Planning or constructing terraces, diversions, and other water-control measures on a complex slope is difficult.

**Complex, soil.** A map unit of two or more kinds of soil 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 are somewhat similar in all areas.

**Concretions.** Grains, pellets, or nodules of various sizes, shapes, and colors consisting of concentrated compounds or cemented soil grains. The composition of most concretions is unlike that of the surrounding soil. Calcium carbonate and iron oxide are common compounds in concretions.

**Consistence, soil.** The feel of the soil and the ease with which a lump can be crushed by the fingers. Terms commonly used to describe consistence are—

*Loose.*—Noncoherent when dry or moist; does not hold together in a mass.

*Friable.*—When moist, crushes easily under gentle pressure between thumb and forefinger and can be pressed together into a lump.

*Firm.*—When moist, crushes under moderate pressure between thumb and forefinger, but resistance is distinctly noticeable.

*Plastic.*—When wet, readily deformed by moderate pressure but can be pressed into a lump; will form a “wire” when rolled between thumb and forefinger.

*Sticky.*—When wet, adheres to other material and tends to stretch somewhat and pull apart rather than to pull free from other material.

*Hard.*—When dry, moderately resistant to pressure; can be broken with difficulty between thumb and forefinger.

*Soft.*—When dry, breaks into powder or individual grains under very slight pressure.

*Cemented.*—Hard; little affected by moistening.

**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.

**Corrosive.** High risk of corrosion to uncoated steel or deterioration of concrete.

**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 arresting grazing for a prescribed period.

**Depth to rock** (in tables). Bedrock is too near the surface for the specified use.

**Diversion (or diversion terrace).** A ridge of earth, generally a terrace, built to protect downslope areas by diverting runoff from its natural course.

**Drainage class** (natural). Refers to the frequency and duration of periods of saturation or partial saturation during soil formation, as opposed to altered drainage, which is commonly the result of artificial drainage or irrigation but may be caused by the sudden deepening of channels or the blocking of drainage outlets. Seven classes of natural soil drainage are recognized:

*Excessively drained.*—Water is removed from the soil very rapidly. Excessively drained soils are commonly very coarse textured, rocky, or shallow. Some are steep. All are free of the mottling related to wetness.

*Somewhat excessively drained.*—Water is removed from the soil rapidly. Many somewhat excessively drained soils are sandy and rapidly pervious. Some are shallow. Some are so steep that much of the water they receive is lost as runoff. All are free of the mottling related to wetness.

*Well drained.*—Water is removed from the soil readily, but not rapidly. It is available to plants throughout most of the growing season, and wetness does not inhibit growth of roots for significant periods during most growing seasons. Well drained soils are commonly medium textured. They are mainly free of mottling.

*Moderately well drained.*—Water is removed from the soil somewhat slowly during some periods. Moderately well drained soils are wet for only a short time during the growing season, but periodically they are wet long enough that most mesophytic crops are affected. They commonly have a slowly pervious layer within or directly below the solum, or periodically receive high rainfall, or both.

*Somewhat poorly drained.*—Water is removed slowly enough that the soil is wet for significant periods during the growing season. Wetness markedly restricts the growth of mesophytic crops unless artificial drainage is provided. Somewhat poorly drained soils commonly have a slowly pervious layer, a high water table, additional water from seepage, nearly continuous rainfall, or a combination of these.

*Poorly drained.*—Water is removed so slowly that the soil is saturated periodically during the growing season or remains wet for long periods. Free water is commonly at or near the surface for long enough during the growing season that most mesophytic crops cannot be grown unless the soil is artificially drained. The soil is not continuously saturated in layers directly below plow depth. Poor drainage results from a high water table, a slowly pervious layer within the profile, seepage, nearly continuous rainfall, or a combination of these.

*Very poorly drained.*—Water is removed from the soil so slowly that free water remains at or on the surface during most of the growing season. Unless the soil is artificially drained, most mesophytic crops cannot be grown. Very poorly drained soils are commonly level or depressed and are frequently ponded. Yet, where rainfall is high and nearly continuous, they can have moderate or high slope gradients.

**Drainage, surface.** Runoff, or surface flow of water, from an area.

**Erosion.** The wearing away of the land surface by water, wind, ice, or other geologic agents and by such processes as gravitational creep.

*Erosion* (geologic). Erosion caused by geologic processes acting over long geologic periods and resulting in the wearing away of mountains and the building up of such landscape features as flood plains and coastal plains. Synonym: natural erosion.

*Erosion* (accelerated). Erosion much more rapid than geologic erosion, mainly as a result of the activities of man or other animals or of a catastrophe in nature, for example, fire, that exposes the surface.

**Excess fines** (in tables). Excess silt and clay in the soil. The soil does not provide a source of gravel or sand for construction purposes.

**Excess lime** (in tables). Excess carbonates in the soil that restrict the growth of some plants.

**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 oven-dry weight, after the gravitational, or free, water has drained away; the field moisture content 2 or 3 days after a soaking rain; also called *normal field capacity*, *normal moisture capacity*, or *capillary capacity*.

**Fine textured soil.** Sandy clay, silty clay, and clay.

**Flagstone.** A thin fragment of sandstone, limestone, slate, shale, or (rarely) schist, 6 to 15 inches (15 to 37.5 centimeters) long.

**Flood plain.** A nearly level alluvial plain that borders a stream and is subject to flooding unless protected artificially.

**Foot slope.** The inclined surface at the base of a hill.

**Forb.** Any herbaceous plant not a grass or a sedge.

**Genesis, soil.** The mode of origin of the soil. Refers especially to the processes or soil-forming factors responsible for the formation of the solum, or true soil; from the unconsolidated parent material.

**Gilgai.** Commonly a succession of microbasins and microknolls in nearly level areas or of microvalleys and microridges parallel with the slope. Typically, the microrelief of Vertisols—clayey soils having a high coefficient of expansion and contraction with changes in moisture content.

**Gravel.** Rounded or angular fragments of rock up to 3 inches (2 millimeters to 7.5 centimeters) in diameter. An individual piece is a pebble.

**Gully.** A miniature valley with steep sides cut by running water and through which water ordinarily runs only after rainfall. The distinction between a gully and a rill is one of depth. A gully generally is an obstacle to farm machinery and is too deep to be obliterated by ordinary tillage; a rill is of lesser depth and can be smoothed over by ordinary tillage.

**Horizon, soil.** A layer of soil, approximately parallel to the surface, having distinct characteristics produced by soil-forming processes. In the identification of soil horizons, an upper case letter represents the major horizons. Numbers or lower case letters that follow represent subdivisions of the major horizons. An explanation of the subdivisions is given in the *Soil Survey Manual*. The major horizons of mineral soil are as follows:

*O horizon.*—An organic layer of fresh and decaying plant residue at the surface of a mineral soil.

*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.

*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. The combined A and B horizons are generally called the solum, or true soil. If a soil does not have a B horizon, the A horizon alone is the solum.

*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 A or B horizon. 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, the Roman numeral II precedes the letter C.

*R layer.*—Consolidated rock beneath the soil. The rock commonly underlies a C horizon, but can be directly below an A or a B horizon.

**Hydrologic soil groups.** Refers to soils grouped according to their runoff-producing characteristics. The chief consideration is the inherent capacity of soil bare of vegetation to permit infiltration. The slope and the kind of plant cover are not considered but are separate factors in predicting runoff. Soils are assigned to four groups. In group A are soils having a high infiltration rate when thoroughly wet and having a low runoff potential. They are mainly deep, well drained, and sandy or gravelly. In group D, at the other extreme, are soils having a very slow infiltration rate and thus a high runoff potential. They have a claypan or clay layer at or near the surface, have a permanent high water table, or are shallow over nearly impervious bedrock or other material. A soil is assigned to two hydrologic groups if part of the acreage is artificially drained and part is undrained.

**Increasers.** Species in the climax vegetation that increase in amount as the more desirable plants are

- reduced by close grazing. Increases 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.
- Large stones** (in tables). Rock fragments 3 inches (7.5 centimeters) or more across. Large stones adversely affect the specified use of the soil.
- Leaching.** The removal of soluble material from soil or other material by percolating water.
- Liquid limit.** The moisture content at which the soil passes from a plastic to a liquid state.
- Loam.** Soil material that is 7 to 27 percent clay particles, 28 to 50 percent silt particles, and less than 52 percent sand particles.
- Low strength.** The soil is not strong enough to support loads.
- Metamorphic rock.** Rock of any origin altered in mineralogical composition, chemical composition, or structure by heat, pressure, and movement. Nearly all such rocks are crystalline.
- 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.
- 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.
- Motte.** A small grove of trees on a prairie.
- Mottling, soil.** Irregular spots of different colors that vary in number and size. Mottling generally indicates poor aeration and impeded drainage. Descriptive terms are as follows: abundance—*few*, *common*, and *many*; size—*fine*, *medium*, and *coarse*; and contrast—*faint*, *distinct*, and *prominent*. The size measurements are of the diameter along the greatest dimension. *Fine* indicates less than 5 millimeters (about 0.2 inch); *medium*, from 5 to 15 millimeters (about 0.2 to 0.6 inch); and *coarse*, more than 15 millimeters (about 0.6 inch).
- Munsell notation.** A designation of color by degrees of the three simple variables—hue, value, and chroma. For example, a notation of 10YR 6/4 is a color of 10YR hue, value of 6, and chroma of 4.
- Neutral soil.** A soil having a pH value between 6.6 and 7.3. (See Reaction, soil.)
- Nutrient, plant.** Any element taken in by a plant essential to its growth. Plant nutrients are mainly nitrogen, phosphorus, potassium, calcium, magnesium, sulfur, iron, manganese, copper, boron, and zinc obtained from the soil and carbon, hydrogen, and oxygen obtained from the air and water.
- Organic matter.** Plant and animal residue in the soil in various stages of decomposition.
- Parent material.** The unconsolidated organic and mineral material in which soil forms.
- Ped.** An individual natural soil aggregate, such as a granule, a prism, or a block.
- Pedon.** The smallest volume that can be called "a soil." A pedon is three dimensional and large enough to permit study of all horizons. Its area ranges from about 10 to 100 square feet (1 square meter to 10 square meters), depending on the variability of the soil.
- Percolation.** The downward movement of water through the soil.
- Percs slowly** (in tables). The slow movement of water through the soil adversely affecting the specified use.
- Permeability.** The quality of the soil that enables water to move downward through the profile. Permeability is measured as the number of inches per hour that water moves downward through the saturated soil. Terms describing permeability are:
- |                       |                        |
|-----------------------|------------------------|
| Very slow.....        | less than 0.06 inch    |
| Slow.....             | 0.06 to 0.20 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.)
- Piping** (in tables). Formation of subsurface tunnels or pipelike cavities by water moving through the soil.
- Plasticity index.** The numerical difference between the liquid limit and the plastic limit; the range of moisture content within which the soil remains plastic.
- Plastic limit.** The moisture content at which a soil changes from semisolid to plastic.
- Plowpan.** A compacted layer formed in the soil directly below the plowed layer.
- Ponding.** Standing water on soils in closed depressions. The water can be removed only by percolation or evapotranspiration.
- 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.
- Rangeland.** Land on which the potential natural vegetation is predominantly grasses, grasslike plants, forbs, or shrubs suitable for grazing or browsing. It includes natural grasslands, savannas, many wetlands, some deserts, tundras, and areas that support certain forb and shrub communities.
- Range condition.** The present composition of the plant community on a range site in relation to the potential natural plant community for that site. Range condition is expressed as excellent, good,

fair, or poor, on the basis of how much the present plant community has departed from the potential.

**Range site.** An area of rangeland where climate, soil, and relief are sufficiently uniform to produce a distinct natural plant community. A range site is the product of all the environmental factors responsible for its development. It is typified by an association of species that differ from those on other range sites in kind or proportion of species or total production.

**Reaction, soil.** A measure of acidity or alkalinity of a soil, expressed in pH values. A soil that tests to pH 7.0 is described as precisely neutral in reaction because it is neither acid nor alkaline. The degree of acidity or alkalinity is expressed as—

	pH
Extremely acid.....	Below 4.5
Very strongly acid.....	4.5 to 5.0
Strongly acid.....	5.1 to 5.5
Medium acid.....	5.6 to 6.0
Slightly acid.....	6.1 to 6.5
Neutral.....	6.6 to 7.3
Mildly alkaline.....	7.4 to 7.8
Moderately alkaline.....	7.9 to 8.4
Strongly alkaline.....	8.5 to 9.0
Very strongly alkaline.....	9.1 and higher

**Relief.** The elevations or inequalities of a land surface, considered collectively.

**Rill.** A steep sided channel resulting from accelerated erosion. A rill is generally a few inches deep and not wide enough to be an obstacle to farm machinery.

**Rock fragments.** Rock or mineral fragments having a diameter of 2 millimeters or more; for example, pebbles, cobbles, stones, and boulders.

**Rooting depth** (in tables). Shallow root zone. The soil is shallow over a layer that greatly restricts roots.

**Runoff.** The precipitation discharged into stream channels from an area. The water that flows off the surface of the land without sinking into the soil is called surface runoff. Water that enters the soil before reaching surface streams is called ground-water runoff or seepage flow from ground water.

**Sand.** As a soil separate, individual rock or mineral fragments from 0.05 millimeter to 2.0 millimeters in diameter. Most sand grains consist of quartz. As a soil textural class, a soil that is 85 percent or more sand and not more than 10 percent clay.

**Sandstone.** Sedimentary rock containing dominantly sand-size particles.

**Sedimentary rock.** Rock made up of particles deposited from suspension in water. The chief kinds of sedimentary rock are conglomerate, formed from gravel; sandstone, formed from sand; shale, formed from clay; and limestone, formed from soft masses of calcium carbonate. There are many intermediate types. Some wind-deposited sand is consolidated into sandstone.

**Seepage** (in tables). The movement of water through the soil. Seepage adversely affects the specified use.

**Series, soil.** A group of soils that have profiles that are almost alike, except for differences in texture of the

surface layer or of the underlying material. All the soils of a series have horizons that are similar in composition, thickness, and arrangement.

**Shale.** Sedimentary rock formed by the hardening of a clay deposit.

**Sheet erosion.** The removal of a fairly uniform layer of soil material from the land surface by the action of rainfall and runoff water.

**Shrink-swell.** The shrinking of soil when dry and the swelling when wet. Shrinking and swelling can damage roads, dams, building foundations, and other structures. It can also damage plant roots.

**Silt.** As a soil separate, individual mineral particles that range in diameter from the upper limit of clay (0.002 millimeter) to the lower limit of very fine sand (0.05 millimeter). As a soil textural class, soil that is 80 percent or more silt and less than 12 percent clay.

**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.

**Slow intake** (in tables). The slow movement of water into the soil.

**Small stones** (in tables). Rock fragments less than 3 inches (7.5 centimeters) in diameter. Small stones adversely affect the specified use of the soil.

**Soil.** A natural, three-dimensional body at the earth's surface. It is capable of supporting plants and has properties resulting from the integrated effect of climate and living matter acting on earthy parent material, as conditioned by relief over periods of time.

**Soil separates.** Mineral particles less than 2 mm in equivalent diameter and ranging between specified size limits. The names and sizes of separates recognized in the United States are as follows:

	Millime- ters
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 and B horizons. Generally, the characteristics of the material in these horizons are unlike those of the underlying material. 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.

**Stony.** Refers to a soil containing stones in numbers that interfere with or prevent tillage.

**Structure, soil.** The arrangement of primary soil particles into compound particles or aggregates. The

principal forms of soil structure are—*platy* (laminated), *prismatic* (vertical axis of aggregates longer than horizontal), *columnar* (prisms with rounded tops), *blocky* (angular or subangular), and *granular*. *Structureless* soils are either *single grained* (each grain by itself, as in dune sand) or *massive* (the particles adhering without any regular cleavage, as in many hardpans).

**Stubble mulch.** Stubble or other crop residue left on the soil or partly worked into the soil. It protects the soil from wind and water erosion after harvest, during preparation of a seedbed for the next crop, and during the early growing period of the new crop.

**Subsoil.** Technically, the B horizon; roughly, the part of the solum below plow depth.

**Subsoiling.** Tilling a soil below normal plow depth, ordinarily to shatter a hardpan or claypan.

**Substratum.** The part of the soil below the solum.

**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."

**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.

**Terrace.** An embankment, or ridge, constructed across sloping soils on the contour or at a slight angle to the contour. The terrace intercepts surface runoff so that water soaks into the soil or flows slowly to a prepared outlet. A terrace in a field is generally built so that the field can be farmed. A terrace intended

mainly for drainage has a deep channel that is maintained in permanent sod.

**Terrace** (geologic). An old alluvial plain, ordinarily flat or undulating, bordering a river, a lake, or the sea.

**Texture, soil.** The relative proportions of sand, silt, and clay particles in a mass of soil. The basic textural classes, in order of increasing proportion of fine particles, are *sand*, *loamy sand*, *sandy loam*, *loam*, *silt loam*, *silt*, *sandy clay loam*, *clay loam*, *silty clay loam*, *sandy clay*, *silty clay*, and *clay*. The sand, loamy sand, and sandy loam classes may be further divided by specifying "coarse," "fine," or "very fine."

**Thin layer** (in tables). Otherwise suitable soil material 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.

**Topsoil.** The upper part of the soil, which is the most favorable material for plant growth. It is ordinarily rich in organic matter and is used to topdress roadbanks, lawns, and land affected by mining.

**Unstable fill** (in tables). Risk of caving or sloughing on banks of fill material.

**Upland** (geology). Land at a higher elevation, in general, than the alluvial plain or stream terrace; land above the lowlands along streams.

**Valley fill.** In glaciated regions, material deposited in stream valleys by glacial melt water. In nonglaciated regions, alluvium deposited by heavily loaded streams.

**Wilting point (or permanent wilting point).** The moisture content of soil, on an oven-dry basis, at which a plant (specifically sunflower) wilts so much that it does not recover when placed in a humid, dark chamber.

**tables**

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TABLE 1.--TEMPERATURE AND PRECIPITATION  
 [Recorded in the period 1963-76 at San Saba, Texas]

Month	Temperature						Precipitation				
	Average daily maximum	Average daily minimum	Average	2 years in 10 will have--		Average number of growing degree days <sup>1</sup>	Average	2 years in 10 will have--		Average number of days with 0.10 inch or more	Average snowfall
				Maximum temperature higher than--	Minimum temperature lower than--			Less than--	More than--		
	<u>°F</u>	<u>°F</u>	<u>°F</u>	<u>°F</u>	<u>°F</u>	<u>Units</u>	<u>In</u>	<u>In</u>	<u>In</u>	<u>In</u>	<u>In</u>
January----	59.4	32.9	46.2	86	9	58	1.28	.03	2.17	3	.4
February---	61.7	35.9	48.9	83	17	78	1.53	.58	2.29	4	.9
March-----	70.2	44.8	57.5	91	24	299	1.37	.22	2.26	2	.0
April-----	78.5	54.9	66.7	94	28	501	3.21	1.62	4.51	5	.0
May-----	83.3	60.8	72.0	98	42	682	3.96	1.92	5.62	5	.0
June-----	90.8	67.8	79.3	102	53	879	1.62	.52	2.54	3	.0
July-----	95.0	70.7	82.9	105	59	1,020	2.08	---	3.72	3	.0
August-----	94.0	69.2	81.6	104	58	980	2.78	.27	4.70	4	.0
September--	86.8	64.4	75.6	99	45	768	3.57	1.92	4.91	5	.0
October----	78.9	52.7	65.8	93	32	490	3.50	.15	5.97	3	.0
November---	68.9	43.4	56.1	87	20	230	1.56	.55	2.42	3	.0
December---	61.3	34.9	48.1	83	16	87	1.09	.20	1.77	3	.0
Yearly:											
Average--	77.4	52.7	65.1	---	---	---	---	---	---	---	---
Extreme--	---	---	---	106	9	---	---	---	---	---	---
Total----	---	---	---	---	---	6,072	27.55	22.25	32.58	43	1.3

<sup>1</sup>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° F).

TABLE 2.--FREEZE DATES IN SPRING AND FALL  
 [Recorded in the period 1963-76 at San Saba, Texas]

Probability	Temperature		
	24° F or lower	28° F or lower	32° F or lower
Last freezing temperature in spring:			
1 year in 10 later than--	March 11	April 6	April 12
2 years in 10 later than--	March 4	March 28	April 7
5 years in 10 later than--	February 21	March 11	March 27
First freezing temperature in fall:			
1 year in 10 earlier than--	November 15	November 4	October 24
2 years in 10 earlier than--	November 22	November 9	October 30
5 years in 10 earlier than--	December 7	November 20	November 10

TABLE 3.--GROWING SEASON  
 [Recorded in the period 1963-76 at San Saba, Texas]

Probability	Daily minimum temperature during growing season		
	Higher than 24° F	Higher than 28° F	Higher than 32° F
	Days	Days	Days
9 years in 10	268	227	207
8 years in 10	275	236	214
5 years in 10	288	253	228
2 years in 10	303	272	243
1 year in 10	315	287	255

TABLE 4.--ACREAGE AND PROPORTIONATE EXTENT OF THE SOILS

Map symbol	Soil name	Acres	Percent
BaB	Bastrop fine sandy loam, 0 to 3 percent slopes-----	2,290	0.3
BaC	Bastrop fine sandy loam, 3 to 5 percent slopes-----	490	0.1
BfB	Bonti fine sandy loam, 1 to 3 percent slopes-----	11,610	1.6
BfC	Bonti fine sandy loam, 3 to 5 percent slopes-----	7,840	1.1
BfC2	Bonti fine sandy loam, 1 to 5 percent slopes, eroded-----	17,480	2.4
By	Bunyan soils, frequently flooded-----	3,080	0.4
CaB	Callahan loam, 1 to 3 percent slopes-----	6,150	0.9
CaC2	Callahan loam, 1 to 5 percent slopes, eroded-----	2,090	0.3
ChC	Cho loam, 0 to 8 percent slopes-----	9,830	1.4
Cm	Clairemont silt loam, frequently flooded-----	870	0.1
CrC	Corkstone clay loam, 1 to 5 percent slopes-----	4,100	0.6
DmB	Demona loamy fine sand, 1 to 3 percent slopes-----	2,330	0.3
DsC	Desan loamy fine sand, 1 to 5 percent slopes-----	420	0.1
EcC	Eckrant stony clay, 1 to 8 percent slopes-----	18,650	2.6
ERE	Eckrant-Rock outcrop association, rolling-----	19,940	2.8
Fr	Frio silty clay loam, occasionally flooded-----	16,100	2.2
Fs	Frio soils, frequently flooded-----	3,260	0.5
HrB	Harper stony clay, 0 to 3 percent slopes-----	8,160	1.1
HyC	Hye fine sandy loam, 1 to 5 percent slopes-----	8,170	1.1
KfC	Katemcy fine sandy loam, 1 to 5 percent slopes-----	1,990	0.3
KLE	Katemcy-Ligon association, rolling-----	3,340	0.5
LeA	Leeray clay, 0 to 1 percent slopes-----	7,760	1.1
LeB	Leeray clay, 1 to 3 percent slopes-----	15,730	2.2
MaA	May fine sandy loam, 0 to 2 percent slopes-----	360	0.1
MeB	Mereta clay loam, 1 to 3 percent slopes-----	3,440	0.5
MfB	Miles fine sandy loam, 1 to 3 percent slopes-----	920	0.1
Mr	Miller silty clay, occasionally flooded-----	740	0.1
NaC	Nimrod loamy fine sand, 1 to 5 percent slopes-----	5,710	0.8
NBE	Nocken-Bonti association, rolling-----	6,950	1.0
NCF	Nocken-Callahan-Throck association, hilly-----	101,980	14.1
NNE	Nocken-Nebgen association, rolling-----	4,930	0.7
NuA	Nuvalde clay loam, 0 to 1 percent slopes-----	2,010	0.3
NuB	Nuvalde clay loam, 1 to 3 percent slopes-----	8,590	1.2
NxC	Nuvalde-Shep complex, 1 to 5 percent slopes-----	1,870	0.3
OYE	Oplin-Yates association, rolling-----	2,690	0.4
PBF	Pebblepoint-Rumple association, hilly-----	7,940	1.1
PfB	Pedernales fine sandy loam, 1 to 3 percent slopes-----	2,120	0.3
PoC	Pontotoc fine sandy loam, 1 to 5 percent slopes-----	2,000	0.3
RfC	Rochelle fine sandy loam, 1 to 5 percent slopes-----	1,570	0.2
RgD	Roughcreek very stony clay loam, gently rolling-----	181,030	25.1
RoB	Rowena clay loam, 1 to 3 percent slopes-----	1,100	0.2
RuC	Rumple cherty clay loam, undulating-----	103,840	14.4
SaA	Sagerton clay loam, 0 to 1 percent slopes-----	11,700	1.6
SaB	Sagerton clay loam, 1 to 3 percent slopes-----	20,880	2.9
SHE	Shep association, rolling-----	690	0.1
SmF	Smithwick clay, hilly-----	7,490	1.0
SoC	Speck-Cho complex, 1 to 5 percent slopes-----	9,450	1.3
StG	Stilskin gravelly loam, steep-----	1,850	0.3
TpB	Tarpley clay loam, 1 to 3 percent slopes-----	2,770	0.4
We	Weswood silt loam-----	6,580	0.9
WfA	Winters fine sandy loam, 0 to 1 percent slopes-----	6,400	0.9
WfB	Winters fine sandy loam, 1 to 3 percent slopes-----	19,530	2.7
Ya	Yahola soils, frequently flooded-----	4,250	0.6
YeC	Yates very stony loam, undulating-----	12,770	1.8
YRG	Yates-Rock outcrop association, steep-----	970	0.1
	Water-----	1,280	0.2
	Total-----	718,080	100.0

TABLE 5.--YIELDS PER ACRE OF CROPS AND PASTURE

[Yields are those that can be expected under a high level of management. Absence of a yield indicates that the soil is not suited to the crop or the crop generally is not grown on the soil]

Soil name and map symbol	Cotton lint	Grain sorghum	Oats	Peanuts	Wheat	Improved bermudagrass
	<u>Lb</u>	<u>Bu</u>	<u>Bu</u>	<u>Lb</u>	<u>Bu</u>	<u>AUM*</u>
BaB----- Bastrop	350	50	40	1,200	25	5.0
BaC----- Bastrop	300	40	35	800	20	4.5
BfB----- Bont1	---	40	35	1,200	20	4.0
BfC----- Bont1	---	35	30	1,000	---	3.5
BfC2----- Bont1	---	25	25	800	---	3.0
By----- Bunyan	---	---	---	---	---	7.0
CaB----- Callahan	---	30	30	---	20	3.0
CaC2----- Callahan	---	20	25	---	---	2.0
ChC----- Cho	---	---	---	---	---	---
Cm----- Clairemont	---	---	---	---	---	5.0
CrC----- Corkstone	---	25	30	---	---	---
DmB----- Demona	---	---	30	1,200	---	5.0
DsC----- Desan	---	---	---	1,200	---	4.5
EcC----- Eckrant	---	---	---	---	---	---
ERE**: Eckrant-----	---	---	---	---	---	---
Rock outcrop.						
Fr----- Frio	450	75	60	---	30	7.0
Fs----- Frio	---	---	---	---	---	7.0
HrB----- Harper	---	---	---	---	---	---
HyC----- Hye	---	40	35	1,000	20	4.5
KfC----- Katemcy	150	40	35	1,000	20	4.5
KLE**: Katemcy-----	---	---	---	---	10	---

See footnotes at end of table.

TABLE 5.--YIELDS PER ACRE OF CROPS AND PASTURE--Continued

Soil name and map symbol	Cotton lint	Grain sorghum	Oats	Peanuts	Wheat	Improved bermudagrass
	<u>Lb</u>	<u>Bu</u>	<u>Bu</u>	<u>Lb</u>	<u>Bu</u>	<u>AUM*</u>
KLE**: Ligon.						
LeA, LeA----- Leeray	300	55	45	---	25	5.0
LeB----- Leeray	250	45	40	---	25	4.5
MaA----- May	---	50	50	1,200	20	5.5
MeB----- Mereta	150	20	25	---	15	2.5
MfB----- Miles	250	30	35	---	20	4.0
Mr----- Miller	450	60	50	---	30	6.0
NaC----- Nimrod	---	---	---	1,400	---	5.5
NBE**: Nocken-----	---	---	---	---	---	---
Bonti-----	---	---	---	---	---	3.5
NCF**: Nocken-----	---	---	---	---	---	---
Callahan----- Throck.	---	---	---	---	---	---
NuA----- Nuvalde	300	40	55	---	25	4.5
NNE**: Nocken-----	---	---	---	---	---	---
Nebgen-----	---	---	---	---	---	---
NuB----- Nuvalde	250	35	50	---	20	4.0
NxC----- Nuvalde-Shep	192	25	35	---	---	3.0
OYE**: Oplin-----	---	---	---	---	---	---
Yates-----	---	---	---	---	---	---
PBF**: Pebblepoint-----	---	---	---	---	---	---
Rumple-----	---	---	---	---	---	---
PfB----- Pedernales	---	35	45	1,000	20	5.0
PoC----- Pontotoc	200	40	40	1,000	---	5.0
RfC----- Rochelle	---	---	---	---	---	3

See footnotes at end of table.

TABLE 5.--YIELDS PER ACRE OF CROPS AND PASTURE--Continued

Soil name and map symbol	Cotton lint	Grain sorghum	Oats	Peanuts	Wheat	Improved bermudagrass
	<u>Lb</u>	<u>Bu</u>	<u>Bu</u>	<u>Lb</u>	<u>Bu</u>	<u>AUM*</u>
RgD----- Roughcreek	---	---	---	---	---	---
RoB----- Rowena	225	40	45	---	25	4.5
RuC----- Rumple	---	---	---	---	---	---
SaA----- Sagerton	250	45	50	---	25	5.0
SaB----- Sagerton	225	40	45	---	20	4.5
SHE**----- Shep	---	---	---	---	---	---
SmF----- Smithwick	---	---	---	---	---	---
SoC----- Speck-Cho	---	---	---	---	---	---
StG----- Stilskin	---	---	---	---	---	---
TpB----- Tarpley	---	25	30	---	---	2.5
We----- Weswood	450	70	70	---	30	7.0
WfA----- Winters	300	55	50	---	25	5.5
WfB----- Winters	250	50	45	---	20	5.0
Ya----- Yahola	---	---	---	---	---	5.5
YeC----- Yates	---	---	---	---	---	---
YRG**: Yates-----	---	---	---	---	---	---
Rock outcrop.						

\* Animal-unit-month: The amount of forage or feed required to feed one animal unit (one cow, one horse, one mule, five sheep, or five goats) for 30 days.

\*\* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 6.--CAPABILITY CLASSES AND SUBCLASSES

[Miscellaneous areas are excluded. Absence of an entry indicates no acreage]

Class	Total acreage	Major management concerns (Subclass)			
		Erosion (e)	Wetness (w)	Soil problem (s)	Climate (c)
		<u>Acres</u>	<u>Acres</u>	<u>Acres</u>	<u>Acres</u>
I	6,580	---	---	---	---
II	83,160	53,350	16,100	---	13,710
III	113,388	104,888	740	7,760	---
IV	23,287	9,016	---	14,271	---
V	11,460	---	11,460	---	---
VI	331,233	30,264	---	300,969	---
VII	114,681	7,490	---	107,191	---
VIII	---	---	---	---	---

TABLE 7.--RANGELAND PRODUCTIVITY

[Only the soils that support rangeland vegetation suitable for grazing are listed]

Soil name and map symbol	Range site name	Potential annual production for kind of growing season		
		Favorable Lb/acre	Average Lb/acre	Unfavorable Lb/acre
BaB, BaC----- Bastrop	Sandy Loam-----	5,500	4,500	3,000
BfB, BfC, BfC2----- Bonti	Sandy Loam-----	4,500	3,500	2,500
By*----- Bunyan	Loamy Bottomland-----	6,500	5,000	3,500
CaB, CaC2----- Callahan	Claypan Prairie-----	4,000	3,500	2,500
ChC----- Cho	Very Shallow-----	2,500	2,000	1,000
Cm----- Clairemont	Loamy Bottomland-----	5,500	4,500	3,500
CrC----- Corkstone	Redland-----	5,000	3,500	2,000
DmB----- Demona	Sandy-----	4,500	3,500	2,000
DsC----- Desan	Deep Sand-----	3,000	2,000	1,000
EcC----- Eckrant	Low Stony Hills-----	3,000	2,500	1,500
ERE*: Eckrant----- Rock outcrop.	Steep Rocky-----	1,800	1,400	800
Fr, Fs*----- Frio	Loamy Bottomland-----	5,500	4,500	3,000
HrB----- Harper	Stony Upland-----	5,000	4,000	2,500
HyC----- Hye	Red Sandy Loam-----	4,500	4,000	2,000
KfC----- Katemcy	Schist-----	3,500	2,800	1,500
KLE*: Katemcy----- Ligon-----	Schist----- Schist-----	3,500 3,400	2,800 2,700	1,500 1,200
LeA, LeB----- Leeray	Clay Loam-----	4,500	3,500	2,500
MaA----- May	Sandy Loam-----	5,500	4,500	3,000
MeB----- Mereta	Shallow-----	3,000	2,500	1,800
MfB----- Miles	Sandy Loam-----	4,500	3,500	2,500

See footnote at end of table.

TABLE 7.--RANGELAND PRODUCTIVITY--Continued

Soil name and map symbol	Range site name	Potential annual production for kind of growing season		
		Favorable Lb/acre	Average Lb/acre	Unfavorable Lb/acre
Mr----- Miller	Clayey Bottomland-----	5,000	3,500	2,500
NaC----- Nimrod	Sandy-----	4,500	3,500	2,000
NBE*: Nocken-----	Sandstone Hill-----	4,000	3,000	2,500
Bont1-----	Sandy Loam-----	4,500	3,500	2,500
NCF*: Nocken-----	Sandstone Hill-----	3,500	2,800	2,000
Callahan-----	Claypan Prairie-----	4,000	3,500	2,500
Throck-----	Shallow Clay-----	3,500	2,500	1,500
NNE*: Nocken-----	Sandstone Hill-----	4,000	3,000	2,500
Nebgen-----	Sandstone Hill-----	3,500	3,000	2,000
NuA, NuB----- Nuvalde	Clay Loam-----	4,500	3,500	2,000
NxC*: Nuvalde-----	Clay Loam-----	4,500	3,500	2,000
Shep-----	Mixedland Slopes-----	4,000	3,000	2,000
OYE*: Oplin-----	Steep Rocky-----	1,700	1,300	900
Yates-----	Very Shallow-----	2,000	1,500	1,000
PBF*: Pebblepoint-----	Sandy Loam-----	4,500	3,500	2,500
Rumple-----	Gravelly Redland-----	4,000	3,000	2,000
PfB----- Pedernales	Tight Sandy Loam-----	3,500	3,000	2,000
PoC----- Pontotoc	Red Sandy Loam-----	4,500	4,000	2,500
RfC----- Rochelle	Sandy Loam-----	4,500	3,500	2,300
RgD----- Roughcreek	Redland-----	4,500	3,500	2,500
RoB----- Rowena	Clay Loam-----	4,500	3,500	2,500
RuC----- Rumple	Gravelly Redland-----	4,000	3,000	2,000
SaA, SaB----- Sagerton	Clay Loam-----	4,500	3,500	2,500
SHE*: Shep-----	Mixedland Slopes-----	4,000	3,000	2,000
SmF----- Smithwick	Shallow Clay-----	3,500	3,000	2,000

See footnote at end of table.

TABLE 7.--RANGELAND PRODUCTIVITY--Continued

Soil name and map symbol	Range site name	Potential annual production for kind of growing season		
		Favorable Lb/acre	Average Lb/acre	Unfavorable Lb/acre
SoC*: Speck-----	Redland-----	3,800	3,000	2,000
Cho-----	Very Shallow-----	2,500	2,000	1,000
StG----- Stilskin	Steep Adobe-----	3,000	2,200	1,200
TpB----- Tarpley	Redland-----	5,000	4,000	2,600
We----- Weswood	Loamy Bottomland-----	6,000	5,000	4,000
WfA, WfB----- Winters	Sandy Loam-----	4,500	3,500	3,000
Ya*----- Yahola	Loamy Bottomland-----	6,500	4,900	3,500
YeC----- Yates	Very Shallow-----	2,000	1,500	1,000
YRG*: Yates-----	Very Shallow-----	2,000	1,500	1,000
Rock outcrop.				

\* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 8.--RECREATIONAL DEVELOPMENT

[Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," and "severe." Absence of an entry indicates that the soil was not rated]

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
BaB----- Bastrop	Slight-----	Slight-----	Slight-----	Severe: erodes easily.	Slight.
BaC----- Bastrop	Slight-----	Slight-----	Moderate: slope.	Severe: erodes easily.	Slight.
BfB, BfC, BfC2----- Bonti	Slight-----	Slight-----	Moderate: slope, depth to rock.	Severe: erodes easily.	Moderate: thin layer.
By*----- Bunyan	Severe: flooding.	Moderate: flooding.	Severe: flooding.	Moderate: flooding.	Severe: flooding.
CaB, CaC2----- Callahan	Moderate: percs slowly.	Moderate: percs slowly.	Moderate: slope, small stones, depth to rock.	Slight-----	Moderate: thin layer.
ChC----- Cho	Severe: cemented pan.	Severe: cemented pan.	Severe: small stones, cemented pan.	Slight-----	Severe: thin layer.
Cm----- Clairemont	Severe: flooding.	Moderate: flooding.	Severe: flooding.	Moderate: flooding.	Severe: flooding.
CrC----- Corkstone	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Slight-----	Severe: large stones, thin layer.
DmB----- Demonia	Moderate: wetness.	Moderate: wetness.	Moderate: slope.	Moderate: wetness.	Moderate: wetness, droughty.
DsC----- Desan	Severe: too sandy.	Severe: too sandy.	Severe: too sandy.	Severe: too sandy.	Moderate: droughty.
EcC----- Eckrant	Severe: large stones, depth to rock.	Severe: large stones, depth to rock.	Severe: large stones, depth to rock.	Severe: large stones.	Severe: large stones, thin layer.
ERE*: Eckrant-----	Severe: large stones, depth to rock.	Severe: large stones, depth to rock.	Severe: large stones, slope, depth to rock.	Severe: large stones.	Severe: large stones, thin layer.
Rock outcrop.					
Fr----- Frio	Severe: flooding.	Severe: too clayey.	Severe: too clayey.	Moderate: too clayey.	Severe: too clayey.
Fs*----- Frio	Severe: flooding.	Severe: flooding, too clayey.	Severe: too clayey, flooding.	Moderate: too clayey, flooding.	Severe: flooding, too clayey.
HrB----- Harper	Severe: small stones, depth to rock.	Severe: small stones, depth to rock.	Severe: large stones, depth to rock.	Severe: large stones.	Severe: large stones, thin layer, too clayey.
HyC----- Hye	Slight-----	Slight-----	Moderate: slope, small stones.	Slight-----	Moderate: thin layer.

See footnote at end of table.

TABLE 8.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
KfC----- Katemcy	Slight-----	Slight-----	Moderate: slope, small stones, depth to rock.	Slight-----	Moderate: thin layer.
KLE*: Katemcy-----	Slight-----	Slight-----	Moderate: slope, small stones, depth to rock.	Slight-----	Moderate: thin layer.
Ligon-----	Severe: depth to rock.	Severe: depth to rock.	Severe: slope, small stones, depth to rock.	Slight-----	Severe: thin layer.
LeA, LeA----- Leeray	Moderate: percs slowly, too clayey.	Moderate: too clayey, percs slowly.	Moderate: too clayey, percs slowly.	Moderate: too clayey.	Severe: too clayey.
LeB----- Leeray	Moderate: percs slowly, too clayey.	Moderate: too clayey, percs slowly.	Moderate: slope, too clayey, percs slowly.	Moderate: too clayey.	Severe: too clayey.
MaA----- May	Slight-----	Slight-----	Slight-----	Severe: erodes easily.	Slight.
MeB----- Mereta	Severe: cemented pan.	Severe: cemented pan.	Severe: cemented pan.	Slight-----	Severe: thin layer.
MfB----- Miles	Slight-----	Slight-----	Moderate: slope.	Slight-----	Slight.
Mr----- Miller	Severe: flooding.	Moderate: percs slowly, too clayey.	Moderate: too clayey, flooding, percs slowly.	Severe: erodes easily.	Severe: too clayey.
NaC----- Nimrod	Moderate: wetness.	Moderate: wetness.	Moderate: slope, wetness.	Moderate: wetness.	Moderate: wetness, droughty.
NBE*: Nocken-----	Severe: small stones.	Severe: small stones.	Severe: large stones, slope.	Severe: large stones, erodes easily.	Severe: large stones.
Bont1-----	Slight-----	Slight-----	Moderate: slope, depth to rock.	Severe: erodes easily.	Moderate: thin layer.
NCF*: Nocken-----	Severe: slope, small stones.	Severe: slope, small stones.	Severe: large stones, slope.	Severe: large stones, erodes easily.	Severe: large stones, slope.
Callahan-----	Moderate: percs slowly.	Moderate: percs slowly.	Severe: slope.	Slight-----	Moderate: thin layer.
Throck-----	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: too clayey, slope.	Severe: slope, too clayey.

See footnote at end of table.

TABLE 8.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
NNE*: Nocken-----	Severe: small stones.	Severe: small stones.	Severe: large stones, slope.	Severe: large stones, erodes easily.	Severe: large stones.
Nebgen-----	Severe: depth to rock.	Severe: depth to rock.	Severe: slope, depth to rock.	Slight-----	Severe: thin layer.
NuA----- Nuvalde	Slight-----	Slight-----	Slight-----	Slight-----	Slight.
NuB----- Nuvalde	Slight-----	Slight-----	Moderate: slope.	Slight-----	Slight.
NxC*: Nuvalde-----	Slight-----	Slight-----	Moderate: slope.	Slight-----	Slight.
Shep-----	Slight-----	Slight-----	Moderate: slope, small stones.	Slight-----	Slight.
OYE*: Oplin-----	Severe: small stones, depth to rock.	Severe: small stones, depth to rock.	Severe: slope, small stones, depth to rock.	Severe: small stones.	Severe: large stones, thin layer.
Yates-----	Severe: depth to rock.	Severe: depth to rock.	Severe: large stones, slope, small stones.	Severe: large stones.	Severe: large stones, thin layer.
PBF*: Pebblepoint-----	Severe: slope, small stones.	Severe: slope, small stones.	Severe: slope, small stones.	Severe: small stones.	Severe: small stones, slope.
Rumple-----	Severe: small stones.	Severe: small stones.	Severe: small stones.	Slight-----	Severe: small stones.
PfB----- Pedernales	Slight-----	Slight-----	Moderate: slope.	Slight-----	Slight.
PoC----- Pontotoc	Slight-----	Slight-----	Moderate: slope, small stones.	Slight-----	Moderate: large stones.
RfC----- Rochelle	Slight-----	Slight-----	Moderate: slope.	Slight-----	Moderate: droughty.
RgD----- Roughcreek	Severe: small stones, depth to rock.	Severe: small stones, depth to rock.	Severe: large stones, depth to rock.	Severe: large stones.	Severe: large stones, thin layer, too clayey.
RoB----- Rowena	Slight-----	Slight-----	Moderate: slope.	Slight-----	Slight.
RuC----- Rumple	Severe: small stones.	Severe: small stones.	Severe: small stones.	Slight-----	Severe: small stones.
SaA----- Sagerton	Slight-----	Slight-----	Slight-----	Slight-----	Slight.

See footnote at end of table.

TABLE 8.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
SaB----- Sagerton	Slight-----	Slight-----	Moderate: slope.	Slight-----	Slight.
SHE*----- Shep	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight-----	Moderate: slope.
SmF----- Smithwick	Severe: slope.	Severe: slope.	Severe: slope, too clayey.	Severe: slope.	Severe: slope, too clayey.
SoC*: Speck-----	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Slight-----	Severe: thin layer.
Cho-----	Severe: cemented pan.	Severe: cemented pan.	Severe: small stones, cemented pan.	Slight-----	Severe: thin layer.
StG----- Stilskin	Severe: slope, small stones, depth to rock.	Severe: slope, small stones, depth to rock.	Severe: slope, small stones, depth to rock.	Severe: slope.	Severe: slope, thin layer.
TpB----- Tarpley	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Slight-----	Severe: thin layer, too clayey.
We----- Weswood	Severe: flooding.	Slight-----	Slight-----	Slight-----	Slight.
WfA----- Winters	Slight-----	Slight-----	Slight-----	Slight-----	Slight.
WfB----- Winters	Slight-----	Slight-----	Moderate: slope.	Slight-----	Slight.
Ya*----- Yahola	Severe: flooding.	Moderate: flooding.	Severe: flooding.	Moderate: flooding.	Severe: flooding.
YeC----- Yates	Severe: depth to rock.	Severe: depth to rock.	Severe: large stones, small stones.	Severe: large stones.	Severe: large stones, thin layer.
YRG*: Yates-----	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: large stones, slope, small stones.	Severe: large stones.	Severe: large stones, slope, thin layer.
Rock outcrop.					

\* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 9.--WILDLIFE HABITAT POTENTIALS

[See text for definitions of "good," "fair," "poor," and "very poor." Absence of an entry indicates that the soil was not rated]

Soil name and map symbol	Potential for habitat elements				Potential as habitat for--	
	Grain and seed crops	Grasses and legumes	Wild herba- ceous plants	Shrubs	Openland wildlife	Rangeland wildlife
BaB Bastrop	Good	Good	Good	Good	Good	Good.
BaC----- Bastrop	Fair	Good	Good	Good	Good	Good.
BfB----- Bont1	Good	Good	Good	Good	Good	Good.
BfC----- Bont1	Fair	Good	Good	Good	Good	Good.
BfC2----- Bont1	Fair	Good	Good	Good	Good	Good.
By*----- Bunyan	Very poor	Poor	Fair	Good	Poor	Fair.
CaB, CaC2----- Callahan	Fair	Good	Fair	Fair	Fair	Fair.
ChC----- Cho	Fair	Poor	Poor	Poor	Poor	Poor.
Cm----- Clairemont	Very poor	Poor	Fair	Good	Poor	Fair.
CrC----- Corkstone	Fair	Fair	Fair	Fair	Fair	Fair.
DmB----- Demona	Fair	Good	Good	Good	Good	Good.
DsC----- Desan	Fair	Good	Fair	Fair	Fair	Fair.
EcC----- Eckrant	Very poor	Very poor	Fair	Fair	Poor	Fair.
ERE*: Eckrant----- Rock outcrop.	Very poor	Very poor	Fair	Fair	Poor	Fair.
Fr----- Frio	Good	Good	Fair	Good	Good	Fair.
Fs*----- Frio	Very poor	Poor	Fair	Good	Poor	Fair.
HrB----- Harper	Poor	Poor	Poor	Fair	Poor	Poor.
HyC----- Hye	Fair	Good	Good	Fair	Good	Fair.
KfC----- Katemcy	Fair	Good	Fair	Fair	Fair	Fair.
KLE*: Katemcy-----	Fair	Good	Fair	Fair	Fair	Fair.

See footnote at end of table.

TABLE 9.--WILDLIFE HABITAT POTENTIALS--Continued

Soil name and map symbol	Potential for habitat elements				Potential as habitat for--	
	Grain and seed crops	Grasses and legumes	Wild herba- ceous plants	Shrubs	Openland wildlife	Rangeland wildlife
KLE*: Ligon-----	Poor	Poor	Fair	Fair	Poor	Fair.
LeA, LeA, LeB----- Leeray	Fair	Fair	Fair	Fair	Fair	Fair.
MaA----- May	Good	Good	Good	Good	Good	Good.
MeB----- Mereta	Fair	Fair	Fair	Fair	Fair	Fair.
MfB----- Miles	Fair	Good	Good	Good	Good	Good.
Mr----- Miller	Fair	Fair	Poor	Poor	Fair	Poor.
NaC----- Nimrod	Fair	Good	Good	Good	Good	Good.
NBE*: Nocken-----	Very poor	Very poor	Good	Good	Poor	Good.
Bont1-----	Fair	Good	Good	Good	Good	Good.
NCF*: Nocken-----	Very poor	Very poor	Good	Good	Poor	Good.
Callahan-----	Fair	Good	Fair	Fair	Fair	Fair.
Throck-----	Poor	Fair	Fair	Fair	Fair	Fair.
NNE*: Nocken-----	Very poor	Very poor	Good	Good	Poor	Good.
Nebgen-----	Very poor	Very poor	Poor	Very poor	Very poor	Very poor.
NuA, NuB----- Nuvalde	Good	Good	Fair	Fair	Good	Fair.
NxC*: Nuvalde-----	Fair	Good	Fair	Fair	Fair	Fair.
Shep-----	Fair	Good	Good	Fair	Good	Fair.
OYE*: Oplin-----	Very poor	Very poor	Fair	Fair	Poor	Fair.
Yates-----	Very poor	Very poor	Poor	Poor	Very poor	Poor.
PBF*: Pebblepoint-----	Poor	Poor	Fair	Fair	Poor	Fair.
Rumple-----	Poor	Poor	Fair	Fair	Poor	Fair.
PfB----- Pedernales	Good	Good	Good	Good	Good	Good.
PoC----- Pontotoc	Fair	Good	Good	Good	Good	Good.
RfC----- Rochelle	Fair	Fair	Good	Good	Fair	Good.

See footnote at end of table.

TABLE 9.--WILDLIFE HABITAT POTENTIALS--Continued

Soil name and map symbol	Potential for habitat elements				Potential as habitat for--	
	Grain and seed crops	Grasses and legumes	Wild herba- ceous plants	Shrubs	Openland wildlife	Rangeland wildlife
RgD----- Roughcreek	Poor	Poor	Fair	Good	Poor	Fair.
RoB----- Rowena	Good	Good	Fair	Fair	Good	Fair.
RuC----- Rumple	Poor	Poor	Fair	Fair	Poor	Fair.
SaA, SaB----- Sagerton	Good	Good	Fair	Good	Good	Fair.
SHE*----- Shep	Poor	Fair	Good	Fair	Fair	Fair.
SmF----- Smithwick	Very poor	Very poor	Fair	Fair	Poor	Fair.
SoC*: Speck-----	Fair	Fair	Fair	Fair	Fair	Fair.
Cho-----	Fair	Poor	Poor	Poor	Poor	Poor.
StG----- Stilskin	Very poor	Very poor	Fair	Fair	Poor	Fair.
TpB----- Tarpley	Fair	Fair	Fair	Fair	Fair	Fair.
We----- Weswood	Good	Good	Fair	Good	Good	Fair.
WfA----- Winters	Good	Good	Good	Good	Good	Good.
WfB----- Winters	Fair	Good	Good	Good	Good	Good.
Ya*----- Yahola	Poor	Fair	Fair	Good	Fair	Fair.
YeC----- Yates	Very poor	Very poor	Poor	Poor	Very poor	Poor.
YRG*: Yates-----	Very poor	Very poor	Poor	Poor	Very poor	Poor.
Rock outcrop.						

\* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 10.--BUILDING SITE DEVELOPMENT

[Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," and "severe." Absence of an entry indicates that the soil was not rated]

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
BaB----- Bastrop	Slight-----	Slight-----	Slight-----	Slight-----	Moderate: low strength.	Slight.
BaC----- Bastrop	Slight-----	Slight-----	Slight-----	Moderate: slope.	Moderate: low strength.	Slight.
BfB----- Bonti	Severe: depth to rock.	Moderate: shrink-swell.	Moderate: depth to rock, shrink-swell.	Moderate: shrink-swell.	Severe: low strength.	Moderate: thin layer.
BfC----- Bonti	Severe: depth to rock.	Moderate: shrink-swell.	Moderate: depth to rock, shrink-swell.	Moderate: shrink-swell, slope.	Severe: low strength.	Moderate: thin layer.
BfC2----- Bonti	Severe: depth to rock.	Moderate: shrink-swell.	Moderate: depth to rock, shrink-swell.	Moderate: shrink-swell.	Severe: low strength.	Moderate: thin layer.
By*----- Bunyan	Moderate: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: low strength, flooding.	Severe: flooding.
CaB, CaC2----- Callahan	Moderate: depth to rock, too clayey.	Moderate: shrink-swell.	Moderate: depth to rock, shrink-swell.	Moderate: shrink-swell.	Severe: low strength.	Moderate: thin layer.
ChC----- Cho	Severe: cemented pan.	Moderate: cemented pan.	Severe: cemented pan.	Moderate: slope, cemented pan.	Moderate: cemented pan.	Severe: thin layer.
Cm----- Clairemont	Moderate: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: low strength, flooding.	Severe: flooding.
CrC----- Corkstone	Severe: depth to rock.	Severe: shrink-swell, depth to rock.	Severe: depth to rock, shrink-swell.	Severe: shrink-swell, depth to rock.	Severe: depth to rock, shrink-swell, low strength.	Severe: large stones, thin layer.
DmB----- Demona	Severe: cutbanks cave, wetness.	Moderate: wetness, shrink-swell.	Severe: wetness.	Moderate: wetness, shrink-swell.	Severe: low strength.	Moderate: wetness, droughty.
DsC----- Desan	Severe: cutbanks cave.	Slight-----	Slight-----	Slight-----	Slight-----	Moderate: droughty.
EcC----- Eckrant	Severe: depth to rock, large stones.	Severe: depth to rock, large stones.	Severe: depth to rock, large stones.	Severe: depth to rock, large stones.	Severe: depth to rock, large stones.	Severe: large stones, thin layer.
ERE*: Eckrant-----	Severe: depth to rock, large stones.	Severe: depth to rock, large stones.	Severe: depth to rock, large stones.	Severe: slope, depth to rock, large stones.	Severe: depth to rock, large stones.	Severe: large stones, thin layer.
Rock outcrop.						
Fr----- Frio	Moderate: too clayey, flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: low strength, flooding.	Severe: too clayey.
Fs*----- Frio	Moderate: too clayey, flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: low strength, flooding.	Severe: flooding, too clayey.

See footnote at end of table.

TABLE 10.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
HrB----- Harper	Severe: depth to rock.	Severe: shrink-swell, depth to rock.	Severe: depth to rock, shrink-swell.	Severe: shrink-swell, depth to rock.	Severe: depth to rock, shrink-swell, low strength.	Severe: large stones, thin layer, too clayey.
HyC----- Hye	Severe: depth to rock.	Moderate: depth to rock.	Severe: depth to rock.	Moderate: depth to rock.	Moderate: depth to rock.	Moderate: thin layer.
KfC----- Katemcy	Moderate: depth to rock, too clayey.	Moderate: shrink-swell.	Moderate: depth to rock, shrink-swell.	Moderate: shrink-swell.	Severe: low strength.	Moderate: thin layer.
KLE*: Katemcy-----	Moderate: depth to rock, too clayey.	Moderate: shrink-swell.	Moderate: depth to rock, shrink-swell.	Moderate: shrink-swell, slope.	Severe: low strength.	Moderate: thin layer.
Ligon-----	Severe: depth to rock.	Moderate: shrink-swell, depth to rock.	Severe: depth to rock.	Moderate: shrink-swell, slope, depth to rock.	Severe: low strength.	Severe: thin layer.
LeA, LeA, LeB----- Leeray	Severe: cutbanks cave.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: low strength, shrink-swell.	Severe: too clayey.
MaA----- May	Slight-----	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: low strength, shrink-swell.	Slight.
MeB----- Mereta	Severe: cemented pan.	Moderate: shrink-swell, cemented pan.	Severe: cemented pan.	Moderate: shrink-swell, cemented pan.	Severe: low strength.	Severe: thin layer.
MfB----- Miles	Slight-----	Slight-----	Slight-----	Slight-----	Slight-----	Slight.
Mr----- Miller	Moderate: too clayey, flooding.	Severe: flooding, shrink-swell.	Severe: flooding, shrink-swell.	Severe: flooding, shrink-swell.	Severe: low strength, flooding, shrink-swell.	Severe: too clayey.
NaC----- Nimrod	Severe: cutbanks cave, wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.	Moderate: wetness.	Moderate: wetness, droughty.
NBE*: Nocken-----	Severe: large stones.	Severe: large stones.	Severe: large stones.	Severe: slope, large stones.	Severe: low strength, large stones.	Severe: large stones.
Bonti-----	Severe: depth to rock.	Moderate: shrink-swell.	Moderate: depth to rock, shrink-swell.	Moderate: shrink-swell.	Severe: low strength.	Moderate: thin layer.
NCF*: Nocken-----	Severe: large stones, slope.	Severe: slope, large stones.	Severe: slope, large stones.	Severe: slope, large stones.	Severe-----	Severe: large stones, slope.
Callahan-----	Moderate: depth to rock, too clayey.	Moderate: shrink-swell.	Moderate: depth to rock, shrink-swell.	Moderate: shrink-swell, slope.	Severe: low strength.	Moderate: thin layer.
Throck-----	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: low strength, slope.	Severe: slope, too clayey.

See footnote at end of table.

TABLE 10.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
NNE#: Nocken-----	Severe: large stones.	Severe: large stones.	Severe: large stones.	Severe: slope, large stones.	Severe: low strength, large stones.	Severe: large stones.
Nebgen-----	Severe: depth to rock.	Moderate: slope, depth to rock.	Severe: depth to rock.	Severe: slope.	Moderate: depth to rock, slope.	Severe: thin layer.
NuA, NuB----- Nuvalde	Slight-----	Severe: shrink-swell.	Moderate: shrink-swell.	Severe: shrink-swell.	Severe: low strength, shrink-swell.	Slight.
NxC#: Nuvalde-----	Slight-----	Severe: shrink-swell.	Moderate: shrink-swell.	Severe: shrink-swell.	Severe: low strength, shrink-swell.	Slight.
Shep-----	Slight-----	Slight-----	Slight-----	Slight-----	Moderate: low strength.	Slight.
OYE#: Oplin-----	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Severe: slope, depth to rock.	Severe: depth to rock.	Severe: large stones, thin layer.
Yates-----	Severe: depth to rock, large stones.	Severe: depth to rock, large stones.	Severe: depth to rock, large stones.	Severe: slope, depth to rock, large stones.	Severe: depth to rock, large stones.	Severe: large stones, thin layer.
PBF#: Pebblepoint-----	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: small stones, slope.
Rumple-----	Severe: depth to rock, large stones.	Moderate: shrink-swell, depth to rock.	Severe: depth to rock.	Severe: large stones.	Severe: large stones.	Severe: small stones.
PfB----- Pedernales	Moderate: too clayey.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Severe: low strength.	Slight.
PoC----- Pontotoc	Slight-----	Slight-----	Slight-----	Slight-----	Slight-----	Moderate: large stones.
RfC----- Rochelle	Severe: cutbanks cave.	Slight-----	Slight-----	Slight-----	Slight-----	Moderate: droughty.
RgD----- Roughcreek	Severe: depth to rock, large stones.	Severe: depth to rock, large stones.	Severe: depth to rock, large stones.	Severe: depth to rock, large stones.	Severe: depth to rock, low strength, large stones.	Severe: large stones, thin layer, too clayey.
RoB----- Rowena	Moderate: too clayey.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: low strength, shrink-swell.	Slight.
RuC----- Rumple	Severe: depth to rock, large stones.	Moderate: shrink-swell, depth to rock.	Severe: depth to rock.	Severe: large stones.	Severe: large stones.	Severe: small stones.
SaA, SaB----- Sagerton	Moderate: too clayey.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Severe: low strength.	Slight.
SHE#----- Shep	Moderate: slope.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: low strength, slope.	Moderate: slope.

See footnote at end of table.

TABLE 10.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
SmF----- Smithwick	Severe: slope.	Severe: shrink-swell, slope.	Severe: slope, shrink-swell.	Severe: shrink-swell, slope.	Severe: shrink-swell, low strength, slope.	Severe: slope, too clayey.
SoC*: Speck-----	Severe: depth to rock.	Severe: shrink-swell, depth to rock.	Severe: depth to rock, shrink-swell.	Severe: shrink-swell, depth to rock.	Severe: depth to rock, low strength, shrink-swell.	Severe: thin layer.
Cho-----	Severe: cemented pan.	Moderate: cemented pan.	Severe: cemented pan.	Moderate: cemented pan.	Moderate: cemented pan.	Severe: thin layer.
StG----- Stilskin	Severe: depth to rock, slope.	Severe: slope.	Severe: depth to rock, slope.	Severe: slope.	Severe: slope.	Severe: slope, thin layer.
TpB----- Tarpley	Severe: depth to rock.	Severe: shrink-swell, depth to rock.	Severe: depth to rock, shrink-swell.	Severe: shrink-swell, depth to rock.	Severe: depth to rock, low strength, shrink-swell.	Severe: thin layer, too clayey.
We----- Weswood	Slight-----	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: low strength.	Slight.
WfA, WfB----- Winters	Moderate: too clayey.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Severe: low strength.	Slight.
Ya*----- Yahola	Severe: cutbanks cave.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.
YeC----- Yates	Severe: depth to rock, large stones.	Severe: large stones, thin layer.				
YRG*: Yates-----	Severe: depth to rock, large stones, slope.	Severe: slope, depth to rock, large stones.	Severe: depth to rock, slope, large stones.	Severe: slope, depth to rock, large stones.	Severe: depth to rock, slope, large stones.	Severe: large stones, slope, thin layer.
Rock outcrop.						

\* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 11.--SANITARY FACILITIES

[Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," "good," "fair," and other terms. Absence of an entry indicates that the soil was not rated]

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
BaB----- Bastrop	Moderate: percs slowly.	Moderate: seepage.	Slight-----	Slight-----	Good.
BaC----- Bastrop	Moderate: percs slowly.	Moderate: seepage, slope.	Slight-----	Slight-----	Good.
BfB, BfC, BfC2----- Bont1	Severe: depth to rock, percs slowly.	Severe: depth to rock.	Severe: depth to rock, too clayey.	Severe: depth to rock.	Poor: area reclaim, too clayey.
By*----- Bunyan	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Fair: too clayey.
CaB, CaC2----- Callahan	Severe: depth to rock, percs slowly.	Severe: depth to rock.	Severe: depth to rock, too clayey.	Severe: depth to rock.	Poor: area reclaim, too clayey.
ChC----- Cho	Severe: cemented pan.	Severe: cemented pan.	Moderate: cemented pan.	Severe: cemented pan.	Poor: area reclaim.
Cm----- Clairemont	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Good.
CrC----- Corkstone	Severe: depth to rock, percs slowly.	Severe: depth to rock.	Severe: depth to rock, too clayey.	Severe: depth to rock.	Poor: area reclaim, too clayey, hard to pack.
DmB----- Demona	Severe: wetness, percs slowly.	Severe: seepage, wetness.	Severe: wetness, too clayey.	Severe: seepage.	Poor: too clayey, hard to pack.
DsC----- Desan	Severe: poor filter.	Severe: seepage.	Moderate: too sandy.	Severe: seepage.	Poor: too sandy.
EcC----- Eckrant	Severe: depth to rock, large stones.	Severe: depth to rock, large stones.	Severe: depth to rock, large stones.	Severe: depth to rock.	Poor: area reclaim, large stones, thin layer.
ERE*: Eckrant-----	Severe: depth to rock, large stones.	Severe: depth to rock, slope, large stones.	Severe: depth to rock, large stones.	Severe: depth to rock.	Poor: area reclaim, large stones, thin layer.
Rock outcrop.					
Fr----- Frio	Severe: flooding, percs slowly.	Slight-----	Severe: flooding, too clayey.	Severe: flooding.	Poor: too clayey, hard to pack.
Fs*----- Frio	Severe: flooding, percs slowly.	Severe: flooding.	Severe: flooding, too clayey.	Severe: flooding.	Poor: too clayey, hard to pack.
HrB----- Harper	Severe: depth to rock.	Severe: depth to rock, large stones.	Severe: depth to rock, too clayey, large stones.	Severe: depth to rock.	Poor: area reclaim, too clayey, hard to pack.
HyC----- Hye	Severe: depth to rock.	Severe: seepage, depth to rock.	Severe: depth to rock.	Severe: depth to rock, seepage.	Poor: area reclaim.

See footnote at end of table.

TABLE 11.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
KfC----- Katemcy	Severe: percs slowly, depth to rock.	Severe: depth to rock.	Severe: depth to rock, too clayey.	Severe: depth to rock.	Poor: area reclaim, too clayey, hard to pack.
KLE*: Katemcy-----	Severe: percs slowly, depth to rock.	Severe: depth to rock.	Severe: depth to rock, too clayey.	Severe: depth to rock.	Poor: area reclaim, too clayey, hard to pack.
Ligon-----	Severe: depth to rock, percs slowly.	Severe: slope.	Severe: depth to rock.	Severe: depth to rock.	Poor: area reclaim.
LeA, LeA----- Leeray	Severe: percs slowly.	Slight-----	Severe: too clayey.	Slight-----	Poor: too clayey, hard to pack.
LeB----- Leeray	Severe: percs slowly.	Moderate: slope.	Severe: too clayey.	Slight-----	Poor: too clayey, hard to pack.
MaA----- May	Slight-----	Moderate: seepage.	Slight-----	Slight-----	Good.
MeB----- Mereta	Severe: cemented pan.	Severe: cemented pan.	Moderate: cemented pan, too clayey.	Severe: cemented pan.	Poor: area reclaim, hard to pack.
MfB----- Miles	Slight-----	Moderate: seepage, slope.	Slight-----	Slight-----	Good.
Mr----- Miller	Severe: flooding, percs slowly.	Severe: flooding.	Severe: flooding, too clayey.	Severe: flooding.	Poor: too clayey, hard to pack.
NaC----- Nimrod	Severe: wetness, percs slowly, poor filter.	Severe: seepage, wetness.	Severe: wetness.	Severe: seepage.	Fair: wetness.
NBE*: Nocken-----	Severe: depth to rock, large stones.	Severe: depth to rock, slope, large stones.	Severe: depth to rock, large stones.	Severe: depth to rock.	Poor: area reclaim, large stones.
Bonti-----	Severe: depth to rock, percs slowly.	Severe: depth to rock.	Severe: depth to rock, too clayey.	Severe: depth to rock.	Poor: area reclaim, too clayey.
NCF*: Nocken-----	Severe: depth to rock, slope, large stones.	Severe: depth to rock, slope, large stones.	Severe: depth to rock, slope, large stones.	Severe: depth to rock, slope.	Poor: area reclaim, large stones, slope.
Callahan-----	Severe: depth to rock, percs slowly.	Severe: depth to rock.	Severe: depth to rock, too clayey.	Severe: depth to rock.	Poor: area reclaim, too clayey.
Throck-----	Severe: percs slowly, slope.	Severe: slope.	Severe: depth to rock, slope, too clayey.	Severe: slope.	Poor: area reclaim, too clayey, slope.

See footnote at end of table.

TABLE 11.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
NNE#: Nocken-----	Severe: depth to rock, large stones.	Severe: depth to rock, slope, large stones.	Severe: depth to rock, large stones.	Severe: depth to rock.	Poor: area reclaim, large stones.
Nebgen-----	Severe: depth to rock.	Severe: depth to rock, slope.	Severe: depth to rock.	Severe: depth to rock.	Poor: area reclaim.
NuA----- Nuvalde	Moderate: percs slowly.	Moderate: seepage.	Moderate: too clayey.	Slight-----	Fair: too clayey, hard to pack.
NuB----- Nuvalde	Moderate: percs slowly.	Moderate: seepage, slope.	Moderate: too clayey.	Slight-----	Fair: too clayey, hard to pack.
NxC#: Nuvalde-----	Moderate: percs slowly.	Moderate: seepage, slope.	Moderate: too clayey.	Slight-----	Fair: too clayey, hard to pack.
Shep-----	Slight-----	Moderate: seepage, slope.	Slight-----	Slight-----	Good.
OYE#: Oplin-----	Severe: depth to rock.	Severe: depth to rock, slope, large stones.	Severe: depth to rock, large stones.	Severe: depth to rock.	Poor: area reclaim, small stones.
Yates-----	Severe: depth to rock, large stones.	Severe: depth to rock, slope, large stones.	Severe: depth to rock, large stones.	Severe: depth to rock.	Poor: area reclaim.
PBF#: Pebblepoint-----	Severe: percs slowly, slope.	Severe: slope.	Severe: depth to rock, slope.	Severe: slope.	Severe: seepage, small stones, slope.
Rumple-----	Severe: depth to rock, percs slowly, large stones.	Severe: depth to rock, large stones.	Severe: depth to rock, too clayey.	Severe: depth to rock.	Poor: area reclaim, too clayey, small stones.
PfB----- Pedernales	Severe: percs slowly.	Moderate: slope.	Severe: too clayey.	Slight-----	Poor: too clayey, hard to pack.
PoC----- Pontotoc	Moderate: percs slowly.	Severe: seepage.	Slight-----	Severe: seepage.	Good.
RfC----- Rochelle	Severe: percs slowly.	Severe: seepage.	Severe: seepage, too sandy.	Severe: seepage.	Poor: too sandy, small stones.
RgD----- Roughcreek	Severe: depth to rock, large stones.	Severe: depth to rock, large stones.	Severe: depth to rock, large stones.	Severe: depth to rock.	Poor: area reclaim, large stones.

See footnote at end of table.

TABLE 11.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
RoB----- Rowena	Severe: percs slowly.	Moderate: slope.	Severe: too clayey.	Slight-----	Poor: too clayey, hard to pack.
RuC----- Rumple	Severe: depth to rock, percs slowly, large stones.	Severe: depth to rock, large stones.	Severe: depth to rock, too clayey.	Severe: depth to rock.	Poor: area reclaim, too clayey, small stones.
SaA----- Sagerton	Severe: percs slowly.	Slight-----	Severe: too clayey.	Slight-----	Poor: too clayey.
SaB----- Sagerton	Severe: percs slowly.	Moderate: slope.	Severe: too clayey.	Slight-----	Poor: too clayey.
SHE*----- Shep	Moderate: slope.	Severe: slope.	Moderate: slope.	Moderate: slope.	Fair: slope.
SmF----- Smithwick	Severe: percs slowly, slope.	Severe: slope.	Severe: slope, too clayey.	Severe: slope.	Poor: area reclaim, too clayey, slope.
SoC*: Speck-----	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock, too clayey.	Severe: depth to rock.	Poor: area reclaim, too clayey, hard to pack.
Cho-----	Severe: cemented pan.	Severe: cemented pan.	Moderate: cemented pan.	Severe: cemented pan.	Poor: area reclaim.
StG----- Stilskin	Severe: depth to rock, slope.	Severe: depth to rock, slope, large stones.	Severe: depth to rock, slope, large stones.	Severe: depth to rock, slope.	Severe: area reclaim, small stones, slope.
TpB----- Tarpley	Severe: depth to rock, percs slowly.	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Poor: area reclaim, too clayey, thin layer.
We----- Weswood	Moderate: flooding.	Severe: flooding.	Moderate: flooding.	Moderate: flooding.	Fair: too clayey.
WfA----- Winters	Severe: percs slowly.	Moderate: seepage.	Poor: too clayey, hard to pack.	Slight-----	Poor: too clayey, hard to pack.
WfB----- Winters	Severe: percs slowly.	Moderate: seepage, slope.	Poor: too clayey, hard to pack.	Slight-----	Fair: too clayey.
Ya*----- Yahola	Severe: flooding.	Severe: seepage, flooding.	Severe: flooding, seepage.	Severe: flooding, seepage.	Good.
YeC----- Yates	Severe: depth to rock, large stones.	Severe: depth to rock, large stones.	Severe: depth to rock, large stones.	Severe: depth to rock.	Poor: area reclaim.
YRG*: Yates-----	Severe: depth to rock, slope, large stones.	Severe: depth to rock, slope, large stones.	Severe: depth to rock, slope, large stones.	Severe: depth to rock, slope.	Poor: area reclaim, slope.
Rock outcrop.					

\* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 12.--CONSTRUCTION MATERIALS

[Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "good," "fair," "poor," "probable," and "improbable." Absence of an entry indicates that the soil was not rated]

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
BaB, BaC----- Bastrop	Fair: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: thin layer.
BfB, BfC, BfC2----- Bonti	Poor: low strength, area reclaim.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer.
By*----- Bunyan	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
CaB, CaC2----- Callahan	Poor: area reclaim, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer.
ChC----- Cho	Good-----	Improbable: excess fines.	Improbable: excess fines.	Poor: area reclaim, small stones.
Cm----- Clairemont	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
CrC----- Corkstone	Poor: area reclaim, low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: area reclaim, large stones, thin layer.
DmB----- Demona	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too sandy.
DsC----- Desan	Good-----	Probable-----	Improbable: too sandy.	Fair: too sandy.
EcC----- Eckrant	Poor: area reclaim, thin layer, large stones.	Improbable: excess fines, thin layer, large stones.	Improbable: excess fines, thin layer, large stones.	Poor: area reclaim, large stones, thin layer.
ERE*: Eckrant-----	Poor: area reclaim, thin layer, large stones.	Improbable: excess fines, thin layer, large stones.	Improbable: excess fines, thin layer, large stones.	Poor: area reclaim, large stones, thin layer.
Rock outcrop.				
Fr, Fs*----- Frlo	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
HrB----- Harper	Poor: area reclaim, low strength, large stones.	Improbable: excess fines.	Improbable: excess fines.	Poor: area reclaim, too clayey, large stones.
HyC----- Hye	Poor: area reclaim.	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones.
KfC----- Katemcy	Poor: area reclaim, low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: thin layer.

See footnote at end of table.

TABLE 12.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
KLE*: Katemcy-----	Poor: area reclaim, low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: thin layer.
Ligon-----	Poor: area reclaim, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: area reclaim, small stones.
LeA, LeA, LeB----- Leeray	Poor: low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
MaA----- May	Fair: low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Good.
MeB----- Mereta	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: area reclaim.
MfB----- Miles	Good-----	Improbable: excess fines.	Improbable: excess fines.	Fair: thin layer.
Mr----- Miller	Poor: low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
NaC----- Nimrod	Fair: wetness.	Improbable: excess fines.	Improbable: excess fines.	Fair: too sandy.
NBE*: Nocken-----	Poor: area reclaim, low strength, large stones.	Improbable: excess fines.	Improbable: excess fines.	Poor: area reclaim, large stones.
Bonti-----	Poor: low strength, area reclaim.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer.
NCF*: Nocken-----	Poor: area reclaim, low strength, large stones.	Improbable: excess fines.	Improbable: excess fines.	Poor: area reclaim, large stones, slope.
Callahan-----	Poor: area reclaim, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer.
Throck-----	Poor: area reclaim, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope, too clayey.
NNE*: Nocken-----	Poor: area reclaim, low strength, large stones.	Improbable: excess fines.	Improbable: excess fines.	Poor: area reclaim, large stones.
Nebgen-----	Poor: area reclaim.	Improbable: excess fines.	Improbable: excess fines.	Poor: area reclaim.
NuA, NuB----- Nuvalde	Poor: low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey.

See footnote at end of table.

TABLE 12.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
NxC#: Nuvalde-----	Poor: low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey.
Shep-----	Fair: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones.
OYE#: Oplin-----	Poor: area reclaim, thin layer.	Improbable: excess fines.	Improbable: excess fines.	Poor: area reclaim, large stones.
Yates-----	Poor: area reclaim, large stones.	Improbable: excess fines.	Improbable: excess fines.	Poor: area reclaim, large stones.
PBF#: Pebblepoint-----	Fair: large stones, slope.	Improbable: small stones.	Probable-----	Poor: large stones, small stones, slope.
Rumple-----	Poor: area reclaim, thin layer.	Improbable: excess fines.	Improbable: excess fines.	Poor: large stones, small stones.
PfB----- Pedernales	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer.
PoC----- Pontotoc	Good-----	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones.
RfC----- Rochelle	Good-----	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, area reclaim.
RgD----- Roughcreek	Poor: area reclaim, large stones.	Improbable: excess fines.	Improbable: excess fines.	Poor: area reclaim, large stones.
RoB----- Rowena	Poor: low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey.
RuC----- Rumple	Poor: area reclaim, thin layer.	Improbable: excess fines.	Improbable: excess fines.	Poor: large stones, small stones.
SaA, SaB----- Sagerton	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer.
SHE#----- Shep	Fair: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones, slope.
SmF----- Smithwick	Poor: area reclaim, low strength, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, slope.
SoC#: Speck-----	Poor: area reclaim, low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: area reclaim.

See footnote at end of table.

TABLE 12.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
SoC*: Cho-----	Good-----	Improbable: excess fines.	Improbable: excess fines.	Poor: area reclaim, small stones.
StG----- Stilskin	Poor: area reclaim, thin layer, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: area reclaim, large stones, slope.
TpB----- Tarpley	Poor: area reclaim, low strength, thin layer.	Improbable: excess fines, thin layer.	Improbable: excess fines, thin layer.	Poor: area reclaim, thin layer, too clayey.
We----- Weswood	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
WfA, WfB----- Winters	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer.
Ya*----- Yahola	Good-----	Improbable: excess fines.	Improbable: excess fines.	Good.
YeC----- Yates	Poor: area reclaim, large stones.	Improbable: excess fines.	Improbable: excess fines.	Poor: area reclaim, large stones.
YRG*: Yates-----	Poor: area reclaim, large stones.	Improbable: excess fines.	Improbable: excess fines.	Poor: area reclaim, large stones, slope.
Rock outcrop.				

\* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 13.--WATER MANAGEMENT

[Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," and "severe." Absence of an entry indicates that the soil was not evaluated]

Soil name and map symbol	Limitations for--		Features affecting--		
	Pond reservoir areas	Embankments, dikes and levees	Irrigation	Terraces and diversions	Grassed waterways
BaB----- Bastrop	Moderate: seepage.	Moderate: piping.	Soil blowing-----	Erodes easily, soil blowing.	Erodes easily.
BaC----- Bastrop	Moderate: seepage.	Moderate: piping.	Soil blowing, slope.	Erodes easily, soil blowing.	Erodes easily.
BfB----- Bont1	Moderate: depth to rock.	Severe: thin layer.	Soil blowing, depth to rock.	Depth to rock, erodes easily, soil blowing.	Erodes easily, depth to rock.
BfC, BfC2----- Bont1	Moderate: depth to rock, slope.	Severe: thin layer.	Soil blowing, depth to rock.	Depth to rock, erodes easily, soil blowing.	Erodes easily, depth to rock.
By*----- Bunyan	Moderate: seepage.	Moderate: piping.	Soil blowing, erodes easily, flooding.	Erodes easily, soil blowing.	Erodes easily.
CaB----- Callahan	Moderate: depth to rock.	Severe: thin layer.	Percs slowly, depth to rock.	Depth to rock, percs slowly.	Depth to rock, percs slowly.
CaC2----- Callahan	Moderate: depth to rock.	Severe: thin layer.	Percs slowly, depth to rock, slope.	Depth to rock, percs slowly.	Depth to rock, percs slowly.
ChC----- Cho	Severe: cemented pan, seepage.	Severe: thin layer.	Cemented pan, slope.	Cemented pan-----	Droughty, cemented pan.
Cm----- Clairemont	Moderate: seepage.	Severe: piping.	Erodes easily, flooding.	Erodes easily-----	Erodes easily.
CrC----- Corkstone	Severe: depth to rock.	Severe: thin layer, hard to pack.	Percs slowly, depth to rock, slope.	Large stones, depth to rock, percs slowly.	Large stones, depth to rock, percs slowly.
DmB----- Demona	Severe: seepage.	Moderate: hard to pack, wetness.	Wetness, droughty, fast intake.	Wetness, soil blowing.	Droughty.
DsC----- Desan	Severe: seepage.	Severe: seepage, piping.	Droughty, fast intake, soil blowing.	Soil blowing-----	Droughty.
EcC----- Eckrant	Severe: depth to rock, seepage.	Severe: thin layer, large stones.	Large stones, droughty, depth to rock.	Large stones, depth to rock.	Large stones, depth to rock.
ERE*: Eckrant-----	Severe: depth to rock, seepage.	Severe: thin layer, large stones.	Large stones, droughty, depth to rock.	Slope, large stones, depth to rock.	Large stones, slope, depth to rock.
Rock outcrop.					
Fr, Fs*----- Frio	Slight-----	Moderate: hard to pack.	Slow intake, flooding.	Favorable-----	Favorable.
HrB----- Harper	Severe: depth to rock.	Severe: thin layer, hard to pack, large stones.	Large stones, slow intake, depth to rock.	Large stones, depth to rock.	Large stones, depth to rock.

See footnote at end of table.

TABLE 13.--WATER MANAGEMENT--Continued

Soil name and map symbol	Limitations for--		Features affecting--		
	Pond reservoir areas	Embankments, dikes and levees	Irrigation	Terraces and diversions	Grassed waterways
HyC----- Hye	Severe: depth to rock.	Moderate: thin layer.	Soil blowing, depth to rock, slope.	Depth to rock, soil blowing.	Depth to rock.
KfC----- Katemcy	Severe: depth to rock.	Severe: thin layer.	Percs slowly, depth to rock, slope.	Depth to rock, percs slowly.	Percs slowly, depth to rock.
KLE*: Katemcy-----	Severe: depth to rock.	Severe: thin layer.	Percs slowly, depth to rock, slope.	Depth to rock, percs slowly.	Percs slowly, depth to rock.
Ligon-----	Severe: depth to rock.	Severe: thin layer.	Depth to rock, slope.	Depth to rock----	Depth to rock.
LeA, LeA, LeB----- Leeray	Slight-----	Severe: hard to pack.	Slow intake, percs slowly.	Percs slowly-----	Percs slowly.
MaA----- May	Moderate: seepage.	Moderate: piping.	Erodes easily----	Erodes easily----	Erodes easily.
MeB----- Mereta	Severe: cemented pan, seepage.	Severe: thin layer.	Cemented pan----	Cemented pan----	Cemented pan.
MfB----- Miles	Moderate: seepage.	Moderate: piping.	Soil blowing-----	Soil blowing-----	Favorable.
Mr----- Miller	Slight-----	Moderate: hard to pack.	Slow intake, percs slowly, erodes easily.	Erodes easily, percs slowly.	Erodes easily, percs slowly.
NaC----- Nimrod	Severe: seepage.	Moderate: thin layer, piping, wetness.	Wetness, droughty, fast intake.	Wetness, soil blowing.	Droughty.
NBE*: Nocken-----	Moderate: depth to rock.	Severe: large stones.	Large stones, droughty, depth to rock.	Slope, large stones, depth to rock.	
Bonti-----	Moderate: depth to rock, slope.	Severe: thin layer.	Soil blowing, depth to rock.	Depth to rock, erodes easily, soil blowing.	Erodes easily, depth to rock.
NCF*: Nocken-----	Moderate: depth to rock.	Severe: large stones.	Large stones, droughty, depth to rock.	Slope, large stones, depth to rock.	
Callahan-----	Moderate: depth to rock.	Severe: thin layer.	Percs slowly, depth to rock, slope.	Depth to rock, percs slowly.	Depth to rock, percs slowly.
Throck-----	Moderate: depth to rock.	Slight-----	Slow intake, percs slowly, slope.	Slope, percs slowly.	Slope, percs slowly.
NNE*: Nocken-----	Moderate: depth to rock.	Severe: large stones.	Large stones, droughty, depth to rock.	Slope, large stones, depth to rock.	
Nebgen-----	Severe: depth to rock.	Severe: thin layer, piping.	Depth to rock, slope.	Slope, large stones, depth to rock.	Large stones, slope, depth to rock.

See footnote at end of table.

TABLE 13.--WATER MANAGEMENT--Continued

Soil name and map symbol	Limitations for--		Features affecting--		
	Pond reservoir areas	Embankments, dikes and levees	Irrigation	Terraces and diversions	Grassed waterways
NuA, NuB----- Nuvalde	Severe: seepage.	Moderate: piping.	Favorable-----	Favorable-----	Favorable.
NxC*: Nuvalde-----	Severe: seepage.	Moderate: piping.	Favorable-----	Favorable-----	Favorable.
Shep-----	Moderate: seepage, slope.	Moderate: piping.	Slope-----	Favorable-----	Favorable.
OYE*: Oplin-----	Severe: depth to rock, slope.	Severe: thin layer, large stones.	Large stones, droughty, depth to rock.	Slope, large stones, depth to rock.	Large stones, slope, droughty.
Yates-----	Severe: depth to rock.	Severe: thin layer, large stones.	Large stones, droughty, depth to rock.	Slope, large stones, depth to rock.	Large stones, slope, droughty.
PBF*: Pebblepoint-----	Moderate: depth to rock.	Severe: seepage.	Large stones, droughty, slope.	Slope, large stones, percs slowly.	Large stones, slope, droughty.
Rumple-----	Severe: seepage.	Moderate: thin layer.	Droughty, depth to rock, slope.	Large stones, depth to rock.	Large stones, droughty, depth to rock.
PfB----- Pedernales	Slight-----	Moderate: hard to pack.	Soil blowing-----	Soil blowing-----	Favorable.
PoC----- Pontotoc	Severe: seepage.	Slight-----	Soil blowing, slope.	Soil blowing-----	Favorable.
RfC----- Rochelle	Severe: seepage.	Severe: seepage.	Droughty, soil blowing, slope.	Erodes easily, too sandy, soil blowing.	Erodes easily, droughty.
RgD----- Roughcreek	Severe: depth to rock.	Severe: thin layer, large stones.	Large stones, percs slowly, rooting depth.	Large stones, depth to rock.	Large stones, depth to rock.
RoB----- Rowena	Slight-----	Moderate: hard to pack.	Favorable-----	Favorable-----	Favorable.
RuC----- Rumple	Severe: seepage.	Moderate: thin layer.	Droughty, depth to rock, slope.	Large stones, depth to rock.	Large stones, droughty, depth to rock.
SaA, SaB----- Sagerton	Slight-----	Moderate: piping.	Favorable-----	Favorable-----	Favorable.
SHE*----- Shep	Severe: slope.	Moderate: piping.	Slope-----	Slope-----	Slope.
SmF----- Smichwick	Severe: slope.	Severe: hard to pack.	Slow intake, percs slowly, slope.	Slope, depth to rock, percs slowly.	Slope, depth to rock, percs slowly.
SoC*: Speck-----	Severe: depth to rock.	Severe: thin layer.	Percs slowly, depth to rock.	Depth to rock, percs slowly.	Depth to rock, percs slowly.
Cho-----	Severe: cemented pan, seepage.	Severe: thin layer.	Cemented pan, slope.	Cemented pan-----	Droughty, cemented pan.

See footnote at end of table.

TABLE 13.--WATER MANAGEMENT--Continued

Soil name and map symbol	Limitations for--		Features affecting--		
	Pond reservoir areas	Embankments, dikes and levees	Irrigation	Terraces and diversions	Grassed waterways
StG----- Stilskin	Severe: depth to rock, slope, seepage.	Severe: thin layer, seepage, large stones.	Large stones, depth to rock, slope.	Slope, large stones, depth to rock.	Large stones, slope, depth to rock.
TpB----- Tarpley	Severe: depth to rock, seepage.	Severe: thin layer, hard to pack.	Percs slowly, depth to rock.	Depth to rock, percs slowly.	Depth to rock, percs slowly.
We----- Weswood	Moderate: seepage.	Moderate: piping.	Erodes easily----	Erodes easily----	Erodes easily.
WfA, WfB----- Winters	Moderate: seepage.	Moderate: hard to pack.	Soil blowing-----	Soil blowing-----	Favorable.
Ya*----- Yahola	Severe: seepage.	Severe: piping.	Flooding-----	Soil blowing-----	Favorable.
YeC----- Yates	Severe: depth to rock.	Severe: thin layer, large stones.	Large stones, droughty, depth to rock.	Large stones, depth to rock.	Large stones, droughty.
YRG*: Yates-----	Severe: depth to rock.	Severe: thin layer, large stones.	Large stones, droughty, depth to rock.	Slope, large stones, depth to rock.	Large stones, slope, droughty.
Rock outcrop.					

\* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 14.--ENGINEERING INDEX PROPERTIES

[The symbol &lt; means less than; &gt; means more than. Absence of an entry indicates that data were not estimated]

Soil name and map symbol	Depth	USDA texture	Classification		Frag-ments > 3 inches	Percentage passing sieve number--				Liquid limit	Plas-ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
BaB----- Bastrop	0-17	Fine sandy loam	ML, SM, CL-ML, SM-SC	A-4	0	95-100	80-100	80-100	36-70	18-25	2-7
	17-80	Sandy clay loam, clay loam, loam.	CL, SC	A-6	0	95-100	80-100	80-100	40-70	26-40	11-22
BaC----- Bastrop	0-16	Fine sandy loam	ML, SM, CL-ML, SM-SC	A-4	0	95-100	80-100	80-100	36-70	18-25	2-7
	16-80	Sandy clay loam, clay loam, loam.	CL, SC	A-6	0	95-100	80-100	80-100	40-70	26-40	11-22
BfB----- Bonti	0-9	Fine sandy loam	SM, SM-SC, ML, CL-ML	A-4, A-2-4	0-2	90-100	90-100	70-100	25-70	18-30	2-7
	9-30	Clay, clay loam, sandy clay.	CL	A-6, A-7	0-4	80-100	80-100	70-100	51-75	30-45	18-25
	30-34	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
BfC----- Bonti	0-13	Fine sandy loam	SM, SM-SC, ML, CL-ML	A-4, A-2-4	0-2	90-100	90-100	70-100	25-70	18-30	2-7
	13-29	Clay, clay loam, sandy clay.	CL	A-6, A-7	0-4	80-100	80-100	70-100	51-75	30-45	18-25
	29-35	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
BfC2----- Bonti	0-7	Fine sandy loam	SM, SM-SC, ML, CL-ML	A-4, A-2-4	0-2	90-100	90-100	70-100	25-70	18-30	2-7
	7-34	Clay, clay loam, sandy clay.	CL	A-6, A-7	0-4	80-100	80-100	70-100	51-75	30-45	18-25
	34-36	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
By*----- Bunyan	0-10	Loam-----	SM-SC, SC, CL, CL-ML	A-4, A-6	0	100	95-100	70-95	40-75	20-35	3-16
	10-42	Stratified clay loam to fine sandy loam.	SC, CL	A-4, A-6	0	100	95-100	80-100	40-95	20-40	8-25
	42-80	Stratified clay loam to fine sandy loam.	SC, CL	A-6, A-7	0	100	95-100	80-95	45-95	30-45	11-25
CaB----- Callahan	0-6	Loam-----	CL, CL-ML, SC, SM-SC	A-4, A-6	0	85-100	85-100	75-100	45-80	25-35	7-16
	6-34	Clay, clay loam	CL	A-6, A-7-6	0	90-100	90-100	80-100	60-95	35-50	19-30
	34-40	Shaly clay, weathered bedrock.	---	---	---	---	---	---	---	---	---
CaC2----- Callahan	0-2	Loam-----	CL, CL-ML, SC, SM-SC	A-4, A-6	0	85-100	85-100	75-100	45-80	25-35	7-16
	2-30	Clay, clay loam	CL	A-6, A-7-6	0	90-100	90-100	80-100	60-95	35-50	19-30
	30-60	Shaly clay, weathered bedrock.	---	---	---	---	---	---	---	---	---
ChC----- Cho	0-10	Loam-----	CL, SC	A-4, A-6, A-7-6	0-5	60-95	55-95	50-80	45-70	25-44	8-22
	10-14	Cemented-----	---	---	---	---	---	---	---	---	---
	14-60	Variable-----	---	---	---	---	---	---	---	---	---
Cm----- Clairemont	0-62	Silt loam-----	CL, CL-ML	A-4, A-6	0	100	98-100	95-100	51-95	25-40	7-20

See footnote at end of table.

TABLE 14.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag-ments > 3 inches	Percentage passing sieve number--				Liquid limit	Plas-ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
CrC----- Corkstone	0-4	Clay loam-----	CL	A-6, A-7-6	0-10	90-100	90-100	80-95	70-90	30-50	15-30
	4-18	Clay, gravelly clay.	CH, CL	A-7-6	0-15	85-100	80-100	70-100	55-95	45-70	25-45
	18-36	Indurated, weathered bedrock.	---	---	---	---	---	---	---	---	---
	36-60	Indurated, unweathered bedrock.	---	---	---	---	---	---	---	---	---
DmB----- Demona	0-24	Loamy fine sand	SM, SP-SM, SM-SC	A-2-4, A-4, A-3	0	80-100	70-100	65-98	7-45	<25	NP-5
	24-58	Sandy clay, clay	CH, CL, SC	A-7-6	0	80-100	80-100	80-100	41-85	33-60	20-40
	48-64	Sandy clay, clay, sandy clay loam.	CL, CH, SC	A-2-6, A-7-6, A-6	0	80-100	80-100	80-100	25-85	25-60	11-40
DsC----- Desan	0-51	Loamy fine sand	SM, SP-SM, SM-SC	A-2-4, A-3	0	98-100	95-100	85-100	8-28	<25	NP-5
	51-96	Sandy clay loam, fine sandy loam.	SC	A-2, A-4, A-6	0	98-100	95-100	90-100	25-50	20-36	8-20
EcC----- Eckrant	0-14	Stony clay-----	GC, SC, CH	A-7-6, A-2-7	25-75	45-98	40-98	35-97	30-94	51-76	31-54
	14-16	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
ERE*: Eckrant-----	0-8	Very stony clay, very cobbly clay.	GC, SC, CH	A-7-6, A-2-7	25-75	45-98	40-98	35-97	30-94	51-76	31-54
	8-10	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Rock outcrop.											
Fr----- Frio	0-42	Silty clay loam	CL, CH	A-6, A-7	0-2	80-100	80-100	70-100	60-95	35-52	20-34
	42-65	Silty clay loam, clay loam, silty clay loam.	CL, CH	A-6, A-7	0-5	80-100	80-100	70-100	60-95	30-52	18-34
Fs*----- Frio	0-36	Silty clay loam	CL, CH	A-6, A-7	0-2	80-100	80-100	70-100	60-95	35-52	20-34
	36-60	Silty clay loam, clay loam, silty clay loam.	CL, CH	A-6, A-7	0-5	80-100	80-100	70-100	60-95	30-52	18-34
HrB----- Harper	0-7	Stony clay-----	CH	A-7-6	20-45	55-90	55-90	55-85	40-70	55-75	33-49
	7-18	Clay-----	CH	A-7-6	0-10	90-100	85-100	85-100	75-95	55-75	33-49
	18-20	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
HyC----- Hye	0-14	Fine sandy loam	SM-SC, SC	A-2, A-4	0-5	85-100	80-100	70-95	25-50	20-30	4-10
	14-36	Sandy clay loam, fine sandy loam.	SC	A-4, A-6, A-2-4, A-2-6	0-5	85-100	80-100	70-98	33-50	27-40	8-21
	36-40	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
KfC----- Katemcy	0-9	Fine sandy loam	CL, CL-ML	A-4, A-6	0-2	85-100	75-99	70-91	51-75	20-35	4-15
	9-36	Clay, clay loam	CL, CH, SC	A-7-6	0-2	85-100	74-99	53-92	39-85	41-65	20-41
	36-48	Weathered bedrock	---	---	---	---	---	---	---	---	---
KLE*: Katemcy-----	0-9	Fine sandy loam	CL, CL-ML	A-4, A-6	0-2	85-100	75-99	70-91	51-75	20-35	4-15
	9-40	Clay, clay loam	CL, CH, SC	A-7-6	0-2	85-100	74-99	53-92	39-85	41-65	20-41
	40-60	Weathered bedrock	---	---	---	---	---	---	---	---	---

See footnote at end of table.

TABLE 14.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Fragments > 3 inches	Percentage passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
KLE#: Ligon-----	0-6	Fine sandy loam	SC, CL, CL-ML, SM-SC	A-4, A-6	0-3	80-100	65-100	60-80	40-75	21-35	4-15
	6-17	Clay loam-----	CL, SC	A-6, A-7-6	0-3	80-95	65-95	60-85	48-85	38-44	16-22
	17-26	Weathered bedrock	---	---	---	---	---	---	---	---	---
LeA----- Leeray	0-34	Clay-----	CH	A-7-6	0-5	95-100	95-100	85-100	75-95	51-70	30-45
	34-75	Clay, silty clay	CH, CL	A-7-6, A-6	0-5	95-100	95-100	85-100	70-95	33-60	19-40
LeB----- Leeray	0-40	Clay-----	CH	A-7-6	0-5	95-100	95-100	85-100	75-95	51-70	30-45
	40-78	Clay, silty clay	CH, CL	A-7-6, A-6	0-5	95-100	95-100	85-100	70-95	33-60	19-40
MaA----- May	0-13	Fine sandy loam	SM, ML, CL-ML, SM-SC	A-4	0	95-100	95-100	80-100	40-60	<25	NP-7
	13-37	Sandy clay loam, clay loam.	SC, CL	A-6	0	95-100	95-100	80-100	40-75	25-40	12-25
	37-60	Sandy clay loam, fine sandy loam, loam.	SC, CL	A-4, A-6	0	95-100	95-100	75-100	40-75	20-40	8-25
MeB----- Mereta	0-18	Clay loam-----	CL, CH	A-6, A-7-6	0-5	90-100	83-100	80-97	60-85	39-52	19-30
	18-23	Variable, cemented.	---	---	---	---	---	---	---	---	---
	23-62	Variable, marl---	---	---	---	---	---	---	---	---	---
MfB----- Miles	0-5	Fine sandy loam	SM, SM-SC, CL-ML, ML	A-2-4, A-4	0	95-100	90-100	80-98	25-55	18-25	2-7
	5-70	Sandy clay loam, clay loam.	CL, SC, SM-SC, CL-ML	A-4, A-6, A-2-4, A-2-6	0	95-100	90-100	90-98	30-72	20-40	4-22
Mr----- Miller	0-20	Silty clay-----	CL, CH	A-7	0	100	100	96-100	90-99	41-60	18-35
	20-60	Clay, silty clay, silty clay loam.	CL, CH	A-7	0	100	98-100	96-100	90-99	41-65	20-40
NaC----- Nimrod	0-27	Loamy fine sand	SP-SM, SM, SM-SC	A-2-4, A-3	0	95-100	95-100	90-100	8-28	<25	NP-4
	27-72	Sandy clay loam	SC, CL	A-6, A-2-6	0	95-100	95-100	90-100	25-55	22-30	11-16
	72-80	Sandy loam, sandy clay loam, loamy fine sand.	SC, CL, SM-SC, CL-ML	A-4, A-6, A-2-4, A-2-6	0	95-100	95-100	90-100	15-55	18-28	2-11
NBE#: Nocken-----	0-17	Very stony fine sandy loam.	SM, SC, SM-SC	A-1, A-2-4, A-4	25-55	70-90	55-80	40-70	20-45	20-30	4-15
	17-40	Very stony sandy clay, very stony clay, very bouldery clay.	SC, CL, CH	A-2, A-6, A-7	25-55	70-90	55-80	50-80	25-70	40-65	25-45
	40-60	Unweathered bedrock.	---	---	---	---	---	---	---	---	---

See footnote at end of table.

TABLE 14.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag-ments > 3 inches	Percentage passing sieve number--				Liquid limit	Plas-ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
NBE*: Bonti-----	0-14	Fine sandy loam	SM, SM-SC, ML, CL-ML	A-4, A-2-4	0-2	90-100	90-100	70-100	25-70	18-30	2-7
	14-34	Clay, clay loam, sandy clay.	CL	A-6, A-7	0-4	80-100	80-100	70-100	51-75	30-45	18-25
	34-40	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
NCF*: Nocken-----	0-9	Very stony fine sandy loam.	SM, SC, SM-SC	A-1, A-2-4, A-4	25-55	70-90	55-80	40-70	20-45	20-30	4-15
	9-38	Very stony sandy clay, very stony clay, very bouldery clay.	SC, CL, CH	A-2, A-6, A-7	25-55	70-90	55-80	50-80	25-70	40-65	25-45
	38-40	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Callahan-----	0-5	Loam-----	CL, CL-ML, SC, SM-SC	A-4, A-6	0	85-100	85-100	75-100	45-80	25-35	7-16
	5-31	Clay, clay loam	CL	A-6, A-7-6	0	90-100	90-100	80-100	60-95	35-50	19-30
	31-50	Shaly clay, weathered bedrock.	---	---	---	---	---	---	---	---	---
Throck-----	0-4	Clay-----	CL	A-6, A-7	0-2	80-100	80-99	75-99	60-90	30-45	18-28
	4-28	Silty clay, silty clay loam, clay.	CL	A-6, A-7	0-2	80-99	80-99	75-99	60-90	35-48	20-30
	28-50	Shaly clay, weathered bedrock.	---	---	---	---	---	---	---	---	---
NNE*: Nocken-----	0-15	Very stony fine sandy loam.	SM, SC, SM-SC	A-1, A-2-4, A-4	25-55	70-90	55-80	40-70	20-45	20-30	4-15
	15-36	Very stony sandy clay, very stony clay, very bouldery clay.	SC, CL, CH	A-2, A-6, A-7	25-55	70-90	55-80	50-80	25-70	40-65	25-45
	36-40	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Nebgen-----	0-8	Stony fine sandy loam.	SC, CL, SM-SC, CL-ML	A-4, A-6	2-25	75-100	75-100	70-85	40-55	20-32	4-13
	8-12	Weathered bedrock	---	---	---	---	---	---	---	---	---
	12-18	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
NuA----- Nuvalde	0-12	Clay loam-----	CH, CL	A-7-6	0	95-100	95-100	90-100	85-96	46-62	25-40
	12-34	Clay loam, clay, silty clay.	CH, CL	A-7-6	0	95-100	95-100	90-100	80-98	42-58	24-40
	34-65	Clay loam, silty clay loam, clay.	CL	A-6, A-7-6	0	85-100	80-100	70-98	65-98	32-50	14-32
NuB----- Nuvalde	0-14	Clay loam-----	CH, CL	A-7-6	0	95-100	95-100	90-100	85-96	46-62	25-40
	14-32	Clay loam, clay, silty clay.	CH, CL	A-7-6	0	95-100	95-100	90-100	80-98	42-58	24-40
	32-70	Clay loam, silty clay loam, clay.	CL	A-6, A-7-6	0	85-100	80-100	70-98	65-98	32-50	14-32

See footnote at end of table.

TABLE 14.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag-ments > 3 inches	Percentage passing sieve number--				Liquid limit	Plas-ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
NxC#: Nuvalde-----	0-12	Clay loam-----	CH, CL	A-7-6	0	95-100	95-100	90-100	85-96	46-62	25-40
	12-34	Clay loam, clay, silty clay.	CH, CL	A-7-6	0	95-100	95-100	90-100	80-98	42-58	24-40
	34-60	Clay loam, silty clay loam, clay.	CL	A-6, A-7-6	0	85-100	80-100	70-98	65-98	32-50	14-32
Shep-----	0-32	Loam-----	CL, SC	A-4, A-6	0-2	85-100	80-100	75-95	40-75	25-40	9-21
	32-60	Loam, clay loam, sandy clay loam.	CL, SC	A-4, A-6	0-2	85-100	80-100	70-95	40-75	25-40	9-21
OYE#: Oplin-----	0-17	Gravelly loam----	CL, GC, SC	A-2, A-4, A-6, A-7	0-25	30-85	30-85	30-70	25-70	25-47	8-25
	17-24	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Yates-----	0-7	Very stony loam	CL, SC, CL-ML, SM-SC	A-4, A-6, A-7	20-85	55-90	55-90	55-85	36-65	20-45	5-25
	7-10	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
PBF#: Pebblepoint----	0-4	Very gravelly fine sandy loam.	GM, GC, GP-GM	A-4, A-2-4, A-1-B	0-25	40-60	25-55	20-50	10-45	15-25	NP-10
	4-22	Very gravelly fine sandy loam, very gravelly loam, very gravelly silt loam.	GM, GC, GM-GC	A-4, A-2-4, A-1-B	10-30	15-60	10-55	7-50	5-45	15-25	NP-10
	22-40	Very gravelly clay, very gravelly sandy clay.	GP, GC, GP-GC	A-2, A-2-6, A-2-7	10-30	15-60	5-45	4-40	3-35	45-70	30-50
	40-65	Very gravelly clay, very gravelly sandy clay.	GP, GC, GP-GC	A-2, A-2-6, A-2-7	10-30	15-60	5-40	4-35	3-30	45-70	30-50
	65-75	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Rumple-----	0-8	Cherty loam-----	GC, CL, SC	A-2-6, A-6	0-10	40-90	35-90	35-80	25-75	30-40	13-22
	8-36	Very cherty clay, very cherty clay loam.	GC, SC	A-2-7	5-65	20-75	13-50	13-40	13-35	41-86	20-60
	36-40	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
PFB----- Pedernales	0-11	Fine sandy loam	SM, ML, CL-ML, SM-SC	A-4, A-2-4	0	95-100	90-100	75-100	33-55	<25	NP-7
	11-34	Sandy clay, clay	CH, CL, SC	A-7, A-6	0	90-100	90-100	85-100	45-75	38-60	20-36
	34-60	Sandy clay loam, clay loam, sandy clay.	SC, CL, CH	A-6, A-7	0-5	90-100	90-100	80-100	36-75	32-55	13-30
PoC----- Pontotoc	0-33	Fine sandy loam	SM, SM-SC	A-2, A-4	0-10	90-100	87-100	70-90	25-40	<25	NP-7
	33-70	Fine sandy loam, sandy clay loam.	SC, SM-SC	A-4, A-6	0-10	90-100	87-100	75-90	36-45	23-40	6-19
	70-80	Unweathered bedrock.	---	---	---	---	---	---	---	---	---

See footnote at end of table.

TABLE 14.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag-ments > 3 inches	Percentage passing sieve number--				Liquid limit	Plas-ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
RfC----- Rochelle	0-6	Fine sandy loam	SM, SM-SC	A-2-4, A-4	0-2	90-100	90-100	65-85	25-45	<25	NP-7
	6-20	Sandy clay loam, gravelly sandy clay loam, gravelly fine sandy loam.	SC, CL	A-2-6, A-6, A-4, A-2-4	0-2	80-95	75-95	60-80	30-55	20-30	8-18
	20-32	Gravelly sandy clay loam, very gravelly sandy clay loam, gravelly clay loam.	SC, GC	A-2-6, A-6	0-5	50-85	50-85	30-65	15-45	25-35	11-20
	32-65	Very gravelly sandy loam, very gravelly sand, very gravelly fine sandy loam.	GM-GC, GM, GC, GP-GC	A-1, A-2-4	0-5	10-40	5-30	5-25	5-20	<25	NP-10
RgD----- Roughcreek	0-7	Very stony clay loam.	CL, CH	A-7, A-6	25-50	85-100	80-98	75-95	65-90	40-60	20-35
	7-18	Very stony clay	CH	A-7	25-70	85-100	80-100	85-100	60-95	51-75	35-50
	18-24	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
RoB----- Rowena	0-7	Clay loam-----	CL	A-6, A-7	0	95-100	90-100	85-100	70-85	35-50	15-30
	7-34	Clay, clay loam	CH, CL	A-7	0	95-100	95-100	90-100	75-95	41-55	25-35
	34-65	Clay, clay loam, silty clay loam.	CH, CL	A-6, A-7	0	85-100	75-100	65-90	55-85	32-55	14-28
RuC----- Rumple	0-8	Cherty loam	GC, CL, SC	A-2-6, A-6	0-10	40-90	35-90	35-80	25-75	30-40	13-22
	8-36	Cherty clay, very cherty clay.	GC, SC	A-2-7	5-65	20-75	13-50	13-40	13-35	41-86	20-60
	36-40	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
SaA----- Sagerton	0-6	Clay loam-----	CL	A-6, A-4	0	95-100	95-100	90-100	55-80	25-35	8-18
	6-24	Clay loam, clay	CL	A-6, A-7-6	0	95-100	95-100	90-100	65-95	36-50	18-30
	24-80	Clay loam, clay	CL	A-6, A-4, A-7-6	0	90-100	90-100	80-100	60-85	25-50	8-30
SaB----- Sagerton	0-6	Clay loam-----	CL	A-6, A-4	0	95-100	95-100	90-100	55-80	25-35	8-18
	6-30	Clay loam, clay	CL	A-6, A-7-6	0	95-100	95-100	90-100	65-95	36-50	18-30
	30-80	Clay loam, clay	CL	A-6, A-4, A-7-6	0	90-100	90-100	80-100	60-85	25-50	8-30
SHE*----- Shep	0-32	Loam-----	CL, SC	A-4, A-6	0-2	85-100	80-100	75-95	40-75	25-40	9-21
	32-65	Loam, clay loam, sandy clay loam.	CL, SC	A-4, A-6	0-2	85-100	80-100	70-95	40-75	25-40	9-21
SmF----- Smithwick	0-5	Clay-----	CH	A-7-6	0-10	90-98	90-98	85-95	80-95	50-70	30-45
	5-34	Clay-----	CH	A-7-6	0-5	95-100	95-100	90-98	80-98	50-70	30-45
	34-65	Weathered bedrock, very shaly clay, shaly clay.	CH	A-7-6	0-5	95-100	95-100	95-100	80-98	50-70	30-45
SoC*: Speck-----	0-8	Clay loam-----	CL	A-6, A-7-6	0	90-100	90-100	80-95	70-90	30-45	15-25
	8-15	Clay, clay loam	CL, CH	A-7-6	0	85-100	80-100	70-100	55-95	45-65	25-40
	15-18	Indurated, unweathered bedrock.	---	---	---	---	---	---	---	---	---

See footnote at end of table.

TABLE 14.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag-ments > 3 inches	Percentage passing sieve number--				Liquid limit	Plas-ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
SoC#: Cho-----	0-8	Clay loam-----	CL, SC	A-4, A-6, A-7-6	0-5	60-95	55-95	50-80	45-70	25-44	8-22
	8-14	Cemented-----	---	---	---	---	---	---	---	---	---
	14-30	Variable-----	---	---	---	---	---	---	---	---	---
StG----- Stilskin	0-6	Gravelly loam----	GM-GC, GM, SM-SC, SM	A-4, A-2-4, A-6	10-25	55-85	50-80	30-60	15-45	20-35	8-20
	6-17	Very gravelly loam, very gravelly fine sandy loam, very cobbly loam.	GM, GM-GC	A-2-4, A-4, A-6	25-45	25-55	10-50	10-45	5-35	20-35	8-20
	17-30	Weathered bedrock	---	---	---	---	---	---	---	---	---
TpB----- Tarpley	0-7	Clay loam-----	CL, CH	A-7	0-3	90-100	90-100	80-95	70-90	41-60	20-38
	7-17	Clay-----	CH	A-7	0	90-100	90-100	90-100	65-98	70-90	45-60
	17-20	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
We----- Weswood	0-8	Silt loam-----	CL, CL-ML	A-4, A-6	0	100	100	95-100	70-95	20-35	4-15
	8-80	Silt loam, silty clay loam, clay loam.	CL	A-6, A-7	0	100	100	90-100	70-98	30-46	11-26
WfA----- Winters	0-7	Fine sandy loam	SM, SM-SC	A-4	0	98-100	95-100	70-90	36-50	<25	NP-7
	7-45	Sandy clay, clay, clay loam.	CL, CH	A-7-6	0	95-100	90-100	80-100	51-85	41-52	20-30
	45-75	Clay loam, sandy clay loam, sandy clay.	CL, CH	A-6, A-7-6	0	95-100	90-100	80-100	51-87	34-52	17-30
WfB----- Winters	0-7	Fine sandy loam	SM, SM-SC	A-4	0	98-100	95-100	70-90	36-50	<25	NP-7
	7-58	Sandy clay, clay, clay loam.	CL, CH	A-7-6	0	95-100	90-100	80-100	51-85	41-52	20-30
	58-80	Clay loam, sandy clay loam, sandy clay.	CL, CH	A-6, A-7-6	0	95-100	90-100	80-100	51-87	34-52	17-30
Ya*----- Yahola	0-10	Fine sandy loam	SM, ML, CL-ML, SM-SC	A-4	0	100	95-100	90-100	36-60	<26	NP-7
	10-30	Fine sandy loam, loam, very fine sandy loam.	SM, ML, CL-ML, SM-SC	A-4	0	100	95-100	90-100	36-85	<26	NP-7
	30-65	Stratified clay loam to loamy fine sand.	SM, ML, CL-ML, SM-SC	A-2, A-4	0	100	95-100	90-100	15-85	<26	NP-7
YeC----- Yates	0-6	Very stony loam	CL, SC, CL-ML, SM-SC	A-4, A-6, A-7	20-85	55-90	55-90	55-85	36-65	20-45	5-25
	6-12	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
YRG*: Yates-----	0-6	Very stony loam	CL, SC, CL-ML, SM-SC	A-4, A-6, A-7	20-85	55-90	55-90	55-85	36-65	20-45	5-25
	6-12	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Rock outcrop.											

\* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 15.--PHYSICAL AND CHEMICAL PROPERTIES OF SOILS

[The symbol < means less than. Entries under "Erosion factors--T" apply to the entire profile. Entries under "Wind erodibility group" and "Organic matter" apply only to the surface layer. Absence of an entry indicates that data were not available or were not estimated]

Soil name and map symbol	Depth	Clay <2mm	Permeability	Available water capacity	Soil reaction	Shrink-swell potential	Erosion factors		Wind erodibility group	Organic matter
							K	T		
	In	Pct	In/hr	In/in	pH					Pct
BaB----- Bastrop	0-17 17-80	5-20 20-35	2.0-6.0 0.6-2.0	0.11-0.17 0.15-0.19	5.6-7.3 5.6-8.4	Low----- Low-----	0.37 0.32	5	3	0.5-1
BaC----- Bastrop	0-16 16-80	5-20 20-35	2.0-6.0 0.6-2.0	0.11-0.17 0.15-0.19	5.6-7.3 5.6-8.4	Low----- Low-----	0.37 0.32	5	3	0.5-1
BfB----- Bont1	0-9 9-30 30-34	10-20 35-50 ---	0.6-2.0 0.2-0.6 ---	0.11-0.15 0.15-0.20 ---	5.6-7.3 5.1-6.0 ---	Low----- Moderate----- ---	0.37 0.32 ---	2	3	<2
BfC----- Bont1	0-13 13-29 29-35	10-20 35-50 ---	0.6-2.0 0.2-0.6 ---	0.11-0.15 0.15-0.20 ---	5.6-7.3 5.1-6.0 ---	Low----- Moderate----- ---	0.37 0.32 ---	2	3	<2
BfC2----- Bont1	0-7 7-34 34-36	10-20 35-50 ---	0.6-2.0 0.2-0.6 ---	0.11-0.15 0.15-0.20 ---	5.6-7.3 5.1-6.0 ---	Low----- Moderate----- ---	0.37 0.32 ---	2	3	<2
By*----- Bunyan	0-10 10-42 42-80	8-25 18-35 18-35	2.0-6.0 0.6-2.0 0.6-2.0	0.11-0.15 0.15-0.19 0.18-0.22	6.1-7.3 5.6-8.4 6.6-8.4	Low----- Low----- Low-----	0.43 0.43 0.43	5	3	<1
CaB----- Callahan	0-6 6-34 34-40	15-30 35-50 ---	0.2-0.6 <0.06 ---	0.15-0.20 0.12-0.18 ---	6.6-8.4 7.4-8.4 ---	Low----- Moderate----- ---	0.32 0.32 ---	4	6	<1
CaC2----- Callahan	0-2 2-30 30-60	15-30 35-50 ---	0.2-0.6 <0.06 ---	0.15-0.20 0.12-0.18 ---	6.6-8.4 7.4-8.4 ---	Low----- Moderate----- ---	0.32 0.32 ---	4	6	<1
ChC----- Cho	0-10 10-14 14-60	20-35 --- ---	0.6-2.0 --- ---	0.10-0.15 --- ---	7.9-8.4 --- ---	Low----- --- ---	0.28 --- ---	1	4L	1-2
Cm----- Clairemont	0-62	18-35	0.6-2.0	0.16-0.22	7.9-8.4	Low-----	0.43	5	6	<2
CrC----- Corkstone	0-4 4-18 18-36 36-60	27-45 55-75 --- ---	0.2-0.6 0.06-0.2 --- ---	0.15-0.20 0.12-0.18 --- ---	6.6-7.8 6.6-7.8 --- ---	Moderate----- High----- --- ---	0.32 0.32 --- ---	2	6	1-3
DmB----- Demona	0-24 24-58 48-64	5-15 35-50 20-45	2.0-6.0 0.2-0.6 0.2-0.6	0.05-0.10 0.15-0.18 0.14-0.18	5.6-7.8 5.1-6.5 5.1-6.5	Very low----- Moderate----- Moderate-----	0.17 0.24 0.24	5	2	---
DsC----- Desan	0-51 51-96	2-12 18-35	6.0-20 0.6-2.0	0.05-0.08 0.14-0.18	5.1-7.3 5.1-6.5	Very low----- Low-----	0.17 0.24	5	2	<1
EcC----- Eckrant	0-14 14-16	35-60 ---	0.2-0.6 ---	0.05-0.12 ---	6.6-8.4 ---	Moderate----- ---	0.10 ---	1	---	---
ERE*: Eckrant	0-8 8-10	35-60 ---	0.2-0.6 ---	0.05-0.12 ---	6.6-8.4 ---	Moderate----- ---	0.10 ---	1	---	---
Rock outcrop.										
Fr----- Fr1o	0-42 42-65	35-50 35-50	0.2-0.6 0.2-0.6	0.15-0.22 0.11-0.22	7.9-8.4 7.9-8.4	Moderate----- Moderate-----	0.32 0.32	5	4	1-4
Fs*----- Fr1o	0-36 36-60	35-50 35-50	0.2-0.6 0.2-0.6	0.15-0.22 0.11-0.22	7.9-8.4 7.9-8.4	Moderate----- Moderate-----	0.32 0.32	5	4	1-4

See footnote at end of table.

TABLE 15.--PHYSICAL AND CHEMICAL PROPERTIES OF SOILS--Continued

Soil name and map symbol	Depth	Clay <2mm	Permeability	Available water capacity	Soil reaction	Shrink-swell potential	Erosion factors		Wind erodibility group	Organic matter
							K	T		
	In	Pct	In/hr	In/in	pH				Pct	
HrB-----	0-7	40-60	0.2-0.6	0.08-0.10	7.4-8.4	Moderate-----	0.32	1	8	1-3
Harper	7-18	40-60	0.2-0.6	0.15-0.20	7.4-8.4	High-----	0.32			
	18-20	---	---	---	---	-----	-----			
HyC-----	0-14	10-18	2.0-6.0	0.11-0.15	6.1-7.3	Low-----	0.24	3	3	<1
Hye	14-36	18-32	0.6-2.0	0.12-0.17	6.1-7.3	Low-----	0.32			
	36-40	---	---	---	---	-----	-----			
KfC-----	0-9	15-32	0.6-2.0	0.15-0.20	6.1-7.8	Low-----	0.32	2	---	0.5-1
Katemcy	9-36	35-50	0.06-0.2	0.14-0.20	6.1-7.8	Moderate-----	0.32			
	36-48	---	---	---	---	-----	-----			
KLE*:										
Katemcy-----	0-9	15-32	0.6-2.0	0.15-0.20	6.1-7.8	Low-----	0.32	2	---	0.5-1
	9-40	35-50	0.06-0.2	0.14-0.20	6.1-7.8	Moderate-----	0.32			
	40-60	---	---	---	---	-----	-----			
Ligon-----	0-6	18-30	0.6-2.0	0.10-0.15	6.1-7.8	Low-----	0.28	1	8	0.5-1
	6-17	30-35	0.2-0.6	0.10-0.15	6.1-7.8	Moderate-----	0.32			
	17-26	---	---	---	---	-----	-----			
LeA-----	0-34	40-60	<0.06	0.12-0.18	7.9-8.4	Very high-----	0.32	5	---	---
Leeray	34-75	40-60	<0.06	0.10-0.15	7.9-8.4	High-----	0.32			
LeB-----	0-40	40-60	<0.06	0.12-0.18	7.9-8.4	Very high-----	0.32	5	---	---
Leeray	40-78	40-60	<0.06	0.10-0.15	7.9-8.4	High-----	0.32			
MaA-----	0-13	8-18	2.0-6.0	0.11-0.15	6.1-7.8	Low-----	0.37	5	---	<1
May	13-37	20-30	0.6-2.0	0.12-0.20	6.6-7.8	Moderate-----	0.37			
	37-60	10-30	0.6-2.0	0.11-0.20	7.4-8.4	Moderate-----	0.37			
MeB-----	0-18	35-45	0.2-0.6	0.15-0.20	7.9-8.4	Moderate-----	0.32	1	---	1-3
Mereta	18-23	---	---	---	---	-----	0.32			
	23-62	---	---	---	---	-----	-----			
MfB-----	0-5	7-18	2.0-6.0	0.10-0.15	6.1-7.8	Low-----	0.24	5	3	---
Miles	5-70	20-35	0.6-2.0	0.12-0.18	6.6-8.4	Low-----	0.32			
Mr-----	0-20	40-50	<0.06	0.12-0.18	7.4-8.4	High-----	0.37	5	---	1-3
Miller	20-60	40-60	<0.06	0.15-0.19	7.4-8.4	High-----	0.37			
NaC-----	0-27	---	6.0-20	0.05-0.10	5.6-7.3	Very low-----	0.17	5	2	---
Nimrod	27-72	---	0.2-0.6	0.12-0.17	5.1-6.0	Low-----	0.24			
	72-80	---	0.2-0.6	0.06-0.17	5.1-6.5	Low-----	0.24			
NBE*:										
Nocken-----	0-17	10-18	0.6-2.0	0.04-0.08	5.6-7.3	Low-----	0.37	2	8	<1
	17-40	40-65	0.2-0.6	0.08-0.12	5.1-6.5	Moderate-----	0.32			
	40-60	---	---	---	---	-----	-----			
Bonti-----	0-14	10-20	0.6-2.0	0.11-0.15	5.6-7.3	Low-----	0.37	2	3	<2
	14-34	35-50	0.2-0.6	0.15-0.20	5.1-6.0	Moderate-----	0.32			
	34-40	---	---	---	---	-----	-----			
NCF*:										
Nocken-----	0-9	10-18	0.6-2.0	0.04-0.08	5.6-7.3	Low-----	0.37	2	8	<1
	9-38	40-65	0.2-0.6	0.08-0.12	5.1-6.5	Moderate-----	0.32			
	38-40	---	---	---	---	-----	-----			
Callahan-----	0-5	15-30	0.2-0.6	0.15-0.20	6.6-8.4	Low-----	0.32	4	6	<1
	5-31	35-50	<0.06	0.12-0.18	7.4-8.4	Moderate-----	0.32			
	31-50	---	---	---	---	-----	-----			
Throck-----	0-4	35-45	0.2-0.6	0.12-0.20	7.9-8.4	Moderate-----	0.32	3	4	<1
	4-28	35-45	0.06-0.2	0.12-0.20	7.9-8.4	Moderate-----	0.32			
	28-50	---	---	---	---	-----	-----			

See footnote at end of table.

TABLE 15.--PHYSICAL AND CHEMICAL PROPERTIES OF SOILS--Continued

Soil name and map symbol	Depth	Clay <2mm	Permeability	Available water capacity	Soil reaction	Shrink-swell potential	Erosion factors		Wind erodibility group	Organic matter
							K	T		
	In	Pct	In/hr	In/in	pH					Pct
NNE*: Nocken-----	0-15 15-36 36-40	10-18 40-65 ---	0.6-2.0 0.2-0.6 ---	0.04-0.08 0.08-0.12 ---	5.6-7.3 5.1-6.5 ---	Low----- Moderate----- -----	0.37 0.32 -----	2	8	<1
Nebgen-----	0-8 8-12 12-18	15-22 --- ---	2.0-6.0 --- ---	0.09-0.14 --- ---	6.1-7.3 --- ---	Low----- ----- -----	0.24 ----- -----	1	8	<1
NuA----- Nuvalde	0-12 12-34 34-65	35-50 35-50 28-45	0.6-2.0 0.6-2.0 0.6-2.0	0.14-0.20 0.12-0.18 0.12-0.18	7.9-8.4 7.9-8.4 7.9-8.4	High----- High----- Moderate-----	0.28 0.28 0.32	5	---	1-3
NuB----- Nuvalde	0-14 14-32 32-70	35-50 35-50 28-45	0.6-2.0 0.6-2.0 0.6-2.0	0.14-0.20 0.12-0.18 0.12-0.18	7.9-8.4 7.9-8.4 7.9-8.4	High----- High----- Moderate-----	0.28 0.28 0.32	5	---	1-3
NxC*: Nuvalde-----	0-12 12-34 34-60	35-50 35-50 28-45	0.6-2.0 0.6-2.0 0.6-2.0	0.14-0.20 0.12-0.18 0.12-0.18	7.9-8.4 7.9-8.4 7.9-8.4	High----- High----- Moderate-----	0.28 0.28 0.32	5	---	1-3
Shep-----	0-32 32-60	18-35 18-35	0.6-2.0 0.6-2.0	0.15-0.19 0.13-0.17	7.9-8.4 7.9-8.4	Low----- Low-----	0.28 0.28	5	4L	<1
OYE*: Oplin-----	0-17 17-24	20-35 ---	0.6-2.0 ---	0.10-0.15 ---	7.9-8.4 ---	Low----- -----	0.10 -----	1	8	---
Yates-----	0-7 7-10	18-32 ---	0.6-2.0 ---	0.06-0.12 ---	6.6-8.4 ---	Low----- -----	0.10 -----	1	8	<1
PBF*: Pebblepoint----	0-4 4-22 22-40 40-65 65-75	5-27 5-27 37-60 37-60 ---	2.0-6.0 2.0-6.0 0.06-0.2 0.06-0.2 ---	0.05-0.10 0.05-0.10 0.03-0.10 0.03-0.10 ---	6.1-8.4 5.1-7.3 5.1-6.0 5.1-6.0 ---	Low----- Low----- Low----- Low----- -----	0.10 0.10 0.10 0.10 -----	3	8	---
Rumple-----	0-8 8-36 36-40	20-40 40-80 ---	0.2-0.6 0.2-0.6 ---	0.08-0.16 0.05-0.15 ---	6.1-7.8 6.1-7.3 ---	Low----- Moderate----- -----	0.17 0.10 -----	2	---	---
PfB----- Pedernales	0-11 11-34 34-60	8-20 35-55 20-50	0.6-2.0 0.2-0.6 0.2-0.6	0.12-0.17 0.15-0.20 0.15-0.20	6.1-7.8 6.1-7.8 7.9-8.4	Low----- Moderate----- Moderate-----	0.32 0.28 0.28	5	3	<1
PoC----- Pontotoc	0-33 33-70 70-80	12-18 18-30 ---	2.0-6.0 0.6-2.0 ---	0.11-0.15 0.12-0.17 ---	6.1-7.3 6.1-7.3 ---	Low----- Low----- -----	0.24 0.24 -----	4	3	0.5-1
RfC----- Rochelle	0-6 6-20 20-32 32-65	14-24 18-35 25-35 5-24	0.6-2.0 0.6-2.0 0.2-0.6 2.0-6.0	0.10-0.15 0.10-0.15 0.05-0.10 0.01-0.05	6.6-7.8 6.6-7.8 6.6-7.8 7.9-8.4	Low----- Low----- Low----- Very low-----	0.37 0.32 0.32 0.17	3	3	<1
RgD----- Roughcreek	0-7 7-18 18-24	30-40 40-60 ---	0.2-0.6 0.06-0.2 ---	0.10-0.16 0.10-0.18 ---	6.1-7.8 6.1-7.8 ---	Low----- Moderate----- -----	0.32 0.32 -----	1	8	1-3
RoB----- Rowena	0-7 7-34 34-65	35-45 35-50 35-50	0.2-0.6 0.2-0.6 0.2-0.6	0.15-0.20 0.14-0.18 0.11-0.15	7.9-8.4 7.9-8.4 7.9-8.4	Moderate----- High----- High-----	0.32 0.32 0.32	5	4	2-4

See footnote at end of table.

TABLE 15.--PHYSICAL AND CHEMICAL PROPERTIES OF SOILS--Continued

Soil name and map symbol	Depth	Clay <2mm	Permeability	Available water capacity	Soil reaction	Shrink-swell potential	Erosion factors		Wind erodibility group	Organic matter
							K	T		
	In	Pct	In/hr	In/in	pH				Pct	
RuC-----	0-8	20-40	0.2-0.6	0.08-0.16	6.1-7.8	Low-----	0.17	2	---	---
Rumple	8-36	40-80	0.2-0.6	0.05-0.15	6.1-7.3	Moderate-----	0.10			
	36-40	---	---	---	---	-----				
SaA-----	0-6	20-35	0.6-2.0	0.15-0.20	6.6-7.8	Moderate-----	0.32	5	6	1-3
Sagerton	6-24	35-45	0.2-0.6	0.14-0.19	6.6-8.4	Moderate-----	0.32			
	24-80	35-45	0.2-0.6	0.10-0.17	7.9-8.4	Moderate-----	0.32			
SaB-----	0-6	20-35	0.6-2.0	0.15-0.20	6.6-7.8	Moderate-----	0.32	5	6	1-3
Sagerton	6-30	35-45	0.2-0.6	0.14-0.19	6.6-8.4	Moderate-----	0.32			
	30-80	35-45	0.2-0.6	0.10-0.17	7.9-8.4	Moderate-----	0.32			
SHE*-----	0-32	18-35	0.6-2.0	0.15-0.19	7.9-8.4	Low-----	0.28	5	4L	<1
Shep	32-65	18-35	0.6-2.0	0.13-0.17	7.9-8.4	Low-----	0.28			
SmF-----	0-5	55-75	<0.06	0.12-0.18	7.9-8.4	Very high-----	0.32	3	4	---
Smithwick	5-34	60-80	<0.06	0.10-0.18	7.9-8.4	Very high-----	0.32			
	34-65	60-80	<0.06	0.10-0.15	7.9-8.4	Very high-----				
SoC#:										
Speck-----	0-8	20-39	0.2-0.6	0.15-0.20	6.1-7.8	Moderate-----	0.32	1	6	1-3
	8-15	35-60	0.06-0.2	0.12-0.18	6.1-7.8	High-----	0.32			
	15-18	---	---	---	---	-----				
Cho-----	0-8	20-35	0.6-2.0	0.10-0.15	7.9-8.4	Low-----	0.28	1	4L	1-2
	8-14	---	---	---	---	-----				
	14-30	---	---	---	---	-----				
StG-----	0-6	7-25	0.6-2.0	0.10-0.15	7.9-8.4	Low-----	0.24	1	8	---
Stilskin	6-17	7-25	0.6-2.0	0.05-0.10	7.9-8.4	Low-----	0.24			
	17-30	---	---	---	---	-----				
TpB-----	0-7	30-50	0.2-0.6	0.15-0.20	6.1-7.8	High-----	0.32	1	---	1-3
Tarpley	7-17	60-80	0.06-0.2	0.12-0.18	6.1-7.8	Very high-----	0.32			
	17-20	---	---	---	---	-----				
We-----	0-8	15-27	0.6-2.0	0.15-0.20	7.9-8.4	Low-----	0.43	5	6	<2
Weswood	8-80	20-35	0.6-2.0	0.15-0.22	7.9-8.4	Low-----	0.43			
WfA-----	0-7	10-20	2.0-6.0	0.10-0.14	6.1-7.8	Low-----	0.24	5	3	<1
Winters	7-45	35-45	0.2-0.6	0.14-0.18	6.1-7.8	Moderate-----	0.28			
	45-75	25-45	0.6-2.0	0.14-0.18	7.9-8.4	Moderate-----	0.24			
WfB-----	0-7	10-20	2.0-6.0	0.10-0.14	6.1-7.8	Low-----	0.24	5	3	<1
Winters	7-58	35-45	0.2-0.6	0.14-0.18	6.1-7.8	Moderate-----	0.28			
	58-80	25-45	0.6-2.0	0.14-0.18	7.9-8.4	Moderate-----	0.24			
Ya*-----	0-10	10-18	2.0-6.0	0.11-0.15	7.4-8.4	Low-----	0.20	5	3	0.5-1
Yahola	10-30	5-18	2.0-6.0	0.11-0.20	7.9-8.4	Low-----	0.20			
	30-65	2-30	2.0-6.0	0.07-0.20	7.9-8.4	Low-----	0.20			
YeC-----	0-6	18-32	0.6-2.0	0.06-0.12	6.6-8.4	Low-----	0.10	1	8	<1
Yates	6-12	---	---	---	---	-----				
YRG#:										
Yates	0-6	18-32	0.6-2.0	0.06-0.12	6.6-8.4	Low-----	0.10	1	8	<1
	6-12	---	---	---	---	-----				
Rock outcrop.										

\* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 16.--SOIL AND WATER FEATURES

["Flooding" and terms such as "rare," "brief," "apparent," and "perched" are explained in the text. The symbol > means more than. Absence of an entry indicates that the feature is not a concern]

Soil name and map symbol	Hydrologic group	Flooding			Bedrock		Risk of corrosion	
		Frequency	Duration	Months	Depth	Hardness	Uncoated steel	Concrete
BaB, BaC----- Bastrop	B	None-----	---	---	In >60	---	Moderate	Low.
BfB, BfC, BfC2---- Bont1	C	None-----	---	---	20-40	Hard	High-----	Moderate.
By*----- Bunyan	B	Frequent----	Brief-----	May-Oct	>60	---	Moderate	Low.
CaB, CaC2----- Callahan	D	None-----	---	---	20-40	Soft	High-----	Low.
ChC----- Cho	C	None-----	---	---	>60	---	High-----	Low.
Cm----- Clairemont	B	Frequent----	Very brief	Apr-Nov	>60	---	Moderate	Low.
CrC----- Corkstone	D	None-----	---	---	12-20	Soft	High-----	Low.
DmB----- Demona	C	None-----	---	---	>60	---	High-----	Moderate.
DsC----- Desan	A	None-----	---	---	>60	---	Moderate	Moderate.
EcC----- Eckrant	D	None-----	---	---	8-20	Hard	High-----	Low.
ERE*: Eckrant----- Rock outcrop.	D	None-----	---	---	8-20	Hard	High-----	Low.
Fr----- Frio	B	Occasional	Brief-----	Oct-May	>60	---	High-----	Low.
Fs*----- Frio	B	Frequent----	Brief-----	Oct-May	>60	---	High-----	Low.
HrB----- Harper	D	None-----	---	---	11-20	Hard	High-----	Low.
HyC----- Hye	B	None-----	---	---	20-40	Hard	Moderate	Low.
KfC----- Katemcy	C	None-----	---	---	20-40	Soft	High-----	Low.
KLE*: Katemcy-----	C	None-----	---	---	20-40	Soft	High-----	Low.
Ligon-----	D	None-----	---	---	12-20	Soft	Moderate	Low.
LeA, LeA, LeB----- Leeray	D	None-----	---	---	>60	---	High-----	Low.
MaA----- May	B	None-----	---	---	>60	---	High-----	Low.

See footnote at end of table.

TABLE 16.--SOIL AND WATER FEATURES--Continued

Soil name and map symbol	Hydrologic group	Flooding			Bedrock		Risk of corrosion	
		Frequency	Duration	Months	Depth	Hardness	Uncoated steel	Concrete
MeB----- Mereta	C	None-----	---	---	In >60	---	High-----	Low.
MfB----- Miles	B	None-----	---	---	>60	---	Moderate	Low.
Mr----- Miller	D	Occasional	Very brief	Mar-May	>60	---	High-----	Low.
NaC----- Nimrod	C	None-----	---	---	>60	---	High-----	Moderate.
NBE*: Nocken-----	C	None-----	---	---	20-40	Soft	High-----	Moderate.
Bonti-----	C	None-----	---	---	20-40	Hard	High-----	Moderate.
NCF*: Nocken-----	C	None-----	---	---	20-40	Soft	High-----	Moderate.
Callahan-----	D	None-----	---	---	20-40	Soft	High-----	Low.
Throck-----	C	None-----	---	---	40-80	Soft	High-----	Low.
NNE*: Nocken-----	C	None-----	---	---	20-40	Soft	High-----	Moderate.
Nebgen-----	D	None-----	---	---	5-14	Soft	Low-----	Low.
NuA, NuB----- Nuvalde	B	None-----	---	---	>60	---	High-----	Low.
NxC*: Nuvalde-----	B	None-----	---	---	>60	---	High-----	Low.
Shep-----	B	None-----	---	---	>60	---	Moderate	Low.
OYE*: Oplin-----	C	None-----	---	---	7-20	Hard	Moderate	Low.
Yates-----	D	None-----	---	---	4-14	Hard	Moderate	Low.
PBF*: Pebblepoint-----	C	None-----	---	---	>40	Hard	High-----	Moderate.
Rumple-----	C	None-----	---	---	20-40	Hard	High-----	Low.
PfB----- Pedernales	C	None-----	---	---	>60	---	High-----	Low.
PoC----- Pontotoc	B	None-----	---	---	>60	---	Low-----	Low.
RfC----- Rochelle	C	None-----	---	---	>60	---	Moderate	Low.
RgD----- Roughcreek	D	None-----	---	---	10-20	Hard	High-----	Low.
RoB----- Rowena	C	None-----	---	---	>60	---	High-----	Low.
RuC----- Rumple	C	None-----	---	---	20-40	Hard	High-----	Low.
SaA, SaB----- Sagerton	C	None-----	---	---	>60	---	Moderate	Low.

See footnote at end of table.

TABLE 16.--SOIL AND WATER FEATURES--Continued

Soil name and map symbol	Hydrologic group	Flooding			Bedrock		Risk of corrosion	
		Frequency	Duration	Months	Depth	Hardness	Uncoated steel	Concrete
SHE*----- Shep	B	None-----	---	---	<u>In</u> >60	---	Moderate	Low.
SmF----- Smithwick	D	None-----	---	---	24-40	Soft	High-----	Low.
SoC*: Speck-----	D	None-----	---	---	14-20	Hard	High-----	Low.
Cho-----	C	None-----	---	---	>60	---	High-----	Low.
StG----- Stilskin	C	None-----	---	---	12-20	Soft	Low-----	Low.
TpB----- Tarpley	D	None-----	---	---	13-20	Hard	High-----	Low.
We----- Weswood	B	Rare-----	---	---	>60	---	High-----	Low.
WfA, WfB----- Winters	C	None-----	---	---	>60	---	High-----	Low.
Ya*----- Yahola	B	Frequent----	Very brief	Apr-Aug	>60	---	Low-----	Low.
YeC----- Yates	D	None-----	---	---	4-14	Hard	Moderate	Low.
YRG*: Yates-----	D	None-----	---	---	4-14	Hard	Moderate	Low.
Rock outcrop.								

\* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 17.--ENGINEERING INDEX TEST DATA  
[Dashes indicate data were not available]

Soil name, report number, horizon, and depth in inches	Classification		Grain size distribution <sup>1</sup>											Plasticity Index	Specific Gravity	Shrinkage		
			Percentage passing sieve--					Percentage smaller than--			Liquid Limit	Plasticity Limit	Linear			Ratio		
			7/4 inch	5/8 inch	3/8 inch	No. 4	No. 10	No. 40	No. 200	.05 mm							.005 mm	Pct
AASHTO	Unified		100	100	100	100	96	92	86	78	74	50	43	28	2.61	15.0	15.5	1.8
Corkstone cl:3 (S77TX-411-005)																		
A1-----0 to 8	CL-CH		100	100	98	96	92	86	78	74	50	43	28	2.61	15.0	15.5	1.8	
B2t-----8 to 17	CH		100	100	100	99	97	92	87	85	68	63	41	2.67	13.0	21.0	1.8	
Eckrant stv-c:4 (S77TX-411-006)																		
A11-----0 to 8	GC		64	100	55	52	50	47	44	42	24	19	32	2.58	13.0	18.9	1.9	
Eckrant cbv-c:5 (S77TX-411-003)																		
A11-----0 to 6	CH		100	100	100	100	100	98	91	87	55	47	39	2.62	12.0	21.6	9.3	
A12-----6 to 14	CH		100	100	100	99	97	94	87	80	47	42	35	2.63	12.0	21.2	9.7	
Katamey fs1:6 (S77TX-411-004)																		
B21t-----9 to 24	CH		100	100	100	99	97	87	66	63	56	52	41	2.70	15.0	20.2	1.9	
B22t-----24 to 36	CH		100	100	100	99	99	91	65	62	50	48	41	2.74	14.0	19.4	1.9	
Pebblepoint vgfs1:7 (S77TX-411-001)																		
A2-----4 to 22	GM-GC		100	100	70	58	51	48	41	37	12	7	5	2.66	17.0	2.2	1.8	
B21t-----22 to 40	GC		100	100	55	38	29	26	23	22	14	12	30	2.68	13.0	14.8	1.9	
B22t-----40 to 65	GC		80	100	33	27	22	19	18	17	13	13	47	2.71	13.0	21.7	1.9	

See footnotes at end of table.

TABLE 17.--ENGINEERING INDEX TEST DATA--Continued

Soil name, report number, horizon, and depth in inches	Classification	Grain size distribution <sup>1</sup>										Plasticity Index <sup>2</sup>	Shrinkage Limit	Specific Gravity	Plasticity Limit	Shrinkage Ratio	
		Percentage passing sieve--					Percentage smaller than--										
		7/4 inch	5/8 inch	3/8 inch	No. 4	No. 10	No. 40	No. 200	No. 400	.075 mm	.05 mm						.002 mm
Roughcreek stv-cl:8 (S75TX-411-004)	Unified	100	100	100	100	99	98	95	89	85	57	50	38	2.68	10.0	20.8	2.0
B2t-----7 to 18	CH	100	100	100	100	47	37	31	27	25	20	19	64	35	16.0	19.4	1.8
Rumple cr-cl:9 (S77TX-411-002)	GC	100	100	100	100	100	100	99	95	93	82	68	40	2.73	12.0	20.8	1.9
Smithwick clay:10 (S75TX-411-003)	CH	100	100	100	100	99	99	99	98	97	84	65	34	2.76	17.0	18.2	1.8

<sup>1</sup>For soil materials larger than 3/8 inch, square mesh wire sieves were used that are slightly larger than equivalent round sieves, but these differences do not seriously affect the data.  
<sup>2</sup>Liquid limit and plasticity index values were determined by the AASHTO-89 and AASHTO-90 methods, except that soil was added to water.  
<sup>3</sup>Corkstone clay loam:  
 5.0 miles west on U.S. Highway 190 from Texas Highway 16 in San Saba, 10 miles southwest on Farm Road 2732, 0.7 mile south, and 150 feet west.  
<sup>4</sup>Eckrant very stony clay:  
 2 miles west on U.S. Highway 190 from Farm Road 45 in Richland Springs, 12.8 miles south, and 100 yards northwest.  
<sup>5</sup>Eckrant very cobbly clay:  
 6.1 miles west of Cherokee on Ranch Road 501, 2.5 miles northwest to windmill, 0.5 mile north, and 350 yards east.  
<sup>6</sup>Katemy fine sandy loam:  
 3.2 miles south of Ranch Road 501 in Cherokee, 0.7 mile southwest to cattle guard, and 80 yards southwest.  
<sup>7</sup>Febblepoint very gravelly fine sandy loam:  
 5 miles east of San Saba on U.S. Highway 190, 0.2 mile south, 0.6 mile southeast, 0.2 mile north, and 200 yards east.  
<sup>8</sup>Roughcreek very stony clay:  
 2.0 miles west on U.S. Highway 190 from Texas Highway 16 in San Saba, and 1.4 miles south in pasture.  
<sup>9</sup>Rumple cherty clay loam:  
 1.2 miles west of Richland Springs on U.S. Highway 190, 13.5 miles south on county road, 0.9 mile west, and 0.1 mile south in range.  
<sup>10</sup>Smithwick clay:  
 4.3 miles west on U.S. Highway 190 from Texas Highway 16 in San Saba, 5.3 miles southwest on Farm Road 2732, and 650 yards south in pasture.

TABLE 18.--CLASSIFICATION OF THE SOILS

[An asterisk in the first column indicates that the soil is a taxadjunct to the series. See text for a description of those characteristics of the soil that are outside the range of the series]

Soil name	Family or higher taxonomic class
Bastrop-----	Fine-loamy, mixed, thermic Udic Paleustalfs
Bonti-----	Fine, mixed, thermic Ultic Paleustalfs
Burman-----	Fine-loamy, mixed, nonacid, thermic Typic Ustifluvents
Callahan-----	Fine, mixed, thermic Typic Haplustalfs
Cho-----	Loamy, carbonatic, thermic, shallow Petrocalcic Calciustolls
Clairemont-----	Fine-silty, mixed (calcareous), thermic Typic Ustifluvents
Corkstone-----	Clayey, mixed, thermic, shallow Udic Argiustolls
*Demona-----	Clayey, mixed, thermic Aquic Arenic Paleustalfs
Desan-----	Loamy, siliceous, thermic Grossarenic Paleustalfs
Eckrant-----	Clayey-skeletal, montmorillonitic, thermic Lithic Haplustolls
Frio-----	Fine, mixed, thermic Cumulic Haplustalfs
Harper-----	Clayey, montmorillonitic, thermic Lithic Vertic Haplustolls
Hye-----	Fine-loamy, mixed, thermic Ultic Haplustalfs
Katemcy-----	Fine, mixed, thermic Udic Haplustalfs
Leeray-----	Fine, montmorillonitic, thermic Typic Chromusterts
Ligon-----	Loamy, mixed, thermic, shallow Udic Rhodustalfs
May-----	Fine-loamy, mixed, thermic Udic Haplustalfs
Mereta-----	Clayey, mixed, thermic, shallow Petrocalcic Calciustolls
*Miles-----	Fine-loamy, mixed, thermic Udic Paleustalfs
Miller-----	Fine, mixed, thermic Vertic Haplustolls
Nebgen-----	Loamy, mixed, nonacid, thermic, shallow Typic Ustorthents
Nimrod-----	Loamy, siliceous, thermic Aquic Arenic Paleustalfs
Nocken-----	Clayey-skeletal, mixed, thermic Ultic Paleustalfs
Nuvalde-----	Fine-silty, mixed, thermic Typic Calciustolls
*Oplin-----	Loamy-skeletal, carbonatic, thermic Lithic Calciustolls
Pebblepoint-----	Clayey-skeletal, mixed, thermic Udic Paleustalfs
Pedernales-----	Fine, mixed, thermic Udic Paleustalfs
Pontotoc-----	Coarse-loamy, mixed, thermic Rhodic Paleustalfs
Rochelle-----	Fine-loamy, mixed, thermic Typic Haplustalfs
Roughcreek-----	Clayey-skeletal, montmorillonitic, thermic Lithic Argiustolls
Rowena-----	Fine, mixed, thermic Vertic Calciustolls
Rumple-----	Clayey-skeletal, mixed, thermic Udic Argiustolls
Sagerton-----	Fine, mixed, thermic Typic Paleustolls
Shep-----	Fine-loamy, mixed, thermic Typic Ustochrepts
Smithwick-----	Very-fine, mixed, thermic Vertic Ustochrepts
Speck-----	Clayey, mixed, thermic Lithic Argiustolls
Stilskin-----	Loamy-skeletal, carbonatic, thermic, shallow Typic Ustochrepts
Tarpley-----	Clayey, montmorillonitic, thermic Lithic Vertic Argiustolls
Throck-----	Fine, mixed, thermic Typic Ustochrepts
Weswood-----	Fine-silty, mixed, thermic Fluventic Ustochrepts
Winters-----	Fine, mixed, thermic Udic Paleustalfs
Yahola-----	Coarse-loamy, mixed (calcareous), thermic Typic Ustifluvents
Yates-----	Loamy-skeletal, mixed, nonacid, thermic Lithic Ustorthents



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