United States
Department of
Agriculture

Natural
Resources
Conservation
Service

In cooperation with
Texas Agricultural
Experiment Station

# Soil Survey of Lampasas County, Texas

# How to Use This Soil Survey

General Soil Map

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

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

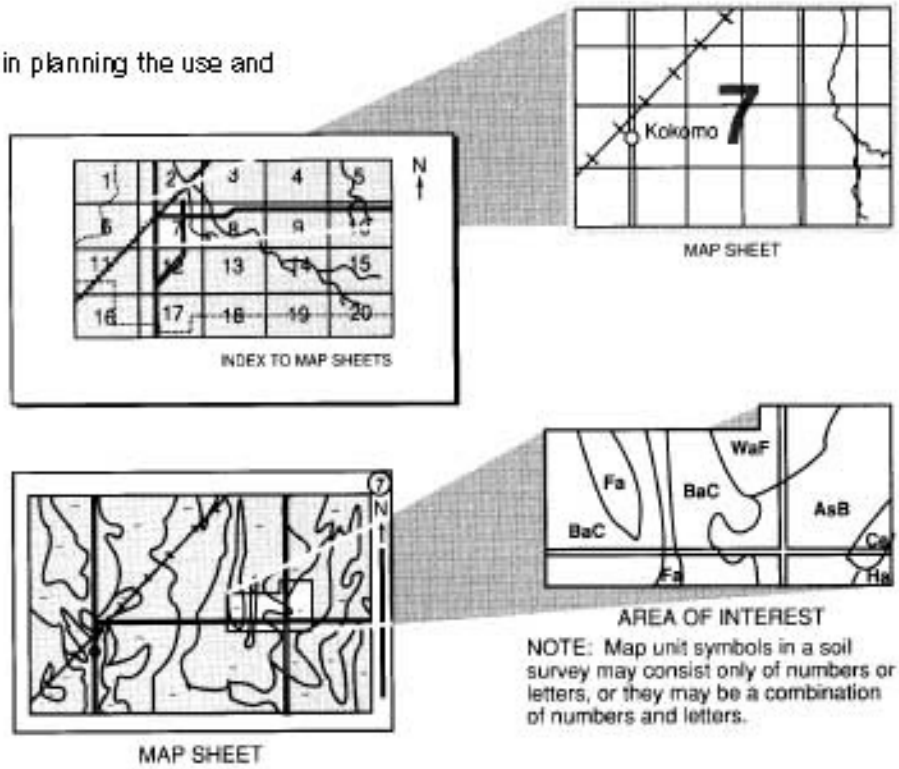
Detailed Soil Maps

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

To find information about your area of interest, locate that area on the Index to Map Sheets. Note the number of the map sheet and turn to that sheet.

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

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




NOTE: Map unit symbols in a soil survey may consist only of numbers or letters, or they may be a combination of numbers and letters.

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

Major fieldwork for this soil survey was completed in 1987. Soil names and descriptions were approved in 1989. Unless otherwise indicated, statements in this publication refer to conditions in the survey area in 1989. This survey was made cooperatively by the Natural Resources Conservation Service and the Texas Agricultural Experiment Station. The survey is part of the technical assistance furnished to the Hill Country 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.

The United States Department of Agriculture (USDA) prohibits discrimination in its programs on the basis of race, color, national origin, sex, religion, age, disability, political beliefs, and marital or familial status. (Not all prohibited bases apply to all programs.) Persons with disabilities who require alternative means for communication of program information (Braille, large print, audiotape, etc.) should contact USDA's TARGET Center at (202) 720-2600 (voice and TDD).

To file a complaint, write the Secretary of Agriculture, U.S. Department of Agriculture, Washington, D.C., 20250, or call 1-800-245-6340 (voice) or (202) 720-1127 (TDD). USDA is an equal employment opportunity employer.

**Cover: Most of the soils in Lampasas County are used to raise livestock because of steepness of slopes, shallow depths, or stoniness. These cattle are grazing on Eckrant-Rock outcrop complex, 1 to 8 percent slopes, very stony.**

# Contents

**Index to map units** ..... iv
**Summary of tables** ..... v
**Foreword** ..... vii
General nature of the county ..... 1
How this survey was made ..... 3
**General soil map units** ..... 5
**Detailed soil map units** ..... 13
**Prime farmland** ..... 39
**Use and management of the soils** ..... 41
Crops and pasture ..... 41
Rangeland ..... 43
Recreation ..... 48
Wildlife habitat ..... 49
Engineering ..... 50
**Soil properties** ..... 55
Engineering index properties ..... 55
Physical and chemical properties ..... 56
Soil and water features ..... 57
Engineering index test data ..... 58
**Classification of the soils** ..... 59
Soil series and their morphology ..... 59
Bastsil series ..... 59
Boerne series ..... 60
Bolar series ..... 61
Brackett series ..... 61
Callahan series ..... 62
Cho series ..... 62
Demona series ..... 63
Doss series ..... 63
Eckrant series ..... 64
Eufaula series ..... 64
Hensley series ..... 65
Krum series ..... 65
Lampasas series ..... 66
Leeray series ..... 66
Lometa series ..... 67
Luckenbach series ..... 68
Mereta series ..... 69
Minwells series ..... 69
Nocken series ..... 70
Nuff series ..... 71
Oakalla series ..... 71
Oglesby series ..... 72
Owens series ..... 72
Patilo series ..... 73
Pedernales series ..... 73
Pidcoke series ..... 74
Real series ..... 74
Roughcreek series ..... 75
Rumley series ..... 75
Seawillow series ..... 76
Slidell series ..... 76
Sunev series ..... 77
Tarpley series ..... 78
Topsey series ..... 78
Weswood series ..... 79
Wise series ..... 80
Yahola series ..... 80
**Formation of the soils** ..... 81
Factors of soil formation ..... 81
Surface geology ..... 82
**References** ..... 87
**Glossary** ..... 89
**Tables** ..... 99

# Index to Map Units


BaB—Bastsil loamy fine sand, 1 to 5 percent slopes ..... 14
BeB—Boerne loam, rarely flooded ..... 14
BoB—Bolar clay loam, 1 to 3 percent slopes ..... 15
BoC—Bolar clay loam, 3 to 5 percent slopes ..... 16
BrC—Brackett clay loam, 1 to 5 percent slopes ..... 16
BrD—Brackett gravelly clay loam, 3 to 8 percent slopes ..... 17
BrE—Brackett-Rock outcrop complex, 10 to 30 percent slopes ..... 17
CaC2—Callahan loam, 3 to 8 percent slopes, eroded ..... 18
ChB—Cho gravelly loam, 1 to 3 percent slopes ..... 18
DeB—Demona fine sand, 0 to 3 percent slopes ..... 18
DoC—Doss silty clay, 1 to 5 percent slopes ..... 19
ErD—Eckrant-Rock outcrop complex, 1 to 8 percent slopes, very stony ..... 19
ErF—Eckrant-Rock outcrop complex, 10 to 40 percent slopes, very stony ..... 21
EuC—Eufaula fine sand, 1 to 5 percent slopes ..... 21
HeC—Hensley loam, 3 to 5 percent slopes ..... 22
HeD—Hensley loam, 1 to 8 percent slopes, very stony ..... 22
KrB—Krum silty clay, 1 to 5 percent slopes ..... 22
LaC—Lampasas gravelly clay, 1 to 5 percent slopes ..... 23
LeB—Leeray clay, 1 to 3 percent slopes ..... 23
LoD—Lometa very gravelly sandy loam, 3 to 12 percent slopes ..... 24
LuB—Luckenbach clay loam, 1 to 3 percent slopes ..... 24
MeB—Mereta clay loam, 1 to 3 percent slopes ..... 25
MnB—Minwells fine sandy loam, 1 to 3 percent slopes ..... 25
NoD—Nocken fine sandy loam, 5 to 15 percent slopes, very stony ..... 26
NsC—Nuff silty clay loam, 2 to 6 percent slopes, very stony ..... 26
NuB—Nuff silty clay, 1 to 3 percent slopes ..... 27
NuC—Nuff silty clay, 3 to 5 percent slopes ..... 27
Oa—Oakalla silty clay loam, rarely flooded ..... 28
OgB—Oglesby silty clay, 0 to 3 percent slopes ..... 28
OwE—Owens clay, 10 to 30 percent slopes, very stony ..... 29
PaB—Patilo fine sand, 1 to 3 percent slopes ..... 29
PeC—Pedernales fine sandy loam, 1 to 5 percent slopes ..... 29
PkB—Pidcoke clay loam, 1 to 3 percent slopes ..... 30
ReD—Real gravelly clay loam, 1 to 8 percent slopes ..... 30
ReE—Real very gravelly clay loam, 10 to 30 percent slopes ..... 31
RoD—Roughcreek-Rock outcrop complex, 1 to 8 percent slopes ..... 31
RuA—Rumley silty clay loam, 0 to 1 percent slopes ..... 32
RuB—Rumley silty clay loam, 1 to 3 percent slopes ..... 32
SeC—Seawillow clay loam, 3 to 5 percent slopes ..... 33
SlB—Slidell clay, 1 to 3 percent slopes ..... 34
SuA—Sunev loam, rarely flooded ..... 34
SuB—Sunev loam, 1 to 3 percent slopes ..... 35
TaB—Tarpley clay, 1 to 3 percent slopes ..... 35
TaD—Tarpley-Rock outcrop complex, 1 to 8 percent slopes, stony ..... 36
ToC—Topsey clay loam, 1 to 5 percent slopes ..... 36
We—Weswood silt loam, rarely flooded ..... 37
WsC—Wise clay loam, 3 to 8 percent slopes ..... 37
Ya—Yahola fine sandy loam, frequently flooded ..... 38

# Summary of Tables

Temperature and precipitation (table 1) ..... 100

Freeze dates in spring and fall (table 2) ..... 101

Growing season (table 3) ..... 101

Acreage and proportionate extent of the soils (table 4) ..... 102

Land capability and yields per acre of crops and pasture (table 5) ..... 103

Rangeland productivity (table 6) ..... 106

Recreational development (table 7) ..... 109

Wildlife habitat (table 8) ..... 113

Building site development (table 9) ..... 116

Sanitary facilities (table 10) ..... 120

Construction materials (table 11) ..... 124

Water management (table 12) ..... 128

Engineering index properties (table 13) ..... 132

Physical and chemical properties of the soils (table 14) ..... 139

Soil and water features (table 15) ..... 143

Engineering index test data (table 16) ..... 146

Classification of the soils (table 17) ..... 149

# Foreword

This soil survey contains information that can be used in land-planning programs in Lampasas County. 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, and agronomists can use it to evaluate the potential of the soil and the management needed for maximum food and fiber production. Planners, community officials, engineers, developers, builders, and home buyers can use the survey to plan land use, select sites for construction, and identify special practices needed to ensure proper performance. Conservationists, teachers, students, and specialists in recreation, wildlife management, waste disposal, and pollution control can use the survey to help them understand, protect, and enhance the environment.

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

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

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

John P. Burt
State Conservationist
Natural Resources Conservation Service

# Soil Survey of
# Lampasas County, Texas

By John E. Allison, Natural Resources Conservation Service

Fieldwork by John E. Allison and Otto W. Bynum, soil scientists, Natural Resources Conservation Service

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

Lampasas County is in central Texas (fig. 1), and Lampasas is the county seat. The county is triangular in shape. The total area of the county is about 714 square miles, or 457,024 acres.

The Colorado River is the western boundary of the county. Other major streams are the Lampasas River, Bennett Creek, Mesquite Creek, School Creek, Simms Creek, and Sulphur Creek. Lampasas and Lometa are the principal towns in the county. Other communities are Adamsville, Kempner, Moline, Nix, Izoro, and Rumley.

The county is divided into three land resource areas with distinct differences in relief, drainage, and vegetation. The southwestern part of the county is in the Edwards Plateau Land Resource Area. The northwestern part of the county is in the North Central Prairie Land Resource Area. The remaining part is in the Grand Prairie Land Resource Area.

About 82 percent of Lampasas County is used as rangeland; 11 percent as cropland; 5 percent as pasture; and 2 percent as roads, farmsteads, or urban and built-up land. The main ranching enterprises are the production of beef cattle, sheep, and goats. Wheat, oats, and forage sorghum are the principal cultivated crops.

## General Nature of the County

This section gives general information about Lampasas County. It describes history and settlement, ranching and farming, and climate.

### History and Settlement

The Apache and Comanche Indian tribes occupied the territory when pioneers permanently settled the area in the early 1850's. The settlers sought the curative powers of the sulphur springs, and many stayed in the area because of the abundant water supply. These early settlers encountered Indian raids, bears, wild horses, and stampeding herds of buffalo.

In 1856, Lampasas County was created. It had originally been part of Bell and Travis Counties. The county took its name from the Lampasas River, which the Spanish Aguayo Expedition named when en route to east Texas in 1721.

With the 1870's came the era of the large cattle drives and the wild west frontier. Cattle rustling was common. The Texas Rangers helped maintain law and order by apprehending cattle thieves and bringing them to justice.

The frontier era gave way to the railroad boom with the coming of the Santa Fe railroad in 1882. The railroad came from Temple, moving west to Brownwood. Trains brought loads of newcomers eager to take part in the economic boom and to buy land. As the railroad boom moved westward, the county stabilized. The ranchers and farmers began producing livestock, grain, and forage crops, as they do today.

### Ranching and Farming

The major livestock products are beef cattle, sheep, and goats. Many ranchers also engage in the commercial leasing of their ranches for deer and turkey hunting. The county has a few dairy and hog farms.

Wheat, oats, and forage sorghum are the main cultivated crops. Small amounts of grain sorghum and peanuts are also grown. Peaches and pecans are grown

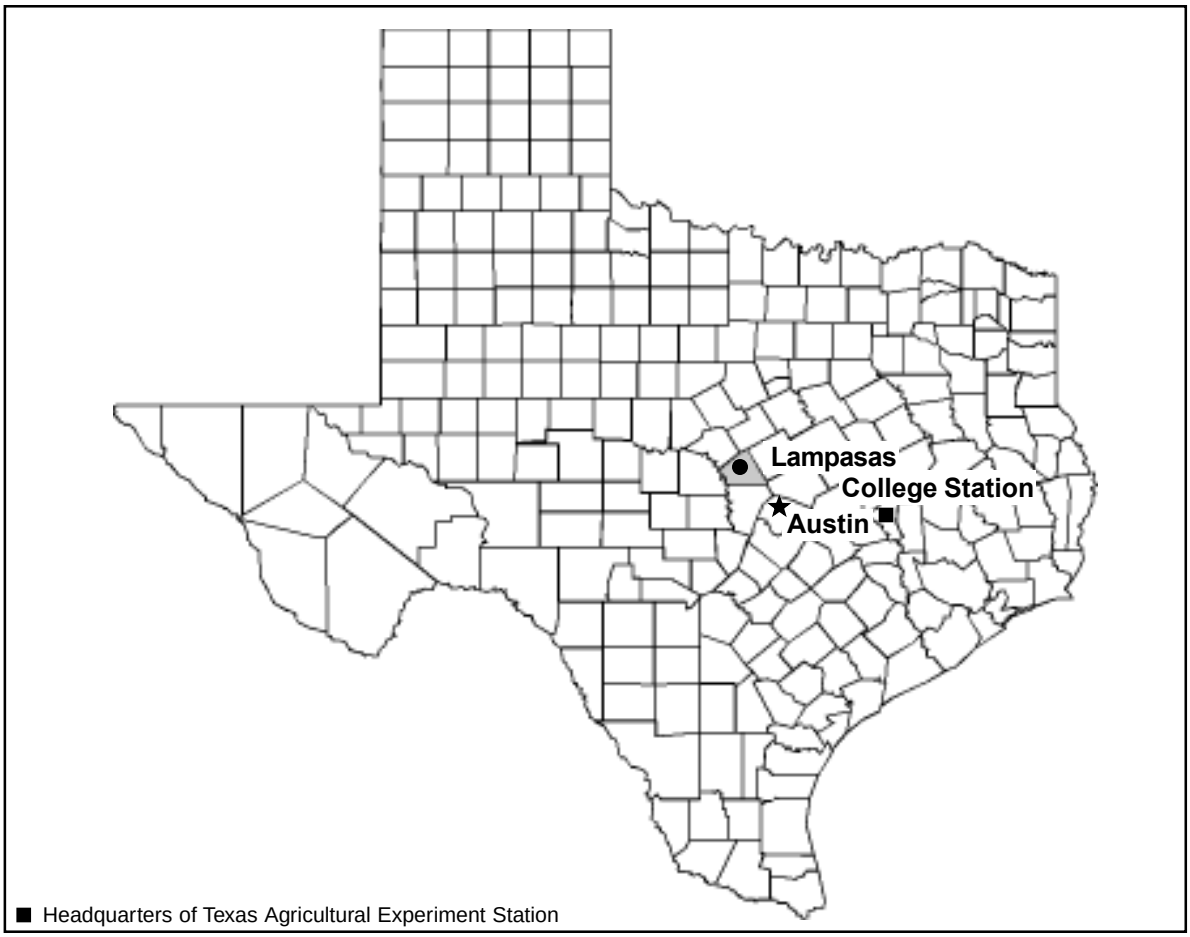



**Figure 1.—Location of Lampasas County in Texas.**

commercially on a limited scale. Coastal bermudagrass and kleingrass are used in improved pastures.

In ranching and farming, the main conservation practices are brush control, range seeding, deferred grazing, providing water for livestock, cross fencing, crop residue management, contour farming, and terracing.

## Climate

Lampasas County is hot in summer and cool in winter when an occasional surge of cold air causes a sharp drop in otherwise mild temperatures. Rainfall is uniformly distributed throughout the year, reaching a slight peak in spring. Snowfalls are infrequent. Annual total precipitation is normally adequate for wheat, oats, and forage sorghum.

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

In winter, the average temperature is 46 degrees F and the average daily minimum temperature is 32 degrees. The lowest temperature on record, which occurred on December 24, 1989, is -4 degrees. In summer, the average temperature is 81 degrees and the average daily maximum temperature is 93 degrees. The highest recorded temperature, which occurred on July 27, 1954, is 111 degrees.

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

The total annual precipitation is about 29 inches. Of this, 17 inches, or about 59 percent, usually falls in April through September. The growing season for most crops falls within this period. In 2 years out of 10, the rainfall in April through September is less than 12 inches. The heaviest recorded 1-day rainfall was 6.95 inches on May 13, 1957. Thunderstorms occur on about 45 days each year, and most occur in summer.

The average seasonal snowfall is about 1 inch. The

greatest snow depth at any one time during the period of record was 8 inches in February 1966.

The average relative humidity in midafternoon is about 55 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 55 percent in winter. The prevailing wind is from the south. Average windspeed is highest, 11 miles per hour, in spring.

Tornadoes and severe thunderstorms occur occasionally. These storms are local and of short duration, and the pattern of damage is variable and spotty.

## How This Survey Was Made

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

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

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

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

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

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

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

The descriptions, names, and delineations of the soils in this survey area do not fully agree with those of the soils

in adjacent survey areas. Differences are the result of a better knowledge of soils, modifications in series concepts, or variations in the intensity of mapping or in the extent of the soils in the survey areas.

# General Soil Map Units

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

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

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

### 1. Brackett-Lampasas

*Shallow and very deep, gently sloping to steep, loamy and clayey, gravelly soils that formed in residuum from chalky limestone, marl, and claystone; on uplands*

This map unit consists of the gently sloping to steep Brackett soils on low hills and side slopes and the gently sloping Lampasas soils on tops of low ridges (fig. 2). Typically, the Brackett soils are on oval hills that have exposed horizontal bands, or ledges, of limestone. Because the underlying material is stratified layers of resistant limestone and softer marl, the resulting weathered landscape has a benched, or stair-stepped, appearance. Slopes range from 1 to 30 percent.

This map unit makes up about 58 percent of the county. It is about 64 percent Brackett soils, 14 percent Lampasas soils, and 22 percent soils of minor extent and rock outcrop.

Typically, the surface layer of the Brackett soil is light brownish gray gravelly clay loam about 9 inches thick. The subsoil, from a depth of 9 to 17 inches, is pale brown clay loam. From a depth of 17 to 60 inches, the underlying material is white, weakly cemented, chalky limestone and marl. The soil is moderately alkaline throughout.

Typically, the surface layer of the Lampasas soil is 13 inches thick. This layer is slightly alkaline, dark reddish brown gravelly clay in the upper part and very gravelly clay in the lower part. The underlying material, from a depth of 13 to 60 inches, is fragmental limestone.

Soils of minor extent in this map unit are the shallow, gravelly, loamy Real soils on ridges and low hills; the very deep, clayey Krum soils along drainageways; the very deep, clayey Nuff soils on low ridges and divides; the moderately deep, loamy Bolar soils on side slopes of low hills; the shallow, clayey Oglesby soils on low ridges; the very deep, loamy Rumley soils on terraces along major streams; the very shallow and shallow, gravelly, loamy Cho soils on ridges; and rock outcrop, which consists of long narrow bands of exposed limestone bedrock, on hillslopes.

The soils in this map unit are mostly used as rangeland. These soils are best suited to this use. The vegetation is typically tall grass savannah with scattered live oak trees.

These soils are not suited to cropland. The main limitations are slope, droughtiness caused by the high lime content of the soil, low available water capacity, and areas of rock outcrop.

The soils in this map unit can be used for most urban and recreational purposes. Low soil strength, slope, small stones, and corrosivity to uncoated steel are the main limitations. These limitations can be partially overcome by proper design and installation.

### 2. Nuff-Brackett-Cho

*Very shallow to very deep, very gently sloping to moderately sloping, loamy and clayey, mostly gravelly and stony soils that formed in residuum from marl, shale, and limestone; on uplands*

This map unit consists of the gently sloping to moderately sloping Nuff soils on low ridges and stream divides, the gently sloping to moderately sloping Brackett soils on low hills and side slopes, and the very gently sloping Cho soils on ridgetops. Slopes range from 1 to 8 percent.

This unit makes up about 15 percent of the county. It is about 31 percent Nuff and the similar Topsey soils; 18 percent Brackett soils; 16 percent Cho and the similar

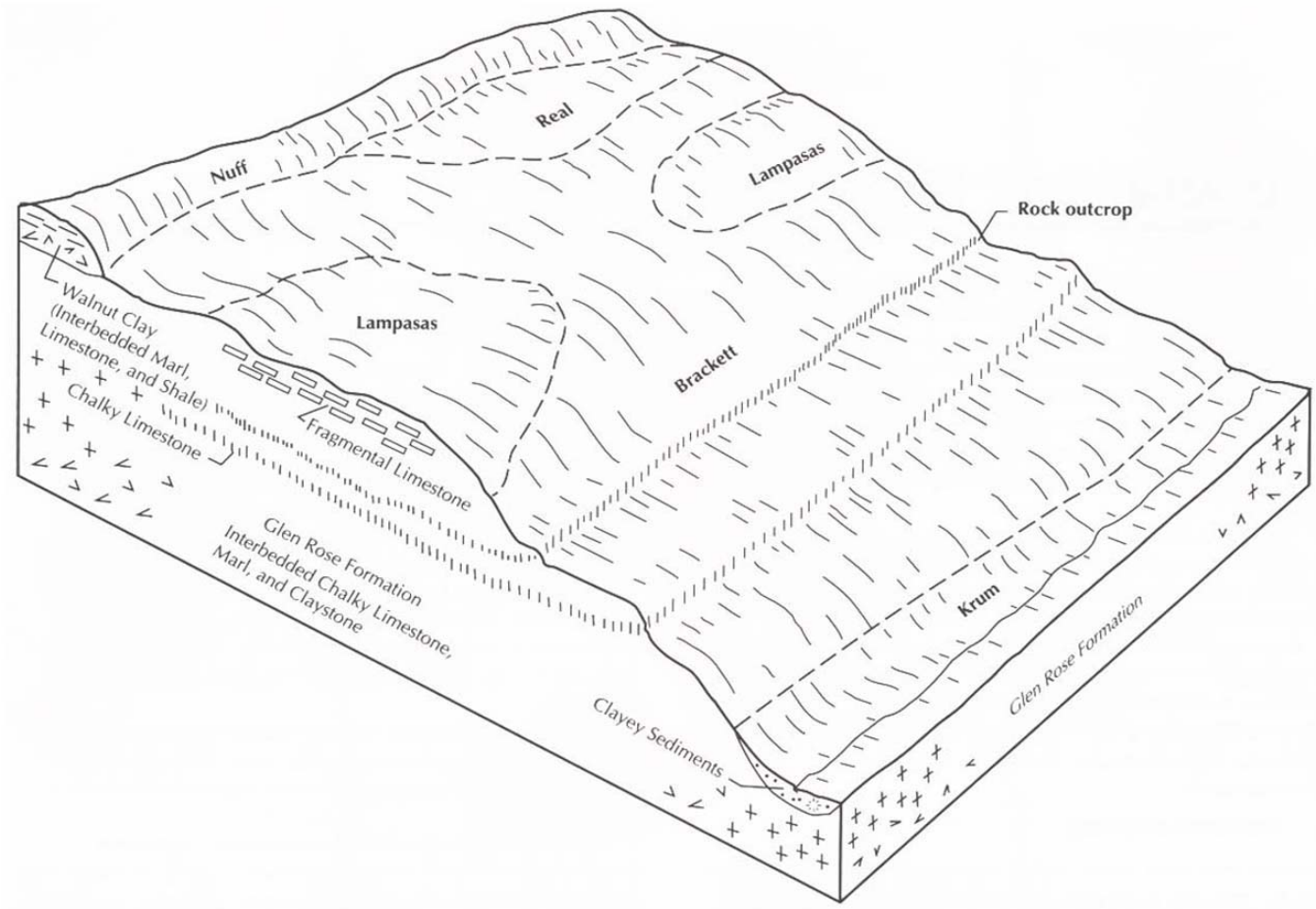



Figure 2.—Typical pattern of soils and underlying material in the Brackett-Lampasas general soil map unit.

Doss, Mereta, Pidcoke, and Real soils; and 35 percent other soils.

Typically, the surface layer of the Nuff soil is dark grayish brown very stony silty clay loam about 13 inches thick. The subsoil, from a depth of 13 to 33 inches, is silty clay loam that is brown in the upper part and light yellowish brown in the lower part. The underlying material, from a depth of 33 to 80 inches, is olive shale. The soil is moderately alkaline throughout.

Typically, the surface layer of the Brackett soil is light brownish gray gravelly clay loam about 9 inches thick. The subsoil, from a depth of 9 to 17 inches, is pale brown clay loam. From a depth of 17 to 60 inches, the underlying material is white, weakly cemented, chalky limestone and marl. The soil is moderately alkaline throughout.

Typically, the surface layer of the Cho soil is dark brown, moderately alkaline gravelly loam about 9 inches thick. This rests on a layer of pink, indurated caliche about 4 inches thick. The underlying material, from a depth of 13 to 60 inches, is pink limy earth.

Soils of minor extent in this map unit are the Krum, Lampasas, Oglesby, Slidell, and Luckenbach soils. The very deep, clayey Krum and Slidell soils are along drainageways. The shallow, gravelly, clayey Lampasas soils and clayey Oglesby soils are on tops of low ridges. The very deep, loamy Luckenbach soils are on stream terraces.

Where surface stones are not a limitation, the Nuff soils of this map unit are well suited to cropland as are the minor Krum and Slidell soils. Small grains, grain sorghum, and forage sorghum are the main crops. These soils can also be used for pasture and hayland. Coastal bermudagrass and kleingrass are the main pasture grasses.

The soils in this map unit are mostly used as

rangeland. The main limitations are large stones on the surface of some of the Nuff soils and shallow depth to a cemented pan in the Cho soils. The vegetation is a mid and tall grass prairie with a few scattered motts of live oak.

The soils in this map unit can be used for most urban and recreational purposes. Low soil strength, corrosivity to uncoated steel, stones on the surface, and depth to cemented pan are the main limitations. These limitations can be partially overcome by proper design and installation.

### 3. Sunev-Rumley-Oakalla

*Very deep, nearly level and very gently sloping, loamy soils that formed in loamy alluvium; on stream terraces and flood plains*

This map unit consists of Sunev soils on low terraces and bottom lands, Rumley soils on terraces, and Oakalla soils on flood plains (fig. 3).

This unit makes up about 9 percent of the county. It is about 34 percent Sunev soils, 20 percent Rumley soils, 11 percent Oakalla soils, and 35 percent other soils. Slopes are 0 to 3 percent.

Typically, the surface layer of the Sunev soil is dark grayish brown loam about 16 inches thick. The upper part of the subsoil, from a depth of 16 to 31 inches, is brown silty clay loam. The lower part of the subsoil, from a depth of 31 to 80 inches, is light yellowish brown clay loam and silty clay loam. The soil is moderately alkaline throughout.

Typically, the surface layer of the Rumley soil is dark grayish brown silty clay loam about 14 inches thick. The upper part of the subsoil, from a depth of 14 to 32 inches, is brown silty clay. The middle part of the subsoil, from a depth of 32 to 48 inches, is brownish yellow gravelly clay loam. The lower part of the subsoil, from a depth of 48 to 63 inches, is reddish yellow clay loam. The soil is moderately alkaline throughout.

Typically, the surface layer of the Oakalla soil is very dark grayish brown silty clay loam about 38 inches thick.

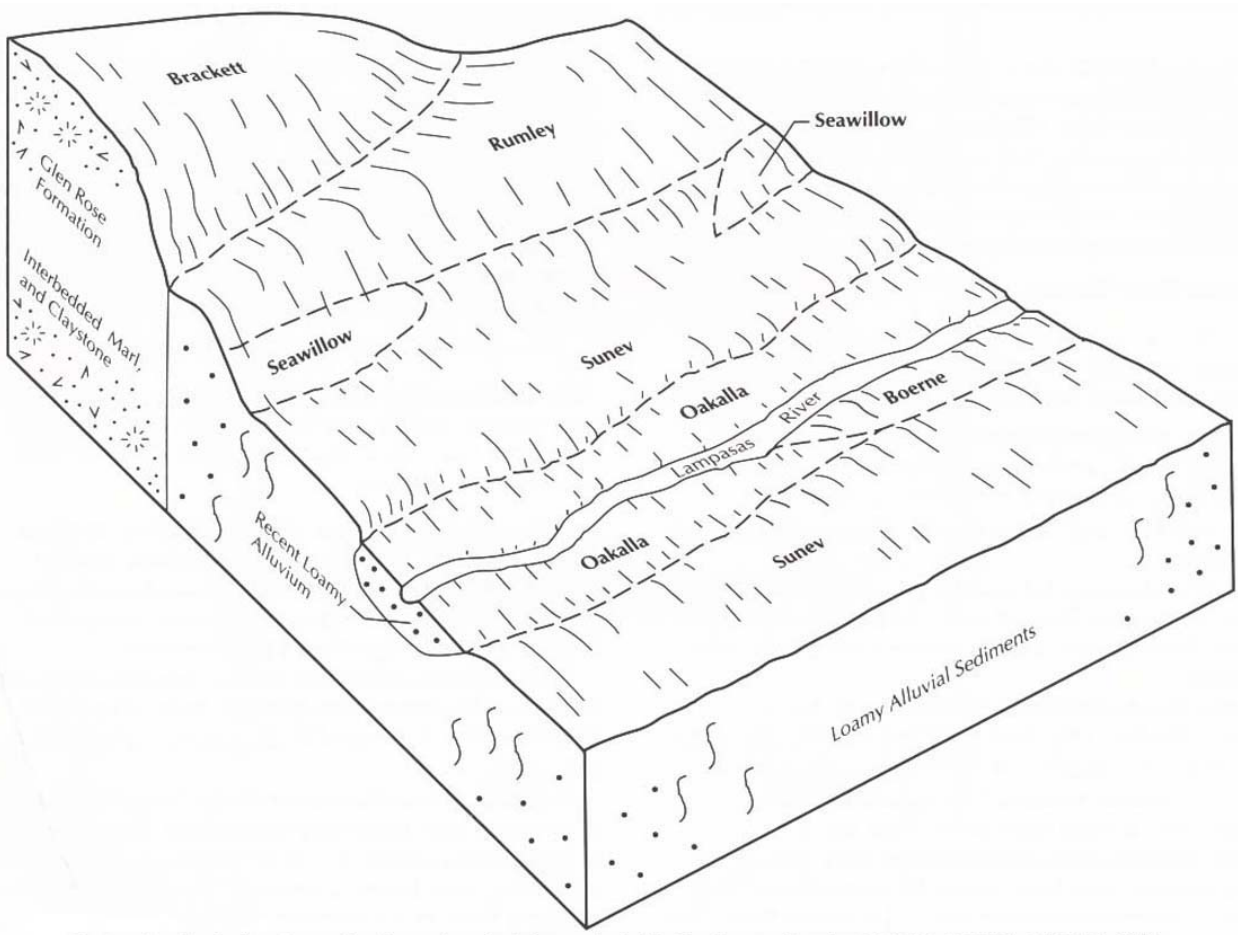



Figure 3.—Typical pattern of soils and underlying material in the Sunev-Rumley-Oakalla general soil map unit.

The upper part of the subsoil, from a depth of 38 to 58 inches, is brown silty clay loam. The lower part of the subsoil, from a depth of 58 to 80 inches, is yellowish brown silty clay loam. The soil is moderately alkaline throughout.

Soils of minor extent are the very deep, loamy Brackett soils on adjacent low hills; the very deep, loamy Seawillow soils along breaks on terraces; the shallow, gravelly, clayey Lampasas and loamy Real soils on adjacent ridges and hills; the very deep, loamy Boerne soils on flood plains; and the very deep, clayey Krum soils along the upper end of drainageways.

The soils in this map unit are mostly used as cropland, pasture, and hayland. Small grains, grain sorghum, and forage sorghum are the main crops. Coastal bermudagrass and kleingrass are the main pasture and hayland grasses. The hazard of flooding limits the uses of the Oakalla and Sunev soils.

The soils in this map unit are well suited to rangeland. The main vegetation is mid and tall grasses. A few live oak trees grow in areas of Rumley soils. A few trees grow along the water courses in areas of the Sunev and Oakalla soils.

The Sunev and Oakalla soils in this unit are subject to flooding and should not have houses or other permanent structures built on them. Otherwise, the soils in this unit are suited to most urban and recreational uses. The shrink-swell potential of the Rumley soil, low soil strength, and corrosivity to uncoated steel are limitations that can be partially overcome by proper design and installation.

### 4. Eckrant-Real-Tarpley

*Very shallow and shallow, undulating to steep, loamy and clayey, gravelly and cobbly soils that formed in residuum from hard and soft limestone; on uplands*

This map unit typically consists of the undulating Eckrant and Tarpley soils on ridgetops and on tops of high hills and divides, and of the steep Real soils on side slopes of high hills and ridges (fig. 4). Slopes range from 1 to 30 percent.

This map unit makes up about 6 percent of the county. It is about 32 percent Eckrant soils, 30 percent Real soils, 17 percent Tarpley soils, and 21 percent other soils and rock outcrop.

Typically, the surface layer of the Eckrant soil is moderately alkaline, very dark gray very cobbly clay about 8 inches thick. At a depth of 8 inches, the underlying material is indurated, fractured, limestone bedrock.

Typically, the surface layer of the Real soil is moderately alkaline, dark grayish brown very gravelly or extremely gravelly clay loam about 16 inches thick. The next layer is cemented limestone about 2 inches thick. The underlying material, to a depth of 60 inches, is weakly cemented limestone interbedded with seams of strongly indurated limestone.

Typically, the surface layer of the Tarpley soil is very dark grayish brown cobbly clay about 6 inches thick. The subsoil, from a depth of 6 to 15 inches, is dark reddish brown clay. Below a depth of 15 inches is indurated, fractured limestone bedrock. The soil is neutral throughout.

Soils of minor extent in this map unit are the very deep, loamy Brackett and Topsey soils on hillsides; the very deep, clayey Krum and Slidell soils along drainageways; the very deep, clayey Nuff soils on low ridges and divides; the shallow, clayey Lampasas soils on low ridgetops; and areas of rock outcrop in long, narrow bands along escarpments and slope breaks.

The soils in this map unit are mostly used as rangeland. They are best suited to this use. Depth to rock, slope, and rock fragments on the surface and in the soil are the main limitations. The vegetation is typically a tall grass savannah with scattered oak trees.

Slope, shallow rooting depth, rock fragments on the surface, and areas of rock outcrop prevent the use of these soils for cropland.

The soils in this map unit can be used for urban and recreational purposes. Corrosivity to uncoated steel, stones on the surface, low soil strength, slope, and shallow depth to rock are the main limitations. The bedrock is difficult to excavate. Disposal of wastes in septic systems is severely limited because of seepage through the underlying fractured bedrock. Soils on steep slopes are subject to erosion. These limitations can be partially overcome by proper design and installation.

### 5. Roughcreek-Eckrant-Rock outcrop

*Very shallow and shallow, undulating to steep, loamy and clayey, cobbly and stony soils that formed in residuum from hard limestone, and areas of rock outcrop; on uplands.*

This map unit consists of the undulating to steep Eckrant soils on broad areas and hillsides and the undulating Roughcreek soils on broad, smooth areas. The Rock outcrop lies in long narrow bands along slope breaks. Slopes range from 1 to 40 percent.

This map unit makes up about 4 percent of the county. It is about 43 percent Roughcreek soils, 28 percent Eckrant soils, 23 percent Rock outcrop, and 6 percent other soils.

Typically, the surface layer of the Roughcreek soil is dark brown very stony clay loam about 8 inches thick. The subsoil, from a depth of 8 to 17 inches, is reddish brown very stony clay. Below a depth of 17 inches is indurated, coarsely fractured, limestone bedrock several feet thick. The soil is neutral throughout.

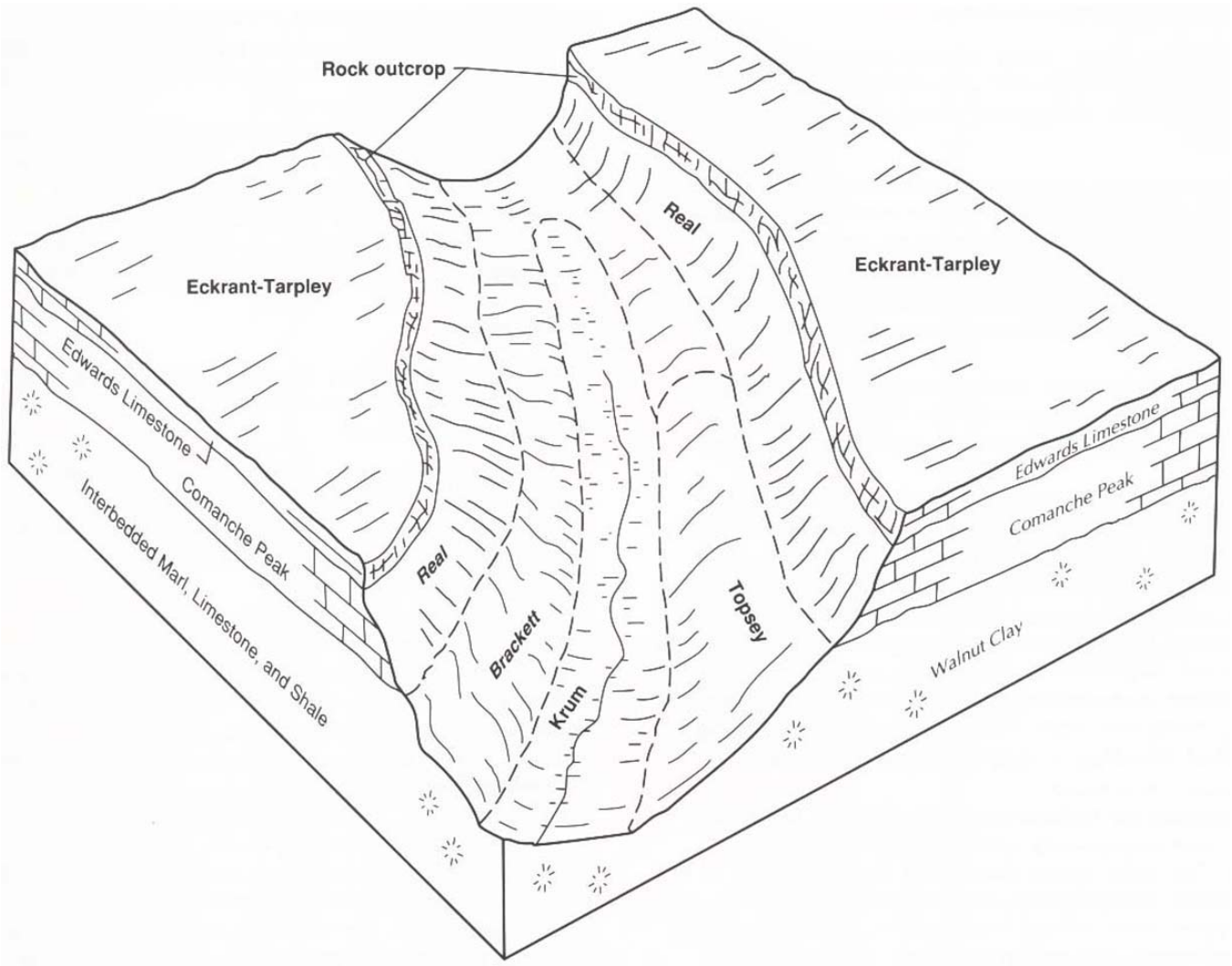



**Figure 4.—Typical pattern of soils and underlying material in the Eckrant-Real-Tarpley general soil map unit.**

Typically, the surface layer of the Eckrant soil is moderately alkaline, very dark gray very cobbly clay about 8 inches thick. At a depth of 8 inches, the surface layer rests abruptly on indurated, fractured, limestone bedrock several feet thick.

Typically, Rock outcrop is fractured limestone bedrock that ranges from a few inches thick to as much as 20 feet thick. In a few places, a thin layer of soil less than 4 inches deep covers the rock.

Soils of minor extent in this map unit are the very deep, gently sloping, loamy Luckenbach soils on broad flats on adjacent terraces; and the very deep, nearly level, loamy Yahola and Weswood soils on adjacent flood plains.

The soils in this map unit are mostly used as rangeland. They are best suited to this use. The main limitations are depth to rock, slope, limestone fragments on the surface, and rock outcrop areas. The vegetation is tall grass savannah with scattered oak trees.

Slope, very shallow and shallow depth to limestone bedrock, large barren rock outcrop areas, and many limestone rocks on the soil surface prevent the use of these soils for cropland.

The soils in this map unit can be used for urban and recreational purposes. The main limitations are very shallow and shallow depth to rock, stones on the surface, slope, low soil strength, and shrink-swell potential. The bedrock provides a good foundation for houses and streets; however, it is difficult to excavate. Disposal of wastes in septic systems is severely limited because of the underlying fractured bedrock. Soils on steep slopes are subject to erosion. These limitations can be partially overcome by proper design and installation.

### 6. Nocken-Lometa-Callahan

*Moderately deep, gently sloping to moderately steep, loamy, mostly stony and gravelly soils that formed in residuum from sandstone, shale, and conglomerate; on uplands*

This map unit consists of the moderately sloping to moderately steep Nocken soils on low knolls and side slopes; the gently sloping to strongly sloping Lometa soils on broad, elongated areas on side slopes; and the gently sloping and moderately sloping Callahan soils on broad flats and side slopes. Slopes range from 3 to 15 percent.

This unit makes up about 4 percent of the county. It is about 36 percent Nocken soils, 22 percent Lometa soils, 17 percent Callahan soils, and 25 percent other soils.

Typically, the upper part of the surface layer of the Nocken soil is moderately acid, grayish brown stony fine sandy loam about 5 inches thick. The lower part of the surface layer, from a depth of 5 to 13 inches, is moderately acid, brown very stony fine sandy loam. The subsoil, from a depth of 13 to 32 inches, is strongly acid and moderately acid, red very stony clay. Below this, from a depth of 32 to 36 inches, is moderately acid, yellowish brown extremely stony sandy clay loam. The underlying material, below a depth of 36 inches, is reddish yellow interbedded sandstone and shale.

Typically, the surface layer of the Lometa soil is slightly acid, pink very gravelly sandy loam about 13 inches thick. The upper part of the subsoil, from a depth of 13 to 24 inches, is slightly acid, red very gravelly clay. The lower part of the subsoil, from a depth of 24 to 38 inches, is moderately acid, red gravelly clay. The underlying material, from a depth of 38 to 70 inches, is strongly cemented conglomerate of siliceous pebbles and cobbles.

Typically, the surface layer of the Callahan soil is brown loam about 4 inches thick. The subsoil, from a depth of 4 to 38 inches, is reddish brown and brown clay. The underlying material, from a depth of 38 to 60 inches, is light olive brown shale. The soil is moderately alkaline throughout.

Soils of minor extent in this map unit are the very deep, loamy Sunev soils on adjacent flood plains; the very deep, loamy Luckenbach and Bastsil soils on terraces; the gravelly, loamy Real soils on low hills; the very deep, loamy Pedernales soils on side slopes; the very deep, sandy Demona soils on flats; and the very deep, clayey Leeray soils on flats and depressions.

The soils in this map unit are mostly used as rangeland. They are best suited to this use. The vegetation is a mid and tall grass savannah with scattered oak trees.

The soils in this map unit are not suited to cropland because of slope, low available water capacity, and stones on the surface and in the soil. Callahan soils are also not suited because of past erosion.

The soils in this map unit can be used for most urban and recreational purposes. Slope, large stones on the surface and in the soil, depth to rock, corrosivity to uncoated steel, very slow permeability, and low soil strength are the main limitations. These limitations can be partially overcome by proper design and installation.

### 7. Hensley

*Shallow, gently sloping to moderately sloping, loamy, stony soils that formed in residuum from hard limestone; on uplands*

This map unit consists of Hensley soils on slightly convex ridges. Slopes range from 1 to 8 percent.

This unit makes up about 1 percent of the county. It is about 61 percent Hensley and similar soils and 39 percent soils of minor extent.

Typically, the surface layer of the Hensley soil is reddish brown stony loam about 5 inches thick. The subsoil, from a depth of 5 to 16 inches, is red clay. Below a depth of 16 inches is indurated, fractured limestone bedrock. The soil is slightly alkaline throughout.

Soils of minor extent are the similar Tarpley soils and the Oakalla, Brackett, Bolar, Lampasas, Doss, Krum, Real, Roughcreek, and Rumley soils. The clayey Doss soils are on side slopes; the gravelly, loamy Real soils are on low hills; and the gravelly, clayey Lampasas soils are on low ridges. The Roughcreek soils are on broad, smooth areas. Also, the very deep, loamy Oakalla soils are along streams; and the Rumley soils are on stream terraces. The very deep, loamy Brackett soils are on low hills and side slopes; the moderately deep, loamy Bolar soils are on side slopes of low ridges; and the very deep, clayey Krum soils are along drainageways.

The Hensley soils are mostly used as rangeland. They are best suited to this use. The vegetation is typically a tall grass savannah with scattered oak trees.

A few small areas are used as cropland or pasture and hayland. Small grains and forage sorghum are the main crops. Coastal bermudagrass and kleingrass are the main pasture and hayland grasses. The major limitations are depth to rock, slope, stoniness, and low available water capacity.

The Hensley soils in this map unit can be used for most urban and recreational purposes. The main limitations are shallow depth to limestone, low soil strength, stones on the surface, and corrosivity to uncoated steel. Good design and careful installation can partially overcome these limitations.

### 8. Luckenbach-Minwells-Bastsil

*Very deep, gently sloping, loamy soils that formed in loamy and clayey alluvium; on stream terraces.*

This map unit consists of the Luckenbach, Minwells, and Bastsil soils on terraces of the Colorado River. Slopes range from 1 to 5 percent.

This unit makes up about 1 percent of the county. It is about 31 percent Luckenbach soils, 18 percent Minwells and similar soils, 12 percent Bastsil and similar soils, and 39 percent other soils.

Typically, the surface layer of the Luckenbach soil is slightly alkaline, dark grayish brown clay loam about 12 inches thick. The upper part of the subsoil, from a depth of 12 to 36 inches, is moderately alkaline, reddish brown clay. The lower part of the subsoil, from a depth of 36 to 80 inches, is moderately alkaline, brown or pink clay loam.

Typically, the surface layer of the Minwells soil is neutral, brown fine sandy loam about 6 inches thick. The subsoil, from a depth of 6 to 54 inches, is sandy clay. From a depth of 6 to 26 inches, it is reddish brown and red and is slightly acid and moderately acid. From a depth of 26 to 54 inches, it is yellowish red and ranges from moderately acid to slightly alkaline. Below this, from a depth of 54 to 82 inches, is slightly alkaline, reddish yellow clay loam.

Typically, the surface layer of the Bastsil soil is slightly acid, brown loamy fine sand about 7 inches thick. The upper part of the subsoil, from a depth of 7 to 68 inches, is neutral, reddish brown sandy clay loam becoming slightly alkaline and yellowish red with depth. The lower part of the subsoil, from a depth of 68 to 77 inches, is slightly alkaline, yellowish red fine sandy loam. The underlying material, from a depth of 77 to 80 inches, is stratified layers of sand and gravel.

Soils of minor extent in this map unit are the similar Demona and Patilo soils and the Mereta, Leeray, Roughcreek, Weswood, Nocken, Yahola, Sunev, and Cho soils. The shallow Mereta soils are on higher positions in the landscape than the Luckenbach and Bastsil soils. The clayey Leeray soils are on flats on positions similar to those of the Luckenbach soils. The shallow Roughcreek and Cho and the moderately deep Nocken soils are all on adjacent uplands. The Weswood, Yahola, and Sunev soils are on adjacent flood plains.

The soils in this map unit are mostly used as cropland, orchardland, pasture, and hayland. Small grains, forage sorghum, and grain sorghum are the main crops. Peaches, plums, pecans, and berries are grown as orchard crops. Coastal bermudagrass and kleingrass are the main grasses grown for use as pasture and hayland. There is a moderate wind erosion hazard for the Bastsil soils in this map unit.

These soils are well suited to rangeland. The vegetation is a mid and tall grass prairie with scattered oak trees.

The soils in this map unit are suited to most urban and recreational uses. The main limitations are slow and moderately slow permeability, low soil strength, shrinking and swelling of the soil with changes in moisture, and corrosivity to uncoated steel. Careful design and installation can partially overcome these limitations.

### 9. Weswood

*Very deep, nearly level, loamy soils that formed in calcareous, loamy alluvium; on flood plains*

This map unit consists of the Weswood soils on the flood plain of the Colorado River. Slopes are dominantly less than 1 percent.

This map unit makes up about 1 percent of the county. It is about 91 percent Weswood soils and 9 percent other soils.

Typically, the surface layer of the Weswood soil is brown silt loam about 8 inches thick. The upper part of the subsoil, from a depth of 8 to 44 inches, is light reddish brown or reddish brown silt loam. From a depth of 44 to 80 inches, the lower part of the subsoil is yellowish red strata of silt loam, silty clay loam, and fine sandy loam. The soil is moderately alkaline throughout.

Soils of minor extent in this map unit are the sandy Eufaula soils on adjacent terraces; the loamy Yahola soils that are frequently flooded; and the moderately deep, loamy Callahan and Nocken soils on adjacent uplands.

The Weswood soils are mostly used for cropland, orchardland, pasture, and hayland. Small grains, grain sorghum, and forage sorghum are the main crops. Pecans are grown as an orchard crop. The main pasture and hayland grasses are coastal bermudagrass and kleingrass.

The soils in this map unit are well suited to rangeland. The vegetation is mid and tall grasses with pecan and elm trees growing along the water courses. Flooding adds additional moisture to the soil and increases yields.

The Weswood soils in this map unit should not have permanent structures built on them because of the hazard of flooding. These soils are suited to most recreational uses; however, the flood hazard should be considered when planning camping areas.

### 10. Eufaula

*Very deep, gently sloping, sandy soils that formed in sandy alluvium; on stream terraces.*

This map unit consists of the Eufaula soils on terraces of the Colorado River. Slopes range from 1 to 5 percent.

This unit makes up about 1 percent of the county.

It is about 93 percent Eufaula soils and 7 percent other soils.

Typically, the surface layer of the Eufaula soil is very pale brown fine sand about 18 inches thick. The subsurface layer, from a depth of 18 to 35 inches, is pink fine sand. The next layer, from a depth of 35 to 84 inches, is very pale brown fine sand with bands of red fine sandy loam lamellae. The soil is slightly acid throughout.

Soils of minor extent are the moderately deep, loamy Callahan, Lometa, and Nocken soils on adjacent uplands and the loamy Yahola and Weswood soils on the adjacent flood plains.

The Eufaula soils are used as cropland, pasture, and hayland. The main crops are peanuts and small grains. Coastal bermudagrass is the main pasture and hayland grass. The low available water capacity is the main limitation. Because of the sandy surface layer, the hazard of wind erosion is severe.

These soils are suited to rangeland. The vegetation is tall grass savannah with scattered oak trees.

The Eufaula soils in this unit are suited to most urban and recreational uses. The main limitations are seepage, soil blowing, and caving in of banks when excavating. These limitations can be partially overcome by proper design and installation.

# Detailed Soil Map Units

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

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

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

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

An identifying symbol precedes the map unit name in the map unit descriptions and delineates each map unit on the detailed maps at the back of this survey.

Each description includes general facts about the unit and gives the principal hazards and limitations to be considered in planning for specific uses. In this survey, each map unit is rated for its potential for use as rangeland. These potential ratings are based on a system that includes consideration of forage production levels; difficulty or relative cost of corrective measures that can improve forage production; and any adverse social, economic, or environmental consequence that cannot be easily overcome. Because comparisons are made only among soils in this county, ratings for a given soil in another county may differ. The ratings used in this survey area are low, medium, and high.

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

Soils of one series can differ in texture of the surface layer, slope, stoniness, salinity, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Brackett gravelly clay loam, 3 to 8 percent slopes is a phase of the Brackett series.

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

A *complex* consists of two or more soils or miscellaneous areas in such an intricate pattern or in such small areas that they cannot be shown separately on the

maps. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas. Eckrant-Rock outcrop complex, 1 to 8 percent slopes, very stony is an example.

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

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

**BaB—Bastsil loamy fine sand, 1 to 5 percent slopes.** This is a very deep, gently sloping, well drained soil on terraces. Areas are irregular in shape and range from 25 to 60 acres.

Typically, the surface layer is slightly acid, brown loamy fine sand about 7 inches thick. The upper part of the subsoil, from a depth of 7 to 68 inches, is sandy clay loam that is neutral and reddish brown above and slightly alkaline and yellowish red below. The lower part of the subsoil, from a depth of 68 to 77 inches, is slightly alkaline, yellowish red fine sandy loam. The underlying material, to a depth of 80 inches, is stratified layers of sand and gravel.

Surface runoff is very low to low. Permeability is moderate, and available water capacity is moderate. The plant root zone is very deep. The hazard of water and wind erosion is moderate.

Included with this soil in mapping are small areas of Minwells soils and some areas of similar soils that have a fine sandy loam surface layer. The Minwells soils are in a higher position on the landscape than the Bastsil soils. The included soils make up less than 10 percent of the map unit.

This soil is used mainly as orchardland. Pears, peaches, plums, and pecans are grown.

This Bastsil soil is also used as cropland. The main crops are small grains and forage sorghum. Terraces and contour farming help control water erosion and conserve moisture. Keeping crop residue on the surface helps to conserve moisture, maintain tilth, and control wind and water erosion. Crops respond well to nitrogen, phosphorus, and potassium fertilizers.

Improved bermudagrass and kleingrass are the main grasses grown for pasture and hay. Nitrogen and phosphorus fertilizers help to increase yields.

This soil is used as rangeland. The climax plant community is a tall grass savannah with scattered post oak and blackjack oak. The range potential for this soil is medium.

The shrink-swell potential, low soil strength, and corrosivity to uncoated steel are moderate limitations for most urban uses. Foundations for buildings, roads, and other structures must be designed and constructed to withstand moderate shrinking and swelling upon drying and wetting and the low soil strength. Septic tank absorption fields must be properly designed and installed to function in this soil. Uncoated steel needs protection. Slope limits some recreational uses.

This soil provides good habitat for deer and good nesting areas for quail, dove, turkey, and songbirds. The woody vegetation attracts small mammals to this site.

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

**BeB—Boerne loam, rarely flooded.** This is a very deep, nearly level and very gently sloping, well drained soil on flood plains. Slopes range from 0 to 3 percent. Areas are long and narrow and range from 15 to 60 acres.

Typically, the upper part of the surface layer is grayish brown loam about 6 inches thick. The lower part of the surface layer, to a depth of 14 inches, is light brownish gray loam. The subsoil, from a depth of 14 to 60 inches, is pale brown loam. The underlying material, below a depth of 60 inches, is very pale brown loam with strata of sandy material. The soil is moderately alkaline throughout.

Surface runoff is negligible. Permeability is moderately rapid, and available water capacity is moderate. The plant root zone is very deep. This soil is subject to flooding no more than once every 20 years The hazard of water erosion is slight.

Included with this soil in mapping are small areas of Oakalla and Sunev soils in landscape positions similar to those of Boerne soils. The Oakalla and Sunev soils are in small areas and make up less than 15 percent of the map unit. Also included is a similar soil in which the underlying material has sandy strata as shallow as 40 inches. This included soil makes up 20 to 30 percent of some mapped areas.

This soil is mainly used as rangeland. The climax plant community is tall and mid grasses with pecan and elm trees near the drainageways. The range potential for this soil is high.

This Boerne soil is also used as cropland. Small grains and forage sorghum are the main crops. Keeping crop residue on the surface helps control water erosion and conserve moisture. Crops respond well to nitrogen and phosphorus fertilizers.

Improved bermudagrass and kleingrass are the main grasses grown for pasture and hay. Nitrogen and phosphorus fertilizers help to increase yields.

The hazard of flooding limits the use of this soil for most urban and recreational purposes. Houses and similar

**Figure 5.—Large round bales of forage sorghum in an area of Bolar clay loam, 1 to 3 percent slopes.**

structures should only be built on this soil in areas protected from flooding. Underground steel pipe corrodes unless protected.

This soil provides fair habitat for rabbits, dove, quail, and small mammals. Deer and turkey from adjacent uplands frequent the areas and feed on pecans and other mast. They also graze on the small-grain fields during the winter months.

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

**BoB—Bolar clay loam, 1 to 3 percent slopes.** This is a moderately deep, very gently sloping, well drained soil on the side slopes of low ridges. Areas are irregular in shape and range from 15 to 70 acres.

Typically, the surface layer of this soil is dark grayish brown clay loam about 11 inches thick. The subsoil, from a depth of 11 to 30 inches, is brown clay loam. The underlying material, below a depth of 30 inches, is hard, platy limestone. The soil is moderately alkaline throughout.

Surface runoff is low. Permeability is moderate, and available water capacity is low. The plant root zone is moderately deep. The hazard of water erosion is moderate.

Included with this soil in mapping are Brackett, Doss, Krum, Mereta, and Nuff soils. Brackett and Mereta soils are in a higher position on the landscape, Doss and Nuff soils are in a similar position, and Krum soils are in a lower position on the landscape. The included soils make up less than 15 percent of the map unit.

This soil is mainly used as cropland. Small grains, grain sorghum, and forage sorghum (fig. 5) are the main crops. Keeping crop residue on the surface helps control water erosion and conserve moisture. Contour farming and terraces are needed to control water erosion. Crops respond well to nitrogen and phosphorus fertilizers.

This Bolar soil is also used as pasture and hayland. Improved bermudagrass and kleingrass are the main grasses grown. Nitrogen and phosphorus fertilizers help to increase production.

This soil is used as rangeland. The climax plant community is a tall grass prairie with scattered motts of live oak. The range potential for this soil is medium.

Depth to rock, low soil strength, and shrink-swell potential are the main limitations for most urban uses of this soil. Foundations for buildings, roads, and other structures must be designed and constructed to withstand the shrinking and swelling upon drying and wetting and the low soil strength. Underground steel pipe corrodes unless protected. Septic systems must be designed and installed properly to function in this soil. Slope is a limiting factor for some playgrounds when this soil is used for recreational purposes.

This soil provides good habitat for dove and quail. Lack of cover is the limiting factor for deer.

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

**BoC—Bolar clay loam, 3 to 5 percent slopes.** This is a moderately deep, gently sloping, well drained soil on the side slopes of low hills. Areas are irregular in shape and range from 15 to 40 acres.

Typically, the surface layer of this soil is dark grayish brown clay loam about 11 inches thick. The upper part of the subsoil, from a depth of 11 to 28 inches, is brown clay loam. The lower part of the subsoil, from a depth of 28 to 32 inches, is yellowish brown cobbly clay loam. The underlying material, below a depth of 32 inches, is indurated limestone bedrock. The soil is moderately alkaline throughout.

Surface runoff is low. Permeability is moderate, and the available water capacity is low. The plant root zone is moderately deep. The hazard of water erosion is severe.

Included with this soil in mapping are Brackett, Cho, Doss, Krum, Mereta, and Nuff soils. Brackett and Mereta soils are in a higher position on the landscape, Doss and Nuff soils are in a similar position, and Krum soils are in a lower position on the landscape. The included soils make up less than 15 percent of the map unit.

This soil is mainly used as rangeland. The climax plant community is a tall grass prairie with scattered motts of live oak trees. The range potential for this soil is medium.

This Bolar soil is also used as pasture and hayland. Improved bermudagrass and kleingrass are the main grasses grown. Nitrogen and phosphorus fertilizers help to increase production.

Depth to rock, low soil strength, and shrink-swell potential are the main limitations for most urban uses. Foundations for buildings, roads, and other structures must be designed and constructed to withstand the shrinking and swelling upon drying and wetting and the low soil strength. Septic systems must be properly designed and installed to function in this soil. Slope is a limiting factor for some playgrounds when this soil is used for recreational purposes.

This soil provides good habitat for dove and quail. Lack of cover is the limiting factor for deer.

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

**BrC—Brackett clay loam, 1 to 5 percent slopes.** This is a very deep, gently sloping, well drained soil on side slopes and low hills. Areas are irregular in shape and range from 10 to 40 acres.

Typically, the surface layer of this soil is grayish brown clay loam about 6 inches thick. The upper part of the subsoil, from a depth of 6 to 16 inches, is light yellowish brown clay loam. The lower part of the subsoil is very pale brown loam from a depth of 16 to 30 inches. The underlying material, from a depth of 30 to 60 inches, is brownish yellow, loamy, marly earth that has a clay loam texture. The soil is moderately alkaline throughout.

Surface runoff is very low to low. Permeability is moderate, and available water capacity is moderate. The hazard of water erosion is moderate.

Included with this soil in mapping are small areas of Doss, Krum, Lampasas, Topsey, and Real soils. Doss and Topsey soils are in landscape positions similar to those of Brackett soils, Krum soils are in lower positions, and Lampasas and Real soils are in higher positions on the landscape. Also included are some small areas of Brackett soils which were once cultivated that have moderate to severe erosion. The included soils make up less than 15 percent of the map unit.

This soil is mainly used as rangeland. The climax plant community is a tall grass savannah with scattered motts of live oak and Texas oak trees. The range potential for this soil is medium.

Some areas of this Brackett soil are used as cropland. Small grains and forage sorghum are the main crops. Keeping crop residue on the surface helps control water erosion, conserve moisture, and improve soil tilth and water intake. Contour farming and terraces are needed in most areas to control water erosion.

This soil is also used as pasture and hayland. Kleingrass is the main grass grown.

Low soil strength and corrosivity to uncoated steel are the main limitations for most urban uses. These limitations can be partially overcome by proper design and installation. Slope is the limiting factor for some playgrounds when this soil is used for recreational purposes.

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

Several species of woody plants, forbs, and grasses provide cover, browse, and mast for wildlife.

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

**BrD—Brackett gravelly clay loam, 3 to 8 percent slopes.** This is a very deep, undulating, well drained soil on low hills and side slopes. The hills are low and oval with exposed horizontal bands, or ledges, of limestone. The sequence of more resistant layers of limestone and softer strata of marl result in a stair-stepped, or benched, appearance in the landscape. Areas are irregular in shape and range from 40 to about 3,000 acres. Gravel size angular and rounded limestone fragments are on the surface as a pavement in some areas of this map unit.

Typically, the surface layer is light brownish gray gravelly clay loam about 9 inches thick. The subsoil, from a depth of 9 to 17 inches, is pale brown clay loam. The underlying material, from a depth of 17 to 60 inches, is white loam with interbedded weakly cemented limestone and marly, loamy earth. The soil is moderately alkaline throughout.

Surface runoff is low to medium. Permeability is moderate, and available water capacity is moderate. A few seeps are common after periods of high rainfall. The hazard of water erosion is severe.

Included with this soil in mapping are small areas of Bolar, Krum, Lampasas, Real, Topsey, and Wise soils. Bolar, Topsey, and Wise soils are in landscape positions similar to those of Brackett soils; Lampasas and Real soils are in higher positions; and Krum soils are in lower positions on the landscape. The included soils make up less than 15 percent of the map unit.

This soil is used as rangeland. The climax plant community is a tall grass savannah with scattered motts of live oak and Texas oak. The range potential for this soil is medium.

This Brackett soil is not used as cropland. Slope, limestone fragments, and limestone ledges are the main limitations.

Slope, low soil strength, and corrosivity to uncoated steel are the main limitations for most urban uses. Local roads and streets should be designed and constructed to compensate for the low strength of the soil. These limitations can be partially overcome by proper design and installation. Small stones and slope are the limiting factors for some playgrounds when this soil is used for recreational purposes.

This soil provides fair habitat for deer, dove, and quail. Several species of woody plants, forbs, and grasses provide cover, browse, and mast for wildlife.

This Brackett soil is in capability subclass VIs and the Adobe range site.

**BrE—Brackett-Rock outcrop complex, 10 to 30 percent slopes.** This complex consists of the very deep, well drained, loamy Brackett soils on side slopes and Rock outcrop along rock ledges. Soils in this complex are strongly sloping to steep. The landscape has a stair-stepped, or benched, appearance with a sequence of narrow, horizontal limestone layers. The limestone layers resist weathering and erosion, but the soils formed in the softer strata of marly, loamy earth are more subject to weathering and erosion. Areas of this complex are irregular in shape and range from 150 to 600 acres.

This complex is about 60 to 80 percent Brackett soils, about 20 to 40 percent Rock outcrop, and less than 20 percent other soils. Included in mapping are Real soils in landscape positions similar to those of the Brackett soils and Eckrant soils that are in higher positions. The Brackett soil and Rock outcrop in this complex are so intricately mixed that separation is not practical at the scale mapped.

Typically, the surface layer of the Brackett soil is light brownish gray clay loam about 6 inches thick. The subsoil, from a depth of 6 to 15 inches, is light yellowish brown clay loam. The underlying material, from a depth of 15 to 60 inches, is yellowish chalky limestone and marly, loamy earth. The soil is moderately alkaline throughout.

The Rock outcrop consists of exposures of limestone bedrock in long, narrow areas. They range from 2 to 12 feet across and are in bands from 6 to 24 inches thick around the hills.

Surface runoff is medium to high. Permeability of the Brackett soil is moderate, and available water capacity is moderate. The hazard of water erosion is severe.

This complex is used as rangeland. The climax plant community on the Brackett soil is a tall grass savannah with scattered motts of live oak and Texas oak. The range potential for this soil is medium.

This unit is not used as cropland. Slope and rock outcrops are the main limitations for cropland.

Slope, low strength of the Brackett soil, corrosivity to uncoated steel, and rock outcrops are limiting factors for most urban and recreational uses. Although there are outstanding views for homeowners in these areas, these soils are difficult to build on. Allowances should be made for the medium to high runoff during rain storms. Septic systems must be specially designed and constructed to function in these areas.

This complex provides fair habitat for a variety of wildlife. Deer, dove, and quail are the most common game species. Several species of woody plants, forbs, and grasses supply cover, browse, and mast for wildlife.

The Brackett soil in this map unit is in capability subclass VIIs and the Steep Adobe range site. Rock outcrop is in capability subclass VIIIs and is not assigned a range site.

**CaC2—Callahan loam, 3 to 8 percent slopes, eroded.** This is a moderately deep, gently sloping and moderately sloping, well drained soil on broad flats and side slopes of low ridges. Areas are irregular in shape and range from 50 to 300 acres.

Typically, the surface layer of this soil is brown loam 4 inches thick. The upper part of the subsoil, from a depth of 4 to 32 inches, is reddish brown clay. The lower part of the subsoil, from a depth of 32 to 38 inches, is brown clay. The underlying material, from a depth of 38 to 60 inches, is light olive brown, weakly consolidated shale of clay texture. The soil is moderately alkaline throughout.

Surface runoff is high to very high. Permeability is very slow, and available water capacity is low. The plant root zone is moderately deep. The high clay content of the subsoil impedes the movement of air, water, and roots. The hazard of water erosion is severe.

Erosion is severe for about 80 percent of the soil areas and moderate for the rest. The surface layer generally ranges from 1 to 4 inches thick, but about 50 percent of the areas have lost all of the surface layer as well as a few inches of the subsoil.

Included with this soil in mapping are small areas of Cho, Lometa, Nocken, and Owens soils. Nocken and Owens soils are in landscape positions similar to those of Callahan soils, and Cho and Lometa soils are in higher positions. Also included are a few areas of noneroded Callahan soils. The included soils make up less than 25 percent of the map unit.

This soil is now used as rangeland. The climax plant community is a mid grass prairie. The range potential for this soil is low.

This Callahan soil is not used as cropland because of the slope, very slow permeability, low available water capacity, crusting of the soil surface, and the hazard of erosion.

Depth to rock, corrosivity to uncoated steel, shrink-swell potential, very slow permeability, slope, and low soil strength are the most limiting features for most urban uses. Foundations for buildings, roads, and other structures must be designed and constructed to withstand the shrinking and swelling of the soil upon drying and wetting and the low soil strength. Septic tank absorption fields must be properly designed and installed to function in this soil. Very slow permeability and slope are the main limitations for most recreational uses.

This soil provides fair habitat for a variety of wildlife including deer, dove, quail, and turkey. Many songbirds and small mammals also inhabit the area.

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

**ChB—Cho gravelly loam, 1 to 3 percent slopes.** This soil is very shallow and shallow to a cemented layer. It is a very gently sloping, well drained soil on low ridges. Areas are irregular in shape and range from 20 to 80 acres.

Typically, the surface layer of this soil is moderately alkaline, dark brown gravelly loam about 9 inches thick. This rests on a layer of pink, indurated caliche about 4 inches thick. The underlying material, from a depth of 13 to 60 inches, is moderately alkaline, pink limy earth.

Surface runoff is very low. Permeability is moderate in the upper 9 inches but slow in the indurated caliche layer. Available water capacity is very low. The plant root zone is very shallow and shallow, but some plant roots can penetrate fractures in the indurated caliche. The hazard of water erosion is moderate.

Included with this soil in mapping are Doss, Mereta, and Real soils. Mereta and Real soils are in landscape positions similar to those of Cho soils, and Doss soils are in lower positions. Also included are a few areas of Cho soils with 3 to 5 percent slopes and a few small areas of Cho soils in old cropland fields that have had the indurated caliche layer broken up by plowing. The included soils make up less than 15 percent of the map unit.

This soil is used as rangeland. The climax plant community is a mid grass prairie. The range potential for this soil is low.

This Cho soil is not used as cropland. Depth to a cemented pan and very low available water capacity are the main limitations for cropland.

Depth to a cemented pan and corrosivity to uncoated steel are the main limitations for urban uses. These limitations can be partially overcome by good design and careful installation. The cemented pan and small stones on the soil surface are the main limitations for most recreational uses.

This soil provides poor habitat for wildlife. Inadequate cover, food, and water are the main limitations.

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

**DeB—Demona fine sand, 0 to 3 percent slopes.** This is a very deep, nearly level and very gently sloping, moderately well drained soil on uplands. Areas are irregular in shape and range from 30 to 150 acres.

Typically, the upper part of the surface layer is slightly acid, light yellowish brown fine sand about 6 inches thick. The lower part of the surface layer is slightly acid, pink fine sand from a depth of 6 to 34 inches. The upper part of the subsoil, from a depth of 34 to 49 inches, is slightly acid, light brownish gray sandy clay with mottles. The middle part of the subsoil, from a depth of 49 to 77 inches, is moderately acid, reddish yellow sandy clay loam with mottles. The lower part of the subsoil, from a depth of 77 to 87 inches, is slightly acid sandy clay loam with gray, yellow, brown, and red mottles.

Surface runoff is very low to low. Permeability is slow,

and available water capacity is moderate. The plant root zone is very deep; however, the high clay content in the subsoil tends to impede the movement of air, water, and roots. For short periods following heavy rainfall, a perched water table is at the top of the subsoil layer. Natural fertility is low. The hazard of wind erosion is severe without protective cover.

Included with this soil in mapping are Bastsil, Minwells, and Patilo soils. The Patilo soils are in landscape positions similar to those of the Demona soils, and the Bastsil and Minwells soils are in lower positions. Also included is a soil similar to the Demona soil except it has a surface layer less than 20 inches thick. The included soils make up less than 15 percent of the map unit.

This soil is used as cropland. Small grains and peanuts are the main crops. Keeping crop residue on the surface helps control wind erosion and conserve moisture. Crops respond well to fertilizers.

This soil is used as pasture and hayland. Improved bermudagrass is the main grass grown.

This Demona soil is also used as orchardland. Peaches, plums, and pecans are the main orchard crops.

This soil is used as rangeland. The climax plant community is a tall grass savannah with scattered post oak and blackjack oak. The range potential for this soil is medium.

The main limitations for most urban uses are slow permeability, wetness caused by a perched water table, shrinking and swelling with changes in moisture, corrosivity to uncoated steel, and low soil strength. The thick, sandy surface layer is also a limitation for some recreational uses. These limitations can be partially overcome by proper design and installation.

This soil provides good habitat for deer, dove, and quail. Many songbirds and small mammals also inhabit the area.

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

**DoC—Doss silty clay, 1 to 5 percent slopes.** This is a shallow, gently sloping, well drained soil on the sides of low ridges. Areas are irregular in shape and range from 15 to 60 acres.

Typically, the surface layer of this soil is moderately alkaline, dark grayish brown silty clay about 8 inches thick. The subsoil, from a depth of 8 to 18 inches, is moderately alkaline, brown silty clay. The underlying material, from a depth of 18 to 60 inches, is weakly cemented, platy limestone interbedded with marl.

Surface runoff is very low to low. Permeability is moderately slow, and available water capacity is very low. The plant root zone is shallow and restricted, but a few roots can penetrate the cemented layer. The hazard of water erosion is moderate.

Included with this soil in mapping are Bolar, Brackett, Cho, and Mereta soils. Bolar and Brackett soils are in landscape positions similar to those of Doss soils. Cho and Mereta soils are in higher positions. The included soils make up less than 15 percent of the map unit.

This soil is mainly used as rangeland. The climax plant community is an open grassland with scattered motts of live oak. The range potential for this soil is medium.

This Doss soil is also used as cropland. Small grains and forage sorghum are the main crops. Contour farming helps control water erosion and conserve moisture. Keeping crop residue on the surface helps conserve moisture, maintain tilth, control erosion, and maintain good structure and aeration. Crops respond well to nitrogen and phosphorus fertilizers.

Improved bermudagrass and kleingrass are the main grasses grown for pasture and hay. Nitrogen and phosphorus fertilizers help to increase yields.

Depth to rock, shrink-swell potential, low soil strength, and corrosivity to uncoated steel are the main limitations for most urban uses. Septic tank absorption fields must be properly designed and installed to function in this soil. These limitations can be partially overcome by good design and careful installation. Depth to rock, slope, and the clayey surface layer are the main limitations for recreational uses.

This soil provides fair habitat for dove and quail. Lack of cover is the limiting factor for deer.

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

**ErD—Eckrant-Rock outcrop complex, 1 to 8 percent slopes, very stony.** This complex is made up of the very shallow and shallow, well drained Eckrant soils and areas of Rock outcrop. This complex is on broad, undulating areas. Slopes range from 1 to 8 percent. Up to 15 percent of the surface of the soils in this complex is covered with limestone cobbles and stones. Areas are irregular in shape and range from 75 to 300 acres.

Eckrant soils average 60 percent of the complex, but range from 50 to 70 percent. Rock outcrop averages 30 percent, but ranges from 20 to 40 percent. The Eckrant soil and Rock outcrop are so intricately mixed that separation is not practical at the scale mapped.

Typically, the Eckrant soil has a surface layer of moderately alkaline, very dark gray very cobbly clay about 8 inches thick. At 8 inches, the surface layer rests abruptly on the underlying material of fractured, indurated limestone bedrock that is several feet thick.

Areas of Rock outcrop are typically long and narrow. They range from 2 to 10 feet across and from 4 to 30 feet long, and in some areas they are up to 6 inches higher than the adjacent Eckrant soils.

Surface runoff is very low to medium. Permeability of the Eckrant soil is moderately slow, available water

capacity is very low, and the plant root zone is shallow. The hazard of water erosion is severe.

Included with this complex in mapping are Brackett, Cho, Lampasas, Real, Roughcreek, and Tarpley soils. Brackett and Real soils are in a lower position on the landscape; and Cho, Lampasas, Roughcreek, and Tarpley soils are in a similar position on the landscape.

This complex is used as rangeland (fig. 6). The climax plant community is a tall grass savannah with scattered motts of live oak. The range site potential for this soil is low.

These areas are not used as cropland. Shallow and very shallow depth to rock, stoniness, slope, and the high percentage of barren bedrock outcrops are the main limitations for cropland.

Stones on the surface, low soil strength, rock outcrops, shallow and very shallow depth to bedrock, corrosivity to uncoated steel, and slope are the main limitations for most urban and recreational uses. Builders should take special precautions at the time of design and construction to partially overcome these limitations. Excavations are difficult in the hard rock. Allowances should be made for surface runoff and water seepage from the limestone following high-intensity and prolonged rainfall. Septic systems must be specially designed and constructed, generally either in raised beds or in enlarged filter fields, to function in these areas. Even so, effluent may seep to the surface downslope or through the bedrock into the underground aquifer. Underground steel pipe needs to be protected to prevent corrosion.

**Figure 6.—Little bluestem grass growing in an area of Eckrant-Rock outcrop complex, 1 to 8 percent slopes, very stony.**

This complex provides fair habitat for a variety of wildlife such as deer, dove, and quail. Several species of woody plants, forbs, and grasses supply cover, browse, and mast for wildlife.

The Eckrant soil in this complex is in capability subclass VIIs and the Low Stony Hills range site. Rock outcrop is in capability subclass VIIIs and is not assigned a range site.

**ErF—Eckrant-Rock outcrop complex, 10 to 40 percent slopes, very stony.** This complex consists of the very shallow and shallow, well drained Eckrant soils and areas of Rock outcrop on side slopes of hills. Slopes are hilly to steep. Up to 15 percent of the surface of the soils in this complex is covered with limestone cobbles and stones. Areas are irregular in shape and range from 50 to several hundred acres.

Eckrant soils average 65 percent of the complex, but range from 60 to 70 percent. Areas of Rock outcrop average 30 percent and range from 20 to 40 percent. The Eckrant soil and Rock outcrop are so intricately mixed that it is not practical to separate them in mapping.

Typically, the Eckrant soil has a surface layer that is moderately alkaline, very dark gray very cobbly clay about 8 inches thick. At 8 inches, the surface layer rests abruptly on the underlying material of fractured, indurated limestone bedrock several feet thick.

The Rock outcrop areas range from 10 to 20 feet wide and from 10 to 30 feet long, and they are as much as 8 inches high.

The included soils are Brackett, Lampasas, Roughcreek, and Tarpley. Brackett soils are in a similar position on the landscape; and Lampasas, Roughcreek, and Tarpley soils are in a higher position on the landscape.

Surface runoff is medium to high. Permeability of the Eckrant soil is moderately slow, available water capacity is very low, and the plant root zone is shallow. The hazard of water erosion is severe.

This complex is used almost entirely as rangeland. The climax plant community is a tall grass savannah with scattered motts of shin oak, live oak, and Texas oak. The range potential is low.

Slope, shallow and very shallow depth to rock, stones on the surface, and the high percentage of barren bedrock outcrops preclude the use of these areas as cropland.

Large stones on the surface, rock outcrops, shallow and very shallow depth to bedrock, corrosivity to uncoated steel, low soil strength, and slope are the main limitations for most urban and recreational uses. These areas provide outstanding views of the surrounding landscape. Builders should take special precautions at the time of design and construction to partially overcome these limitations. Excavations are difficult in the hard rock. Allowances should be made for surface runoff and water seepage from the limestone following high-intensity and prolonged rainfall. Septic systems must be specially designed and constructed, generally either in raised beds or in large filter fields, to function in these areas. Even so, effluent may seep to the surface downslope or through the bedrock into the underground aquifer.

This complex provides fair habitat for a variety of wildlife such as deer, dove, and quail. Many songbirds and small mammals also inhabit these areas. Because of the slopes and the rocky terrain, wildlife habitat is sometimes the primary land use.

The Eckrant soil in this complex is in capability subclass VIIs and the Steep Rocky range site. Rock outcrop is in capability subclass VIIIs and is not assigned a range site.

**EuC—Eufaula fine sand, 1 to 5 percent slopes.** This is a very deep, gently sloping, somewhat excessively drained soil on terraces of the Colorado River. Areas are irregular in shape and range from 30 to 90 acres.

Typically, the surface layer of this soil is very pale brown fine sand about 18 inches thick. The subsurface layer, from a depth of 18 to 35 inches, is pink fine sand. The next layer, from a depth of 35 to 84 inches, is light yellowish brown fine sand that has bands of red fine sandy loam lamellae. The soil is slightly acid throughout.

Surface runoff is negligible to very low. Permeability is rapid, and available water capacity is low. The plant root zone is very deep. Air, water, and roots can move easily through the soil. Unless the soil is protected with some type of ground cover, the hazard of wind erosion is severe.

Included with this soil in mapping are small, oval areas of Patilo soils which are in a slightly lower position on the landscape. The included soils make up less than 5 percent of the map unit.

This soil is mainly used as pasture and hayland. Improved bermudagrass and weeping lovegrass are the main grasses grown. Nitrogen, phosphorus, and potassium fertilizers help to increase yields.

This Eufaula soil is also used as rangeland. The climax plant community is a tall grass, post oak, and blackjack oak savannah. The range potential for this soil is medium.

This soil is used as cropland. Peanuts and small grains are the main crops. Crop residue left on the surface helps control wind erosion and conserve moisture. Crops respond well to nitrogen, phosphorus, and potassium fertilizers.

Excavation cut banks that cave in, seepage, and soil blowing are the main limitations for most urban uses of this soil. This soil is a poor filter for effluent; therefore, septic systems must be specially designed and installed to function properly. The Eufaula soil is too sandy for most recreational uses.

This soil provides fair habitat for a variety of wildlife. Deer, dove, quail, songbirds, and small mammals inhabit the area.

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

**HeC—Hensley loam, 3 to 5 percent slopes.** This is a shallow, gently sloping, well drained soil on slightly convex ridges. Areas are irregular in shape and range from 10 to 30 acres.

Typically, the surface layer is slightly alkaline, dark brown loam 5 inches thick. The subsoil, from a depth of 5 to 18 inches, is slightly alkaline, red clay. The underlying material, below a depth of 18 inches, is indurated limestone.

Surface runoff is medium. Permeability is slow, and available water capacity is very low. The plant root zone is shallow. The hazard of water erosion is moderate.

Included with this soil in mapping are Oglesby, Pedernales, and Tarpley soils. Oglesby and Tarpley soils are in a higher position on the landscape than Hensley soils, and Pedernales soils are in a lower position. The included soils make up less than 20 percent of the map unit.

This soil is used mainly as rangeland. The climax plant community is a tall grass savannah with scattered post oak, blackjack oak, and live oak. The range potential for this soil is medium.

This Hensley soil is also used as cropland. Small grains and forage sorghum are the main crops. Keeping crop residue on the surface helps control water erosion, conserve moisture, and improve soil tilth and water intake. Contour farming is needed in most areas to control water erosion. Crops respond well to nitrogen and phosphorus fertilizers.

Improved bermudagrass and kleingrass are the main grasses grown for pasture and hay. Nitrogen and phosphorus fertilizers help to increase yields.

Depth to rock, low soil strength, and corrosivity to uncoated steel are the main limitations for most urban and recreational uses of this soil. Excavations are difficult in the hard rock. Proper design and installation can partially overcome these limitations.

This soil provides fair habitat for a variety of wildlife such as deer, quail, dove, songbirds, and small mammals.

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

**HeD—Hensley loam, 1 to 8 percent slopes, very stony.** This is a shallow, gently sloping to moderately sloping, well drained soil on slightly convex ridges. Areas are irregular in shape and range from 40 to 150 acres. Up to 15 percent of the soil surface is covered with limestone fragments.

Typically, the surface layer of this soil is slightly alkaline, reddish brown stony loam about 5 inches thick. The subsoil, from a depth of 5 to 16 inches, is slightly alkaline, red clay. The underlying material, below a depth of 16 inches, is indurated, fractured limestone bedrock.

Surface runoff is medium to high. Permeability is slow, and available water capacity is very low. The plant root zone is shallow. The hazard of water erosion is moderate.

Included with this soil in mapping are small areas of Eckrant, Lampasas, and Tarpley soils. Lampasas soils are in landscape positions similar to those of Hensley soils. Eckrant and Tarpley soils are in higher positions. The included soils make up less than 15 percent of the map unit.

This soil is used as rangeland. The climax plant community is a tall grass savannah with scattered post oak, blackjack oak, and live oak. The range potential for this soil is medium.

Shallow depth to rock and stoniness preclude the use of this soil as cropland.

The depth to rock, corrosivity to uncoated steel, and low soil strength are the main limitations for most urban uses. Excavations are difficult in the indurated limestone. These limitations can be partially overcome by proper design and installation. Shallow depth to rock and stoniness limit some recreational uses of this soil.

This soil provides fair habitat for a variety of wildlife. Deer, dove, quail, many songbirds, and small mammals inhabit the area.

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

**KrB—Krum silty clay, 1 to 5 percent slopes.** This is a very deep, gently sloping, well drained soil along drainageways in valleys between limestone hills. Areas are long and narrow and range from 10 to 150 acres.

Typically, the surface layer is dark grayish brown silty clay about 22 inches thick. The upper part of the subsoil, from a depth of 22 to 41 inches, is yellowish brown silty clay. The lower part of the subsoil, from a depth of 41 to 80 inches, is pale brown silty clay. The soil is moderately alkaline throughout.

Surface runoff is very low to low. Permeability is moderately slow, and available water capacity is high. The plant root zone is very deep; however, the high clay content tends to impede the movement of air, water, and roots. The hazard of water erosion is moderate.

Included with this soil in mapping are Nuff, Slidell, Sunev, and Rumley soils. Slidell, Sunev, and Rumley soils are in landscape positions similar to those of Krum soils; and Nuff soils are in higher positions. The included soils make up less than 15 percent of the map unit.

This soil is mainly used as rangeland. The climax plant community is a tall grass prairie with occasional motts of live oak. The range potential for this soil is medium.

This Krum soil is also used as cropland. Small grains

and forage sorghum are the main crops. Keeping crop residue on the surface helps control water erosion, conserve moisture, and improve soil tilth and water intake. Tilling the soil when moisture content is low helps maintain good soil structure and aeration. Contour farming and terraces are needed to control water erosion. Crops respond well to fertilizers.

Improved bermudagrass and kleingrass are the main grasses grown for pasture and hay. Fertilizers help to improve yields.

Shrink-swell potential, low soil strength, corrosivity to uncoated steel, and moderately slow permeability are the main limitations for most urban uses. Foundations for buildings, roads, and other structures must be designed and constructed to withstand the low soil strength and the shrinking and swelling of the soil upon drying and wetting. Underground steel pipe needs protection. Septic tank absorption fields must be properly designed and installed to function in this clayey, moderately slowly permeable soil.

This soil can be used for most recreational purposes. The clayey surface layer causes it to be muddy and sticky when wet, making foot and vehicle traffic difficult. Slope is also a limiting factor for some playgrounds.

This soil provides good habitat for dove and quail. Lack of cover is the limiting factor for deer.

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

**LaC—Lampasas gravelly clay, 1 to 5 percent slopes.** This soil is shallow to fragmental limestone. It is a gently sloping, well drained soil on low ridgetops and divides. Areas are broad to elongated and range from 20 to 200 acres.

Typically, the upper part of the surface layer of this soil is slightly alkaline, dark reddish brown gravelly clay about 5 inches thick. The lower part of the surface layer, from a depth of 5 to 13 inches, is slightly alkaline, dark reddish brown very gravelly clay. The underlying material, below a depth of 13 inches, is a bed of fragmental limestone.

Surface runoff is very low to low. Permeability is moderately slow, and available water capacity is very low. The plant root zone is shallow; however, some plant roots penetrate into fractures in the underlying material. The hazard of water erosion is moderate.

Included with this soil in mapping are Brackett, Cho, Krum, Oglesby, Real, and Tarpley soils. Oglesby and Tarpley soils are in landscape positions similar to those of Lampasas soils; Brackett, Cho, and Real soils are in higher positions; and Krum soils are in lower positions. The included soils make up less than 15 percent of the map unit.

This soil is mainly used as rangeland. The climax plant community is a mid and tall grass savannah with scattered motts of live oak. The range potential for this soil is medium.

This Lampasas soil is not used as cropland. Depth to rock, very low available water capacity, and coarse fragments are the main limitations for cropland.

Depth to the fractured limestone bedrock, slope, and small stones on the surface are the main limitations for most urban and recreational uses of this soil. Septic systems must be specially constructed in raised beds or large fields. Even so, effluent may seep downslope or through the underlying material into the underground aquifer. These limitations can be partially overcome by proper design and installation. The underlying limestone material is valued for use as roadfill because it is easily excavated and crushed by machinery.

This soil provides fair habitat for a variety of wildlife such as deer, dove, and quail. Many songbirds and small mammals also inhabit the area.

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

**LeB—Leeray clay, 1 to 3 percent slopes.** This is a very deep, very gently sloping, well drained soil on uplands or valley fill positions. Areas are oblong to irregular in shape and range from 15 to 200 acres. Undisturbed rangeland areas have low mounds and shallow depressions.

Typically, the surface layer is dark grayish brown and very dark grayish brown clay about 20 inches thick. The upper part of the subsoil, from a depth of 20 to 60 inches, is grayish brown and dark grayish brown clay. The lower part of the subsoil, from a depth of 60 to 80 inches, is light olive brown clay containing films, threads, and concretions of calcium carbonate. The soil is moderately alkaline throughout.

Surface runoff is medium. Permeability is very slow. When dry, this soil has cracks 1 to 3 inches wide that are more than 20 inches deep. Water enters the soil rapidly when it is dry and cracked, but enters very slowly after the cracks close. Available water capacity is high. The plant root zone is very deep. The hazard of water erosion is moderate.

Included with this soil in mapping are small areas of Bastsil, Luckenbach, and Minwells soils and a closely similar soil that is grayish in the upper part of the profile. Bastsil soils are in a lower position on the landscape, Luckenbach soils are in a similar position on the landscape, and Minwells soils are in a higher position on the landscape. Some areas of Leeray clay with slopes of less than 1 percent and more than 3 percent are also included. The included soils make up less than 15 percent of the map unit.

This soil is used as cropland. Small grains, forage sorghum, and grain sorghum are the main crops. Keeping

crop residue on the surface helps control water erosion, conserve moisture, and improve soil tilth and water intake. Tilling this soil when moisture content is low helps maintain good soil structure and aeration and avoids soil compaction. Contour farming and terraces are needed in most areas to control water erosion. Crops respond well to nitrogen and phosphorus fertilizers.

This Leeray soil is also used as rangeland. The climax plant community is a tall grass prairie with occasional live oak motts. The range potential for this soil is medium.

Improved bermudagrass and kleingrass are the main grasses grown for pasture and hay. Nitrogen and phosphorus fertilizers help to increase yields.

The shrink-swell potential and low strength of the soil, very slow permeability, corrosivity to uncoated steel, and clayey texture are the main limitations of the soil for urban uses. These limitations can be partially overcome by proper design and installation.

This soil can be used for most recreational purposes. The clayey surface layer causes the soil to be muddy and sticky when wet, making foot and vehicle traffic difficult. Slope is a limiting factor for some playgrounds.

This soil provides fair habitat for dove and quail. Lack of cover is the limiting factor for deer.

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

**LoD—Lometa very gravelly sandy loam, 3 to 12 percent slopes.** This is a moderately deep, gently sloping to strongly sloping, well drained soil on uplands. Areas are broad and elongated and range from 30 to 150 acres.

Typically, the surface layer is slightly acid, pink very gravelly sandy loam about 13 inches thick. The upper part of the subsoil, from a depth of 13 to 24 inches, is slightly acid, red very gravelly clay. The lower part of the subsoil, from a depth of 24 to 38 inches, is moderately acid, red gravelly clay. The underlying material, from a depth of 38 to 70 inches, is a strongly cemented conglomerate of rounded siliceous pebbles and cobbles and is slightly effervescent.

Surface runoff is medium to high. Permeability is slow, and available water capacity is low. The plant root zone is moderately deep. The high clay content of the subsoil tends to impede the movement of air, water, and roots. The hazard of water erosion is severe.

Included with this soil in mapping are small areas of Cho, Luckenbach, and Real soils. Cho and Real soils are in a higher position on the landscape, and Luckenbach soils are in a lower position on the landscape than Lometa soils. Also included is a soil on ridgetops that is similar to the Lometa soil except that it is less than 20 inches deep to a cemented conglomerate. The included soils make up less than 20 percent of the map unit.

This soil is mainly used as rangeland. The climax plant community is a tall grass savannah with scattered blackjack oak and post oak. The range potential for this soil is medium.

This Lometa soil is not used as cropland. Slope, small stones, depth to rock, and low available water capacity are the main limitations for cropland.

Depth to rock, corrosivity to uncoated steel, and slow permeability are the main limitations for most urban uses. Excavations are difficult in the hard rock. These limitations can be partially overcome by proper design and installation. Recreational uses are limited by small stones and slope.

This soil provides fair habitat for a variety of wildlife. Game species are deer, turkey, dove, and quail. Many songbirds and small mammals also inhabit the area.

This Lometa soil is in capability subclass VIs and the Gravelly Sandy Loam range site.

**LuB—Luckenbach clay loam, 1 to 3 percent slopes.** This is a very deep, very gently sloping, well drained soil along narrow valleys and in flats and depressions on terraces. Most areas are oblong and range from 15 to 60 acres.

Typically, the surface layer is slightly alkaline, dark grayish brown clay loam about 12 inches thick. The upper part of the subsoil, from a depth of 12 to 36 inches, is moderately alkaline, reddish brown clay. The lower part of the subsoil, from a depth of 36 to 80 inches, is moderately alkaline, brown or pink clay loam containing limestone fragments.

Surface runoff is very low. Permeability is moderately slow, and available water capacity is moderate. The plant root zone is very deep; however, the high clay content of the subsoil tends to impede the movement of air, water, and roots. The hazard of water erosion is moderate.

Included with this soil in mapping are small areas of Krum, Mereta, and Nuff soils. Mereta soils are in a higher position on the landscape, Nuff soils are in a similar position, and Krum soils are in a lower position. Also included is a soil similar to the Luckenbach soil in which limy earth is found at depths greater than 40 inches. Included soils make up less than 20 percent of the map unit.

This soil is mainly used as cropland. Small grains, forage sorghum, and grain sorghum are the main crops. Keeping crop residue on the surface helps control water erosion and conserve moisture. It also helps improve soil tilth and water intake. Tilling when moisture content is low prevents soil compaction and helps maintain good soil structure and aeration. Contour farming and terraces are needed in most areas to control water erosion. Crops respond well to nitrogen and phosphorus fertilizers.

This Luckenbach soil is used as pasture and hayland. Improved bermudagrass and kleingrass are the main

grasses grown. Nitrogen and phosphorus fertilizers help to increase yields.

This soil is also used as rangeland. The climax plant community is a tall grass prairie with occasional motts of live oak. The range potential for this soil is high.

Shrinking and swelling with changes in moisture, low soil strength, corrosivity to uncoated steel, and moderately slow permeability are the main limitations for most urban uses. These limitations can be partially overcome by proper design and installation. This soil can be used for most recreational purposes. Slope is a limiting factor for some playgrounds.

This soil provides fair habitat for dove and quail. Lack of cover is the limiting factor for deer.

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

**MeB—Mereta clay loam, 1 to 3 percent slopes.** This soil is shallow to a cemented layer. It is a very gently sloping, well drained soil on terraces. Areas are irregular in shape and range from 15 to 70 acres.

Typically, the upper part of the surface layer is dark grayish brown clay loam about 9 inches thick. The lower part of the surface layer, from a depth of 9 to 18 inches, is dark brown clay loam. From a depth of 18 to 22 inches, is a layer of pink, strongly cemented, platy caliche. The underlying material, from a depth of 22 to 60 inches, is reddish yellow and very pale brown limy earth of clay loam texture. The soil is moderately alkaline throughout.

Surface runoff is very low. Permeability is moderately slow in the soil and slow to very slow in the cemented caliche layer. Available water capacity is low. The plant root zone is shallow. The hazard of water erosion is moderate.

Included with this soil in mapping are Cho, Luckenbach, and Leeray soils. Cho soils are in landscape positions similar to those of the Mereta soils, and Luckenbach and Leeray soils are in lower positions. The included soils makes up as much as 15 percent of the map unit.

This soil is used mainly as rangeland. The climax plant community is an open grassland prairie with scattered motts of live oak. The range potential for this soil is medium.

This Mereta soil is also used as cropland. The main crops are cool season crops like wheat, oats, and barley. Keeping crop residue on the surface helps control water erosion and conserve moisture. It also helps improve soil tilth and water intake. Tilling when moisture content is low prevents soil compaction and helps maintain good soil structure and aeration. Contour farming is needed in most areas to control water erosion. Crops respond well to nitrogen and phosphorus fertilizers.

Improved bermudagrass and kleingrass are the main grasses grown for pasture and hay. Nitrogen and phosphorus fertilizers help to increase yields.

The cemented pan, corrosivity to uncoated steel, and shrink-swell potential are the most limiting factors for most urban and recreational uses. Underground steel pipes need protection. Septic tank absorption fields must be properly designed and installed to function in this soil.

This soil provides fair habitat for a variety of wildlife such as dove, quail, songbirds, and small mammals. Lack of cover is a limiting factor for deer.

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

**MnB—Minwells fine sandy loam, 1 to 3 percent slopes.** This is a very deep, very gently sloping, well drained soil on old, high terraces of the Colorado River. Areas are irregular in shape and range from 15 to 100 acres.

Typically, the surface layer of this soil is neutral, brown fine sandy loam 6 inches thick. The subsoil, from a depth of 6 to 54 inches, is sandy clay. From a depth of 6 to 14 inches, it is slightly acid and reddish brown; from a depth of 14 to 26 inches, it is moderately acid and red; from a depth of 26 to 40 inches, it is moderately acid and yellowish red; and from a depth of 40 to 54 inches, it is slightly alkaline and yellowish red. Below this, from a depth of 54 to 82 inches, is slightly alkaline, reddish yellow clay loam.

Surface runoff is medium. Permeability is slow, and available water capacity is moderate. The plant root zone is very deep; however, the clay content tends to impede the movement of air, water, and roots. The hazard of water erosion is moderate.

Included with this soil in mapping are Bastsil, Demona, and Luckenbach soils. Bastsil soils are in a lower position on the landscape, Demona soils are in a similar position, and Luckenbach soils are in a higher position. The included soils make up less than 15 percent of the map unit.

This soil is used as cropland. Small grains and forage sorghum are the main crops. Keeping crop residue on the surface helps control water erosion and conserve moisture. It also helps improve soil tilth and water intake. Contour farming and terraces are needed in most areas to control water erosion. Crops respond well to nitrogen and phosphorus fertilizers.

This Minwells soil is used as rangeland. The climax plant community is a tall grass savannah with occasional post oak and blackjack oak. The range potential for this soil is high.

This soil is also used as orchardland. Peaches, plums, pecans, and berries are the main orchard crops.

Improved bermudagrass and kleingrass are the main

grasses grown for pasture and hay. Nitrogen and phosphorus fertilizers help to improve yields.

Shrinking and swelling with changes in moisture, corrosivity to uncoated steel, and low soil strength are the main limitations for most urban uses. Foundations for buildings, roads, and other structures must be designed and constructed to partially overcome the limitations of the soil. Underground steel pipes need to be protected. Septic tank absorption fields must be properly designed and installed to function in this slowly permeable soil. This soil can be used for most recreational purposes. Slope is a limiting factor for some playgrounds.

This soil provides good habitat for deer, dove, quail, songbirds, and small mammals.

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

**NoD—Nocken fine sandy loam, 5 to 15 percent slopes, very stony.** This is a moderately deep, strongly sloping to moderately steep, well drained soil on low knolls and hillsides. Areas are broad to elongated and range from 75 to 300 acres. Up to 15 percent of the soil surface is covered with sandstone cobbles and stones.

Typically, the upper part of the surface layer is moderately acid, grayish brown stony fine sandy loam 5 inches thick. The lower part of the surface layer is moderately acid, brown very stony fine sandy loam about 8 inches thick. The subsoil, from a depth of 13 to 32 inches, is strongly acid and moderately acid, red very stony clay. Below this, from a depth of 32 to 36 inches, is moderately acid, yellowish brown extremely stony sandy clay loam. The underlying material, below a depth of 36 inches, is reddish yellow interbedded sandstone and shale.

Surface runoff is medium. Permeability is moderately slow, and available water capacity is low. The plant root zone is moderately deep. The high clay content of the subsoil impedes the movement of air, water, and roots. The hazard of water erosion is severe.

Included with this soil in mapping are Callahan, Lometa, and Owens soils. Callahan and Owens soils are in landscape positions similar to those of the Nocken soils, and Lometa soils are in higher positions. Also included is a soil similar to the Nocken soil but not as stony. The included soils make up less than 20 percent of the map unit.

This soil is used as rangeland. The climax plant community is a mid and tall grass savannah with scattered post oak and blackjack oak. The range potential for this soil is low.

This Nocken soil is not used as cropland because of slope, large stones, and low available water capacity.

Depth to sandstone bedrock, large stones on the surface and in the soil, corrosivity to uncoated steel, slope, and low soil strength are the main limitations for most urban and recreational uses. Septic tank absorption fields are difficult to design and install because of the large stones and moderately slow permeability of the subsoil. These limitations can be partially overcome by proper design and installation.

This soil provides good habitat for deer, turkey, dove, and quail. Many songbirds and small mammals also inhabit the area.

This Nocken soil is in capability subclass VIs and the Sandstone Hills range site.

**NsC—Nuff silty clay loam, 2 to 6 percent slopes, very stony.** This is a very deep, gently sloping to moderately sloping, well drained soil on low ridges and stream divides. Areas are irregular in shape and range from 20 to 300 acres. Limestone fragments, most from 6 to 24 inches across and 2 to 5 inches thick, cover about 15 percent of the soil surface and are tilted at a 30 to 50 degree angle.

Typically, the surface layer is dark grayish brown very stony silty clay loam about 13 inches thick. The subsoil is silty clay loam that is brown from a depth of 13 to 23 inches and light yellowish brown from a depth of 23 to 33 inches. The underlying material, from a depth of 33 to 80 inches, is olive shale of silty clay texture. The soil is moderately alkaline throughout.

Surface runoff is very low to medium. Permeability is moderately slow, and available water capacity is high. The plant root zone is very deep; however, stones and the more dense, clayey underlying material tend to impede the movement of roots. The hazard of water erosion is moderate.

Included with this soil in mapping are Brackett, Eckrant, Krum, and Wise soils. Brackett and Eckrant soils are in a higher position on the landscape, Wise soils are in a similar position, and Krum soils are in a lower position. The included soils make up less than 15 percent of the map unit.

This soil is used as rangeland. The climax plant community is a tall grass prairie with a few scattered motts of live oak. The range potential for this soil is medium.

This Nuff soil is not used as cropland. Large stones are the main limitation for cropland.

Corrosivity to uncoated steel, shrinking and swelling upon drying and wetting, low soil strength, and moderately slow permeability are the main limitations for urban uses. Foundations for buildings, roads, and other structures must be properly designed and constructed to remain stable in this soil. Underground steel pipe needs to be protected. Septic tank absorption fields must be properly designed and installed to function properly in this soil. Large stones are the main limitation for recreational uses.

This soil provides fair habitat for a variety of wildlife such as dove, quail, songbirds, and rabbits. Lack of cover is a limiting factor for deer.

This Nuff soil is in capability subclass VIs and the Stony Clay Loam range site.

**NuB—Nuff silty clay, 1 to 3 percent slopes.** This is a very deep, very gently sloping, well drained, clayey soil on low ridges. Areas are irregular in shape and range from 15 to 80 acres.

Typically, the surface layer is very dark grayish brown silty clay about 12 inches thick. The subsoil is silty clay loam that is brown from a depth of 12 to 21 inches and yellowish brown from a depth of 21 to 32 inches. The underlying material is pale yellow silty clay loam from a depth of 32 to 40 inches. From a depth of 40 to 80 inches, it is shale with a silty clay loam texture and discontinuous layers of limestone bedrock. The soil is moderately alkaline throughout.

Surface runoff is very low. Permeability is moderately slow, and available water capacity is high. The plant root zone is very deep; however, the high clay content tends to impede the movement of air, water, and roots. Natural fertility is moderate. The hazard of water erosion is moderate.

Included with this soil in mapping are small areas of Doss, Krum, Oglesby, and Topsey. Doss and Oglesby soils are in a higher position on the landscape, Topsey soils are in a similar position, and Krum soils are in a lower position. The included soils make up less than 15 percent of the map unit.

This soil is used mainly as cropland. Small grains, forage sorghum, and grain sorghum are the main crops. Keeping crop residue on the surface helps conserve moisture, maintain tilth, control erosion, and maintain good soil structure and aeration. Terraces and contour farming help control water erosion and conserve moisture. Crops respond well to nitrogen and phosphorus fertilizers.

This Nuff soil is also used as rangeland. The climax plant community is a tall grass prairie with occasional motts of live oak. The range potential for this soil is medium.

Improved bermudagrass and kleingrass are the main grasses grown for pasture and hay. Nitrogen and phosphorus fertilizers help to improve yields.

Corrosivity to uncoated steel, shrinking and swelling upon drying and wetting, moderately slow permeability, and low soil strength are the main limitations for most urban uses. Foundations for buildings, roads, and other structures must be designed and constructed to remain stable in this soil. Underground steel pipe needs to be protected. Septic tank absorption fields must be properly designed and installed to function in this soil.

For some recreational uses, the clayey surface texture causes the soil to be muddy and sticky when wet, making foot and vehicle traffic difficult. Slopes of more than 2 percent also limit some playground uses.

This soil provides good habitat for quail and dove. Lack of cover is the limiting factor for deer.

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

**NuC—Nuff silty clay, 3 to 5 percent slopes.** This is a very deep, gently sloping, well drained soil on low ridges and stream divides. Areas are irregular in shape and range from 15 to 40 acres.

Typically, the surface layer is moderately alkaline, dark brown silty clay about 16 inches thick. The subsoil, from a depth of 16 to 40 inches, is moderately alkaline, yellowish brown silty clay loam. The underlying material, from a depth of 40 to 80 inches, is marl and shale of silty clay texture with a few layers of limestone bedrock.

Surface runoff is low. Permeability is moderately slow, and available water capacity is high. The plant root zone is very deep; however, the high clay content tends to impede the movement of air, water, and roots. The hazard of water erosion is moderate.

Included with this soil in mapping are small areas of Doss, Krum, Oglesby, and Topsey soils. Doss and Oglesby soils are in a higher position on the landscape, Topsey soils are in a similar position, and Krum soils are in a lower position. The included soils make up less than 15 percent of the map unit.

This soil is used as cropland. Small grains, grain sorghum, and forage sorghum are the main crops. Terraces and contour farming help control water erosion and conserve moisture. Keeping crop residue on the surface helps conserve moisture, maintain tilth, control erosion, and maintain good soil structure and aeration. Crops respond well to nitrogen and phosphorus fertilizers.

This Nuff soil is used as pasture and hayland. Improved bermudagrass and kleingrass are the main grasses grown. Nitrogen and phosphorus fertilizers help to improve yields.

This soil is also used as rangeland. The climax plant community is a tall grass prairie with occasional motts of live oak. The range potential for this soil is medium.

Corrosivity to uncoated steel, shrinking and swelling upon wetting and drying, low soil strength, and moderately slow permeability are the main limitations for most urban uses. Foundations for buildings, roads, and other structures must be designed and constructed to remain stable in this soil. Underground steel pipe needs to be protected. Septic tank absorption fields must be properly designed and installed to function in this soil.

For some recreational uses, the clayey surface layer

causes the soil to be muddy and sticky when wet, making foot and vehicle traffic difficult. Slope is also a limiting factor for playgrounds.

This soil provides good habitat for quail and dove. Lack of cover is the limiting factor for deer.

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

**Oa—Oakalla silty clay loam, rarely flooded.** This is a very deep, nearly level, well drained soil on flood plains of major streams. Slopes are 0 to 1 percent. Areas of this soil are oblong to elongated and are oriented with stream flow. They range from 30 to 400 acres.

Typically, the surface layer is very dark grayish brown silty clay loam about 38 inches thick. The upper part of the subsoil, from a depth of 38 to 58 inches, is brown silty clay loam. The lower part of the subsoil, from a depth of 58 to 80 inches, is yellowish brown silty clay loam. The soil is moderately alkaline throughout.

Surface runoff is negligible. Permeability is moderate, and available water capacity is high. The plant root zone is very deep and is easily penetrated by roots. Flooding occurs about once every 20 years. The hazard of water erosion is slight.

Included with this soil in mapping are small areas of Rumley, Seawillow, and Sunev soils and a few areas of soils that have a clayey overwash surface layer. Rumley and Seawillow soils are in a higher position on the landscape, and Sunev soils are in a similar position. Also included are Oakalla soils with slopes up to 3 percent and areas along small streams that have steep slopes and channel fill. The included soils make up less than 15 percent of the map unit.

This soil is mainly used as cropland. Small grains, forage sorghum, and grain sorghum are the main crops. Keeping crop residue on the surface helps conserve moisture and improve tilth. Crops respond well to nitrogen and phosphorus fertilizers.

This Oakalla soil is used as pasture and hayland. Improved bermudagrass and kleingrass are the main grasses grown. Nitrogen and phosphorus fertilizers help to increase yields.

This soil is also used as rangeland. The climax plant community is tall and mid grasses with occasional pecan and elm trees near the drainageways. The range potential for this soil is high.

The hazard of flooding limits the use of this soil for urban and recreational purposes. Houses or other structures should not be built unless they are protected from flooding. The low soil strength and corrosivity to uncoated steel are limitations that can be partially overcome by proper design and installation.

This soil provides good habitat for dove, quail, songbirds, and rabbits. Lack of cover is the limiting factor for deer.

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

**OgB—Oglesby silty clay, 0 to 3 percent slopes.** This is a shallow, nearly level and very gently sloping, well drained soil on low ridgetop divides. Areas are irregular in shape and range from 10 to 40 acres.

Typically, the upper part of the surface layer of this soil is moderately alkaline, dark brown silty clay about 6 inches thick. The lower part of the surface layer is moderately alkaline, dark reddish brown silty clay from a depth of 6 to 16 inches. The underlying material, below a depth of 16 inches, is indurated limestone.

Surface runoff is low to medium. Permeability is slow, and available water capacity is very low. The plant root zone is shallow. The high clay content tends to impede the movement of air, water, and roots through the soil. The hazard of water erosion is moderate.

Included with this soil in mapping are Brackett, Doss, Lampasas, Nuff, and Tarpley soils. Brackett and Lampasas soils are in a higher position on the landscape; and Doss, Nuff, and Tarpley soils are in a position similar to that of the Oglesby soils. The included soils make up less than 15 percent of the map unit.

This soil is mainly used as rangeland. The climax plant community is an open grassland with scattered motts of live oak. The range potential for this soil is medium.

A few areas of this Oglesby soil are used as cropland. Small grains and forage sorghum are the main crops. Keeping crop residue on the surface helps control water erosion, conserve moisture, and improve soil tilth and water intake. Tilling this soil when the moisture content is low helps maintain good soil structure and aeration and prevents soil compaction. Contour farming is needed in some areas to control water erosion. Crops respond well to nitrogen and phosphorus fertilizers.

This soil is also used as pasture and hayland. Improved bermudagrass and kleingrass are the main grasses grown. Nitrogen and phosphorus fertilizers help to increase yields.

Depth to limestone bedrock, corrosivity to uncoated steel, and shrinking and swelling with changes in soil moisture are the main limitations for most urban and recreational uses. These limitations can be partially overcome by proper design and installation.

This soil provides fair habitat for a variety of wildlife such as deer, quail, dove, songbirds, and small mammals.

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

**OwE—Owens clay, 10 to 30 percent slopes, very stony.** This soil is shallow and moderately deep to claystone. It is a strongly sloping to steep, well drained soil on hillsides. Areas are oval or elongated and range from 30 to 140 acres. Sandstone fragments from 3 to 24 inches across cover up to 15 percent of the soil surface.

Typically, the surface layer is light brownish gray clay about 11 inches thick. The subsoil, from a depth of 11 to 16 inches, is light olive brown clay. The underlying material, from a depth of 16 to 60 inches, is olive claystone. The presence of sandstone fragments on the soil surface is a result of downward creep from a disintegrating sandstone cap at the top of receding scarps. The soil is moderately alkaline throughout.

Surface runoff is very high. Permeability is very slow, and available water capacity is low. The plant root zone is shallow and moderately deep. The hazard of water erosion is severe.

Included with this soil in mapping are long, narrow areas of Nocken soil and a soil similar to the Nocken soil except it has no stones on the surface. The included soils make up less than 15 percent of the map unit.

This soil is used mainly as rangeland. The climax plant community is a mid grass savannah with scattered live oak trees, whitebrush, and mesquite trees. The range potential for this soil is low.

This Owens soil is not used as cropland. Slope, low available water capacity, and stones on the surface are the main limitations for cropland.

Shrinking and swelling with changes in moisture, clay texture, low soil strength, slope, and corrosivity to uncoated steel are the main limitations for most urban and recreational uses. These limitations are so severe that it is usually not practical to build houses on this soil. These limitations can only partially be overcome by proper design and costly installation.

This soil provides fair habitat for a variety of wildlife such as dove, quail, songbirds, small mammals, and deer. Because of the slope and rocky nature of this soil, wildlife habitat is sometimes the primary land use.

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

**PaB—Patilo fine sand, 1 to 3 percent slopes.** This is a very deep, very gently sloping, moderately well drained soil on stream terraces. Areas are oval to irregular in shape and range from 15 to 40 acres.

Typically, this soil has a surface layer of slightly acid, very pale brown fine sand that is about 48 inches thick. The subsoil, from a depth of 48 to 80 inches, is light gray sandy clay loam with red and yellowish red mottles. It is moderately acid in the upper part and strongly acid in the lower part.

Surface runoff is negligible. Permeability is moderately slow. A perched water table occurs for short periods following heavy rainfall. Available water capacity is low. The plant root zone is very deep. Without ground cover, the hazard of wind erosion is severe for this soil.

Included with this soil in mapping are Bastsil, Demona, and Eufaula soils and a soil similar to the Patilo soil but with a red subsoil. Demona and Eufaula soils are in a landscape position similar to that of the Patilo soils, and Bastsil soils are in a lower position on the landscape. The included soils make up less than 10 percent of the map unit.

This soil is mainly used as orchardland. Peaches, pears, plums, and pecans are the main orchard crops.

This Patilo soil is used as cropland. Small grains and peanuts are the main field crops. Keeping crop residue on the surface helps control soil blowing. Crops respond well to fertilizers.

This soil is used as pasture and hayland. Improved bermudagrass is the main grass grown.

This soil is also used as rangeland. The climax plant community is a mid grass, post oak, and blackjack oak savannah with some tall grasses in the open areas. The range potential for this soil is medium.

Excavation cut banks that cave in, seepage, poor filter for septic tank absorption fields, and corrosivity to uncoated steel are the main limitations for most urban uses. These limitations can be partially overcome by proper design and installation. The surface texture of this soil is too sandy for most recreational uses.

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

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

**PeC—Pedernales fine sandy loam, 1 to 5 percent slopes.** This is a very deep, gently sloping, well drained soil on flats and lower side slopes. Areas are irregular in shape and range from 10 to 60 acres.

Typically, the surface layer of this soil is neutral, brown fine sandy loam about 13 inches thick. The upper part of the subsoil is slightly alkaline, red sandy clay from a depth of 13 to 22 inches. The middle part of the subsoil, from a depth of 22 to 44 inches, is moderately alkaline, reddish brown and yellowish red sandy clay. The lower part of the subsoil, from a depth of 44 to 63 inches, is moderately alkaline, reddish yellow clay loam that contains soft masses of calcium carbonates.

Surface runoff is very low to low. Permeability is moderately slow, and available water capacity is high. The

plant root zone is very deep; however, clay content of the subsoil tends to impede the movement of air, water, and roots. The hazard of water erosion is moderate.

Included with this soil in mapping are small areas of Bastsil, Krum, Luckenbach, and Minwells soils. Luckenbach and Minwells soils are in a landscape position similar to that of the Pedernales soils, and Bastsil and Krum soils are in a lower position on the landscape. Also included are a few small areas of a soil with a sandy loam subsoil. The included soils make up less than 15 percent of the map unit.

This soil is mainly used as rangeland. The climax plant community is a mid grass savannah with occasional post oak and blackjack oak. The range potential for this soil is medium.

This Pedernales soil is also used as cropland. Small grains and forage sorghum are the main crops. Keeping crop residue on the surface helps control water erosion, conserve moisture, and improve soil tilth and water intake. Contour farming and terraces are needed in most areas to control water erosion. Crops respond well to nitrogen and phosphorus fertilizers.

Improved bermudagrass and kleingrass are the main grasses grown for pasture and hay. Nitrogen and phosphorus fertilizers help to increase yields.

Slope, shrinking and swelling with changes in moisture, corrosivity to uncoated steel, low soil strength, and moderately slow permeability are the main limitations for urban and recreational uses. Foundations for buildings, roads, and other structures must be designed and constructed to withstand the shrinking and swelling upon drying and wetting and the low soil strength. Underground steel pipe needs to be protected. Septic tank absorption fields must be properly designed and installed to function in this soil.

This soil provides good habitat for dove, quail, deer, songbirds, rabbits, and small mammals.

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

**PkB—Pidcoke clay loam, 1 to 3 percent slopes.** This is a shallow, very gently sloping, well drained soil on top of low hills. Areas are irregular in shape and range from 15 to 40 acres.

Typically, the surface layer of this soil is moderately alkaline, dark grayish brown clay loam about 8 inches thick. The subsoil, from a depth of 8 to 17 inches, is moderately alkaline, brown clay loam. The underlying material, below a depth of 17 inches, is indurated, fossiliferous limestone.

Surface runoff is medium. Permeability is moderately slow, and available water capacity is very low. The plant root zone is shallow. The hazard of water erosion is moderate.

Included with this soil in mapping are small areas of Brackett, Cho, and Nuff soils. Cho soils are in a landscape position similar to that of the Pidcoke soils, and Brackett and Nuff soils are in a lower position on the landscape. The included soils make up less than 20 percent of the map unit.

This soil is mainly used as rangeland. The climax plant community is an open grassland with scattered motts of live oak. The range potential for this soil is medium.

This Pidcoke soil is also used as cropland. Small grains and forage sorghum are the main crops. Keeping crop residue on the surface helps control water erosion, conserve moisture, and improve soil tilth and water intake. Contour farming and terraces are needed in most areas to control water erosion. Crops respond well to nitrogen and phosphorus fertilizers.

Improved bermudagrass and kleingrass are the main grasses grown for pasture and hay. Nitrogen and phosphorus fertilizers help to increase yields.

Depth to rock and corrosivity to uncoated steel are the main limitations for most urban and recreational uses. Excavations are difficult in the hard rock. Septic systems must be specially designed and constructed to function properly in this soil. Underground steel pipe needs to be protected.

This soil provides poor habitat for most wildlife. Because of the lack of cover and food, only a few dove and quail use these areas.

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

**ReD—Real gravelly clay loam, 1 to 8 percent slopes.** This is a shallow, gently sloping to moderately sloping, well drained soil on low hills. Areas are irregular in shape and range from 20 to 300 acres.

Typically, the upper part of the surface layer is moderately alkaline, dark grayish brown gravelly clay loam about 6 inches thick. The lower part of the surface layer, from a depth of 6 to 14 inches, is moderately alkaline, dark grayish brown very gravelly clay loam. The next layer is cemented limestone about 2 inches thick. The underlying material, to a depth of 60 inches, is weakly cemented limestone.

Surface runoff is very low to medium. Permeability is moderate, and available water capacity is very low. The plant root zone is shallow. The hazard of water erosion is severe.

Included with this soil in mapping are small areas of Brackett, Cho, Doss, Krum, and Lometa soils. Brackett and Cho soils are in a higher position on the landscape, Doss and Lometa soils are in a similar position, and Krum soils are in a lower position. Also included are small areas of a moderately deep, reddish brown, calcareous, loamy

soil. The included soils make up less than 20 percent of the map unit.

This soil is used as rangeland. The climax plant community is a tall grass savannah with scattered motts of live oak and Texas oak. The range potential for this soil is medium.

This Real soil is not used as cropland. Depth to rock, very low available water capacity, and slope are the main limitations for cropland.

Depth to rock, slope, and corrosivity to uncoated steel are the main limitations for most urban and recreational uses. These limitations can be partially overcome by proper design and installation.

This soil provides good habitat for deer, turkey, dove, quail, songbirds, and small mammals. Woody plants, forbs, and grasses supply good cover, browse, and mast.

This Real soil is in capability subclass VIs and the Adobe range site.

**ReE—Real very gravelly clay loam, 10 to 30 percent slopes.** This is a shallow, strongly sloping to steep, well drained soil on side slopes of mesa-like hills. Areas are elongated and range from a few hundred to several thousand acres.

Typically, the surface layer is moderately alkaline, dark grayish brown very gravelly or extremely gravelly clay loam about 16 inches thick. The next layer is cemented limestone about 2 inches thick. The underlying material, to a depth of 60 inches, is weakly cemented limestone interbedded with seams of strongly indurated limestone.

Surface runoff is medium to high. Permeability is moderate, and available water capacity is very low. The plant root zone is shallow. The hazard of water erosion is severe.

Included with this soil in mapping are Brackett, Cho, Eckrant, Krum, and Nuff soils. Cho and Eckrant soils are in a higher position on the landscape, and Krum and Nuff soils are in a lower position on the landscape than Real soils. Areas of these included soils range from 1 to 5 acres. The Brackett soils are mostly on crests of hills and foot slopes and range up to 15 acres. The included soils make up from 15 to 20 percent of the map unit.

This soil is used as rangeland. The climax plant community is a tall grass savannah with scattered live oak and Texas oak. The range potential for this soil is low.

This Real soil is not used as cropland. Slope, depth to rock, and very low available water capacity are the main limitations for cropland.

The gravelly surface, corrosivity to uncoated steel, depth to rock, and slope are the main limitations for most urban and recreational uses. Although there are spectacular views for homeowners, special precautions should be taken when buildings are designed and constructed. Allowances should be made for the slope, depth to rock, surface runoff, and water seepage through and from the fractured limestone following rains. Septic systems are especially difficult to design and construct so that they will function in this shallow soil on these slopes. These limitations can be partially overcome by proper design and installation.

This soil provides fair habitat for a variety of wildlife such as deer, turkey, dove, quail, songbirds, and small mammals.

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

**RoD—Roughcreek-Rock outcrop complex, 1 to 8 percent slopes.** This complex is made up of shallow, undulating, well drained soils and Rock outcrop on broad, smooth areas. Areas of this map unit are irregular in shape and range from 150 to 5,200 acres. Coarse limestone fragments from 6 to 36 inches across cover about 1 percent of the soil surface.

Roughcreek soils average 70 percent of the complex, but range from 60 to 80 percent. Rock outcrop averages 20 percent of the complex, but ranges from 10 to 30 percent. The Roughcreek soil and Rock outcrop are so intricately mixed that separation is not practical at the scale mapped.

Typically, Roughcreek soils have a surface layer of neutral, dark brown very stony clay loam about 8 inches thick. The subsoil, from a depth of 8 to 17 inches, is neutral, reddish brown very stony clay. The underlying material, below a depth of 17 inches, is coarsely fractured, indurated limestone bedrock several feet thick.

The Rock outcrop areas are typically long and narrow. They are from 20 to 30 feet across and from 40 to 70 feet long, and may be up to 12 inches higher than the adjacent Roughcreek soil.

Surface runoff is medium to high. Permeability of the Roughcreek soil is slow, the plant root zone is shallow, and available water capacity is very low. This complex has a severe water erosion hazard.

The included soils are Cho, Eckrant, Krum, Lometa, Owens, Real, and Tarpley. Owens and Tarpley soils are in a landscape position similar to that of the Roughcreek soils; Cho, Eckrant, Lometa, and Real soils are in a higher position on the landscape; and Krum soils are in a lower position. Also included are a few areas from 2 to 5 acres that contain limestone boulders about 4 feet thick and 20 feet across. The included soils make up less than 15 percent of the map unit.

This map unit is used as rangeland. The climax plant community is a tall grass savannah with post oak, blackjack oak, and live oak throughout the area. The range potential for this complex is medium.

Areas of this map unit are not used as cropland. Slope,

stones, shallow depth to rock, and very low available water capacity are the main limitations for cropland.

The very stony surface, corrosivity to uncoated steel, rock outcrops, depth to rock, low soil strength, slope, and shrink-swell potential are the main limitations for most urban and recreational uses. Excavations are difficult in the hard limestone rock. Septic tank absorption fields must be designed and installed properly to function in this complex. These limitations can be partially overcome by proper design and installation.

These areas provide fair habitat for a variety of wildlife such as deer, turkey, dove, quail, songbirds, and small mammals.

The Roughcreek soil in this complex is in capability subclass VIs and the Redland range site. Rock outcrop is in capability subclass VIIIs and is not assigned a range site.

**RuA—Rumley silty clay loam, 0 to 1 percent slopes.** This is a very deep, nearly level, well drained soil on terraces of major streams. Areas are longer than they are wide and range from 15 to 180 acres.

Typically, the surface layer is dark brown silty clay loam about 14 inches thick. The upper part of the subsoil, from a depth of 14 to 32 inches, is brown silty clay loam. The lower part of the subsoil, from a depth of 32 to 63 inches, is reddish yellow clay loam. The soil is moderately alkaline throughout.

Surface runoff is negligible. Permeability is moderate, and available water capacity is high. The plant root zone is very deep. The hazard of water erosion is slight.

Included with this soil in mapping are small areas of Oakalla, Seawillow, and Sunev. Oakalla and Sunev soils are in a lower position on the landscape, and Seawillow soils are in a slightly higher position on the landscape than Rumley soils. The included soils make up less than 15 percent of the map unit.

This soil is mainly used as cropland. Small grains, grain sorghum, and forage sorghum are the main crops. Crop residue left on the surface helps conserve moisture, maintain tilth, control erosion, and improve soil structure and aeration. Crops respond well to nitrogen and phosphorus fertilizers.

This Rumley soil is also used as pasture and hayland. Improved bermudagrass and kleingrass are the main grasses grown. Nitrogen and phosphorus fertilizers help to increase yields.

This soil is used as rangeland. The climax plant community is a tall grass prairie with occasional motts of live oak. The range potential for this soil is high.

Shrink-swell potential, low soil strength, and corrosivity to uncoated steel are the main limitations for most urban and recreational uses. Foundations for buildings, roads, and other structures must be designed and constructed to withstand the shrinking and swelling of the soil upon drying and wetting and the low soil strength. Underground steel pipe needs to be protected.

This soil provides good habitat for quail and dove. Lack of cover is the limiting factor for deer.

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

**RuB—Rumley silty clay loam, 1 to 3 percent slopes.** This is a very deep, very gently sloping, well drained soil on terraces of major streams. Areas are long and narrow and range from 10 to 140 acres.

Typically, the surface layer is dark grayish brown silty clay loam about 14 inches thick. The upper part of the subsoil, from a depth of 14 to 32 inches, is brown silty clay. The middle part of the subsoil, from a depth of 32 to 48 inches, is brownish yellow gravelly clay loam. The lower part of the subsoil, from a depth of 48 to 63 inches, is reddish yellow clay loam. The soil is moderately alkaline throughout.

Surface runoff is very low. Permeability is moderate, and available water capacity is high. The plant root zone is very deep. The hazard of water erosion is moderate.

Included with this soil in mapping are small areas of Oakalla, Seawillow, and Sunev soils. Seawillow soils are in a position similar to that of the Rumley soils, and Oakalla and Sunev soils are in a lower position. The included soils make up less than 15 percent of the map unit.

This soil is mainly used as cropland (fig. 7). Small grains, grain sorghum, and forage sorghum are the main crops. Terraces and contour farming help control water erosion and conserve moisture. Crop residue left on the surface helps conserve moisture, maintain tilth, control erosion, and maintain good soil structure and aeration. Crops respond well to nitrogen and phosphorus fertilizers.

This Rumley soil is also used as pasture and hayland. Improved bermudagrass and kleingrass are the main grasses grown. Nitrogen and phosphorus fertilizers help to increase yields.

This soil is used as rangeland. The climax plant community is a tall grass prairie with occasional motts of live oak. The range potential for this soil is high.

Shrink-swell potential, low soil strength, and corrosivity to uncoated steel are the main limitations for most urban and recreational uses. Foundations for buildings, roads, and other structures must be designed and constructed to withstand the shrinking and swelling of the soil upon wetting and drying and the low soil strength. Underground steel pipe needs to be protected. Septic tank absorption fields must be properly designed and installed to function in this soil. Slopes of 2 to 3 percent limit some recreational uses.

**Figure 7.—Wheat growing in an area of Rumley silty clay loam, 1 to 3 percent slopes.**

This soil provides good habitat for quail and dove. Lack of cover is the limiting factor for deer.

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

**SeC—Seawillow clay loam, 3 to 5 percent slopes.** This is a very deep, gently sloping, well drained soil on terraces of major streams. Areas are oblong and range from 15 to 40 acres.

Typically, the surface layer is brown clay loam about 6 inches thick. The upper part of the subsoil, from a depth of 6 to 21 inches, is reddish yellow clay loam. The lower part of the subsoil, from a depth of 21 to 80 inches, is light yellowish brown clay loam. The soil is moderately alkaline throughout.

Surface runoff is low. Permeability is moderate, and available water capacity is moderate. The plant root zone is very deep. The hazard of water erosion is severe.

Included with this soil in mapping are small areas of Boerne, Brackett, Oakalla, Rumley, and Sunev soils. Rumley soils are in a landscape position similar to that of the Seawillow soils; Brackett soils are in a higher position on the landscape; and Boerne, Oakalla, and Sunev soils are in a lower position. The included soils make up less than 10 percent of the map unit.

This soil is mainly used as cropland. Small grains, grain sorghum, and forage sorghum are the main crops. Terraces are needed to help control erosion and conserve moisture. Crop residue left on the surface helps conserve moisture, maintain tilth, control erosion, and maintain good

soil structure and aeration. Crops respond well to nitrogen and phosphorus fertilizers.

This Seawillow soil is also used as rangeland. The climax plant community is a tall grass prairie with occasional motts of live oak. The range potential for this soil is medium.

Improved bermudagrass and kleingrass are the main grasses grown for pasture and hay. Nitrogen and phosphorus fertilizers help to increase yields.

Slope, shrink-swell potential, corrosivity to uncoated steel, and low soil strength are the main limitations for most urban uses. Foundations for buildings, roads, and other structures must be designed and constructed to withstand the shrinking and swelling upon drying and wetting and the low soil strength. Underground steel pipe needs to be protected. Septic tank absorption fields must be properly designed and installed to function in this soil. Slope limits some recreational uses.

This soil provides good habitat for dove and quail. Lack of cover is the limiting factor for deer.

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

**SlB—Slidell clay, 1 to 3 percent slopes.** This is a very deep, very gently sloping, moderately well drained soil along drainageways. Areas are long and narrow and range from 20 to 50 acres.

Typically, the surface layer is moderately alkaline, dark gray clay about 24 inches thick. The subsoil, from a depth of 24 to 80 inches, is moderately alkaline clay that is gray to grayish brown in the upper part and light yellowish brown in the lower part.

Surface runoff is medium. Permeability is very slow. When dry, this soil has cracks that extend to more than 20 inches below the surface. Water enters rapidly when the soil is dry and cracked, but enters very slowly after the cracks swell closed. Available water capacity is high. The plant root zone is very deep; however, the high clay content tends to impede the movement of air, water, and roots. The hazard of water erosion is moderate.

Included with this soil in mapping are small areas of Krum, Leeray, and Nuff soils. Krum soils are in a landscape position similar to that of the Slidell soils, and Leeray and Nuff soils are in a higher position. A few areas of nearly level soils are also included. The included soils make up less than 20 percent of the map unit.

This soil is used as cropland. Small grains, grain sorghum, and forage sorghum are the main crops. Keeping crop residue on the surface helps control water erosion, conserve moisture, and improve soil tilth and water intake. Tilling when moisture content is low avoids soil compaction and helps maintain good soil structure and aeration. Contour farming and terraces are needed to control water erosion. Crops respond well to nitrogen and phosphorus fertilizers.

This Slidell soil is also used as rangeland. The climax plant community is a tall grass prairie. The range potential is medium.

Improved bermudagrass and kleingrass are the main grasses grown for pasture and hay. Nitrogen and phosphorus fertilizers help to increase yields.

Shrink-swell potential, low soil strength, corrosivity to uncoated steel, clay texture, and very slow permeability are the main limitations for most urban uses. Foundations for buildings, roads, and other structures must be designed and constructed to withstand the shrinking and swelling of the soil upon drying and wetting and the low soil strength. Underground steel pipe needs to be protected. Septic tank absorption fields must be properly designed and installed to function in this soil.

This soil can be used for most recreational purposes. The clayey surface causes the soil to be muddy and sticky when wet, making foot and vehicle traffic difficult. Slopes of 2 to 3 percent are also a limiting factor for some playgrounds.

This soil provides good habitat for dove and quail. Lack of cover is the limiting factor for deer.

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

**SuA—Sunev loam, rarely flooded.** This is a very deep, nearly level, well drained soil on low terraces and bottom lands along major streams. Areas are irregular to oblong in shape and range from 10 to 200 acres. Slopes are 0 to 1 percent.

Typically, the surface layer of this soil is dark grayish brown loam about 16 inches thick. The upper part of the subsoil, from a depth of 16 to 31 inches, is brown silty clay loam. The middle part of the subsoil, from a depth of 31 to 60 inches, is light yellowish brown clay loam that has many films and threads of calcium carbonate. The lower part of the subsoil, from a depth of 60 to 80 inches, is light yellowish brown silty clay loam that contains many films and threads and soft masses of calcium carbonate. The soil is moderately alkaline throughout.

Surface runoff is negligible. Permeability is moderate, and available water capacity is moderate. The plant root zone is very deep. Air, water, and roots move through the soil easily. A few hours of flooding is expected about once every 20 years. The hazard of water erosion is slight.

Included with this soil in mapping are Boerne, Krum, Oakalla, Rumley, and Seawillow soils. Boerne, Krum, and Oakalla soils are in a landscape position similar to that of the Sunev soils; and Rumley and Seawillow soils are in a higher position on the landscape. The included soils make up less than 10 percent of the map unit.

This soil is mainly used as cropland. Small grains, grain sorghum, and forage sorghum are the main crops. Keeping crop residue on the surface helps conserve moisture and improve soil tilth and water intake. Crops respond well to nitrogen and phosphorus fertilizers.

This Sunev soil is also used as pasture and hayland. Improved bermudagrass and kleingrass are the main grasses grown. Nitrogen and phosphorus fertilizers help to increase yields.

This soil is used as rangeland. The climax plant community is mid and tall grasses with occasional trees near the drainageways. The range potential for this soil is high.

The hazard of flooding limits the use of this soil for urban and recreational purposes. Houses and other permanent structures should not be built on this soil because of the flooding hazard. Low soil strength and corrosivity to uncoated steel can be partially overcome by proper design and installation.

This soil provides good habitat for dove, quail, turkey, and small mammals. Lack of cover is the limiting factor for deer; however, they graze the small grain fields at night.

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

**SuB—Sunev loam, 1 to 3 percent slopes.** This is a very deep, very gently sloping, well drained soil on terraces. Areas are irregular in shape and range from 10 to 60 acres.

Typically, the surface layer of this soil is dark grayish brown loam about 10 inches thick. The upper part of the subsoil, from a depth of 10 to 21 inches, is yellowish brown loam. The lower part of the subsoil, from a depth of 21 to 53 inches, is yellowish brown loam containing many films and threads of calcium carbonate. The underlying material, below a depth of 53 inches, is yellowish brown loam containing a few soft masses of calcium carbonates. The soil is moderately alkaline throughout.

Surface runoff is very low. Permeability is moderate, and available water capacity is moderate. The plant root zone is very deep. Air, water, and roots move through the soil easily. The hazard of water erosion is moderate.

Included with this soil in mapping are small areas of Bolar, Doss, and Krum soils. Bolar and Doss soils are in a landscape position similar to that of the Sunev soils; and Krum soils are in a lower position on the landscape. The included soils make up less than 15 percent of the map unit.

This soil is mainly used as cropland. Small grains and forage sorghum are the main crops. Keeping crop residue on the surface helps control water erosion, conserve moisture, and improve soil tilth and water intake. Contour farming and terraces are needed in some areas to control water erosion. Crops respond well to nitrogen and phosphorus fertilizers.

This Sunev soil is also used as pasture and hayland. Improved bermudagrass and kleingrass are the main grasses grown. Nitrogen and phosphorus fertilizers help to increase yields.

This soil is used as rangeland. The climax plant community is a tall grass prairie with occasional motts of live oak. The range potential for this soil is high.

Low soil strength and corrosivity to uncoated steel are limitations for most urban uses. These limitations can be partially overcome by proper design and installation. Slopes of 1 to 3 percent are a limitation for playground uses.

This soil provides good habitat for dove, quail, turkey, and small mammals. Lack of cover is the limiting factor for deer; however, they graze the small grain fields at night.

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

**TaB—Tarpley clay, 1 to 3 percent slopes.** This is a shallow, very gently sloping, well drained soil on ridgetops and divides. Areas are irregular in shape and range from 15 to 60 acres.

Typically, the surface layer of this soil is neutral, dark brown clay 7 inches thick. The subsoil is neutral, dark reddish brown clay from a depth of 7 to 18 inches. The underlying material is coarse-grained, indurated limestone bedrock.

Surface runoff is medium. Permeability is slow, and available water capacity is very low. The plant root zone is shallow. The hazard of water erosion is moderate.

Included with this soil in mapping are small areas of Oglesby soil and a soil similar to the Tarpley soil except it is deeper and located in depressions. Also included is a soil that is underlain by softer limestone and located on slightly higher ground. Oglesby soils are in a landscape position similar to that of the Tarpley soils. The included soils make up less than 15 percent of the map unit.

This soil is mainly used as rangeland. The climax plant community is a tall grass savannah with scattered post oak, blackjack oak, and live oak. The range potential for this soil is medium.

A few areas of this Tarpley soil are used as cropland. Small grains and forage sorghum are the main crops. Keeping crop residue on the surface helps control water erosion, conserve moisture, and improve soil tilth and water intake. Tilling when moisture content is low helps avoid soil compaction and maintains good soil structure and aeration. Contour farming is needed in most areas to control water erosion. Crops respond well to nitrogen and phosphorus fertilizers.

This soil is also used as pasture and hayland. Improved bermudagrass and kleingrass are the main grasses

grown. Nitrogen and phosphorus fertilizers help to increase yields.

Shrinking and swelling upon drying and wetting, corrosivity to uncoated steel, low soil strength, depth to rock, and slow permeability are the main limitations for most urban and recreational uses. Excavations are difficult in the hard rock. These limitations can be partially overcome by proper design and installation.

This soil provides fair habitat for a variety of wildlife such as deer, dove, quail, songbirds, and small mammals.

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

**TaD—Tarpley-Rock outcrop complex, 1 to 8 percent slopes, stony.** This complex is made up of the shallow, undulating, well drained Tarpley soils and areas of Rock outcrop on ridgetops. Up to 5 percent of the surface of the soils in this complex is covered with limestone cobbles and stones. Areas of this complex are irregular in shape and range from 30 to 150 acres. Tarpley soils average 75 percent of the complex, but range from 60 to 90 percent. Areas of Rock outcrop average 20 percent, but range from 10 to 30 percent. The Tarpley soil and Rock outcrop are so intricately mixed that separation is not practical at the scale mapped.

Typically, the surface layer of the Tarpley soil is neutral, very dark grayish brown cobbly clay about 6 inches thick. The subsoil, from a depth of 6 to 15 inches, is neutral, dark reddish brown clay. The underlying bedrock, below a depth of 15 inches, is coarse-grained, indurated, fractured limestone.

Areas of Rock outcrop are typically long and narrow. They range from 2 to 8 feet across and from 5 to 20 feet long and may be up to 8 inches higher than the adjacent Tarpley soils.

The included soils are Eckrant and Oglesby soils and a soil similar to the Tarpley soil except it is underlain by softer limestone. The Eckrant soils are in a lower position on the landscape, and the Oglesby soils are in a position similar to that of the Tarpley soils. The included soils make up less than 15 percent of the map unit.

Surface runoff is medium to high. Permeability is slow, and available water capacity is very low. The plant root zone is shallow. The hazard of water erosion is moderate.

Areas of this complex are used as rangeland. The climax plant community is a tall grass savannah with scattered post oak, blackjack oak, and live oak. The range potential for this complex is medium.

This map unit is not used as cropland. Shallow depth to rock, very low available water capacity, slope, and stones on and in the soil surface are the main limitations for cropland.

The shrinking and swelling of the soil upon drying and wetting, low soil strength, stones on the surface, shallow depth to rock, very low available water capacity, outcrops of limestone bedrock, and corrosivity to uncoated steel are the main limitations for most urban and recreational uses. These limitations can be partially overcome by proper design and installation.

These areas provide fair habitat for a variety of wildlife such as deer, dove, quail, and many songbirds and small mammals.

The Tarpley soil in this complex is in capability subclass VIs and the Redland range site. The Rock outcrop is in capability subclass VIIIs and is not assigned a range site.

**ToC—Topsey clay loam, 1 to 5 percent slopes.** This is a very deep, gently sloping, well drained soil on low hillsides and side slopes along drains. Areas are irregular in shape and range from 10 to about 30 acres.

Typically, the surface layer of this soil is dark grayish brown clay loam about 10 inches thick. The upper part of the subsoil, from a depth of 10 to 19 inches, is very pale brown clay loam. The lower part of the subsoil, from a depth of 19 to 30 inches, is pale yellow gravelly clay loam with accumulations of calcium carbonate. The underlying material, from a depth of 30 to 80 inches, is pale yellow silty clay loam containing more than 60 percent calcium carbonate. The soil is moderately alkaline throughout.

Surface runoff is very low to low. Permeability is moderately slow, and available water capacity is moderate. The plant root zone is very deep and easily penetrated by roots. The hazard of water erosion is moderate.

Included with this soil in mapping are small areas of Brackett, Cho, Krum, and Nuff soils. Brackett and Cho soils are in a higher position on the landscape, Nuff soils are in a similar position, and Krum soils are in a lower position. The included soils make up less than 15 percent of the map unit.

This soil is mainly used as rangeland. The climax plant community is a tall grass prairie with scattered motts of live oak. The range potential for this soil is medium.

A few areas of this Topsey soil are used as cropland. Small grains and forage sorghum are the main crops. Keeping crop residue on the surface helps control water erosion, conserve moisture, and improve soil tilth and water intake. Contour farming and terraces are needed in most areas to control water erosion. Crops respond well to nitrogen and phosphorus fertilizers.

This soil is also used as pasture and hayland. Improved bermudagrass and kleingrass are the main grasses grown. Nitrogen and phosphorus fertilizers help to increase yields.

Low soil strength, corrosivity to uncoated steel, and shrink-swell potential are the main limitations for most urban uses. Foundations for buildings, roads, and other structures must be designed and constructed to withstand the low soil strength and the shrinking and swelling of the soil upon drying and wetting. Underground steel pipe needs to be protected. Septic tank absorption fields must be properly designed and installed to function in this moderately slowly permeable soil. Slope is a limitation for some recreational uses.

This soil provides fair habitat for dove and quail. Lack of cover is the limiting factor for deer.

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

**We—Weswood silt loam, rarely flooded.** This is a very deep, nearly level, well drained soil mostly on the flood plain of the Colorado River. Minor areas of the soil extend up major tributaries of the river. Slopes are dominantly less than 1 percent. The areas are oblong, oval, or long and narrow, and range from 30 to 350 acres. These areas flood for brief periods about one time in 20 years.

Typically, the surface layer of this soil is brown silt loam about 8 inches thick. The upper part of the subsoil, from a depth of 8 to 44 inches, is reddish brown or light reddish brown silt loam. The lower part of the subsoil, from a depth of 44 to 80 inches, is yellowish red with strata of silt loam, silty clay loam, and fine sandy loam. The soil is moderately alkaline throughout.

Surface runoff is negligible. Permeability is moderate, and available water capacity is high. The plant root zone is very deep. The hazard of water erosion is slight.

Included with this soil in mapping are small areas of Oakalla and Yahola soils and a deep, dark reddish gray, clayey soil in narrow, concave slough areas. Oakalla soils are in a landscape position similar to that of the Weswood soils, and Yahola soils are in a lower position on the landscape. Also included are areas of Weswood soils on slopes of up to 2 percent. The included soils make up less than 10 percent of the map unit.

This soil is mainly used as cropland. Small grains and forage sorghum are the main crops. Keeping crop residue on the surface helps conserve moisture and improve tilth. Crops respond well to nitrogen and phosphorus fertilizers.

This Weswood soil is also used as orchardland with pecans being the main crop.

Improved bermudagrass and kleingrass are the main grasses grown for pasture and hay. Nitrogen and phosphorus fertilizers help to increase yields.

This soil is used as rangeland. The climax plant community is tall and mid grasses with a few trees near drainageways. The range potential for this soil is high.

Because these soils are subject to flooding, houses and other permanent structures should not be built on them unless the site is protected. Low soil strength and corrosivity to uncoated steel are limitations that can be partially overcome by proper design and installation.

This soil provides fair habitat for rabbits, dove, quail, and small mammals. Deer and turkey from adjacent uplands frequent the areas and feed on pecans and other mast.

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

**WsC—Wise clay loam, 3 to 8 percent slopes.** This is a very deep, gently sloping and moderately sloping, well drained soil on side slopes of low hills. Areas are long and narrow and range from 10 to 40 acres.

Typically, the surface layer of this soil is brown clay loam about 7 inches thick. The upper part of the subsoil, from a depth of 7 to 18 inches, is pale brown clay loam. The lower part of the subsoil, from a depth of 18 to 32 inches, is light grayish brown clay loam. The underlying material, from a depth of 32 to 60 inches, is stratified layers of reddish, yellowish, and olive sand and shale. The soil is moderately alkaline throughout.

Surface runoff is low to medium. Permeability is moderate, and available water capacity is moderate. The plant root zone is very deep; however, in the underlying material root growth tends to concentrate along bedding planes and fractures. The hazard of water erosion is severe.

Included with this soil in mapping are small areas of Brackett, Nuff, and Pedernales soils. Pedernales soils are in a landscape position similar to that of the Wise soils, and Brackett and Nuff soils are in a higher position on the landscape. Also included are soils with a darker surface layer. The included soils make up less than 15 percent of the map unit.

This soil is mainly used as rangeland. The climax plant community is a tall grass prairie with occasional motts of live oak. The range potential for this soil is medium.

This Wise soil is also used as cropland. Small grains and forage sorghum are the main crops. Keeping crop residue on the surface helps control erosion, conserve moisture, and improve soil tilth and water intake. Contour farming and terraces are needed in most areas to control water erosion. Grassed waterways make good outlets for terrace systems when excess water is a problem.

Improved bermudagrass and kleingrass are the main grasses grown for pasture and hay. Nitrogen and phosphorus fertilizers help to increase yields.

Slope, corrosivity to uncoated steel, low soil strength, and shrinking and swelling with changes in moisture are the main limitations for most urban and recreational uses.

These limitations can be partially overcome by proper design and installation.

This soil provides fair habitat for rabbits, dove, and quail. Lack of cover is the limiting factor for deer.

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

**Ya—Yahola fine sandy loam, frequently flooded.** This is a very deep, nearly level, well drained soil on flood plains along the Colorado River. The areas are dissected in places by small drainageways. Slopes are mainly less than 1 percent. Areas are long and narrow and range from 15 to 40 acres. These form a nearly continuous, elongated band along the Colorado River and extend for short distances up major tributaries.

Typically, the surface layer of this soil is reddish brown, fine sandy loam about 9 inches thick. The upper part of the underlying material, from a depth of 9 to 36 inches, is reddish brown and yellowish red fine sandy loam. The lower part of the underlying material, from a depth of 36 to 80 inches, is yellowish red sandy loam that has thin strata of silt loam and loamy fine sand. The soil is moderately alkaline throughout.

Surface runoff is negligible. Permeability is moderately rapid, and available water capacity is moderate. The plant root zone is very deep. Flooding is expected for brief periods one or more times every 2 years. Scouring and deposition take place with each flood.

Included with this soil in mapping are Weswood soils and a reddish brown clayey soil, both of which are in a higher position on the landscape than Yahola soils. Also included are areas of Yahola soils on slopes of up to 2 percent. The included soils make up less than 15 percent of the map unit.

This soil is used as rangeland. The climax plant community is mid and tall grasses with occasional cottonwood, pecan, and elm trees near drainageways. The range potential for this soil is high.

Houses and other permanent structures should not be built on this soil because of the hazard of flooding.

This soil provides fair habitat for a variety of wildlife such as deer, turkey, dove, quail, and small mammals.

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

# Prime Farmland

Prime farmland is one of several kinds of important farmland defined by the U.S. Department of Agriculture. It is of major importance in meeting the Nation's short- and long-range needs for food and fiber. Because the supply of high-quality farmland is limited, the U.S. Department of Agriculture recognizes that responsible levels of government, as well as individuals, should encourage
and facilitate the wise use of our Nation's prime farmland.

Prime farmland, as defined by the U.S. Department of Agriculture, is land that has the best combination of physical and chemical characteristics for producing food, feed, forage, fiber, and oilseed crops and is available for these uses. It could be cultivated land, pastureland, forest land, or other land, but it is not urban or built-up land or water areas. The soil qualities, growing season, and moisture supply are those needed for the soil to economically produce sustained high yields of crops when proper management, including water management, and acceptable farming methods are applied. In general, prime farmland has an adequate and dependable supply of moisture from precipitation or irrigation, a favorable temperature and growing season, acceptable acidity or alkalinity, an acceptable salt and sodium content, and few or no rocks. It is permeable to water and air. It is not excessively erodible or saturated with water for long periods, and it either is not frequently flooded during the growing season or is protected from flooding. The slope ranges mainly from 0 to 5 percent. More detailed information about the criteria for prime farmland is available at the local office of the Natural Resources Conservation Service.

About 105,000 acres in the survey area, or nearly 23 percent of the total acreage, meets the requirements for prime farmland. Areas of these soils are scattered throughout the county. General soil map units 1, 2, 3, and 9 have the largest areas of prime farmland soils. General soil map units 6 and 8 have substantial areas, and general soil map units 4, 5, 7, and 10 have small, scattered areas. These are described under the heading "General Soil Map Units."

A recent trend in land use in some parts of the survey area has been the loss of some prime farmland to industrial and urban uses. The loss of prime farmland to other uses puts pressure on marginal lands, which generally are more erodible, droughty, and less productive and cannot be easily cultivated.

The map units in the survey area that are considered prime farmland are listed at the end of this section. This list does not constitute a recommendation for a particular land use. The extent of each listed map unit is shown in table 4. The location is shown on the detailed soil maps at the back of this publication. The soil qualities that affect use and management are described under the heading "Detailed Soil Map Units."

The map units that meet the requirements for prime farmland are:

| | |
|---|---|
| BaB | Bastsil loamy fine sand, 1 to 5 percent slopes |
| BoB | Bolar clay loam, 1 to 3 percent slopes |
| BoC | Bolar clay loam, 3 to 5 percent slopes |
| KrB | Krum silty clay, 1 to 5 percent slopes |
| LeB | Leeray clay, 1 to 3 percent slopes |
| LuB | Luckenbach clay loam, 1 to 3 percent slopes |
| MnB | Minwells fine sandy loam, 1 to 3 percent slopes |
| NuB | Nuff silty clay, 1 to 3 percent slopes |
| NuC | Nuff silty clay, 3 to 5 percent slopes |
| Oa | Oakalla silty clay loam, rarely flooded |
| PeC | Pedernales fine sandy loam, 1 to 5 percent slopes |
| RuA | Rumley silty clay loam, 0 to 1 percent slopes |
| RuB | Rumley silty clay loam, 1 to 3 percent slopes |
| SlB | Slidell clay, 1 to 3 percent slopes |
| SuA | Sunev loam, rarely flooded |
| SuB | Sunev loam, 1 to 3 percent slopes |
| ToC | Topsey clay loam, 1 to 5 percent slopes |
| We | Weswood silt loam, rarely flooded |

# Use and Management of the Soils

This soil survey is an inventory and evaluation of the soils in the survey area. It can be used to adjust land uses to the limitations and potentials of natural resources and the environment. Also, it can help to prevent soil-related failures in land uses.

In preparing a soil survey, soil scientists, conservationists, engineers, and others collect extensive field data about the nature and behavioral characteristics of the soils. They collect data on erosion, droughtiness, flooding, and other factors that affect various soil uses and management. Field experience and collected data on soil properties and performance are used as a basis in predicting soil behavior.

Information in this section can be used to plan the use and management of soils for crops and pasture; as rangeland and woodland; as sites for buildings, sanitary facilities, highways and other transportation systems, and parks and other recreational facilities; and for wildlife habitat. It can be used to identify the potentials, suitabilities, 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 nature.

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 Natural Resources Conservation Service is explained in this section. The estimated yields of the main crops and hay and pasture plants are listed for each soil in table 5.

Planners of management systems for individual fields or farms should consider the detailed information given in the description of each soil under the heading “Detailed Soil Map Units.” Specific information can be obtained from the local office of the Natural Resources Conservation Service or the Texas Agricultural Extension Service.

According to the most recent resource data for Lampasas County, about 48,500 acres in the survey area was used for crops and 24,000 acres for pasture and hayland. The major crops in the county are wheat, oats, and forage sorghum. Small amounts of grain sorghum and peanuts are also grown. Special crops are grown commercially on a small scale. Pecans and peaches are the most important of these.

Soil erosion is the major problem on nearly all of the cropland where the slope exceeds 2 percent. Loss of the surface layer decreases productivity and is damaging to the environment. Fertility is progressively reduced in the root zone as erosion removes the topsoil, and the less fertile subsoil is incorporated into the plow layer. Erosion also results in sediments entering streams. Controlling erosion minimizes the pollution of streams by sediments and improves the quality of water for municipal use, for recreation, and for fish and wildlife.

Crop residue management helps to control erosion. A good cover of residue left on the surface minimizes compaction caused by heavy rainfall, slows runoff, increases the rate of water infiltration, and minimizes the formation of crusts and the evaporation of moisture from the soil. An adequate crop residue cover shades the soil and thus reduces soil temperature. Also, it adds organic matter to the soil, improves tilth, and minimizes the compaction caused by farm machinery. Overgrazing by livestock, excessive tillage, or burning will remove beneficial crop residue. A conservation tillage system that leaves crop residue on the surface is effective in controlling erosion in sloping areas, and it can be adapted to most of the soils that are used as cropland in the county.

Contour terraces reduce the length of the slope and thus 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.

Pasture is important in Lampasas 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 hayland. Generally, land used for pasture and hay is planted to introduced grasses that will 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 hybrid bermudagrass, kleingrass, indiangrass, Old World bluestem varieties, Alamo switchgrass, weeping lovegrass, and King Ranch bluestem. Hybrid bermudagrass, kleingrass, and Alamo switchgrass are best suited to deep soils on bottom lands. The first two grasses, however, are adapted to most of the soils of the county if a good seedbed can be prepared. Weeping lovegrass and hybrid bermudagrass provide good yields of forage on moderately coarse-textured soils on uplands.

Good management practices for pasture include fertilization, rotation grazing to maintain proper grazing height, and weed and brush management. Good management practices for hayland are fertilizing 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 land capability classification of each map unit also is shown in the table.

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

The management needed to obtain the indicated yields of the various crops depends on the kind of soil and the crop. Management can include drainage, erosion control, and protection from flooding; the proper planting and seeding rates; suitable high-yielding crop varieties; appropriate and timely tillage; control of weeds, plant diseases, and harmful insects; favorable soil reaction and optimum levels of nitrogen, phosphorus, potassium, and trace elements for each crop; effective use of crop residue, barnyard manure, and green manure crops; and harvesting that ensures the smallest possible loss.

The estimated yields reflect the productive capacity of each soil for each of the principal crops. Yields are likely to increase as new production technology is developed. The productivity of a given soil compared with that of other soils, however, is not likely to change.

Crops other than those shown in table 5 are grown in the survey area, but estimated yields are not listed because the acreage of such crops is small. The local office of the Natural Resources Conservation Service or of the Texas Agricultural Extension Service can provide information about the management and productivity of the soils for those crops.

### Land Capability Classification

Land capability classification shows, in a general way, the suitability of soils for most kinds of field crops *(17)*. Crops that require special management are excluded. The soils are grouped according to their limitations for field crops, the risk of damage if they are used for crops, and the way they respond to management. The criteria used in grouping the soils do not include major and generally expensive landforming that would change slope, depth, or other characteristics of the soils, nor do they include possible but unlikely major reclamation projects. Capability classification is not a substitute for interpretations designed to show suitability and limitations of groups of soils for rangeland, for woodland, and for engineering purposes.

In the capability system, soils are generally grouped at three levels—capability class, subclass, and unit. Only class and subclass are used in this survey.

*Capability classes*, the broadest groups, are designated by numerals I through VIII. The numerals indicate progressively greater limitations and narrower choices for practical use. The classes are defined as follows:

Class I soils have few limitations that restrict their use.

Class II soils have moderate limitations that reduce the choice of plants or that require moderate conservation practices.

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

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

Class V soils are not likely to erode but have other limitations, impractical to remove, that limit their use.

Class VI soils have severe limitations that make them generally unsuitable for cultivation.

Class VII soils have very severe limitations that make them unsuitable for cultivation.

Class VIII soils and miscellaneous areas have limitations that nearly preclude their use for commercial crop production.

*Capability subclasses* are soil groups within one class. They are designated by adding a small letter, ***e, w, s,*** or ***c,*** to the class numeral, for example, IIe. The letter ***e*** shows that the main hazard is the risk of erosion unless

close-growing plant cover is maintained; *w* shows that water in or on the soil interferes with plant growth or cultivation (in some soils the wetness can be partly corrected by artificial drainage); *s* shows that the soil is limited mainly because it is shallow, droughty, or stony; and *c,* used in only some parts of the United States, shows that the chief limitation is climate that is very cold or very dry.

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

*Capability units* are soil groups within a subclass. The soils in a capability unit are enough alike to be suited to the same crops and pasture plants, to require similar management, and to have similar productivity. Capability units are generally designated by adding an Arabic numeral to the subclass symbol, for example, IIe-4 and IIIe-6.

The capability classification of each map unit is given in the section “Detailed Soil Map Units” and in table 5.

## Rangeland

William W. Reeder, range conservationist, Natural Resources Conservation Service, assisted in preparing this section.

In areas of rangeland the native vegetation consists of a wide variety of grasses, grasslike plants, forbs, shrubs, and trees. The vegetation is generally suitable for grazing and browsing by livestock and wildlife. Rangeland is not regularly treated with intensive cultural practices such as fertilization or tillage. The composition and production of the plant community is strongly influenced by soils, climate, topography, overstory canopy, and grazing management.

About 375,000 acres, or 82 percent of Lampasas County, is rangeland. The native plant community was once an open, tall grass prairie with trees along the streams and scattered motts of live oak, Texas oak, or shin oak on the adjacent upland slopes.

The plant community has undergone a significant change in the last 100 years as most of the area was continuously and heavily grazed by cattle, horses, sheep, and goats. The tall grasses and desirable forbs were slowly replaced by mid grasses, woody plants, and undesirable forbs. The tall grasses remain only on well managed range and in protected areas. In most areas the original plant community can be reestablished only through the initiation of range improvement practices.

A majority of the local ranches and livestock farms are cow-calf or stocker calf operations. The number of sheep and goat operations has declined since the mid-1960’s. Losses to predators, labor costs and market prices, and cost of fencing have all contributed to this decline. A combination of all classes of livestock is sometimes recommended to provide more flexibility for the operator during market price and weather fluctuations.

Pastures of coastal bermudagrass, kleingrass, or King Ranch bluestem are included in the grazing program of most livestock operations in the county. Hybrid sudan and small grains are planted in small cropland areas to produce hay and provide supplemental forage. Small grains can also provide supplemental forage when grazed in the winter.

Range forage production generally is highest during two distinct growth periods. Approximately 70 percent of the annual growth is produced in April, May, and June. Spring rains and moderate temperatures promote the growth of warm season plants. A second growth period commonly occurs in September and October, resulting from the fall rains and gradually cooling temperatures. Droughts of varying lengths are frequent in the survey area. Short, midsummer droughts are normal, but droughts lasting many months can occur.

As land values increase and ranch profits decrease, many of the larger, established ranches have been sold and subdivided into smaller tracts.

### Range Sites and Range Condition

Soils vary in their capability to produce grasses and other plants suitable for grazing. Soils that produce about the same kinds and amounts of forage are grouped into a range site.

A range site is a distinctive kind of rangeland that produces a characteristic natural plant community. This community differs from natural plant communities on other range sites in kind, amount, and proportion of range plants. This natural plant community is also referred to as the climax plant community or climax vegetation because it is the product of all the environmental factors responsible for its development.

Generally, the climax vegetation consists of the plants that were present when the area was first settled. If a site contains at least 75 percent of the plants that characterize the climax vegetation, the plant community is relatively stable. It will reproduce itself so that plant composition will not change significantly as long as the environment remains unchanged. If the area is undisturbed and improved plants are not introduced, the most productive combination of forage plants on a range site is the climax vegetation.

Decreasers are plants in the climax vegetation that tend to decrease in proportion under close, continuous grazing. Generally, they are the tallest and most productive perennial grasses and forbs and the most palatable to livestock.

Increasers are plants in the climax vegetation that increase in proportion as the more desirable decreaser plants are reduced by close grazing. Increasers commonly are shorter than decreasers and generally are less palatable to livestock.

Invaders are plants that ordinarily are not able to compete with other plants in the climax plant community for moisture, nutrients, and light. Invaders enter the plant community and grow in conjunction with increasers after the climax vegetation has been reduced by heavy, continuous grazing. Invaders generally are of little value for livestock grazing. However, they can help protect the soil from erosion until the more desirable plants are reestablished.

Range condition is an evaluation of the ecological status of the present plant community. It is determined by comparing the present plant community with the climax vegetation on a particular range site. The more closely the existing plant community resembles the climax vegetation, the better the range condition. Knowledge of range condition provides a starting point for management decisions.

Four range condition classes are used to indicate the degree to which the present vegetation differs from the potential, or climax, vegetation as results of grazing or other uses. A range is in excellent condition if 76 to 100 percent of the vegetation is similar to the climax stand; in good condition if the percentage is 51 to 75; in fair condition if the percentage is 26 to 50; and in poor condition if the percentage is 25 or less.

Potential forage production depends on the range site. Current forage production depends on the range condition and the moisture available to plants during the growing season.

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 vegetation, reduction of undesirable brush species, conservation of water, and control of erosion. Sometimes, however, a range condition somewhat below the potential meets grazing needs, provides wildlife habitat, and protects soil and water resources.

Table 6 shows, for each soil that supports rangeland vegetation suitable for grazing, the range site and the potential annual production of vegetation in favorable, average, and unfavorable years. An explanation of the column headings in table 6 follows.

A *range site* is listed for each soil map unit. The relationship between soils and vegetation was ascertained during this survey; thus, range sites generally can be determined directly from the soil map. Soil properties that affect moisture supply and plant nutrients have the greatest influence on the productivity of range plants. Soil reaction, salt content, and a seasonal high water table are also important.

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

Yields are adjusted to a common percent of air-dry moisture content. The relationship of green weight to air-dry weight varies according to such factors as exposure, amount of shade, recent rains, and unseasonable dry periods.

The soils in the survey area have been assigned to 19 range sites. The range sites are described in the paragraphs that follow.

**Adobe range site.** The Brackett and Real soils in map units BrC, BrD, and ReD are in this range site. The climax plant community is a tall grass savannah with motts of live oak and Texas oak scattered throughout the landscape.

The dominant grass is little bluestem, which generally makes up 50 percent of the total vegetation. Other grasses include indiangrass, 5 percent; sideoats grama and tall grama, 15 percent; seep muhly, green sprangletop, tall dropseed, and perennial threeawn, 10 percent; forbs such as Maximilian sunflower, Engelmann daisy, gayfeather, and prairie clovers, about 10 percent; and woody plants such as Texas oak and live oak, about 10 percent.

Continuous grazing with heavy stocking rates will slowly eliminate little bluestem, indiangrass, and sideoats grama from the plant community. These are then replaced by grasses such as seep muhly, threeawn, hairy grama, and dropseed, and by woody plants. Eventually, this site will become dominated by blueberry juniper, Texas persimmon, live oak, Texas grama, hairy tridens, red grama, prairie coneflower, broomweed, and ragweed.

The nutritional quality of the forage produced on this site is limited because of the high lime content of the soil, which inhibits the amount of phosphate and iron available to the plants.

**Blackland range site.** The Slidell soil in map unit SlB is in this range site. The climax plant community is a tall grass prairie.

The dominant grass is little bluestem, which generally makes up 50 percent of the total vegetation. Other grasses include big bluestem and indiangrass, 20 percent; wildrye and plains lovegrass, 15 percent; seep muhly, green sprangletop, tall dropseed, and perennial threeawn, 5 percent; and forbs such as Maximilian sunflower, Engelmann daisy, gayfeather, and bundleflower, about 10 percent.

Continuous grazing with heavy stocking rates will slowly eliminate little bluestem, indiangrass, and big bluestem from the plant community. These are then replaced by grasses such as sideoats grama, threeawn, silver bluestem, dropseed, and woody plants such as mesquite. Eventually, this site will become dominated by mesquite, elm, Texas wintergrass, buffalograss, Texas grama, prickly pear, red grama, snow-on-the-mountain, broomweed, and ragweed.

Many acres of this range site have a history of being cropped. This use destroyed the seed sources of the native plants on the site.

**Clay Loam range site.** The Bolar, Krum, Leeray, Luckenbach, Nuff, Rumley, Seawillow, Sunev, Topsey, and Wise soils in map units BoB, BoC, KrB, LeB, LuB, NuB, NuC, RuA, RuB, SeC, SuA, SuB, ToC, and WsC are in this range site. The climax plant community is a tall grass prairie with occasional motts of live oak.

The dominant grass is little bluestem, which generally makes up 40 percent of the total vegetation. Other grasses include indiangrass and big bluestem, 20 percent; eastern gamagrass, switchgrass, wildrye, sideoats grama, tall dropseed, and vine-mesquite, 15 percent; Texas cupgrass, plains lovegrass, buffalograss, and sedges, 5 percent; woody plants including live oak, elm, and hackberry, 10 percent; forbs such as Maximilian sunflower, Engelmann daisy, bundleflower, bushsunflower, and prairie clover, about 10 percent.

Continuous grazing with heavy stocking rates will slowly eliminate little bluestem, big bluestem, indiangrass, and eastern gamagrass from the plant community. These are then replaced by grasses such as sideoats grama, silver bluestem, tall dropseed, and plains lovegrass. Eventually, this site will become dominated by mesquite, juniper, hairy tridens, Texas grama, buffalograss, Texas wintergrass, evax, red grama, prairie coneflower, broomweed, and ragweed.

**Claypan Prairie range site.** The Callahan soil in map unit CaC2 is in this range site. The climax plant community is a mid grass prairie.

The dominant grasses are sideoats grama and silver bluestem, which generally make up 30 percent of the total vegetation. Other grasses include Texas wintergrass, Arizona cottontop, white tridens, buffalograss, vine-mesquite, 60 percent; woody plants including hackberry and lotebush, 5 percent; forbs such as bundleflower, Engelmann daisy, and heath aster, about 5 percent.

Continuous grazing with heavy stocking rates will slowly eliminate sideoats grama, cottontop, and vine-mesquite from the plant community. These are then replaced by grasses such as buffalograss, threeawn, Texas wintergrass, and lotebush. Eventually, this site will become dominated by whitebrush, prickly pear, tasajillo, mesquite, lotebush, threeawn, red grama, Texas grama, prairie coneflower, broomweed, and ragweed.

**Deep Sand range site.** The Eufaula and Patilo soils in map units EuC and PaB are in this range site. The climax plant community is a mid grass post oak and blackjack oak savannah with some tall grasses in the open areas.

The dominant grass is sand lovegrass, which generally makes up 25 percent of the total vegetation. Other grasses include indiangrass, 5 percent; switchgrass, 5 percent; purpletop tridens, 5 percent; red lovegrass, 5 percent; woody plants including post oak, blackjack oak, greenbriar and skunkbush, 50 percent; forbs such as trailing wildbean, erect dayflower, and lespedeza, about 5 percent.

Continuous grazing with heavy stocking rates will slowly eliminate sand lovegrass, indiangrass, and switchgrass from the plant community. These are then replaced by red lovegrass, Scribner panicum, sand dropseed, greenbriar, and post oak. Eventually, this site will become dominated by post oak, greenbriar, prickly ash, skunkbush, threeawns, low panicums, and annual weeds and grasses.

**Gravelly Sandy Loam range site.** The Lometa soil in map unit LoD is in this range site. The climax plant community is a tall grass post oak savannah with occasional blackjack oak throughout the landscape.

The dominant grass is little bluestem, which generally makes up 30 percent of the total vegetation. Other grasses include indiangrass, 10 percent; big bluestem, 10 percent; sideoats grama, 10 percent; purpletop tridens, wildrye, plains lovegrass, sand lovegrass, hooded windmillgrass, fringeleaf paspalum, and pinhole bluestem, 20 percent; woody plants including post oak, blackjack oak, live oak, and greenbriar, 10 percent; forbs such as Maximilian sunflower, Engelmann daisy, sensitive briar, and prairie clover, about 10 percent.

Continuous grazing with heavy stocking rates will slowly eliminate little bluestem, indiangrass, and big bluestem from the plant community. These are then replaced by grasses such as sideoats grama, purpletop tridens, pinhole bluestem, hairy grama, sand lovegrass, Texas wintergrass, and the woody plants. Eventually, this site will become dominated by blueberry juniper, whitebrush, mesquite, greenbriar, live oak, Texas grama, camphorweed, red grama, curlycup gumweed, sneezeweed, and ragweed.

**Loamy Bottomland range site.** The Boerne, Oakalla, Weswood, and Yahola soils in map units BeB, Oa, We, and Ya are in this range site. The climax plant community is a semi-wooded flood plain with trees shading as much as 30 percent of the area near the drainageways. Tall and mid grasses with scattered trees are in other areas of the flood plain.

The dominant grasses are indiangrass, eastern gamagrass, big bluestem, little bluestem, and switchgrass, which generally make up 35 percent of the total vegetation. Other grasses include southwestern bristlegrass, Virginia wildrye, purpletop tridens, and broadleaf uniola, 10 percent; Scribner panicum, plains lovegrass, Texas wintergrass, sideoats grama, cane bluestem, vine-mesquite, and buffalograss, 25 percent; woody plants such as pecan, walnut, oaks, elms, bald cypress, mulberry, sycamore, wild grape, hackberry, greenbriar, honeysuckle, peppervine, and poison ivy or poison oak, 25 percent; forbs such as Maximilian sunflower, bushsunflower, Engelmann daisy, bloodweed, ragweed, and yellow neptunia, about 5 percent.

Continuous grazing with heavy stocking rates will slowly eliminate grasses such as indiangrass, eastern gamagrass, big bluestem, little bluestem, and switchgrass from the plant community. These are then replaced by plants such as meadow dropseed, vine-mesquite, silver bluestem, sideoats grama, and buffalograss. Eventually, this site will become dominated by an understory plant community of prickly pear, buffalograss, threeawn, Texas wintergrass, red grama, and annual weeds and grasses with a dense overstory of oak, elm, mesquite, and hackberry. Extensive shading by trees and thicket-forming plants is a major management problem on this site.

**Low Stony Hills range site.** The Eckrant soil in map unit ErD is in this range site. The climax plant community is a tall grass savannah with motts of live oak throughout the landscape.

The dominant grass is little bluestem, which generally makes up 50 percent of the total vegetation. Other grasses include big bluestem and indiangrass, 20 percent; sideoats grama, wildrye, green sprangletop, tall dropseed, cane and pinhole bluestems, vine-mesquite, Texas wintergrass, and buffalograss, 15 percent; woody plants including live oak, shin oak, evergreen sumac, hackberry, elbowbush, redbud, and white honeysuckle, 10 percent; forbs such as Maximilian sunflower, Engelmann daisy, gayfeather, prairie clover, and bushsunflower, 5 percent.

Continuous grazing with heavy stocking rates will slowly eliminate little bluestem, indiangrass, big bluestem, and climax forbs from the plant community. These are then replaced by grasses such as sideoats grama, buffalograss, hairy grama, dropseed, and the woody plants. Eventually, this site will become dominated by blueberry juniper, Texas persimmon, live oak, Texas grama, hairy tridens, curlymesquite, threeawn, prairie coneflower, and broomweed.

**Redland range site.** The Hensley, Roughcreek, and Tarpley soils in map units HeC, HeD, RoD, TaB, and TaD are in this range site. The climax plant community is a tall grass savannah with post oak, blackjack oak, and live oak throughout the landscape.

The dominant grass is little bluestem, which generally makes up 50 percent of the total vegetation. Other grasses include big bluestem and indiangrass, 10 percent; sideoats grama, wildrye, plains lovegrass, and Texas wintergrass, 15 percent; vine-mesquite, pinhole bluestem, tall dropseed, and buffalograss, 10 percent; woody plants including live oak, post oak, blackjack oak, redbud, greenbriar, and hackberry, 10 percent; forbs such as velvet bundleflower, Engelmann daisy, orange zexmenia, and Mexican sagewort, about 5 percent.

Continuous grazing with heavy stocking rates will slowly eliminate big bluestem, indiangrass, and little bluestem from the plant community. These are then replaced by grasses such as sideoats grama, plains lovegrass, buffalograss, dropseed, and the woody plants. Eventually, this site will become dominated by blueberry juniper, Texas persimmon, prickly pear, live oak, Texas grama, hairy tridens, red grama, prairie coneflower, and broomweed.

**Sandy range site.** The Demona soil in map unit DeB is in this range site. The climax plant community is a tall grass and mid grass savannah with stands of post oak and blackjack oak throughout the landscape.

The dominant grass is little bluestem, which generally makes up 40 percent of the total vegetation. Other grasses include big bluestem, 10 percent; indiangrass, 10 percent; sand lovegrass, purpletop tridens, tall dropseed, and switchgrass, 15 percent; Scribner panicum, plains lovegrass, and silver bluestem, 5 percent; woody plants including post oak, blackjack oak, greenbriar, skunkbush sumac, and Texas oak, 10 percent; forbs such as Maximilian sunflower, sensitive briar, gayfeather, trailing wildbean, and evening primrose, about 10 percent.

Continuous grazing with heavy stocking rates will slowly eliminate little bluestem, indiangrass, and big bluestem from the plant community. These are then replaced by grasses such as silver bluestem, hooded windmillgrass, dropseed, and the woody plants. Eventually, this site will become dominated by prickly ash, post oak, catclaw, skunkbush, sumac, greenbriar, tumble lovegrass, red lovegrass, windmillgrass, and weedy forbs.

**Sandy Loam range site.** The Bastsil and Minwells soils in map units BaB and MnB are in this range site. The climax plant community is a tall grass savannah with occasional post oak and blackjack oak throughout the landscape.

The dominant grass is little bluestem, which generally

makes up 30 percent of the total vegetation. Other grasses include indiangrass, 10 percent; big bluestem, 10 percent; sideoats grama, 10 percent; purpletop tridens, wildrye, plains lovegrass, sand lovegrass, hooded windmillgrass, fringeleaf paspalum, and pinhole bluestem, 20 percent; woody plants including post oak, blackjack oak, live oak, and greenbriar, 10 percent; forbs such as Maximilian sunflower, Engelmann daisy, sensitive briar, and prairie clover, about 10 percent.

Continuous grazing with heavy stocking rates will slowly eliminate little bluestem, indiangrass, and big bluestem from the plant community. These are then replaced by grasses such as sideoats grama, purpletop tridens, pinhole bluestem, hairy grama, sand lovegrass, Texas wintergrass and the woody plants. Eventually, this site will become dominated by blueberry juniper, whitebrush, mesquite, greenbriar, live oak, Texas grama, camphorweed, red grama, curlycup gumweed, sneezeweed, and ragweed.

**Sandstone Hills range site.** The Nocken soil in map unit NoD is in this range site. The climax plant community is a tall and mid grass savannah with post oak and blackjack oak throughout the landscape.

The dominant grass is little bluestem, which generally makes up 50 percent of the total vegetation. Other grasses include indiangrass, big bluestem, sideoats grama, and sand lovegrass, 25 percent; purpletop tridens, green sprangletop, tall dropseed, and wildrye, 10 percent; forbs such as sensitive briar, Engelmann daisy, Mexican sagewort, and prairie clover, about 10 percent; and woody plants such as post oak and elm, about 5 percent.

Continuous grazing with heavy stocking rates will slowly eliminate little bluestem, big bluestem, indiangrass, plains lovegrass, and sideoats grama from the plant community. These are then replaced by grasses such as Texas wintergrass, silver bluestem, Arizona cottontop, hooded windmillgrass, dropseed, and woody plants. Eventually, this site will become dominated by post oak, greenbriar, catclaw, red lovegrass, tumble windmillgrass, sand dropseed, and prairie coneflower.

**Shallow range site.** The Doss, Lampasas, Mereta, Oglesby and Pidcoke soils in map units DoC, LaC, MeB, OgB, and PkB are in this range site. The climax plant community is an open grassland with motts of live oak scattered throughout the landscape.

The dominant grass is little bluestem, which generally makes up 50 percent of the total vegetation. Other grasses include big bluestem and indiangrass, 10 percent; sideoats grama, tall dropseed, and pinhole bluestem, 20 percent; Texas wintergrass, green sprangletop, tall grama, and plains lovegrass, 10 percent; woody plants including live oak, shin oak, and hackberry, 5 percent; forbs such as Maximilian sunflower, Engelmann daisy, bushsunflower, and prairie clover, about 5 percent.

Continuous grazing with heavy stocking rates will slowly eliminate little bluestem, indiangrass, and big bluestem from the plant community. These are then replaced by grasses such as sideoats grama, buffalograss, pinhole bluestem, Texas wintergrass, hairy grama, and the woody plants. Eventually, this site will become dominated by blueberry juniper, Texas persimmon, agarito, live oak, buffalograss, Texas grama, hairy tridens, red grama, prairie coneflower, broomweed, and ragweed.

**Shallow Clay range site.** The Owens soil in map unit OwE is in this range site. The climax plant community is a mid grass savannah with scattered live oak and whitebrush throughout the landscape.

The dominant grass is sideoats grama, which generally makes up 25 percent of the total vegetation. Other grasses include cane bluestem, 5 percent; Arizona cottontop, 10 percent; buffalograss, green sprangletop, curlymesquite, vine-mesquite, Texas wintergrass, and perennial threeawn, 40 percent; woody plants including live oak, hackberry, elm, and whitebrush, 10 percent; forbs such as Mexican sagewort, sensitive briar, gayfeather, and prairie clover, about 10 percent.

Continuous grazing with heavy stocking rates will slowly eliminate sideoats grama, cane bluestem, and Texas wintergrass from the plant community. These are then replaced by grasses such as curlymesquite, buffalograss, threeawn, hairy grama, and the woody plants. Eventually, this site will become dominated by condalia, tasajillo, whitebrush, agarito, prickly pear, threeawns, Texas grama, hairy tridens, red grama, broomweed, ragweed, and annual weeds.

**Steep Adobe range site.** The Brackett and Real soils in map units BrE and ReE are in this range site. The climax plant community is a tall grass savannah with motts of live oak and Texas oak scattered throughout the landscape.

The dominant grass is little bluestem, which generally makes up 40 percent of the total vegetation. Other grasses include indiangrass, 5 percent; sideoats grama and tall grama, 20 percent; seep muhly, slim tridens, tall dropseed, and perennial threeawn, 15 percent; forbs such as bundleflower, sensitive briar, Maximilian sunflower, Engelmann daisy, and gayfeather, about 10 percent; and woody plants such as Texas oak and live oak, about 10 percent.

Continuous grazing with heavy stocking rates will slowly eliminate little bluestem, indiangrass, and sideoats grama from the plant community. These are then replaced by grasses such as seep muhly, threeawn, hairy grama, dropseed, and the woody plants. Eventually, this site will

become dominated by blueberry juniper, Texas persimmon, agarito, live oak, threeawn, Texas grama, hairy tridens, red grama, prairie coneflower, broomweed, and ragweed.

The nutritional quality of the forage produced on this site is limited because of the high lime content of the soil, which inhibits the amount of phosphate and iron available to the plant.

**Steep Rocky range site.** The Eckrant soil in map unit ErF is in this range site. The climax plant community is a tall grass savannah with motts of live oak, Texas oak, and shin oak throughout the landscape.

The dominant grass is little bluestem, which generally makes up 35 percent of the total vegetation. Other grasses include indiangrass and big bluestem, 5 percent; sideoats grama, 15 percent; tall grama, cane bluestem, tall dropseed, slim tridens, green sprangletop, and perennial threeawn, 20 percent; woody plants including live oak, Texas oak, shin oak, Texas madrone, and cherry, 15 percent; forbs such as bundleflower, sensitive briar, Maximilian sunflower, Engelmann daisy, and gayfeather, 10 percent.

Continuous grazing with heavy stocking rates will slowly eliminate little bluestem, indiangrass, big bluestem, and sideoats grama from the plant community. These are then replaced by grasses such as seep muhly, Texas wintergrass, threeawn, hairy grama, dropseed, and the woody plants. Eventually, this site will become dominated by blueberry juniper, Texas persimmon, agarito, live oak, threeawns, Texas grama, hairy tridens, red grama, prairie coneflower, broomweed, and ragweed.

**Stony Clay Loam range site.** The Nuff soil in map unit NsC is in this range site. The climax plant community is a tall grass prairie with motts of live oak widely spaced throughout the landscape.

The dominant grass is indiangrass, which generally makes up 40 percent of the total vegetation. Other grasses include little bluestem, 25 percent; big bluestem, 5 percent; sideoats grama, Texas wintergrass, meadow dropseed, cane bluestem, and vine-mesquite, 20 percent; woody plants including live oak, 5 percent; forbs such as Maximilian sunflower, Engelmann daisy, gayfeather, and prairie clover, about 5 percent.

Continuous grazing with heavy stocking rates will slowly eliminate big bluestem, Engelmann daisy, indiangrass, and little bluestem from the plant community. These are then replaced by grasses such as sideoats grama, meadow dropseed, vine-mesquite, and silver bluestem. Eventually, this site will become dominated by buffalograss, Texas wintergrass, mesquite, juniper, Texas grama, hairy tridens, red grama, prairie coneflower, broomweed, ragweed, and annual weeds.

**Tight Sandy Loam range site.** The Pedernales soil in map unit PeC is in this range site. The climax plant community is a mid grass savannah with a few post oak and blackjack oak throughout the landscape.

The dominant grass is sideoats grama, which generally makes up 25 percent of the total vegetation. Other grasses include little bluestem, 15 percent; cane and pinhole bluestems, 10 percent; vine-mesquite, wildrye, Arizona cottontop, Texas wintergrass, and hooded windmillgrass, 30 percent; woody plants including post oak, blackjack oak, live oak, and greenbriar, 10 percent; forbs such as Maximilian sunflower, Engelmann daisy, orange zexmenia, and bushsunflower, about 10 percent.

Continuous grazing with heavy stocking rates will slowly eliminate little bluestem, sideoats grama, and wildrye from the plant community. These are then replaced by grasses such as hooded windmillgrass, vine-mesquite, Texas wintergrass, threeawn, hairy grama, buffalograss, and the woody plants. Eventually, this site will become dominated by blueberry juniper, whitebrush, tasajillo, Texas persimmon, live oak, Texas grama, hairy tridens, red grama, prairie coneflower, broomweed, and ragweed.

**Very Shallow range site.** The Cho soil in map unit ChB is in this range site. The climax plant community is a mid grass prairie.

The dominant grasses are sideoats grama and silver bluestem, which generally make up 50 percent of the total vegetation. Other grasses include Texas wintergrass, Arizona cottontop, dropseed, white tridens, buffalograss, and curlymesquite, 35 percent; woody plants including live oak, 5 percent; forbs such as bushsunflower, orange zexmenia, and gayfeather, about 10 percent.

Continuous grazing with heavy stocking rates will slowly eliminate sideoats grama and the climax forbs from the plant community. These are replaced by plants such as buffalograss, curlymesquite, threeawn, agarito, and lotebush. Eventually, this site will become dominated by lotebush, prickly pear, tasajillo, agarito, threeawn, red grama, Texas grama, hairy tridens, prairie coneflower, and broomweed.

## Recreation

The soils of the survey area are rated in table 7 according to limitations that affect their suitability for recreation. The ratings are based on restrictive soil features, such as wetness, slope, and texture of the surface layer. Susceptibility to flooding is considered. Not considered in the ratings, but important in evaluating a site, are the location and accessibility of the area, the size and shape of the area and its scenic quality, vegetation, access to water, potential water impoundment sites, and access to public sewer lines. The capacity of the soil to

absorb septic tank effluent and the ability of the soil to support vegetation are also important. Soils subject to flooding are limited for recreational uses by the duration and intensity of flooding and the season when flooding occurs. In planning recreational facilities, onsite assessment of the height, duration, intensity, and frequency of flooding is essential.

In table 7, the degree of soil limitation is expressed as slight, moderate, or severe. *Slight* means that soil properties are generally favorable and that limitations are minor and easily overcome. *Moderate* means that limitations can be overcome or alleviated by planning, design, or special maintenance. *Severe* means that soil properties are unfavorable and that limitations can be offset only by costly soil reclamation, special design, intensive maintenance, limited use, or a combination of these measures.

The information in table 7 can be supplemented by other information in this survey, for example, interpretations for septic tank absorption fields in table 10 and interpretations for dwellings without basements and for local roads and streets in table 9.

*Camp areas* require site preparation, such as shaping and leveling the tent and parking areas, stabilizing roads and intensively used areas, and installing sanitary facilities and utility lines. Camp areas are subject to heavy foot traffic and some vehicular traffic. The best soils have mild slopes and are not wet or subject to flooding during the period of use. The surface has few or no stones or boulders, absorbs rainfall readily but remains firm, and is not dusty when dry. Strong slopes and stones or boulders can greatly increase the cost of constructing campsites.

*Picnic areas* are subject to heavy foot traffic. Most vehicular traffic is confined to access roads and parking areas. The best soils for picnic areas are firm when wet, are not dusty when dry, are not subject to flooding during the period of use, and do not have slopes or stones or boulders that increase the cost of shaping sites or of building access roads and parking areas.

*Playgrounds* require soils that can withstand intensive foot traffic. The best soils are almost level and are not wet or subject to flooding during the season of use. The surface is free of stones and boulders, is firm after rains, and is not dusty when dry. If grading is needed, the depth of the soil over bedrock or a hardpan should be considered.

*Paths and trails* for hiking and horseback riding should require little or no cutting and filling. The best soils are not wet, are firm after rains, are not dusty when dry, and are not subject to flooding more than once a year during the period of use. They have moderate slopes and few or no stones or boulders on the surface.

## Wildlife Habitat

Frank Sprague, biologist, Natural Resources Conservation Service, helped prepare this section.

Lampasas County has a diversity of wildlife habitat provided by the mixture of land uses and vegetative types. Lampasas County is part of a rural environment bounded on the west by the Colorado River and bisected by the Lampasas River on the east. The uplands are dominated by oak, elm, and hackberry trees. Bottomland hardwoods exist along smaller streams but have been cleared for agricultural use on most of the major flood plains.

The major game species in Lampasas County is the white-tailed deer. Other important game species include turkey, fox squirrel, bobwhite quail, and dove. Lampasas County is located in the Central flyway, and waterfowl are commonly seen on ponds and streams during peak migration periods. Important furbearers include fox, raccoon, opossum, skunk, and beaver. Coyotes are numerous in the county. Cottontail rabbits and jackrabbits are common.

White-tailed deer numbers have increased significantly in Lampasas County since the reintroduction of deer in the 1940's. Populations have reached and exceeded carrying capacity in portions of the county in recent years. Leasing of hunting rights constitutes a major source of income for many landowners, and the income from it often exceeds the returns from livestock grazing. A majority of the county is leased for hunting, and hunting pressure is heavy throughout the county. Heavy hunting pressure and restricted doe harvest have resulted in distorted buck-doe ratios. Bucks in younger age classes constitute the vast majority of the harvest. Numerous small land holdings make management of deer difficult and contribute to increased hunting pressure. Critical stress periods for deer are midsummer and late winter in years of below or abnormal rainfall. Deer habitat in the county can be improved by proper grazing management, prescribed burning, and planting of food plots.

Quail populations in Lampasas County have declined over the past 50 years with the decrease in small farming units that produced seeds of domestic crops and weeds. The potential for improvement of quail habitat is great. In areas where the soils are suitable, quail populations can be increased by practices such as disking to promote weed growth and annual planting of seed producing crops.

Squirrels are numerous along streams and in bottom lands which have been retained in oak and other mast producing species.

A large number of Rio Grande turkeys inhabit most of the county except in excessively open areas.

The Lampasas and Colorado Rivers and numerous

ponds and lakes provide opportunities for fishing throughout the county for residents and visitors. In the rivers, white bass, sunfish, and catfish are some of the major species. Black bass, channel catfish, and several types of sunfish are the main species in the county's ponds and lakes. Interest in stocking and management of the estimated 2,000 farm ponds continues to increase.

Conservation practices applied by landowners can be modified or adapted to maintain or enhance wildlife habitat on most farms and ranches. Grazing management of domestic livestock is particularly important where deer and livestock occupy the same range. Proper stocking rates and adequate rest periods to avoid competition for key plants is essential. Prescribed burning can improve the quantity and quality of forage for livestock as well as wildlife. Pasture planting and management programs which use plant species of value to wildlife, as well as livestock, can be implemented along with practices that avoid elimination of valuable wildlife plants. Brush management and clearing practices should be well planned to retain adequate browse and cover for wildlife. Excessive land clearing or other improperly planned practices detrimental to wildlife habitat can reduce land values.

Soils affect the kind and amount of vegetation that is available to wildlife as food and cover. They also affect the construction of water impoundments. The kind and abundance of wildlife depend largely on the amount and distribution of food, cover, and water. Wildlife habitat can be created or improved by planting appropriate vegetation, by maintaining the existing plant cover, or by promoting the natural establishment of desirable plants.

In table 8, the soils in the survey area are rated according to their potential for providing habitat for various kinds of wildlife. This information can be used in planning parks, wildlife refuges, nature study areas, and other developments for wildlife; in selecting soils that are suitable for establishing, improving, or maintaining specific elements of wildlife habitat; and in determining the intensity of management needed for each element of the habitat.

The potential of the soil is rated good, fair, poor, or very poor. A rating of *good* indicates that the element or kind of habitat is easily established, improved, or maintained. Few or no limitations affect management, and satisfactory results can be expected. A rating of *fair* indicates that the element or kind of habitat can be established, improved, or maintained in most places. Moderately intensive management is required for satisfactory results. A rating of *poor* indicates that limitations are severe for the designated element or kind of habitat. Habitat can be created, improved, or maintained in most places, but management is difficult and must be intensive. A rating of *very poor* indicates that restrictions for the element or kind of habitat are very severe and that unsatisfactory results can be expected. Creating, improving, or maintaining habitat is impractical or impossible.

The elements of wildlife habitat are described in the following paragraphs.

*Grain and seed crops* are domestic grains and seed-producing herbaceous plants. Soil properties and features that affect the growth of grain and seed crops are depth of the root zone, texture of the surface layer, available water capacity, wetness, slope, surface stoniness, and flooding. Soil temperature and soil moisture are also considerations. Examples of grain and seed crops are corn, wheat, oats, grain sorghum, and barley.

*Grasses and legumes* are domestic perennial grasses and herbaceous legumes. Soil properties and features that affect the growth of grasses and legumes are depth of the root zone, texture of the surface layer, available water capacity, wetness, surface stoniness, flooding, and slope. Soil temperature and soil moisture are also considerations. Examples of grasses and legumes are fescue, lovegrass, kleingrass, clover, and vetch.

*Wild herbaceous plants* are native or naturally established grasses and forbs, including weeds. Soil properties and features that affect the growth of these plants are depth of the root zone, texture of the surface layer, available water capacity, wetness, surface stoniness, and flooding. Soil temperature and soil moisture are also considerations. Examples of wild herbaceous plants are bluestem, beggarweed, croton, and grama.

*Shrubs* are bushy woody plants that produce fruit, buds, twigs, bark, and foliage. Soil properties and features that affect the growth of shrubs are depth of the root zone, available water capacity, salinity, and soil moisture. Examples of shrubs are skunkbush, kidneywood, algerita, and wild plum.

The habitat for various kinds of wildlife is described in the following paragraphs.

*Habitat for openland wildlife* consists of cropland, pasture, meadows, and areas that are overgrown with grasses, herbs, shrubs, and vines. These areas produce grain and seed crops, grasses and legumes, and wild herbaceous plants. Wildlife attracted to these areas include bobwhite quail, 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 deer, dove, turkey, meadowlark, and bobcat.

## Engineering

This section provides information for planning land uses related to urban development and to water management. Soils are rated for various uses, and the most limiting

features are identified. Ratings are given for building site development, sanitary facilities, construction materials, and water management. The ratings are based on observed performance of the soils and on the estimated data and test data in the "Soil Properties" section.

*Information in this section is intended for land use planning, for evaluating land use alternatives, and for planning site investigations prior to design and construction. The information, however, has limitations. For example, estimates and other data generally apply only to that part of the soil within a depth of 5 or 6 feet. Because of the map scale, small areas of different soils may be included within the mapped areas of a specific soil.*

*The information is not site specific and does not eliminate the need for onsite investigation of the soils or for testing and analysis by personnel experienced in the design and construction of engineering works.*

Government ordinances and regulations that restrict certain land uses or impose specific design criteria were not considered in preparing the information in this section. Local ordinances and regulations should be considered in planning, in site selection, and in design.

Soil properties, site features, and observed performance were considered in determining the ratings in this section. During the fieldwork for this soil survey, determinations were made about grain-size distribution, liquid limit, plasticity index, soil reaction, depth to bedrock, hardness of bedrock within 5 or 6 feet of the surface, soil wetness, depth to a seasonal high water table, slope, likelihood of flooding, natural soil structure aggregation, and soil density. Data were collected about kinds of clay minerals, mineralogy of the sand and silt fractions, and the kinds of adsorbed cations. Estimates were made for erodibility, permeability, corrosivity, shrink-swell potential, available water capacity, and other behavioral characteristics affecting engineering uses.

This information can be used to evaluate the potential of areas for residential, commercial, industrial, and recreational uses; make preliminary estimates of construction conditions; evaluate alternative routes for roads, streets, highways, pipelines, and underground cables; evaluate alternative sites for sanitary landfills, septic tank absorption fields, and sewage lagoons; plan detailed onsite investigations of soils and geology; locate potential sources of gravel, sand, earthfill, and topsoil; plan drainage systems, irrigation systems, ponds, terraces, and other structures for soil and water conservation; and predict performance of proposed small structures and pavements by comparing the performance of existing similar structures on the same or similar soils.

The information in the tables, along with the soil maps, the soil descriptions, and other data provided in this survey, can be used to make additional interpretations.

Some of the terms used in this soil survey have a special meaning in soil science and are defined in the "Glossary."

### Building Site Development

Table 9 shows the degree and kind of soil limitations that affect shallow excavations, dwellings with and without basements, small commercial buildings, local roads and streets, and lawns and landscaping. The limitations are considered *slight* if soil properties and site features are generally favorable for the indicated use and limitations are minor and easily overcome; *moderate* if soil properties or site features are not favorable for the indicated use and special planning, design, or maintenance is needed to overcome or minimize the limitations; and *severe* if soil properties or site features are so unfavorable or so difficult to overcome that special design, significant increases in construction costs, and possibly increased maintenance are required. Special feasibility studies may be required where the soil limitations are severe.

*Shallow excavations* are trenches or holes dug to a maximum depth of 5 or 6 feet for basements, graves, utility lines, open ditches, and other purposes. The ratings are based on soil properties, site features, and observed performance of the soils. The ease of digging, filling, and compacting is affected by the depth to bedrock, a cemented pan, or a very firm dense layer; stone content; soil texture; and slope. The time of the year that excavations can be made is affected by the depth to a seasonal high water table and the susceptibility of the soil to flooding. The resistance of the excavation walls or banks to sloughing or caving is affected by soil texture and depth to the water table.

*Dwellings* and *small commercial buildings* are structures built on shallow foundations on undisturbed soil. The load limit is the same as that for single-family dwellings no higher than three stories. Ratings are made for small commercial buildings without basements, for dwellings with basements, and for dwellings without basements. The ratings are based on soil properties, site features, and observed performance of the soils. A high water table, flooding, shrinking and swelling, and organic layers can cause the movement of footings. A high water table, depth to bedrock or to a cemented pan, large stones, slope, and flooding affect the ease of excavation and construction. Landscaping and grading that require cuts and fills of more than 5 or 6 feet are not considered.

*Local roads and streets* have an all-weather surface and carry automobile and light truck traffic all year. They have a subgrade of cut or fill soil material; a base of gravel, crushed rock, or stabilized soil material; and a flexible or rigid surface. Cuts and fills are generally limited to less than 6 feet. The ratings are based on soil properties, site features, and observed performance of the

soils. Depth to bedrock or to a cemented pan, a high water table, flooding, large stones, and slope affect the ease of excavating and grading. Soil strength (as inferred from the engineering classification of the soil), shrink-swell potential, frost action potential, and depth to a high water table affect the traffic-supporting capacity.

*Lawns and landscaping* require soils on which turf and ornamental trees and shrubs can be established and maintained. The ratings are based on soil properties, site features, and observed performance of the soils. Soil reaction, a high water table, depth to bedrock or to a cemented pan, the available water capacity in the upper 40 inches, and the content of salts, sodium, and sulfidic materials affect plant growth. Flooding, wetness, slope, stoniness, and the amount of sand, clay, or organic matter in the surface layer affect trafficability after vegetation is established.

**Sanitary Facilities**

Table 10 shows the degree and kind of soil limitations that affect septic tank absorption fields, sewage lagoons, and sanitary landfills. The limitations are considered *slight* if soil properties and site features are generally favorable for the indicated use and limitations are minor and easily overcome; *moderate* if soil properties or site features are not favorable for the indicated use and special planning, design, or maintenance is needed to overcome or minimize the limitations; and *severe* if soil properties or site features are so unfavorable or so difficult to overcome that special design, significant increases in construction costs, and possibly increased maintenance are required.

Table 10 also shows the suitability of the soils for use as daily cover for landfill. A rating of *good* indicates that soil properties and site features are favorable for the use and good performance and low maintenance can be expected; *fair* indicates that soil properties and site features are moderately favorable for the use and one or more soil properties or site features make the soil less desirable than the soils rated good; and *poor* indicates that one or more soil properties or site features are unfavorable for the use and overcoming the unfavorable properties requires special design, extra maintenance, or costly alteration.

*Septic tank absorption fields* are areas in which effluent from a septic tank is distributed into the soil through subsurface tiles or perforated pipe. Only that part of the soil between depths of 24 and 72 inches is evaluated. The ratings are based on soil properties, site features, and observed performance of the soils. Permeability, a high water table, depth to bedrock or to a cemented pan, and flooding affect absorption of the effluent. Large stones and bedrock or a cemented pan interfere with installation.

Unsatisfactory performance of septic tank absorption fields, including excessively slow absorption of effluent, surfacing of effluent, and hillside seepage, can affect public health. Ground water can be polluted if highly permeable sand and gravel or fractured bedrock is less than 4 feet below the base of the absorption field, if slope is excessive, or if the water table is near the surface. There must be unsaturated soil material beneath the absorption field to filter the effluent effectively. Many local ordinances require that this material be of a certain thickness.

*Sewage lagoons* are shallow ponds constructed to hold sewage while aerobic bacteria decompose the solid and liquid wastes. Lagoons should have a nearly level floor surrounded by cut slopes or embankments of compacted soil. Lagoons generally are designed to hold the sewage within a depth of 2 to 5 feet. Nearly impervious soil material for the lagoon floor and sides is required to minimize seepage and contamination of ground water.

Table 10 gives ratings for the natural soil that makes up the lagoon floor. The surface layer and, generally, 1 or 2 feet of soil material below the surface layer are excavated to provide material for the embankments. The ratings are based on soil properties, site features, and observed performance of the soils. Considered in the ratings are slope, permeability, a high water table, depth to bedrock or to a cemented pan, flooding, large stones, and content of organic matter.

Excessive seepage resulting from rapid permeability in the soil or a water table that is high enough to raise the level of sewage in the lagoon causes a lagoon to function unsatisfactorily. Pollution results if seepage is excessive or if floodwater overtops the lagoon. A high content of organic matter is detrimental to proper functioning of the lagoon because it inhibits aerobic activity. Slope, bedrock, and cemented pans can cause construction problems, and large stones can hinder compaction of the lagoon floor.

*Sanitary landfills* are areas where solid waste is disposed of by burying it in soil. There are two types of landfill—trench and area. In a trench landfill, the waste is placed in a trench. It is spread, compacted, and covered daily with a thin layer of soil excavated at the site. In an area landfill, the waste is placed in successive layers on the surface of the soil. The waste is spread, compacted, and covered daily with a thin layer of soil from a source away from the site.

Both types of landfill must be able to bear heavy vehicular traffic. Both types involve a risk of ground-water pollution. Ease of excavation and revegetation should be considered.

The ratings in table 10 are based on soil properties, site features, and observed performance of the soils. Permeability, depth to bedrock or to a cemented pan, a high water table, slope, and flooding affect both types of landfill. Texture, stones and boulders, highly organic

layers, soil reaction, and content of salts and sodium affect trench landfills. Unless otherwise stated, the ratings apply only to that part of the soil within a depth of about 6 feet. For deeper trenches, a limitation rated slight or moderate may not be valid. Onsite investigation is needed.

*Daily cover for landfill* is the soil material that is used to cover compacted solid waste in an area sanitary landfill. The soil material is obtained offsite, transported to the landfill, and spread over the waste.

Soil texture, wetness, coarse fragments, and slope affect the ease of removing and spreading the material during wet and dry periods. Loamy or silty soils that are free of large stones or excess gravel are the best cover for a landfill. Clayey soils are sticky or cloddy and are difficult to spread; sandy soils are subject to wind erosion.

After soil material has been removed, the soil material remaining in the borrow area must be thick enough over bedrock, a cemented pan, or the water table to permit revegetation. The soil material used as the final cover for a landfill should be suitable for plants. The surface layer generally has the best workability, more organic matter, and the best potential for plants. Material from the surface layer should be stockpiled for use as the final cover.

### Construction Materials

Table 11 gives information about the soils as a source of roadfill, sand, gravel, and topsoil. The soils are rated *good, fair,* or *poor* as a source of roadfill and topsoil. They are rated as a *probable* or *improbable* source of sand and gravel. The ratings are based on soil properties and site features that affect the removal of the soil and its use as construction material. Normal compaction, minor processing, and other standard construction practices are assumed. Each soil is evaluated to a depth of 5 or 6 feet.

*Roadfill* is soil material that is excavated in one place and used in road embankments in another place. In this table, the soils are rated as a source of roadfill for low embankments, generally less than 6 feet high and less exacting in design than higher embankments.

The ratings are for the soil material below the surface layer to a depth of 5 or 6 feet. It is assumed that soil layers will be mixed during excavating and spreading. Many soils have layers of contrasting suitability within their profile. The table showing engineering index properties provides detailed information about each soil layer. This information can help to determine the suitability of each layer for use as roadfill. The performance of soil after it is stabilized with lime or cement is not considered in the ratings.

The ratings are based on soil properties, site features, and observed performance of the soils. The thickness of suitable material is a major consideration. The ease of excavation is affected by large stones, a high water table, and slope. How well the soil performs in place after it has been compacted and drained is determined by its strength (as inferred from the engineering classification of the soil) and shrink-swell potential.

Soils rated *good* contain significant amounts of sand or gravel or both. They have at least 5 feet of suitable material, a low shrink-swell potential, few cobbles and stones, and slopes of 15 percent or less. Depth to the water table is more than 3 feet. Soils rated *fair* are more than 35 percent silt- and clay-sized particles and have a plasticity index of less than 10. They have a moderate shrink-swell potential, slopes of 15 to 25 percent, or many stones. Depth to the water table is 1 to 3 feet. Soils rated *poor* have a plasticity index of more than 10, a high shrink-swell potential, many stones, or slopes of more than 25 percent. They are wet and have a water table at a depth of less than 1 foot. They may have layers of suitable material, but the material is less than 3 feet thick.

*Sand* and *gravel* are natural aggregates suitable for commercial use with a minimum of processing. They are used in many kinds of construction. Specifications for each use vary widely. In table 11, only the probability of finding material in suitable quantity is evaluated. The suitability of the material for specific purposes is not evaluated, nor are factors that affect excavation of the material.

The properties used to evaluate the soil as a source of sand or gravel are gradation of grain sizes (as indicated by the engineering classification of the soil), the thickness of suitable material, and the content of rock fragments. Kinds of rock, acidity, and stratification are given in the soil series descriptions. Gradation of grain sizes is given in the table on engineering index properties.

A soil rated as a probable source has a layer of clean sand or gravel or a layer of sand or gravel that is up to 12 percent silty fines. This material must be at least 3 feet thick and less than 50 percent, by weight, large stones. All other soils are rated as an improbable source. Coarse fragments of soft bedrock, such as shale and siltstone, are not considered to be sand and gravel.

*Topsoil* is used to cover an area so that vegetation can be established and maintained. The upper 40 inches of a soil is evaluated for use as topsoil. Also evaluated is the reclamation potential of the borrow area.

Plant growth is affected by toxic material and by such properties as soil reaction, available water capacity, and fertility. The ease of excavating, loading, and spreading is affected by rock fragments, slope, a water table, soil texture, and thickness of suitable material. Reclamation of the borrow area is affected by slope, a water table, rock fragments, bedrock, and toxic material.

Soils rated *good* have friable, loamy material to a depth of at least 40 inches. They are free of stones and cobbles, have little or no gravel, and have slopes of less than 8 percent. They are low in content of soluble salts, are naturally fertile or respond well to fertilizer, and are not so wet that excavation is difficult.

Soils rated *fair* are sandy soils, loamy soils that have a relatively high content of clay, soils that have only 20 to 40 inches of suitable material, soils that have an appreciable amount of gravel, stones, or soluble salts, or soils that have slopes of 8 to 15 percent. The soils are not so wet that excavation is difficult.

Soils rated *poor* are very sandy or clayey, have less than 20 inches of suitable material, have a large amount of gravel, stones, or soluble salts, have slopes of more than 15 percent, or have a seasonal high water table at or near the surface.

The surface layer of most soils is generally preferred for topsoil because of its organic matter content. Organic matter greatly increases the absorption and retention of moisture and nutrients for plant growth.

**Water Management**

Table 12 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 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 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 control erosion and conserve moisture by intercepting runoff. Slope, wetness, large stones, and depth to bedrock or to a cemented pan affect the construction of terraces and diversions. A restricted rooting depth, a severe hazard of wind erosion or water erosion, an excessively coarse texture, and restricted permeability adversely affect maintenance.

*Grassed waterways* are natural or constructed channels, generally broad and shallow, that conduct surface water to outlets at a nonerosive velocity. Large stones, wetness, slope, and depth to bedrock or to a cemented pan affect the construction of grassed waterways. A hazard of wind erosion, low available water capacity, restricted rooting depth, toxic substances such as salts and sodium, and restricted permeability adversely affect the growth and maintenance of the grass after construction.

# Soil Properties

Data relating to soil properties are collected during the course of the soil survey. The data and the estimates of soil and water features, listed in tables, are explained on the following pages.

Soil properties are determined by field examination of the soils and by laboratory index testing of some benchmark soils. Established standard procedures are followed. During the survey, many shallow borings are made and examined to identify and classify the soils and to delineate them on the soil maps. Samples are taken from some typical profiles and tested in the laboratory to determine grain-size distribution, plasticity, and compaction characteristics. These results are reported in table 16.

Estimates of soil properties are based on field examinations, on laboratory tests of samples from the survey area, and on laboratory tests of samples of similar soils in nearby areas. Tests verify field observations, verify properties that cannot be estimated accurately by field observation, and help to characterize key soils.

The estimates of soil properties shown in the tables include the range of grain-size distribution and Atterberg limits, the engineering classification, and the physical and chemical properties of the major layers of each soil. Pertinent soil and water features also are given.

## Engineering Index Properties

Table 13 gives estimates of the engineering classification and of the range of index properties for the major layers of each soil in the survey area. Most soils have layers of contrasting properties within the upper 5 or 6 feet.

*Depth* to the upper and lower boundaries of each layer is indicated. The range in depth and information on other properties of each layer are given for each soil series under the heading “Soil Series and Their Morphology.”

*Texture* is given in the standard terms used by the U.S. Department of Agriculture. These terms are defined according to percentages of sand, silt, and clay in the fraction of the soil that is less than 2 millimeters in diameter. “Loam,” for example, is soil that is 7 to 27 percent clay, 28 to 50 percent silt, and less than 52 percent sand. If the content of particles coarser than sand is as much as about 15 percent, an appropriate modifier is added, for example, “gravelly.” Textural terms are defined in the “Glossary.”

*Classification* of the soils is determined according to the Unified soil classification system *(3)* and the system adopted by the American Association of State Highway and Transportation Officials *(2)*.

The Unified system classifies soils according to properties that affect their use as construction material. Soils are classified according to grain-size distribution of the fraction less than 3 inches in diameter and according to plasticity index, liquid limit, and organic matter content. Sandy and gravelly soils are identified as GW, GP, GM, GC, SW, SP, SM, and SC; silty and clayey soils as ML, CL, OL, MH, CH, and OH; and highly organic soils as PT. Soils exhibiting engineering properties of two groups can have a dual classification, for example, CL-ML.

The AASHTO system classifies soils according to those properties that affect roadway construction and maintenance. In this system, the fraction of a mineral soil that is less than 3 inches in diameter is classified in one of seven groups from A-1 through A-7 on the basis of grain-size distribution, liquid limit, and plasticity index. Soils in group A-1 are coarse grained and low in content of fines (silt and clay). At the other extreme, soils in group A-7 are fine grained. Highly organic soils are classified in group A-8 on the basis of visual inspection.

If laboratory data are available, the A-1, A-2, and A-7 groups are further classified as A-1-a, A-1-b, A-2-4, A-2-5, A-2-6, A-2-7, A-7-5, or A-7-6. As an additional refinement, the suitability of a soil as subgrade material can be indicated by a group index number. Group index numbers range from 0 for the best subgrade material to 20 or higher for the poorest. The AASHTO classification for soils tested, with group index numbers in parentheses, is given in table 16.

*Rock fragments* 3 to 10 inches in diameter are indicated as a percentage of the total soil on a dry-weight basis. The percentages are estimates determined mainly by converting volume percentage in the field to weight percentage.

*Percentage (of soil particles) passing designated sieves* is the percentage of the soil fraction less than 3 inches in diameter based on an ovendry weight. The sieves, numbers 4, 10, 40, and 200 (USA Standard Series), have openings of 4.76, 2.00, 0.420, and 0.074

millimeters, respectively. Estimates are based on laboratory tests of soils sampled in the survey area and in nearby areas and on estimates made in the field.

*Liquid limit* and *plasticity index* (Atterberg limits) indicate the plasticity characteristics of a soil. The estimates are based on test data from the survey area or from nearby areas and on field examination.

The estimates of grain-size distribution, liquid limit, and plasticity index are generally rounded to the nearest 5 percent. Thus, if the ranges of gradation and Atterberg limits extend a marginal amount (1 or 2 percentage points) across classification boundaries, the classification in the marginal zone is omitted in the table.

## Physical and Chemical Properties

Table 14 shows estimates of some characteristics and features that affect soil behavior. These estimates are given for the major layers of each soil in the survey area. The estimates are based on field observations and on test data for these and similar soils.

*Clay* as a soil separate consists of mineral soil particles that are less than 0.002 millimeter in diameter. In this table, the estimated clay content of each major soil layer is given as a percentage, by weight, of the soil material that is less than 2 millimeters in diameter.

The amount and kind of clay greatly affect the fertility and physical condition of the soil. They determine the ability of the soil to adsorb cations and to retain moisture. They influence shrink-swell potential, permeability, plasticity, the ease of soil dispersion, and other soil properties. The amount and kind of clay in a soil also affect tillage and earthmoving operations.

*Moist bulk density* is the weight of soil (ovendry) per unit volume. Volume is measured when the soil is at field moisture capacity, that is, the moisture content at $^1/_3$-bar moisture tension. Weight is determined after drying the soil at 105 degrees C. In this table, the estimated moist bulk density of each major soil horizon is expressed in grams per cubic centimeter of soil material that is less than 2 millimeters in diameter. Bulk density data are used to compute shrink-swell potential, available water capacity, total pore space, and other soil properties. The moist bulk density of a soil indicates the pore space available for water and roots. A bulk density of more than 1.6 can restrict water storage and root penetration. Moist bulk density is influenced by texture, kind of clay, content of organic matter, and soil structure.

*Permeability* refers to the ability of a soil to transmit water or air. The estimates indicate the rate of downward movement of water when the soil is saturated. They are based on soil characteristics observed in the field, particularly structure, porosity, and texture. Permeability is considered in the design of soil drainage systems and septic tank absorption fields.

*Available water capacity* refers to the quantity of water that the soil is capable of storing for use by plants. The capacity for water storage is given in inches of water per inch of soil for each major soil layer. The capacity varies, depending on soil properties that affect the retention of water and the depth of the root zone. The most important properties are the content of organic matter, soil texture, bulk density, and soil structure. Available water capacity is an important factor in the choice of plants or crops to be grown and in the design and management of irrigation systems. Available water capacity is not an estimate of the quantity of water actually available to plants at any given time.

*Soil reaction* is a measure of acidity or alkalinity and is expressed as a range in pH values. The range in pH of each major horizon is based on many field tests. For many soils, values have been verified by laboratory analyses. Soil reaction is important in selecting crops and other plants, in evaluating soil amendments for fertility and stabilization, and in determining the risk of corrosion.

*Shrink-swell potential* is the potential for volume change in a soil with a loss or gain in moisture. Volume change occurs mainly because of the interaction of clay minerals with water and varies with the amount and type of clay minerals in the soil. The size of the load on the soil and the magnitude of the change in soil moisture content influence the amount of swelling of soils in place. Laboratory measurements of swelling of undisturbed clods were made for many soils. For others, swelling was estimated on the basis of the kind and amount of clay minerals in the soil and on measurements of similar soils.

If the shrink-swell potential is rated moderate to very high, shrinking and swelling can cause damage to buildings, roads, and other structures. Special design is often needed.

Shrink-swell potential classes are based on the change in length of an unconfined clod as moisture content is increased from air-dry to field capacity. The classes are *low*, a change of less than 3 percent; *moderate*, 3 to 6 percent; *high*, more than 6 percent; and *very high*, greater than 9 percent.

*Erosion factor K* indicates the susceptibility of a soil to sheet and rill erosion by water. Factor K is one of six factors used in the Universal Soil Loss Equation (USLE) to predict the average annual rate of soil loss by sheet and rill erosion in tons per acre per year. The estimates are based primarily on percentage of silt, sand, and organic matter (up to 4 percent) and on soil structure and permeability. Values of K range from 0.02 to 0.64. Other factors being equal, the higher the value, the more susceptible the soil is to sheet and rill erosion by water.

*Erosion factor T* is an estimate of the maximum average annual rate of soil erosion by wind or water that can occur without affecting crop productivity over a sustained period. The rate is in tons per acre per year.

*Wind erodibility groups* are made up of soils that have similar properties affecting their resistance to wind erosion in cultivated areas. The groups indicate the susceptibility of soil to wind erosion. The soils assigned to group 1 are the most susceptible to wind erosion, and those assigned to group 8 are the least susceptible. The groups are as follows:

1. Coarse sands, sands, fine sands, and very fine sands.
2. Loamy coarse sands, loamy sands, loamy fine sands, loamy very fine sands, ash material, and sapric soil material.
3. Coarse sandy loams, sandy loams, fine sandy loams, and very fine sandy loams.

4L. Calcareous loams, silt loams, clay loams, and silty clay loams.

4. Clays, silty clays, noncalcareous clay loams, and silty clay loams that are more than 35 percent clay.
5. Noncalcareous loams and silt loams that are less than 20 percent clay and sandy clay loams, sandy clays, and hemic soil material.
6. Noncalcareous loams and silt loams that are more than 20 percent clay and noncalcareous clay loams that are less than 35 percent clay.
7. Silts, noncalcareous silty clay loams that are less than 35 percent clay, and fibric soil material.
8. Soils that are not subject to wind erosion because of coarse fragments on the surface or because of surface wetness.

*Organic matter* is the plant and animal residue in the soil at various stages of decomposition. In table 14, the estimated content of organic matter is expressed as a percentage, by weight, of the soil material that is less than 2 millimeters in diameter.

The content of organic matter in a soil can be maintained or increased by returning crop residue to the soil. Organic matter affects the available water capacity, infiltration rate, and tilth. It is a source of nitrogen and other nutrients for crops.

## Soil and Water Features

Table 15 gives estimates of various soil and water features. The estimates are used in land use planning that involves engineering considerations.

*Hydrologic soil groups* are based on estimates of runoff potential. Soils are assigned to one of four groups according to the rate of water infiltration when the soils are not protected by vegetation, are thoroughly wet, and receive precipitation from long-duration storms.

The four hydrologic soil groups are:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep and very deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep to very deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

*Flooding*, the temporary inundation of an area, is caused by overflowing streams, by runoff from adjacent slopes, or by tides. Water standing for short periods after rainfall or snowmelt is not considered flooding, and water standing in swamps and marshes is considered ponding rather than flooding.

Table 15 gives the frequency and duration of flooding and the time of year when flooding is most likely.

Frequency, duration, and probable dates of occurrence are estimated. Frequency is expressed as none, rare, occasional, and frequent. *None* means that flooding is not probable; *rare* that it is unlikely but possible under unusual weather conditions (the chance of flooding is nearly 0 percent to 5 percent in any year); *occasional* that it occurs, on the average, once or less in 2 years (the chance of flooding is 5 to 50 percent in any year); and *frequent* that it occurs, on the average, more than once in 2 years (the chance of flooding is more than 50 percent in any year). *Common* is used when the occasional and frequent classes are grouped for certain purposes. Duration is expressed as *very brief* if less than 2 days, *brief* if 2 to 7 days, *long* if 7 days to 1 month, and *very long* if more than 1 month. Probable dates are expressed in months. About two-thirds to three-fourths of all flooding occurs during the stated period.

The information is based on evidence in the soil profile, namely thin strata of gravel, sand, silt, or clay deposited by floodwater; irregular decrease in organic matter content with increasing depth; and little or no horizon development.

Also considered are local information about the extent and levels of flooding and the relation of each soil on the landscape to historic floods. Information on the extent of flooding based on soil data is less specific than that provided by detailed engineering surveys that delineate flood-prone areas at specific flood frequency levels.

*Depth to bedrock* is given if bedrock is within a depth of 5 feet. The depth is based on many soil borings and on observations during soil mapping. The rock is either soft or hard. If the rock is soft or fractured, excavations can be made with trenching machines, backhoes, or small rippers. If the rock is hard or massive, blasting or special equipment generally is needed for excavation.

A *cemented pan* is a cemented or indurated subsurface layer within a depth of 5 feet. Such a pan causes difficulty in excavation. Pans are classified as thin or thick. A thin pan is less than 3 inches thick if continuously indurated or less than 18 inches thick if discontinuous or fractured. Excavations can be made by trenching machines, backhoes, or small rippers. A thick pan is more than 3 inches thick if continuously indurated or more than 18 inches thick if discontinuous or fractured. Such a pan is so thick or massive that blasting or special equipment is needed in excavation.

*Risk of corrosion* pertains to potential soil-induced electrochemical or chemical action that dissolves or weakens uncoated steel or concrete. The rate of corrosion of uncoated steel is related to such factors as soil moisture, particle-size distribution, acidity, and electrical conductivity of the soil. The rate of corrosion of concrete is based mainly on the sulfate and sodium content, texture, moisture content, and acidity of the soil. Special site examination and design may be needed if the combination of factors results in a severe hazard of corrosion. The steel in installations that intersect soil boundaries or soil layers is more susceptible to corrosion than steel in installations that are entirely within one kind of soil or within one soil layer.

For uncoated steel, the risk of corrosion, expressed as *low, moderate,* or *high,* is based on soil drainage class, total acidity, electrical resistivity near field capacity, and electrical conductivity of the saturation extract.

For concrete, the risk of corrosion is also expressed as *low, moderate,* or *high*. It is based on soil texture, acidity, and amount of sulfates in the saturation extract.

## Engineering Index Test Data

Table 16 shows laboratory test data for several pedons sampled at carefully selected sites in the survey area. The pedons are representative of the series described in the section “Soil Series and Their Morphology.” The soil samples were tested by the Texas 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 422 (ASTM), D 2217 (ASTM); Liquid limit—T 89 (AASHTO), D 4318 (ASTM); Plasticity index—T 90 (AASHTO), D 4318 (ASTM); Specific gravity—T 100 (AASHTO), D 854 (ASTM); and Shrinkage—T 92 (AASHTO), D 427 (ASTM).

# Classification of the Soils

The system of soil classification used by the National Cooperative Soil Survey has six categories *(18,19)*. Beginning with the broadest, these categories are the order, suborder, great group, subgroup, family, and series. Classification is based on soil properties observed in the field or inferred from those observations or from laboratory measurements. Table 17 shows the classification of the soils in the survey area. The categories are defined in the following paragraphs.

ORDER. Eleven 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 burnt or 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; type of saturation; and base status. Each great group is identified by the name of a suborder and by a prefix that indicates a property of the soil. An example is Calciustolls (*Calci*, meaning lime, plus *ustoll*, the suborder of the Mollisols that has an ustic moisture regime).

SUBGROUP. Each great group has a typic subgroup. Other subgroups are intergrades or extragrades. The typic subgroup is the central concept of the great group; it is not necessarily the most extensive. Intergrades are transitions to other orders, suborders, or great groups. Extragrades have some properties that are not representative of the great group but do not indicate transitions to any other taxonomic class. Each subgroup is identified by one or more adjectives preceding the name of the great group. The adjective *Typic* identifies the subgroup that typifies the great group. An example is Typic Calciustolls.

FAMILY. Families are established within a subgroup on the basis of physical and chemical properties and other characteristics that affect management. Generally, the properties are those of horizons below plow depth where there is much biological activity. Among the properties and characteristics considered are particle size, mineral content, soil temperature regime, soil depth, and reaction. A family name consists of the name of a subgroup preceded by terms that indicate soil properties. An example is loamy, carbonatic, thermic, shallow Typic Calciustolls.

SERIES. The series consists of soils within a family that have horizons similar in color, texture, structure, reaction, consistence, mineral and chemical composition, and arrangement in the profile.

## Soil Series and Their Morphology

In this section, each soil series recognized in the survey area is described. Characteristics of the soil and the material in which it formed are identified for each series. A pedon, a small three-dimensional area of soil, that is typical of the series in the survey area is described. The detailed description of each soil horizon follows standards in the “Soil Survey Manual” *(20)*. Many of the technical terms used in the descriptions are defined in “Soil Taxonomy” *(18)* and in “Keys to Soil Taxonomy” *(19)*. Unless otherwise indicated, colors in the descriptions are for dry soil. Following the pedon description is the range of important characteristics of the soils in the series.

The map units of each soil series are described in the section “Detailed Soil Map Units.”

### Bastsil Series

The Bastsil series consists of very deep, well drained, gently sloping soils on terraces. They formed in loamy alluvial sediments (fig. 8). Slopes are 1 to 5 percent.

Typical pedon of Bastsil loamy fine sand, 1 to 5 percent slopes; from the intersection of U.S. Highway 190 and U.S. Highway 183 in Lometa, 10.0 miles west on U.S. Highway 190, 0.4 mile south on county road, 0.55 mile south on county road, 0.4 mile southwest on unpaved road, and 300 feet south in a field.

Ap—0 to 7 inches; brown (7.5YR 5/4) loamy fine sand, dark brown (7.5YR 4/4) moist; weak fine granular structure; slightly hard, friable; common fine roots; slightly acid; abrupt smooth boundary.

Bt1—7 to 25 inches; reddish brown (2.5YR 4/4) sandy clay

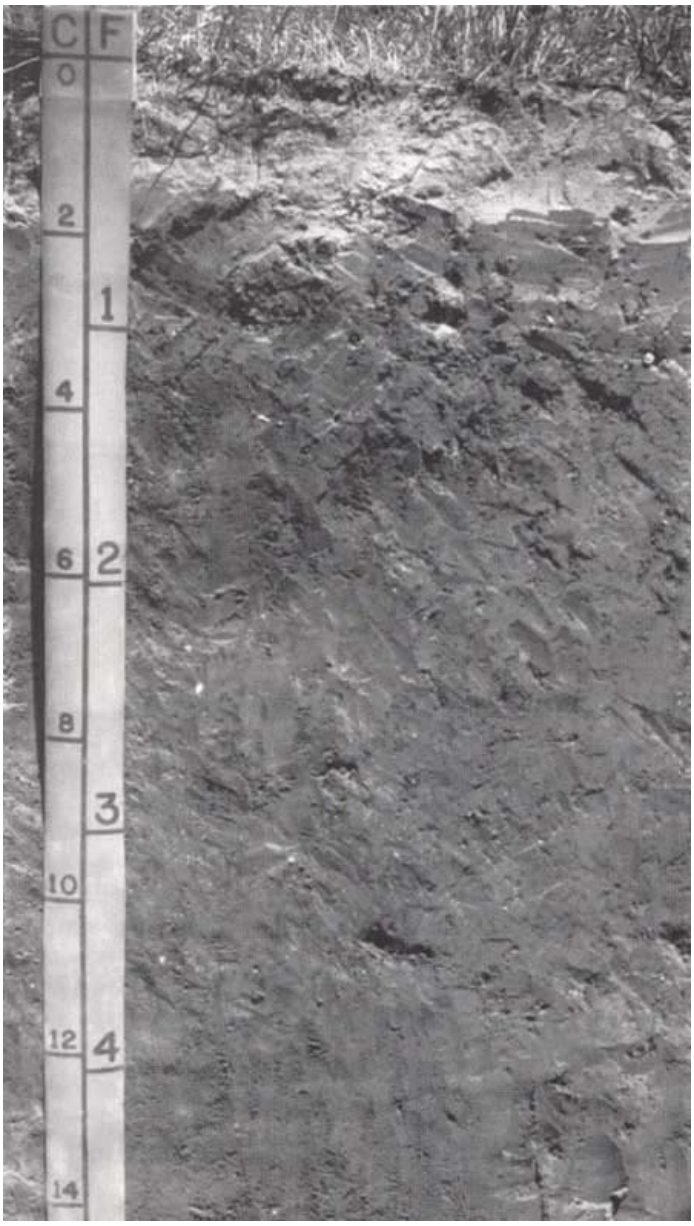



**Figure 8.—In Bastsil loamy fine sand, 1 to 5 percent slopes, the boundary is abrupt between the surface layer and the sandy clay loam subsoil.**

loam, dark reddish brown (2.5YR 3/4) moist; moderate medium prismatic structure parting to moderate fine and medium angular blocky; hard, friable; few fine roots; common fine pores; few thin clay films on faces of peds; few siliceous pebbles; neutral; gradual smooth boundary.

Bt2—25 to 43 inches; red (2.5YR 5/6) sandy clay loam, red (2.5YR 4/6) moist; moderate medium prismatic structure parting to moderate fine angular blocky; hard, friable; few fine roots; few fine pores; common patchy clay films on ped faces; few siliceous pebbles; neutral; gradual smooth boundary.

Bt3—43 to 68 inches; yellowish red (5YR 5/8) sandy clay loam, yellowish red (5YR 5/8) moist; moderate medium prismatic structure parting to moderate fine subangular blocky; hard, friable; few fine roots; common fine pores; few thin clay films on faces of peds; some prism surfaces have uncoated sand grains; few siliceous pebbles; slightly alkaline; gradual smooth boundary.

BCt—68 to 77 inches; yellowish red (5YR 5/8) fine sandy loam, yellowish red (5YR 4/8) moist; weak fine subangular blocky structure; slightly hard, friable; many medium pores; few streaks of uncoated sand grains; few patchy clay films on ped faces; few siliceous pebbles; slightly alkaline; abrupt smooth boundary.

C—77 to 80 inches; brownish yellow (10YR 6/6) stratified layers of sand and gravel, yellowish brown (10YR 5/6) moist; single grained; calcareous; moderately alkaline.

Thickness of the solum ranges from 60 to more than 80 inches. The clay content of the control section ranges from 22 to 30 percent. The content of siliceous pebbles ranges from none to few throughout the soil. Beds of siliceous gravel and sand are in some pedons at a depth of 5 to 12 feet.

The A horizon is reddish brown (5YR 5/3, 5/4), dark brown (7.5YR 4/2), brown (7.5YR 5/4, 10YR 5/3), reddish yellow (7.5YR 6/6), grayish brown (10YR 5/2), or light brownish gray (10YR 6/2). The reaction is slightly acid or neutral.

The Bt horizons are reddish brown (2.5YR 4/4, 5YR 5/4), red (2.5YR 5/6), yellowish red (5YR 5/6), or brown (7.5YR 5/4). The texture is loam or sandy clay loam. The reaction is slightly acid or neutral.

The 2C, or C horizon in some pedons, is yellowish red (5YR 5/6), reddish yellow (5YR 6/6), reddish brown (5YR 5/4), light reddish brown (5YR 6/4), brown (7.5YR 5/4), yellowish brown (10YR 5/6), or brownish yellow (10YR 6/6). The texture is clay loam, sandy clay loam, loam, sandy loam, or sand. Pebbles make up 2 to about 30 percent by volume of these horizons.

## Boerne Series

The Boerne series consists of very deep, well drained, nearly level to very gently sloping soils on bottom lands. They formed in loamy alluvial sediments. Slopes are from 0 to 3 percent.

A typical pedon of Boerne loam, rarely flooded; from Rumley, 0.2 mile west on Farm Road 580, 0.3 mile south on field road, and 10 feet west in cropland.

Ap—0 to 6 inches; grayish brown (10YR 5/2) loam, dark grayish brown (10YR 4/2) moist; weak medium subangular blocky structure; hard, friable; common fine and medium roots; common fine and medium pores; few earthworm casts; few fine concretions of calcium carbonate; calcareous; moderately alkaline; abrupt smooth boundary.

A—6 to 14 inches; light brownish gray (10YR 6/2) loam, grayish brown (10YR 5/2) moist; weak fine subangular blocky structure; hard, friable; common fine roots; common fine and medium pores; common earthworm casts; few films and threads of calcium carbonate; calcareous; moderately alkaline; gradual smooth boundary.

Bk—14 to 60 inches; pale brown (10YR 6/3) loam, brown (10YR 5/3) moist; weak fine subangular blocky structure; slightly hard, friable; few fine roots; common fine pores; many films and threads of calcium carbonate; calcareous; moderately alkaline; gradual smooth boundary.

Ck—60 to 80 inches; very pale brown (10YR 7/4) loam, light yellowish brown (10YR 6/4) moist; massive; hard, friable; many films and threads of calcium carbonate; few thin strata that are more sandy; calcareous; moderately alkaline.

Thickness of the solum ranges from 60 to more than 80 inches. The calcium carbonate equivalent ranges from 50 to 70 percent in the 10- to 40-inch control section. The A and Bk horizons are fine sandy loam or loam with 9 to 18 percent silicate clay.

The A horizon is grayish brown (10YR 5/2), yellowish brown (10YR 5/4), or light brownish gray (10YR 6/2).

The Bk horizon is brown (10YR 5/3), pale brown (10YR 6/3), or light yellowish brown (10YR 6/4).

The Ck horizon, when present, is light yellowish brown (10YR 6/4) or very pale brown (10YR 7/4). The texture is loamy sand, fine sandy loam, or loam. Waterworn pebbles make up 0 to 5 percent of the volume of this horizon.

## Bolar Series

The Bolar series consists of moderately deep, well drained, gently sloping soils on uplands. They formed in interbedded limestone and marl. Slopes are 1 to 5 percent.

A typical pedon of Bolar clay loam, 1 to 3 percent slopes; from the intersection of U.S. Highway 183 and Farm Road 2942 in Lometa, 4.3 miles north on Farm Road 2942, and 600 feet west in rangeland.

A—0 to 11 inches; dark grayish brown (10YR 4/2) clay loam, very dark grayish brown (10YR 3/2) moist; moderate fine subangular blocky and granular structure; hard, firm; many fine and medium roots; common fine and medium pores; few fine calcium carbonate concretions; calcareous; moderately alkaline; clear smooth boundary.

Bk1—11 to 23 inches; brown (10YR 5/3) clay loam, dark brown (10YR 4/3) moist; moderate fine subangular blocky and granular structure; hard, firm; few fine roots; common fine calcium carbonate concretions; few gravel size limestone fragments; calcareous; moderately alkaline; gradual smooth boundary.

Bk2—23 to 30 inches; brown (10YR 5/3) clay loam, dark brown (10YR 4/3) moist; moderate fine subangular blocky structure; hard, firm; few fine roots; common fine and medium soft masses and concretions of calcium carbonate; few gravel size limestone fragments; calcareous; moderately alkaline; abrupt wavy boundary.

R—30 to 34 inches; hard, platy limestone.

The solum thickness ranges from 20 to 40 inches. The calcium carbonate equivalent ranges from 40 to 60 percent. The texture of the solum ranges from clay loam to silty clay loam. The silicate clay content of the control section ranges from 27 to 35 percent.

The A horizon is very dark grayish brown (10YR 3/2) or dark grayish brown (10YR 4/2). The gravel content ranges from 0 to 5 percent by volume.

The Bk horizon is brown (7.5YR 5/4, 10YR 5/3), dark yellowish brown (10YR 4/4), yellowish brown (10YR 5/4), pale brown (10YR 6/3), or light yellowish brown (10YR 6/4). The gravel content ranges from 0 to 8 percent by volume.

The R horizon is indurated limestone interbedded with soft limestone and marl.

## Brackett Series

The Brackett series consists of very deep, well drained, gently sloping to steep soils on uplands. They formed in interbedded chalky limestone and marl. Slopes are 1 to 30 percent.

A typical pedon of Brackett gravelly clay loam, 3 to 8 percent slopes; from the junction of U.S. Highway 281 and Farm Road 580 in Lampasas, 8.6 miles west on Farm Road 580, 1.4 miles north on county road, 0.6 mile east on dirt road in rangeland, and 450 feet north of farm pond.

A—0 to 9 inches; light brownish gray (10YR 6/2) gravelly clay loam, grayish brown (10YR 5/2) moist; moderate fine granular structure; slightly hard, friable, slightly sticky; common fine and medium roots; 20 percent by volume small, rounded, weakly cemented limestone fragments; calcareous; moderately alkaline; clear smooth boundary.

Bk—9 to 17 inches; pale brown (10YR 6/3) clay loam, brown (10YR 5/3) moist; moderate fine subangular blocky and granular structure; hard, friable, slightly

sticky; few fine roots; common fine pores; few soft masses of calcium carbonate; 5 percent, by volume, gravel size limestone fragments; calcareous; moderately alkaline; clear smooth boundary.

C—17 to 60 inches; white (10YR 8/2) loam, light gray (10YR 7/2) moist; massive; estimated 60 percent, by volume, masses of calcium carbonate; interbedded weakly cemented chalky limestone and marly, loamy earth.

Thickness of the solum ranges from 14 to 30 inches. The content of coarse fragments ranges from few to 25 percent gravel and cobble size limestone fragments. The calcium carbonate equivalent of the soil ranges from 60 to 75 percent. The silicate clay content ranges from 18 to 30 percent.

The A horizon is grayish brown (10YR 5/2, 2.5YR 5/2), light brownish gray (10YR 6/2), pale brown (10YR 6/3), or light gray (10YR 7/2). It is clay loam or gravelly clay loam with clay content ranging from 27 to 32 percent.

The Bk horizon is yellowish brown (10YR 5/4), pale brown (10YR 6/3), light yellowish brown (10YR 6/4), light gray (10YR 7/2), or very pale brown (10YR 7/3, 7/4).

The C horizon is light gray (10YR 7/2), very pale brown (10YR 7/3, 7/4), white (10YR 8/2), light brownish gray (2.5Y 6/2), or pale yellow (2.5Y 7/4, 8/4).

## Callahan Series

The Callahan series consists of moderately deep, well drained, gently sloping and moderately sloping soils on uplands. They formed in weakly consolidated shale and sandstone. Slopes are 3 to 8 percent.

A typical pedon of Callahan loam, 3 to 8 percent slopes, eroded; from the intersection of U.S. Highway 183 and U.S. Highway 190 in Lometa, 9.9 miles west on U.S. Highway 190, 2.1 miles north on gravel county road, and 270 feet southeast in rangeland.

A—0 to 4 inches; brown (7.5YR 5/4) loam, dark brown (7.5YR 4/4) moist; massive; hard, firm; common fine roots; common fine and medium pores; 10 percent sandstone and quartz fragments on surface, from 1/2 to 2 inches across long axis; surface has 1/4 inch crust; moderately alkaline; clear smooth boundary.

Bt—4 to 22 inches; reddish brown (5YR 5/4) clay, reddish brown (5YR 4/4) moist; moderate fine angular blocky structure; very hard, very firm; few fine roots; few fine pores; few patchy clay films; moderately alkaline; clear smooth boundary.

Btk—22 to 32 inches; reddish brown (5YR 4/4) clay, dark reddish brown (5YR 3/4,) moist; moderate fine angular blocky structure; very hard, very firm; few fine roots; few fine pores; few weakly and strongly cemented concretions of calcium carbonates; calcareous; moderately alkaline; gradual wavy boundary.

Btk/C—32 to 38 inches; brown (7.5YR 5/4) clay, dark brown 7.5YR 4/4) moist; weak fine angular blocky structure; very hard, very firm; few fine roots; few soft masses and concretions of calcium carbonate; 10 percent, by volume, partially weathered fragments of shale; calcareous; moderately alkaline; clear smooth boundary.

Crk—38 to 60 inches; light olive brown (2.5Y 5/4) weakly consolidated shale of clay texture, olive brown (2.5Y 4/4) moist; few fine faint reddish brown mottles; massive; few concretions and soft masses of calcium carbonate; few partially weathered fragments of shale; calcareous; moderately alkaline.

Solum thickness ranges from 24 to 40 inches. Calcium carbonate in the form of films, threads, soft masses, and concretions is at depths ranging from 18 to 28 inches below the surface. The average clay content ranges from 35 to 50 percent.

The A horizon is reddish brown (5YR 5/4) or brown (7.5YR 5/4). The thickness of the horizon ranges from 1 to 5 inches. Pedons with thicknesses of less than 4 inches are assumed to be eroded.

The Bt horizon is reddish brown (5YR 4/3, 4/4, 5/4). It is clay or clay loam.

The Btk/C horizon is yellowish red (5YR 4/6, 5/6) or brown (7.5YR 5/4).

The Crk horizon is light olive brown (2.5Y 5/4), light yellowish brown (2.5Y 6/4) or olive (5Y 5/3). It is shale, or in some pedons, thinly interbedded shale and sandstone.

## Cho Series

The Cho series consists of soils that are very shallow and shallow to a petrocalcic horizon. They are well drained, very gently sloping soils on uplands. They formed in loamy, calcareous materials. Slopes are 1 to 3 percent.

A typical pedon of Cho gravelly loam, 1 to 3 percent slopes; from the intersection of U.S. Highway 281 and Farm Road 580, 19.8 miles west on Farm Road 580, 5.2 miles north on Farm Road 581, 0.7 mile west on pasture road, and 165 feet south in rangeland.

A—0 to 9 inches; dark brown (10YR 4/3) gravelly loam, dark brown (10YR 3/3) moist; weak fine granular and weak medium subangular blocky structure; hard, friable; many fine and medium roots; common fine pores; estimated 15 percent, by volume, fragments of caliche from 1 to 3 inches across and 2 to 3 inches thick; about 10 to 20 percent of surface is covered with gravel size caliche fragments; calcareous; moderately alkaline; abrupt wavy boundary.

Bkm—9 to 13 inches; pink (7.5YR 8/4) indurated caliche; massive; platy; clear wavy boundary.

Ck—13 to 60 inches; pink (7.5YR 8/4) limy earth of loam texture; massive; hard, friable; about 20 percent, by volume, concretions and fragments of caliche; calcareous; moderately alkaline.

Thickness of the solum ranges from 8 to 16 inches. The calcium carbonate equivalent ranges from 40 to 60 percent. The silicate clay content ranges from 20 to 35 percent.

The A horizon is dark brown (10YR 4/3), grayish brown (10YR 5/2), or brown (10YR 5/3). It is loam or clay loam with a range in clay content from 20 to 35 percent. Platy fragments of caliche make up 15 to 20 percent of this horizon.

The Bkm horizon is indurated caliche from 3 to 6 inches thick.

The Ck horizon is pink (7.5YR 8/4), very pale brown (10YR 7/3, 7/4, 8/3, 8/4), or white (10YR 8/2). It is loam or clay loam.

## Demona Series

The Demona series consists of very deep, moderately well drained, nearly level to very gently sloping soils on uplands. They formed in sandy and clayey materials. Slopes are 0 to 3 percent.

A typical pedon of Demona fine sand, 0 to 3 percent slopes; from the intersection of U.S. Highway 183 and U.S. Highway 190 at Lometa, 9.7 miles west of Lometa on U.S. Highway 190, 0.8 mile south on private road, 0.55 mile west along trail, and 145 feet north in rangeland.

A—0 to 6 inches; light yellowish brown (10YR 6/4) fine sand, yellowish brown (10YR 5/4) moist; single grained; loose, very friable; common fine and medium roots; slightly acid; abrupt irregular boundary.

E—6 to 34 inches; pink (7.5YR 8/4) fine sand, pink (7.5YR 7/4) moist; few grayish and yellowish mottles in lower part of horizon; single grained; loose, very friable; few fine and medium roots; slightly acid; abrupt wavy boundary.

Bt1—34 to 49 inches; light brownish gray (10YR 6/2) sandy clay, grayish brown (10YR 5/2) moist; common coarse distinct brownish yellow (10YR 6/6) mottles and common medium prominent red (2.5YR 4/8) mottles; dark staining of very dark grayish brown (10YR 3/2) on ped faces; strong coarse prismatic structure parting to moderate coarse angular blocky; extremely hard, very firm; few fine roots; few fine pores; distinct clay films on vertical surface of peds; slightly acid; gradual wavy boundary.

BCt1—49 to 77 inches; reddish yellow (7.5YR 6/6) sandy clay loam, strong brown (7.5YR 5/6) moist; common coarse prominent red (2.5YR 4/6) and gray (5Y 5/1) mottles in vertical streaks and common coarse faint yellowish brown (10YR 5/6) mottles; dark staining of very dark grayish brown (10YR 3/2) on ped faces; strong coarse prismatic structure parting to moderate medium angular blocky; extremely hard, very firm; few fine roots; distinct clay films on vertical surfaces of peds; moderately acid; gradual wavy boundary.

BCt2—77 to 87 inches; coarsely mottled light brownish gray (2.5Y 6/2), reddish yellow (7.5YR 6/6), light yellowish brown (10YR 6/4), and red (2.5YR 4/8) sandy clay loam; gray vertical streaks more clayey than red streaks; moderate medium subangular blocky structure; extremely hard, very firm; slightly acid.

Thickness of the solum ranges from 60 to more than 80 inches. The reaction of the solum ranges from strongly acid to slightly alkaline.

The A and E horizons are light brown (7.5YR 6/4), pink (7.5YR 7/4, 8/4), brown (10YR 5/3), pale brown (10YR 6/3), light yellowish brown (10YR 6/4) or very pale brown (10YR 7/3, 7/4). The texture is fine sand or loamy fine sand. The reaction is moderately acid or slightly acid.

The Bt horizons are yellowish brown (10YR 5/6), brownish yellow (10YR 6/6), light brownish gray (10YR 6/2), light gray (10YR 7/2), and very pale brown (10YR 7/4) and are mottled in shades of red, gray, or yellow. The reaction is moderately acid or slightly acid. The texture is sandy clay or clay.

## Doss Series

The Doss series consists of shallow, well drained, gently sloping soils on uplands. They formed in interbedded soft limestone and marl. Slopes are 1 to 5 percent.

A typical pedon of Doss silty clay, 1 to 5 percent slopes; from the intersection of U.S. Highway 281 and Farm Road 580 in Lampasas, 3.0 miles west on Farm Road 580, 2.0 miles southwest on Farm Road 1494, 1.6 miles west on county gravel road, 0.7 mile northwest on pasture road, 60 feet east in field.

Ap—0 to 8 inches; dark grayish brown (10YR 4/2) silty clay, very dark grayish brown (10YR 3/2) moist; moderate fine and medium subangular blocky structure; very hard, firm, sticky and plastic; many fine and medium roots; common fine pores; common fine and very fine, weakly cemented concretions of calcium carbonate; few angular limestone fragments less than 3 inches in diameter; calcareous; moderately alkaline; abrupt smooth boundary.

Bk—8 to 18 inches; brown (10YR 5/3) silty clay, dark brown (10YR 4/3) moist; moderate fine and medium subangular blocky structure; very hard, firm, sticky

and plastic; common fine and medium roots; common fine pores; few soft masses of calcium carbonate; common fine and very fine weakly cemented concretions of calcium carbonate; calcareous; moderately alkaline; clear smooth boundary.

Crk—18 to 60 inches; very pale brown (10YR 7/3) weakly cemented, platy limestone interbedded with marl of silty clay texture, pale brown (10YR 6/3) moist; weakly cemented in the upper 2 inches becoming softer with depth; calcareous; moderately alkaline.

Thickness of the solum ranges from 13 to 20 inches. The calcium carbonate equivalent of the soil ranges from 50 to 70 percent. The silicate clay content of the soil ranges from 20 to 35 percent.

The A horizon is dark brown (7.5YR 4/2, 10YR 4/3) or dark grayish brown (10YR 4/2). It is clay or silty clay.

The Bk horizon is dark brown (7.5YR 4/4), brown (10YR 5/3), yellowish brown (10YR 5/4), pale brown (10YR 6/3), or light yellowish brown (10YR 6/4).

The Crk layer is brownish to yellowish, weakly cemented limestone interbedded with marl and limy earth of clayey and loamy textures.

## Eckrant Series

The Eckrant series consists of very shallow and shallow, well drained, undulating to steep soils on uplands. They formed in indurated weathered limestone. Slopes are 1 to 40 percent.

A typical pedon of Eckrant very cobbly clay in an area of Eckrant-Rock outcrop complex, 1 to 8 percent slopes, very stony; from the intersection of U.S. Highway 281 and Farm Road 580 in Lampasas, 10.6 miles west on Farm Road 580, 1.5 miles north on county road, 0.6 mile west on pasture road, 0.1 mile south to top of ridge in rangeland.

Al—0 to 5 inches; very dark gray (10YR 3/1) very cobbly clay, black (10YR 2/1) moist; moderate medium subangular blocky structure; very hard, firm, sticky; common fine and medium roots; about 10 percent, by volume, angular limestone pebbles and about 30 percent angular limestone cobbles; up to 15 percent of the surface is covered with limestone cobbles and stones; moderately alkaline; clear irregular boundary.

A2—5 to 8 inches; very dark gray (10YR 3/1) very cobbly clay, black (10YR 2/1) moist; moderate medium subangular blocky structure; very hard, firm, sticky; common fine and medium roots; about 60 percent, by volume, angular limestone pebbles and cobbles; moderately alkaline; abrupt wavy boundary.

R—8 to 11 inches; fractured, indurated limestone bedrock.

Thickness of the solum ranges from 5 to 20 inches. The fine-earth fraction is clay, silty clay, or clay loam with 35 to 60 percent clay. Coarse fragments, mostly of cobble size, make up 35 to 70 percent of the solum.

The A1 horizon is dark brown (7.5YR 3/2), very dark brown (10YR 2/2), very dark gray (10YR 3/1), very dark grayish brown (10YR 3/2), or dark grayish brown (10YR 4/2).

The A2 horizon, when present, is very dark gray (10YR 3/1), very dark grayish brown (10YR 3/2), or dark grayish brown (10YR 4/2). The reaction ranges from neutral to moderately alkaline.

The R layer is indurated limestone bedrock.

## Eufaula Series

The Eufaula series consists of very deep, somewhat excessively drained, gently sloping soils on terraces. They formed in sandy alluvial sediments. Slopes are 1 to 5 percent.

A typical pedon of Eufaula fine sand, 1 to 5 percent slopes; from the intersection of U.S. Highway 281 and Farm Road 580 in Lampasas, 20.9 miles west of Lampasas on Farm Road 580, west and north 0.8 mile on county road, and east 200 feet in field.

Ap—0 to 9 inches; very pale brown (10YR 7/4) fine sand, light yellowish brown (10YR 6/4) moist; single grained; loose, very friable; common fine and medium roots; slightly acid; abrupt smooth boundary.

A—9 to 18 inches; very pale brown (10YR 7/4) fine sand, light yellowish brown (10YR 6/4) moist; single grained; loose, very friable; few fine roots; slightly acid; clear smooth boundary.

E—18 to 35 inches; pink (5YR 7/4) fine sand, light reddish brown (5YR 6/4) moist; single grained; loose, very friable; slightly acid; clear wavy boundary.

E&Bt—35 to 84 inches; very pale brown (10YR 7/4) fine sand (E part), light yellowish brown (10YR 6/4) moist; single grained; loose, very friable; lamellae (Bt part) of red (2.5YR 5/6) fine sandy loam; massive; slightly hard, firm; lamellae are wavy, 2 to 4 inches thick and 3 to 5 inches apart; slightly acid.

Thickness of the solum ranges from 75 to more than 90 inches. Reaction of the solum is moderately acid to neutral. The average clay content of the soil ranges from 5 to 18 percent.

The A horizon is brown (10YR 5/3), pale brown (10YR 6/3, 7/3, 7/4), or light yellowish brown (10YR 6/4). The texture is fine sand or loamy fine sand.

The E horizon is pink (5YR 7/4, 7.5YR 7/4), or very pale brown (10YR 8/4). The texture is fine sand or loamy fine sand.

The Bt horizon part of the E and Bt layer is red (2.5YR 4/6, 5/6), or yellowish red (5YR 4/6, 5/6). The lamellae average 33 to 40 percent by volume, and the texture

ranges from loamy fine sand to fine sandy loam. The lamellae are continuous horizontally and 1 to 4 inches thick and 2 to 6 inches apart.

## Hensley Series

The Hensley series consists of shallow, well drained, gently sloping to moderately sloping soils on uplands. They formed in weathered limestone. Slopes are 1 to 8 percent.

A typical pedon of Hensley loam, 1 to 8 percent slopes, very stony; from the intersection of U.S. Highway 281 and Farm Road 580 in Lampasas, 3.0 miles west on Farm Road 580, 1.9 miles southwest on Farm Road 1494, 2.2 miles southwest on gravel county road, and 0.4 mile east on trail in rangeland.

A—0 to 5 inches; reddish brown (5YR 4/4) stony loam, dark reddish brown (5YR 3/4) moist; moderate fine granular structure; hard, friable; common fine and medium roots; about 20 percent, by volume, limestone fragments 10 to 24 inches across; about 15 percent of the surface is covered with flat stones; noncalcareous; slightly alkaline; clear smooth boundary.

Bt—5 to 16 inches; red (2.5YR 4/6) clay, dark red (2.5YR 3/6) moist; moderate fine angular blocky structure; very hard, very firm; common fine and medium roots; about 10 percent, by volume, limestone pebbles; noncalcareous; slightly alkaline; abrupt smooth boundary.

R—16 to 20 inches; indurated limestone bedrock; a few narrow vertical fractures at intervals of 12 to 24 inches.

Thickness of the solum ranges from 14 to 20 inches. The reaction ranges from slightly acid to moderately alkaline. The average clay content of the subsoil ranges from 35 to 50 percent.

The A horizon is reddish brown (5YR 4/4), dark brown (7.5YR 4/2), or brown (7.5YR 5/4). The texture is loam, clay loam or their stony counterparts.

The Bt horizon is dark red (2.5YR 3/6) or red (2.5YR 4/6). The texture is clay, with stone size limestone fragments ranging from 0 to 10 percent by volume.

## Krum Series

The Krum series consists of very deep, well drained, gently sloping soils on uplands. They formed in calcareous, clayey sediments. Slopes are 1 to 5 percent.

A typical pedon of Krum silty clay, 1 to 5 percent slopes; from the intersection of U.S. Highway 281 and Farm Road 580 in Lampasas, 14.8 miles northeast on Farm Road 580, 2.9 miles north and east on dirt road, and 150 feet east in field.

Ap—0 to 6 inches; dark grayish brown (10YR 4/2) silty clay, very dark grayish brown (10YR 3/2) moist; moderate fine subangular blocky structure; very hard, firm, sticky and plastic; common fine roots; few limestone fragments less than one inch across; calcareous; moderately alkaline; abrupt smooth boundary.

A1—6 to 22 inches; dark grayish brown (10YR 4/2) silty clay, very dark grayish brown (10YR 3/2) moist; moderate medium angular blocky structure; very hard, firm, sticky and plastic; common fine roots; few fine pores; few fine and medium calcium carbonate concretions; calcareous; moderately alkaline; gradual wavy boundary.

Bk—22 to 41 inches; yellowish brown (10YR 5/4) silty clay, dark yellowish brown (10YR 4/4) moist; moderate medium angular blocky structure; very hard, firm, sticky and plastic; darker soil in cracks from horizon above; 10 percent, by volume, fine and medium calcium carbonate concretions; few fine iron concretions; calcareous; moderately alkaline; gradual wavy boundary.

CBk—41 to 80 inches; pale brown (10YR 6/3) silty clay, brown (10YR 5/3) moist; massive; hard, firm, sticky and plastic; estimated 30 percent, by volume, soft masses and concretions of calcium carbonate; calcareous; moderately alkaline.

The solum ranges in thickness from 40 to more than 80 inches. The calcium carbonate equivalent ranges from 15 to 35 percent. When dry, these soils have cracks from 0.4 inch to 1 inch wide that extend to a depth of about 30 inches. The average clay content of the 10- to 40-inch control section ranges from 40 to 60 percent.

Thickness of the A horizon ranges from 14 to 36 inches. It is dark brown (7.5YR 4/2), very dark grayish brown (10YR 3/2), dark gray (10YR 4/1), or dark grayish brown (10YR 4/2). Texture is clay loam, clay, or silty clay.

The Bk horizon is reddish brown (5YR 5/4), brown (7.5YR 5/4), (10YR 5/3), reddish yellow (7.5YR 6/6), grayish brown (10YR 5/2), yellowish brown (10YR 5/4), light yellowish brown (10YR 6/4), or brownish yellow (10YR 6/6). The texture is clay or silty clay. The content of calcium carbonate ranges from 5 to 15 percent by volume.

The CBk horizon, when present, is light brown (7.5YR 6/4), reddish brown (7.5YR 6/6), pale brown (10YR 6/3), light yellowish brown (10YR 6/4) or brownish yellow (10YR 6/6). The texture is clay, silty clay, or silty clay loam. The content of calcium carbonate ranges from 20 to 35 percent by volume.

The Krum soils described in Lampasas County are a taxadjunct to the Krum series because of the presence of a calcic horizon. This difference does not adversely affect or significantly change use and management of the soils.

## Lampasas Series

The Lampasas series consists of soils that are shallow to fragmental limestone. These are well drained, gently sloping soils on uplands. They formed in fragmental limestone (claystone). Slopes are 1 to 5 percent.

A typical pedon of Lampasas gravelly clay, 1 to 5 percent slopes; from the intersection of U.S. Highway 183 and Farm Road 2942 in Lometa, 4.9 miles north on Farm Road 2942, and 30 feet east in rangeland.

Al—0 to 5 inches; dark reddish brown (5YR 3/2) gravelly clay, dark reddish brown (5YR 2/2) moist; moderate fine subangular blocky structure; hard, firm, sticky and plastic; many fine roots; common fine pores; about 20 percent, by volume, limestone fragments less than 3 inches across; slightly alkaline; clear smooth boundary.

A2—5 to 13 inches; dark reddish brown (5YR 3/2) very gravelly clay, dark reddish brown (5YR 2/2) moist; moderate very fine subangular blocky structure; hard, firm, sticky and plastic; common fine and medium roots; common fine pores; about 50 percent, by volume, limestone fragments less than 3 inches across; 10 percent limestone fragments from 3 to 5 inches across; slightly alkaline; abrupt wavy boundary.

C—13 to 60 inches; bed of interlocking very pale brown fragmental limestone; fractured at about 1- to 4-inch intervals with thin coatings of secondary carbonates along some fractures; few roots along fractures only.

Thickness of the solum ranges from 9 to 20 inches. The fine-earth fraction is clay loam, silty clay loam, or clay with a clay content of 35 to 45 percent. Reaction is neutral to slightly alkaline in the fine-earth fraction and is calcareous in some pedons.

The A horizon is dark reddish brown (5YR 3/2, 3/3), dark reddish gray (5YR 4/2), reddish brown (5YR 4/3), dark brown (7.5YR 3/2, 4/2 and 10YR 3/3, 4/3), very dark brown (10YR 2/2), very dark grayish brown (10YR 3/2), and dark grayish brown (10YR 4/2). Coarse fragments make up 25 to 80 percent of the solum and consist of limestone fragments mainly less than 3 inches across. Some pedons contain from 5 to 15 percent limestone fragments from 3 to 10 inches across. Individual horizons are gravelly, very gravelly, or extremely gravelly counterparts of the fine-earth fraction; and the amount of fragments increases with depth.

The C horizon is a bed of interlocking fragmental limestone or claystone with fractures at various angles. Size of fragments are typically 2 to 4 inches but range from 1/2 inch to 6 inches across.

## Leeray Series

The Leeray series consists of very deep, well drained, very gently sloping soils on uplands or valley fill positions. They formed in calcareous clays. Slopes are 1 to 3 percent.

A typical pedon in an area of Leeray clay, 1 to 3 percent slopes; from the intersection of U.S. Highway 183 and U.S. Highway 190 in Lometa, 4.8 miles northwest on U.S. Highway 190, 2.4 miles north on county road, 1.6 miles west on county road, and 660 feet south in rangeland.

A1—0 to 8 inches; dark grayish brown (10YR 4/2) clay, very dark grayish brown (10YR 3/2) 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.

A2—8 to 20 inches; very dark grayish brown (10YR 3/2) clay, very dark grayish brown (10YR 2/2) 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.

Bss1—20 to 50 inches; dark grayish brown (10YR 4/2) clay, very dark grayish brown (10YR 3/2) moist; moderate medium angular blocky structure; extremely hard, very firm; few fine roots; prominent grooved slickensides that intersect; few fine concretions of calcium carbonate; few siliceous pebbles; calcareous; moderately alkaline; gradual wavy boundary.

Bss2—50 to 60 inches; grayish brown (2.5Y 5/2) clay, dark grayish brown (2.5Y 4/2) moist; moderate medium angular blocky structure; extremely hard, very firm; few fine roots; common grooved slickensides; few films, threads, and concretions of calcium carbonate; few siliceous pebbles; calcareous; moderately alkaline; gradual wavy boundary.

BCk—60 to 80 inches; light olive brown (2.5Y 5/4) clay, olive brown (2.5Y 4/4) moist; few fine faint olive yellow mottles; weak fine subangular blocky structure; very hard, firm; few black concretions; common films, threads, and weakly cemented concretions of calcium carbonate; moderately alkaline.

When dry, these soils have cracks up to 1 inch wide that extend from the surface to depths 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 dark grayish brown (10YR 4/2), dark brown (10YR 4/3, 3/3 and 7.5YR 4/2), brown (10YR 4/3), very dark grayish brown (10YR 3/2), grayish brown (10YR 5/2), dark gray (10YR 4/1), or very dark gray (10YR 3/1). In less than one-half of the pedons, microdepressions may have chromas less than 1.5.

The Bss horizon is dark grayish brown (10YR 4/2), brown (10YR 4/3, 10YR 5/3), dark yellowish brown (10YR 4/4), grayish brown (10YR 5/2, 2.5Y 5/2), or light olive brown (2.5Y 5/4). Concretions, soft masses, and threads of calcium carbonate range from few to common.

The BCk horizon is pale brown (10YR 6/3), light yellowish brown (10YR 6/4), very pale brown (10YR 7/4), or light olive brown (2.5Y 5/4). Some pedons are underlain by shale or limestone.

## Lometa Series

The Lometa series consists of moderately deep, well drained, gently sloping to strongly sloping soils on uplands. They formed in a conglomerate of round siliceous pebbles cemented with sand (fig. 9). Slopes are 3 to 12 percent.

A typical pedon of Lometa very gravelly sandy loam, 3 to 12 percent slopes; from the intersection of U.S. Highway 190 and Farm Road 581 in Lometa, west and southwest 4.2 miles on Farm Road 581, 1.4 miles southeast on pasture road, and 30 feet south in rangeland.

A1—0 to 4 inches; pink (7.5YR 7/4) very gravelly sandy loam, brown (7.5YR 5/4) moist; weak fine granular structure; extremely hard, friable; many fine and medium roots; estimated 60 percent, by volume, round siliceous pebbles less than 3 inches across; slightly acid; gradual smooth boundary.

A2—4 to 13 inches; pink (7.5YR 7/4) extremely gravelly sandy loam, brown (7.5YR 5/4) moist; weak fine granular structure; extremely hard, friable; common fine and medium roots; estimated 80 percent, by volume, round siliceous pebbles less than 1 inch across; estimated 10 percent waterworn siliceous cobbles: slightly acid; abrupt smooth boundary.

Bt1—13 to 24 inches; red (2.5YR 4/6) very gravelly clay, dark red (2.5YR 3/6) moist; moderate medium angular blocky structure; very hard, firm, sticky and plastic; few fine roots; few clay films on faces of peds and on pebbles; estimated 50 percent, by volume, round siliceous pebbles less than 2 inches across; slightly acid; gradual smooth boundary.

Bt2—24 to 38 inches; red (2.5YR 4/6) gravelly clay, dark red (2.5YR 3/6) moist; moderate medium angular blocky structure; very hard, very firm; sticky and plastic; few clay films on faces of peds and rock fragments; estimated 25 percent, by volume, round siliceous pebbles less than 2 inches across; moderately acid; abrupt wavy boundary.

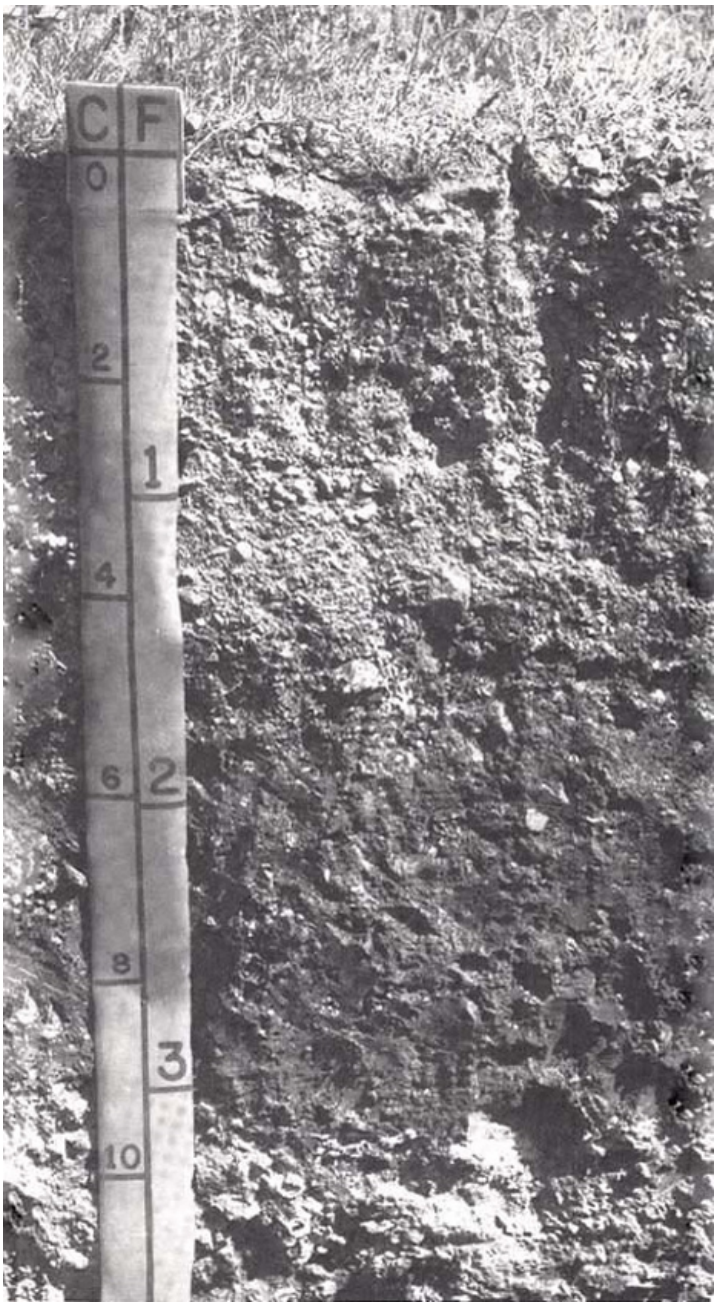



**Figure 9.—Lometa very gravelly sandy loam, 3 to 12 percent slopes. Lometa soils have siliceous pebbles throughout the profile.**

R—38 to 70 inches; strongly cemented conglomerate of round siliceous pebbles, cobbles, and sand cemented with silica; slightly effervescent.

Solum thickness ranges from 20 to 40 inches. Contents

of coarse fragments of gravel size range from 25 to 80 percent by volume. Contents of cobble size coarse fragments range from 0 to 10 percent. Depth to secondary carbonates is greater than 30 inches.

The A horizon is light reddish brown (5YR 6/4), brown (7.5YR 5/2), or pinkish gray (7.5YR 7/2). It is neutral or slightly acid. Texture is gravelly sandy loam, very gravelly sandy loam, or extremely gravelly sandy loam.

The Bt horizon is reddish brown (2.5YR 4/4), dark reddish brown (2.5YR 3/4), or red (2.5YR 4/6, 5/6, 5/8). The soil reaction ranges from neutral to moderately acid. It is gravelly clay, very gravelly clay, or extremely gravelly clay. The fine-earth fraction ranges from 35 to 60 percent clay. Base saturation ranges from 75 to 100 percent.

A Bk horizon occurs in some pedons. When present, it is less than 10 inches thick and is reddish brown (5YR 5/4), reddish yellow (5YR 7/8, 6/6), or yellowish red (5YR 5/6). The soil reaction ranges from slightly acid to moderately alkaline. It ranges from gravelly clay or extremely gravelly clay to gravelly sandy loam.

## Luckenbach Series

The Luckenbach series consists of very deep, well drained, very gently sloping soils on terraces and along narrow valleys. They formed in loamy and clayey alluvium (fig. 10). Slopes are 1 to 3 percent.

A typical pedon of Luckenbach clay loam, 1 to 3 percent slopes; from the intersection of U.S. Highway 183 and U.S. Highway 190 in Lometa, 5.3 mile west on U.S. Highway 190, 2.3 miles north on paved county road, 0.7 mile west on gravel road, and 300 yards south in rangeland.

A—0 to 12 inches; dark grayish brown (10YR 4/2) clay loam, very dark grayish brown (10YR 3/2) moist; moderate fine subangular blocky structure; hard, firm; common fine and medium roots; slightly alkaline; clear smooth boundary.

Bt—l2 to 19 inches; reddish brown (5YR 5/4) clay, reddish brown (5YR 4/4) moist; moderate fine angular blocky and subangular blocky structure; hard, firm; few fine roots; few patchy clay films; slightly alkaline; gradual smooth boundary.

Btk—19 to 36 inches; reddish brown (5YR 5/3) clay, reddish brown (5YR 4/3) moist; moderate fine subangular blocky and angular blocky structure; hard, firm; few fine roots; few soft masses and concretions of calcium carbonate; calcareous; moderately alkaline; clear smooth boundary.

Bk1—36 to 42 inches; brown (7.5YR 5/4) clay loam, dark brown (7.5YR 4/4) moist; weak fine subangular blocky structure; hard, friable; contains about 15 percent, by volume, soft masses and concretions of calcium carbonate; moderately alkaline; clear smooth boundary.

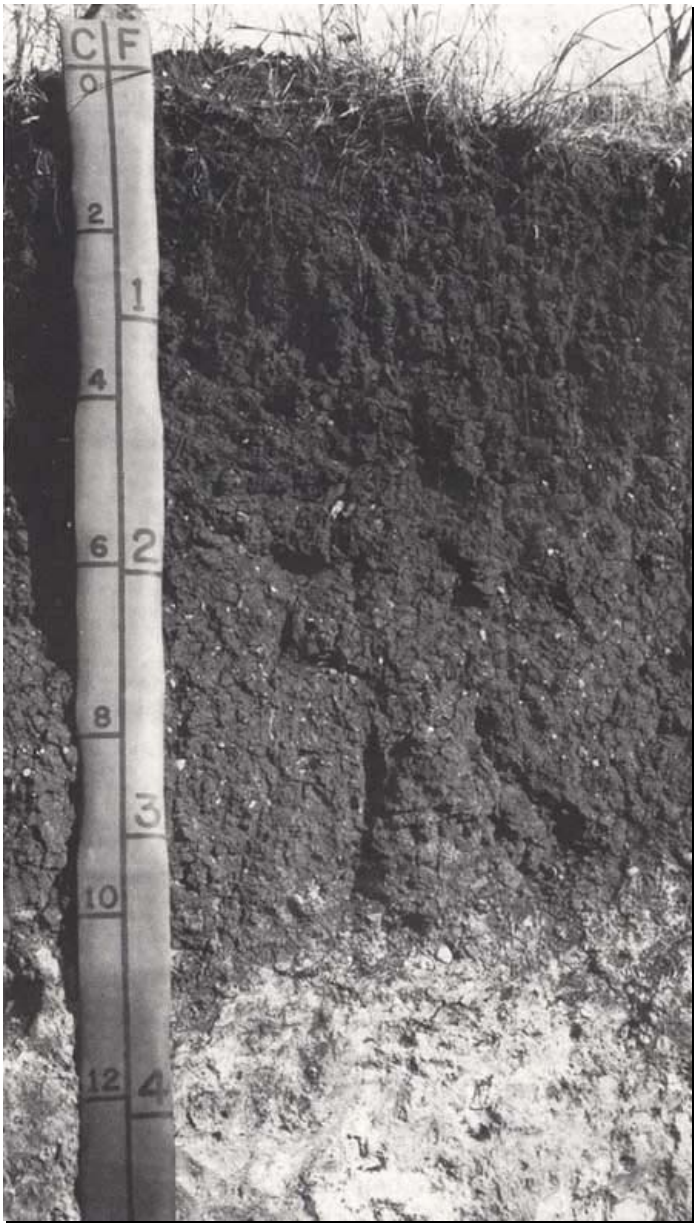



**Figure 10.—Profile of Luckenbach clay loam, 1 to 3 percent slopes, with common soft masses and concretions of calcium carbonate beginning at a depth of about 36 inches.**

Bk2—42 to 80 inches; pink (7.5YR 7/4) clay loam, light brown (7.5YR 6/4) moist; weak fine subangular blocky structure; contains about 15 percent, by volume, soft masses of calcium carbonate; contains about 10 percent, by volume, gravel size limestone fragments; moderately alkaline.

The solum ranges in thickness from 60 to 80 inches. The reaction of the soil ranges from slightly acid to

moderately alkaline. Secondary carbonates are within a depth of 18 to 28 inches. The average clay content of the control section ranges from 35 to 55 percent.

The A horizon is dark brown (7.5YR 3/2, 4/2 and 10YR 3/3), very dark grayish brown (10YR 3/2), or dark grayish brown (10YR 4/2). Chert pebbles make up 0 to 5 percent by volume.

The Bt horizon is reddish brown (5YR 5/4, 5/3), dark brown (7.5YR 4/4), brown (7.5YR 5/4), grayish brown (10YR 5/2), dark yellowish brown (10YR 4/4), or yellowish brown (10YR 5/4). It is clay or clay loam. Concretions and soft masses of calcium carbonate make up 5 to 10 percent by volume. Chert pebbles make up 0 to 10 percent. The reaction is slightly alkaline or moderately alkaline.

The Bk horizons are shades of brown or pink clay loam or clay. Fragments of limestone and chert make up 5 to 20 percent by volume of most pedons. Concretions and soft masses of calcium carbonate range from 5 to 25 percent.

## Mereta Series

The Mereta series consists of soils that are shallow to a petrocalcic horizon. They are well drained, very gently sloping soils on terraces. They formed in loamy outwash material. Slopes are 1 to 3 percent.

A typical pedon of Mereta clay loam, 1 to 3 percent slopes; from the intersection of U.S. Highway 183 and U.S. Highway 190 in Lometa, 4.2 miles west on U.S. Highway 190, 0.4 mile north along fence, and 345 feet east in rangeland.

Al—0 to 9 inches; dark grayish brown (10YR 4/2) clay loam, very dark grayish brown (10YR 3/2) moist; moderate very fine subangular blocky structure; hard, friable; many fine roots; few fine and medium pores; few fine caliche fragments; calcareous; moderately alkaline; abrupt smooth boundary.

A2—9 to 18 inches; dark brown (10YR 4/3) clay loam, dark brown (10YR 3/3) moist; moderate fine subangular blocky structure; hard, firm; common fine roots; few fine and medium pores; common films and threads of calcium carbonate; few caliche fragments 1/4 to 1/2 inch across; calcareous; moderately alkaline; abrupt wavy boundary.

Bkm—18 to 22 inches; pink (7.5YR 8/4) caliche; strongly cemented and platy; clear wavy boundary.

Ck1—22 to 33 inches; reddish yellow (7.5YR 7/6) limy earth of clay loam texture, reddish yellow (7.5YR 6/6) moist; massive; soft, friable; contains 40 percent or more by volume of calcium carbonate in the form of fine caliche fragments, concretions, and soft masses; moderately alkaline; gradual smooth boundary.

Ck2—33 to 60 inches; very pale brown (10YR 7/4) clay loam, light yellowish brown (10YR 6/4) moist; massive; friable and crumbly; contains more than 50 percent by volume of calcium carbonate in the form of concretions and caliche fragments 1/2 to 2 inches across; moderately alkaline.

Thickness of the solum ranges from 14 to 20 inches. The reaction of the soil is slightly alkaline or moderately alkaline. The average clay content of the soil ranges from 35 to 45 percent.

The A horizon is very dark grayish brown (10YR 3/2), dark grayish brown (10YR 4/2), dark brown (7.5YR 4/2, 10YR 4/3), brown (10YR 5/3), or reddish brown (5YR 4/3).

The Bkm horizon ranges from strongly cemented to indurated and from massive to platy.

The Ck horizon is loamy and ranges in color from shades of pink to yellow.

## Minwells Series

The Minwells series consists of very deep, well drained, very gently sloping soils on terraces. They formed in ancient river terrace sediments. Slopes are 1 to 3 percent.

A typical pedon of Minwells fine sandy loam, 1 to 3 percent slopes; from the intersection of U.S. Highway 281 and Farm Road 580 in Lampasas, 19.2 miles west on Farm Road 580, north 0.7 mile on private road, 465 feet east on field road, and 195 feet north in cropland.

Ap—0 to 6 inches; brown (7.5YR 5/4) fine sandy loam, dark brown (7.5YR 4/4) moist; massive; hard, friable; common fine and medium roots; neutral; abrupt smooth boundary.

Bt1—6 to 14 inches; reddish brown (2.5YR 4/4) sandy clay, dark reddish brown (2.5YR 3/4) moist; moderate fine angular blocky structure; very hard, firm, sticky; common fine and medium roots; few fine pores; nearly continuous clay films; slightly acid; clear smooth boundary.

Bt2—14 to 26 inches; red (2.5YR 4/6) sandy clay, dark red (2.5YR 3/6) moist; moderate medium angular blocky structure; very hard, very firm, sticky; few fine roots; few fine pores; nearly continuous clay films; moderately acid; gradual smooth boundary.

Bt3—26 to 40 inches; yellowish red (5YR 5/6) sandy clay, yellowish red (5YR 4/6) moist; moderate medium angular blocky structure; very hard, very firm, sticky; few fine roots; few patchy clay films; moderately acid; clear wavy boundary.

Btk—40 to 54 inches; yellowish red (5YR 5/6) sandy clay, yellowish red (5YR 4/6) moist; moderate medium angular blocky structure; very hard, very firm; few fine roots; few patchy clay films; about 5 percent, by volume, soft masses and weakly cemented calcium carbonate concretions; few rounded siliceous pebbles; slightly alkaline; gradual wavy boundary.

BCk—54 to 82 inches; reddish yellow (5YR 6/6) clay loam, yellowish red (5YR 5/6) moist; weak fine angular blocky structure; very hard, firm; few fine roots; few weakly cemented calcium carbonate concretions; few rounded siliceous pebbles; slightly alkaline.

Thickness of the solum is 60 to more than 80 inches. Some pedons are underlain by beds of gravel, or sand and gravel, at depths of 4 to 7 feet. The reaction of the soil ranges from moderately acid to moderately alkaline. The clay content of the control section ranges from 35 to 45 percent. The volume of siliceous pebbles ranges from 0 to 5 percent.

The A horizon is brown (7.5YR 5/4, 10YR 5/3). The reaction is slightly acid or slightly alkaline.

The Bt horizon is reddish brown (2.5YR 4/4, 5/4), red (2.5YR 4/6), reddish brown (5YR 4/4, 5/4), or yellowish red (5YR 5/6). The texture is sandy clay or sandy clay loam. The reaction is moderately acid or slightly acid.

The BCk horizon is reddish yellow (5YR 6/6, 7.5YR 6/6) or brown (7.5YR 5/4). The texture is clay loam or sandy clay loam. The reaction ranges from neutral to moderately alkaline.

## Nocken Series

The Nocken series consists of moderately deep, well drained, strongly sloping to moderately steep soils on uplands. They formed in interbedded sandstone and shale. Slopes are 5 to 15 percent.

A typical pedon of Nocken fine sandy loam, 5 to 15 percent slopes, very stony; from the intersection of U.S. Highway 183 and U.S. Highway 190 in Lometa, 10.5 miles west on U.S. Highway 190, 0.5 mile southwest on private road, and 300 feet southeast in rangeland.

A1—0 to 5 inches; grayish brown (10YR 5/2) stony fine sandy loam, dark grayish brown (10YR 4/2) moist; weak subangular blocky structure; slightly hard, friable; many fine roots; about 15 percent, by volume, sandstone cobbles and stones; about 15 percent of the soil surface is covered with cobbles and stones; moderately acid; clear wavy boundary.

A2—5 to 13 inches; brown (10YR 5/3) very stony fine sandy loam, brown (10YR 4/3) moist; weak subangular blocky structure; slightly hard, friable; common fine roots; about 40 percent, by volume, sandstone cobbles and stones and 15 percent sandstone pebbles; moderately acid; clear wavy boundary.

Bt1—13 to 21 inches; red (2.5YR 5/6) very stony clay, red (2.5YR 4/6) moist; moderate medium and fine angular 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; strongly acid; gradual smooth boundary.

Bt2—21 to 32 inches; red (2.5YR 5/6) very stony clay, red (5YR 4/6) moist; common medium faint mottles of reddish brown (5YR 4/4) moist; moderate fine and medium angular 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 make up 50 to 80 percent by volume; moderately acid; gradual wavy boundary.

BC—32 to 36 inches; yellowish red (5YR 5/6) extremely stony sandy clay loam, yellowish red (5YR 4/6) moist; weak medium subangular blocky structure; hard, firm; few fine roots; about 70 percent, by volume, cobbles and stones; moderately acid; abrupt wavy boundary.

Cr—36 to 60 inches; reddish yellow, weakly cemented sandstone with thin, interbedded, massive, pale olive shale.

Solum thickness ranges from 20 to 40 inches. Base saturation ranges from 50 to about 75 percent. The clay content of the control section ranges from 40 to about 60 percent. Sandstone pebbles, cobbles, stones, flags, and boulders make up 35 to 85 percent by volume of the solum. Coarse fragments are mostly of cobble and stone size. Some pedons have ironstone fragments.

The A1 horizon ranges from 5 to 12 inches thick. It is brown (7.5YR 5/2, 5/4 and 10YR 4/3, 5/3), dark yellowish brown (10YR 4/4), grayish brown (10YR 5/2), or yellowish brown (10YR 5/4). The A2 horizon ranges from 2 to 14 inches thick. It is strong brown (7.5YR 5/6), light brown (7.5YR 6/4), reddish yellow (7.5YR 6/6, 7/6), pink (7.5YR 7/4), dark yellowish brown (10YR 4/4), brown (10YR 5/3), yellowish brown (10YR 5/4), pale brown (10YR 6/3), light yellowish brown (10YR 6/4), or very pale brown (10YR 7/3, 7/4). Reaction ranges from strongly acid to neutral.

The Bt1 horizon ranges from 6 to 20 inches thick. It is red (2.5YR 5/6), or yellowish red (5YR 5/6, 5/8). The Bt2 horizon ranges from 7 to 20 inches in thickness. It is red (2.5YR 5/6, 5/8), light red (2.5YR 6/8), or yellowish red (5YR 5/6, 5/8). The fine-earth fraction of the Bt horizon is clay or sandy clay with a clay content of 40 to 60 percent. Reaction is strongly acid or moderately acid. Base saturation is from 50 to 75 percent.

The BC horizon is yellowish red or light red (5YR 5/6, 5/8, 2.5YR 6/8). The texture is sandy clay loam or clay loam.

The Cr horizon is weakly cemented sandstone. Some

pedons have layered sandstone with interbedded massive shale, weakly consolidated shale of clay texture, or loamy earth.

## Nuff Series

The Nuff series consists of very deep, well drained, gently sloping to moderately sloping soils on uplands. These soils formed in interbedded marl, limestone, and shale. Slopes are 2 to 6 percent.

A typical pedon of Nuff silty clay loam, 2 to 6 percent slopes, very stony; from the intersection of U.S. Highway 281 and Farm Road 580 in Lampasas, 14.8 miles northeast on Farm Road 580, 1.2 miles north on private ranch road, 0.7 mile northeast on private road, 0.2 mile south on trail, and 30 feet east in rangeland.

A1—0 to 5 inches; dark grayish brown (10YR 4/2) very stony silty clay loam, very dark grayish brown (10YR 3/2) moist; moderate fine granular and subangular blocky structure; hard, friable, sticky and plastic; many fine and medium roots; 35 percent, by volume, limestone fragments 6 to 24 inches across and 2 to 5 inches thick; similar size fragments of limestone cover about 15 percent of the surface; calcareous; moderately alkaline; clear smooth boundary.

A2—5 to 13 inches; dark grayish brown (10YR 4/2) very stony silty clay loam, very dark grayish brown (10YR 3/2) moist; moderate fine subangular blocky structure; hard, friable, sticky and plastic; common fine and medium roots; limestone fragments from 5 to 34 inches across and 2 to 5 inches thick make up 35 percent by volume of this layer; calcareous; moderately alkaline; clear wavy boundary.

Bk1—13 to 23 inches; brown (10YR 5/3) silty clay loam, dark brown (10YR 4/3) moist; moderate medium subangular blocky structure; hard, friable, sticky and plastic; common fine roots; few fine concretions and soft masses of calcium carbonate; calcareous; moderately alkaline; gradual smooth boundary.

Bk2—23 to 33 inches; light yellowish brown (2.5Y 6/4) silty clay loam, light olive brown (2.5Y 5/4) moist; moderate fine subangular blocky structure; hard, firm, sticky and plastic; few fine roots; common fine and medium concretions and soft masses of calcium carbonate; calcareous; moderately alkaline; gradual wavy boundary.

Ck—33 to 80 inches; olive (5Y 5/3) weakly consolidated shale of clay texture, olive (5Y 4/3) moist; massive; hard, firm, sticky and plastic; many soft masses of calcium carbonate.

Thickness of the solum ranges from 27 to 40 inches. Limestone fragments up to 30 inches across and 2 to 5 inches thick cover from 0 to 15 percent of the surface. Calcium carbonate concretions are typically throughout the soil. Films, threads, or soft masses of calcium carbonate are within a depth of 15 to 24 inches. The average clay content of the control section ranges from 20 to 35 percent.

The A horizon is very dark grayish brown (10YR 3/2), dark grayish brown (10YR 4/2), or dark gray (10YR 4/1). The texture is silty clay loam or silty clay, or their stony or very stony counterparts. Pebbles, cobbles, and stone size limestone fragments range from 5 to 35 percent by volume.

The B horizon is brown (10YR 5/3), pale brown (10YR 6/3), very pale brown (10YR 7/3), grayish brown (2.5Y 5/2), light olive brown (2.5Y 5/4), light brownish gray (2.5Y 6/2), light yellowish brown (2.5Y 6/4), or olive yellow (2.5Y 6/6). It is silty clay loam or stony silty clay loam. Limestone fragments range from 0 to 20 percent by volume.

The C horizon has colors in shades of yellow, gray, or olive. It is interbedded marl and weakly consolidated shale of silty clay loam or silty clay texture.

## Oakalla Series

The Oakalla series consists of very deep, well drained, nearly level soils on bottom lands. They formed in loamy alluvium with a high calcium carbonate content. Slopes are 0 to 1 percent.

A typical pedon of Oakalla silty clay loam, rarely flooded; from the intersection of U.S. Highway 281 and Farm Road 580 in Lampasas, 11.9 miles east on Farm Road 580, 3.9 miles north on Farm Road 2527, 0.4 mile east on field road, and 500 feet southeast in coastal bermudagrass pasture.

Ap—0 to 6 inches; very dark grayish brown (10YR 3/2) silty clay loam, very dark brown (10YR 2/2) moist; moderate fine and very fine subangular blocky and granular structure; hard, friable; common fine and medium roots; calcareous; moderately alkaline; abrupt smooth boundary.

Ak—6 to 38 inches; very dark grayish brown (10YR 3/2) silty clay loam, very dark brown (10YR 2/2) moist; moderate fine and very fine subangular blocky and granular structure; hard, friable; common fine and medium roots; common fine and medium pores; few soft masses and weakly cemented concretions of calcium carbonate; few snail shell fragments; calcareous; moderately alkaline; clear smooth boundary.

Bk1—38 to 58 inches; brown (10YR 5/3) silty clay loam, dark brown (10YR 4/3) moist; weak medium subangular blocky structure; hard, friable; few fine roots; few soft masses and weakly cemented concretions of calcium carbonate; common films and

threads of calcium carbonate; few snail shell fragments; few earthworm casts; calcareous; moderately alkaline; gradual smooth boundary.

Bk2—58 to 80 inches; yellowish brown (10YR 5/4) silty clay loam, dark yellowish brown (10YR 4/4) moist; weak medium subangular blocky structure; hard, friable; many fine pores; few soft masses and weakly cemented concretions of calcium carbonate in the upper 14 inches, decreasing with depth; many films and threads of calcium carbonate; calcareous; moderately alkaline.

The thickness of the mollic epipedon ranges from 20 to 40 inches. The calcium carbonate equivalent of the control section ranges from 40 to 55 percent. Total clay content of the control section ranges from 25 to 35 percent.

The A horizons are very dark grayish brown (10YR 3/2) or dark grayish brown (10YR 4/2).

The B horizons are brown (10YR 4/3, 5/3), yellowish brown (10YR 5/4), or light yellowish brown (10YR 6/4). The texture is silty clay loam or clay loam.

## Oglesby Series

The Oglesby series consists of shallow, well drained, nearly level and very gently sloping soils on uplands. They formed in weathered limestone and marine sediments. Slopes are 0 to 3 percent.

A typical pedon of Oglesby silty clay, 0 to 3 percent; from the intersection of U.S. Highway 183 and Farm Road 581 in Lometa, 1.3 miles south on U.S. Highway 183, 0.9 mile south on Farm Road 3415, 1.4 miles southeast on private road, and 925 feet southeast in cropland.

Ap—0 to 6 inches; dark brown (7.5YR 3/2) silty clay, very dark brown (7.5YR 2/2) moist; moderate fine and medium subangular blocky structure; very hard, very firm, sticky and plastic; common fine roots; common fine pores; 3 percent, by volume, limestone fragments less than 3 inches across; moderately alkaline; abrupt smooth boundary.

A—6 to 16 inches; dark reddish brown (5YR 3/2) silty clay, dark reddish brown (5YR 2/2) moist; moderate fine and medium angular blocky structure; very hard, very firm, sticky and plastic; few fine roots; few fine pores; common pressure faces; few small slickensides; 5 percent, by volume, limestone fragments less than 3 inches across; moderately alkaline; abrupt wavy boundary.

R—16 to 20 inches; bed of indurated limestone with a hardness of 3 or more on Moh's scale; upper part has fractures filled with soil material.

The solum ranges in thickness from 10 to 20 inches. The reaction of the soil is neutral or slightly alkaline. The fine-earth fraction is silty clay or clay with a clay content ranging from 40 to 50 percent.

The Ap horizon is dark brown (7.5YR 3/2, 4/2), very dark brown (10YR 2/2), very dark gray (10YR 3/1), very dark grayish brown (10YR 3/2), or dark grayish brown (10YR 4/2). In addition, the A horizon is dark reddish brown (5YR 3/2), dark reddish gray (5YR 4/2), dark brown (7.5YR 3/2, 4/2), (10YR 4/3, 3/3), very dark brown (10YR 2/2), very dark gray (10YR 3/1), very dark grayish brown (10YR 3/2), or dark grayish brown (10YR 4/2). Coarse fragments make up from 0 to 10 percent of the solum and consist of limestone fragments mostly 2 mm to 3 inches across. In some pedons, there is a 2- to 3-inch layer with more than 35 percent coarse fragments that rests upon the R layer.

The R layer is indurated and finely fractured limestone bedrock.

## Owens Series

The Owens series consists of soils that are shallow and moderately deep to claystone. They are well drained, strongly sloping to steep soils on uplands. They formed in residuum weathered from shale. Slopes are 10 to 30 percent.

A typical pedon of Owens clay, 10 to 30 percent slopes, very stony; from the intersection of U.S. Highway 281 and Farm Road 580 in Lampasas, 19.0 miles west on Farm Road 580, 0.6 mile north on dirt road, and 110 feet east in rangeland.

A—0 to 11 inches; light brownish gray (2.5Y 6/2) clay, grayish brown (2.5Y 5/2) moist; moderate fine angular blocky structure; very hard, very firm; surface crusts on drying; many fine and medium roots; about 15 percent of the surface covered with sandstone fragments from 6 to 24 inches across; calcareous; moderately alkaline; gradual smooth boundary.

Bk—ll to 16 inches; light olive brown (2.5Y 5/4) clay, olive brown (2.5Y 4/4) moist; moderate fine and medium angular blocky structure; very hard, very firm; few fine roots; common films and threads of calcium carbonate; few sandstone fragments; calcareous; moderately alkaline; gradual smooth boundary.

C—16 to 60 inches; olive (5Y 5/3) claystone, olive (5Y 5/3) moist; massive; extremely hard, extremely firm; few fine roots; about 10 percent, by volume, sandstone fragments from 1 to 6 inches across; calcareous; moderately alkaline.

Thickness of the solum ranges from 16 to 30 inches. The soil is moderately alkaline, but some pedons are noncalcareous in the surface layer. Fragments of sandstone, limestone, and ironstone range from 3 to 24

inches across and cover from 5 to 15 percent of the surface. The average clay content of the control section is 40 to 55 percent.

The A horizon is grayish brown (2.5Y 5/2), light olive brown (2.5Y 5/4), light brownish gray (2.5Y 6/2)), or light yellowish brown (2.5Y 6/4). The texture is clay loam or clay.

The B horizon is light olive brown (2.5Y 5/4), light yellowish brown (2.5Y 6/2), light yellowish brown (2.5Y 6/4), or pale olive (5Y 6/4). Calcium carbonate content ranges from a few films and threads to about 5 percent, by volume, soft powdery masses.

The C horizon ranges from olive to light brownish gray.

## Patilo Series

The Patilo series consists of very deep, moderately well drained, very gently sloping soils on uplands. They formed in thick sandy deposits reworked by wind. Slopes are 1 to 3 percent.

A typical pedon of Patilo fine sand, 1 to 3 percent slopes; from the intersection of U.S. Highway 183 and U.S. Highway 190 in Lometa, 10.0 miles west on U.S. Highway 190, 0.5 mile west on field road, 0.7 mile south on field road, 0.2 mile north along trail, and 330 feet east in pecan orchard.

Ap—0 to 6 inches; very pale brown (10YR 7/4) fine sand, light yellowish brown (10YR 6/4) moist; single grained; loose, very friable; few fine roots; slightly acid; clear smooth boundary.

E—6 to 48 inches; very pale brown (10YR 7/4) fine sand, light yellowish brown (10YR 6/4) moist; single grained; loose, very friable; few fine and medium roots; slightly acid; clear wavy boundary.

Bt1—48 to 60 inches; light gray (10YR 7/1) sandy clay loam, gray (10YR 6/1) moist; few fine distinct red (2.5YR 4/6) and reddish yellow (7.5YR 6/8) mottles; weak coarse subangular blocky structure; extremely hard, very firm; few fine roots; patchy clay films on ped faces; moderately acid; gradual wavy boundary.

Bt2—60 to 80 inches; light gray (10YR 7/1) sandy clay loam, gray (10YR 6/1) moist; common coarse distinct reddish yellow (5YR 6/8) mottles and few fine distinct red (2.5YR 5/8) mottles; weak coarse subangular blocky structure; hard, firm; few fine and medium roots; strongly acid.

Thickness of the solum ranges from 80 to more than 100 inches. The reaction of the solum ranges from strongly acid to neutral. The average clay content of the control section is 18 to 35 percent.

The A and E horizons are brown (10YR 5/3), pale brown (10YR 6/3), or very pale brown (10YR 7/3, 7/4, 8/4). The reaction is slightly acid or neutral. When combined, these horizons are 40 to 80 inches thick.

The Bt horizon has red, reddish yellow, or brownish yellow mottles. The matrix colors are brownish yellow (10YR 6/8), light gray (10YR 7/1, 5Y 7/2), or very pale brown (10YR 7/3). Reaction ranges from slightly acid to strongly acid. The texture is sandy clay loam or fine sandy loam.

## Pedernales Series

The Pedernales series consists of very deep, well drained, gently sloping soils on uplands. They formed in calcareous, loamy and clayey sediments. Slopes are 1 to 5 percent.

A typical pedon of Pedernales fine sandy loam, 1 to 5 percent slopes; from the intersection of U.S. Highway 190 and Farm Road 3415 south of Lometa, 5.7 miles south on Farm Road 3415, 0.3 mile southwest, and 0.2 mile west in rangeland.

A—0 to 13 inches; reddish brown (5YR 4/4) fine sandy loam, dark reddish brown (5YR 3/4) moist; weak fine subangular blocky structure; hard, friable; many fine and medium roots; neutral; clear smooth boundary.

Bt1—13 to 22 inches; red (2.5YR 4/6) sandy clay, dark red (2.5YR 3/6) moist; moderate medium angular blocky structure; very hard, very firm; few fine roots; few fine pores; common clay films on ped faces; few siliceous pebbles; slightly alkaline; gradual smooth boundary.

Bt2—22 to 32 inches; reddish brown (5YR 5/4) sandy clay, reddish brown (5YR 4/4) moist; weak medium angular blocky structure; very hard, very firm; few fine pores; common thin clay films on ped faces; few siliceous pebbles; moderately alkaline; gradual smooth boundary.

Btk—32 to 44 inches; yellowish red (5YR 5/6) sandy clay, yellowish red (5YR 4/6) moist; few fine distinct red (2.5YR 4/6) mottles; weak coarse subangular blocky structure; very hard, firm; few thin clay films on ped faces; estimated 20 percent, by volume, soft masses of calcium carbonate; moderately alkaline; clear smooth boundary.

BCtk—44 to 63 inches; pink (7.5YR 7/4) clay loam, light brown (7.5YR 6/4) moist; weak fine subangular blocky structure; hard, friable; few thin patchy clay films on ped faces; contains an estimated 30 percent, by volume, soft masses of calcium carbonate; moderately alkaline.

Thickness of the solum ranges from 60 to 80 inches. Secondary carbonates are at depths of more than 28

inches. The average clay content of the control section is 35 to 55 percent.

The A horizon is reddish brown (5YR 4/3, 4/4, 5/3, 5/4), brown (7.5YR 5/4, 10YR 5/3), light brown (7.5YR 6/4), or light yellowish brown (10YR 6/4). The reaction is neutral or slightly alkaline.

The Bt and Btk horizons are red (2.5YR 4/6, 5/6, 5/8), reddish brown (5YR 5/4), yellowish red (5YR 5/6), brown (7.5YR 5/4), or strong brown (7.5YR 5/6). Texture is clay, sandy clay, or sandy clay loam. Reaction is slightly alkaline or moderately alkaline.

The BCtk horizon is strong brown (7.5YR 5/6), light reddish brown (5YR 6/4), pink (7.5YR 7/4), or reddish yellow (5YR 6/6). Texture is clay loam or sandy clay loam.

## Pidcoke Series

The Pidcoke series consists of shallow, well drained, very gently sloping soils on uplands. They formed in indurated fossiliferous limestone. Slopes are 1 to 3 percent.

A typical pedon of Pidcoke clay loam, 1 to 3 percent slopes; from the intersection of U.S. Highway 281 and U.S. Highway 190 in Lampasas, 11.6 miles north on U.S. Highway 281, northeast 7.1 miles on Farm Road 1690, north 1.2 miles on gravel road, and west 75 feet in rangeland.

A—0 to 8 inches; dark grayish brown (10YR 4/2) clay loam, very dark grayish brown (10YR 3/2) moist; weak fine subangular blocky and granular structure; hard, friable; common fine roots; common fine concretions of calcium carbonates; calcareous; moderately alkaline; clear smooth boundary.

Bk—8 to 17 inches; brown (10YR 5/3) clay loam, dark brown (10YR 4/3) moist; weak fine subangular blocky structure; hard, friable; common fine roots; common fine concretions and few films and threads of calcium carbonate; few fossil shells; calcareous; moderately alkaline; abrupt smooth boundary.

R—17 to 20 inches; indurated, fossiliferous limestone; massive; contains many imbedded fossil shells.

Thickness of the solum ranges from 13 to 20 inches. The calcium carbonate equivalent ranges from 40 to 60 percent. The silicate clay content of the soil ranges from 20 to 35 percent.

The A horizon is dark brown (7.5YR 4/2), very dark grayish brown (10YR 3/2), or dark grayish brown (10YR 4/2). Texture is clay loam or silty clay loam.

The B horizon is brown (7.5YR 5/4, 10YR 5/3), pale brown (10YR 6/3), or light yellowish brown (10YR 6/4). Texture is clay loam or silty clay loam. Fossil shells range from 1 to 5 percent by volume.

## Real Series

The Real series consists of shallow, well drained, gently sloping to steep soils on uplands. They formed in weakly cemented limestone. Slopes are 1 to 30 percent.

A typical pedon of Real very gravelly clay loam, 10 to 30 percent slopes; from the intersection of U.S. Highway 281 and U.S. Highway 190 in Lampasas, 11.6 miles north on U.S. Highway 281, 7.1 miles east on Farm Road 1690, 2.3 miles east on pasture road, and 200 feet south on side of hill in rangeland.

A—0 to 8 inches; dark grayish brown (10YR 4/2) very gravelly clay loam, very dark grayish brown (10YR 3/2) moist; moderate very fine subangular blocky and granular structure; hard, friable; many fine roots; common fine and medium pores; common fine wormcasts; estimated 50 percent, by volume, limestone gravel and 5 percent limestone cobbles; about 30 percent of the surface is covered by limestone gravels and cobbles and a few boulders; calcareous; moderately alkaline; gradual diffuse boundary.

Ak—8 to 16 inches; dark grayish brown (10YR 4/2) extremely gravelly clay loam, very dark grayish brown (10YR 3/2) moist; moderate very fine subangular blocky and granular structure; hard, friable; many fine roots; common fine and medium pores; common fine wormcasts; estimated 75 percent limestone gravel and 5 percent limestone cobbles; calcareous; moderately alkaline; abrupt wavy boundary.

Bkm—16 to 18 inches; white (10YR 8/2) strongly cemented caliche forming a laminar cap; clear wavy boundary.

Crk—18 to 60 inches; light gray (2.5Y 7/2) weakly cemented limestone interbedded with seams of strongly indurated limestone; coatings of calcium carbonate on the underside of limestone fragments.

Thickness of the solum ranges from 8 to 18 inches. Coarse fragments make up from 35 to 75 percent by volume of the soil and consist of limestone fragments 1/8 inch to 10 inches across. The calcium carbonate equivalent ranges from 55 to 70 percent. The texture is loam or clay loam and their gravelly counterparts, with a clay content estimated to range from 27 to 35 percent.

The A horizon is very dark grayish brown (10YR 3/2), dark grayish brown (10YR 4/2), or dark brown (10YR 4/3).

The Crk horizon is weakly cemented limestone interbedded with seams of strongly indurated limestone

that becomes softer with depth. Layers of loamy, marly earth are in some pedons.

## Roughcreek Series

The Roughcreek series consists of shallow, well drained, undulating soils on uplands. They formed in residuum weathered from dolomitic limestone. Slopes are 1 to 8 percent.

A typical pedon of Roughcreek very stony clay loam in an area of Roughcreek-Rock outcrop complex, 1 to 8 percent slopes; from the intersection of U.S. Highway 281 and Farm Road 580 in Lampasas, 11.2 miles west on Farm Road 580 to Nix, 3.3 miles south on paved county road, 2.5 miles west and southwest to ranch headquarters, 1.7 miles west on ranch road, 3.3 miles northwest along trails, and 300 feet north in rangeland.

A—0 to 8 inches; dark brown (7.5YR 4/2) very stony clay loam, dark brown (7.5YR 3/2) moist; moderate very fine subangular blocky structure; very hard, firm; common fine and medium roots; about 40 percent, by volume, limestone fragments from 10 to 24 inches across, and 10 percent from 1 to 3 inches across; boulders 1 to 5 feet across, 1 to 8 feet long, and 6 inches to 3 feet thick cover 1 percent of the surface; neutral; clear smooth boundary.

Bt—8 to 17 inches; reddish brown (5YR 5/4) very stony clay, reddish brown (5YR 4/4) moist; moderate fine angular blocky structure; very hard, very firm; common fine roots; patchy clay films on ped faces; contains about 50 percent by volume limestone gravel, cobbles, stones, and boulders; neutral; abrupt smooth boundary.

R—17 to 19 inches; coarsely fractured, indurated, dolomitic limestone.

Thickness of the solum ranges from 10 to 20 inches. The reaction ranges from slightly acid to slightly alkaline. The clay content of the solum ranges from 35 to 60 percent. The solum contains from 40 to 70 percent, by volume, rock fragments. The amount of coarse fragments in the A horizon ranges from 40 to 70 percent and from 40 to 60 percent in the Bt horizon. These rock fragments are from gravel to stone size.

The A horizon is dark reddish brown (5YR 3/2), dark brown (7.5YR 4/2) or very dark grayish brown (10YR 3/2).

The Bt horizon is reddish brown (5YR 4/3, 4/4, 5/4) or dark brown (7.5YR 4/2).

The R layer is coarsely fractured, indurated, dolomitic limestone. This dolomitic limestone is of the Ellenberger geological formation and has a hardness of 4 to 5 on Moh's scale.

## Rumley Series

The Rumley series consists of very deep, well drained, nearly level and very gently sloping soils on terraces. They formed in loamy and calcareous alluvial sediments. Slopes are 0 to 3 percent.

A typical pedon of Rumley silty clay loam, 1 to 3 percent slopes; from the intersection of U.S. Highway 281 and Farm Road 580 in Lampasas, 8.1 miles east and 2.6 miles north on Farm Road 580, and 400 feet east in cropland.

Ap—0 to 6 inches; dark grayish brown (10YR 4/2) silty clay loam, very dark grayish brown (10YR 3/2) moist; moderate very fine subangular blocky and granular structure; hard, friable; many fine and medium roots; few fine strongly cemented calcium carbonate concretions; few fragments of snail shells; strongly effervescent; moderately alkaline; abrupt smooth boundary.

A—6 to 14 inches; dark grayish brown (10YR 4/2) silty clay loam, very dark grayish brown (10YR 3/2) moist; moderate very fine and fine subangular blocky structure; hard, firm; common fine roots; few fine strongly cemented calcium carbonate concretions; few fragments of snail shells; strongly effervescent; moderately alkaline; gradual smooth boundary.

Bk1—14 to 26 inches; brown (10YR 5/3) silty clay, dark brown (10YR 4/3) moist; moderate fine subangular blocky structure; hard, firm; few fine roots; common fine and few medium calcium carbonate concretions; few fine soft masses of calcium carbonate; strongly effervescent; moderately alkaline; gradual smooth boundary.

Bk2—26 to 32 inches; brown (7.5YR 5/4) silty clay, dark brown (7.5YR 4/4) moist; moderate fine subangular blocky structure; hard, firm; few fine roots; common fine and medium strongly cemented calcium carbonate concretions; few fine, soft masses of calcium carbonate; violently effervescent; moderately alkaline; clear smooth boundary.

Bk3—32 to 48 inches; brownish yellow (10YR 6/6) gravelly clay loam, yellowish brown (10YR 5/6) moist; weak fine subangular blocky structure; hard, friable; few fine roots; about 30 percent, by volume, fine and medium strongly cemented calcium carbonate concretions; about 10 percent fine, soft masses of calcium carbonate; violently effervescent; moderately alkaline; gradual smooth boundary.

Bk4—48 to 63 inches; reddish yellow (7.5YR 6/6) clay

loam, strong brown (7.5YR 5/6) moist); weak fine subangular blocky structure; hard, friable; about 15 percent, by volume, fine and medium calcium carbonate concretions; about 15 percent, by volume, soft masses of calcium carbonate; violently effervescent; moderately alkaline.

Solum thickness is greater than 60 inches. Texture is clay loam, silty clay loam, or silty clay with silicate clay content ranging from 25 to 35 percent. Calcium carbonate equivalent in the 10- to 40-inch control section ranges from 40 to 70 percent. Depth to a distinct and contrasting calcic horizon ranges from 28 to 42 inches.

The A horizon is dark brown (7.5YR 3/2 and 10YR 3/3, 4/3), brown (7.5YR 5/2, 10YR 5/3), very dark grayish brown (10YR 3/2), or dark grayish brown (10YR 4/2).

The Bk1 and Bk2 horizons are dark brown (7.5YR 4/4), brown (7.5YR 5/4, 10YR 5/3), or dark yellowish brown (10YR 4/4), yellowish brown (10YR 5/4, 5/6), pale brown (10YR 6/3), or brownish yellow (10YR 6/6). Pitted concretions of calcium carbonate range from few to common. Soft masses and threads of calcium carbonate range from few to common. Calcium carbonate equivalent ranges from 40 to 60 percent.

The Bk3 and Bk4 horizons are light brown (7.5YR 6/4), pink (7.5YR 7/4), reddish yellow (7.5YR 6/6, 7/6), light yellowish brown (10YR 6/4), brownish yellow (10YR 6/6), or very pale brown (10YR 7/4). Concretions, soft masses, and films and threads of calcium carbonate range from common to many; visibly comprising 10 to 35 percent of the volume. The calcium carbonate equivalent ranges from 50 to 70 percent.

## Seawillow Series

The Seawillow series consists of very deep, well drained, gently sloping soils along breaks on terraces. They formed in limy, loamy alluvial sediments. Slopes are 3 to 5 percent.

A typical pedon of Seawillow clay loam, 3 to 5 percent slopes; from the intersection of U.S. Highway 281 and U.S. Highway 190 in Lampasas, 11.8 miles north on U.S. Highway 281, 4.6 miles northeast and north on Farm Road 1690, and 125 feet west in cropland.

Ap—0 to 6 inches; brown (7.5YR 5/4) clay loam, dark brown (7.5YR 4/4) moist; weak fine granular structure; hard, friable; many fine roots; many wormcasts; about 5 percent, by volume, weakly and strongly cemented concretions of calcium carbonate; calcareous; moderately alkaline; abrupt smooth boundary.

Bk—6 to 21 inches; reddish yellow (7.5YR 6/6) clay loam, strong brown (7.5YR 5/6) moist; moderate fine granular structure; hard, friable; few fine roots; about 15 percent, by volume, very fine to medium soft masses and concretions of calcium carbonate; many threads and films of calcium carbonate; calcareous; moderately alkaline; gradual smooth boundary.

BCk—21 to 80 inches; light yellowish brown (10YR 6/4) clay loam, yellowish brown (10YR 5/4) moist; weak fine granular structure; hard, friable; few fine roots; about 25 percent, by volume, very fine to medium soft masses and concretions of calcium carbonate; many threads and films of calcium carbonate; calcareous; moderately alkaline.

Solum thickness ranges from 60 to more than 80 inches. Texture is loam, clay loam, or silty clay loam. The calcium carbonate equivalent of all horizons ranges from 40 to 70 percent. Silicate clay ranges from 18 to 35 percent with carbonate clay ranging from 2 to 10 percent. The solum is moderately alkaline and calcareous throughout.

The A horizon is brown (7.5YR 5/4, 10YR 5/3), or yellowish brown (10YR 5/4).

The Bk and BCk horizons are reddish yellow (7.5YR 6/6), light yellowish brown (10YR 6/4), brownish yellow (10YR 6/6), or very pale brown (10YR 7/4).

## Slidell Series

The Slidell series consists of very deep, moderately well drained, very gently sloping soils on uplands. They formed in calcareous, clayey sediments. Slopes are 1 to 3 percent.

A typical pedon of Slidell clay, 1 to 3 percent slopes; from the intersection of U.S. Highway 281 and Farm Road 580 in Lampasas, 8.8 miles west on Farm Road 580, 1.4 miles north on county road, 0.9 mile southeast on private road, 0.3 mile east on private road, and 0.4 mile southeast on unpaved road in cropland.

Ap—0 to 6 inches; dark gray (10YR 4/1) clay, very dark gray (10YR 3/1) moist; moderate fine subangular blocky and granular structure; extremely hard, very firm, sticky and plastic; many fine and medium roots; common fine and medium concretions of calcium carbonate; calcareous; moderately alkaline; abrupt smooth boundary.

A—6 to 24 inches; dark gray (10YR 4/1) clay, very dark gray (10YR 3/1) moist; moderate medium angular blocky structure; extremely hard, very firm, sticky and plastic; common fine and medium roots; common fine and medium concretions of calcium carbonate; calcareous; moderately alkaline; gradual wavy boundary.

Bkss1—24 to 38 inches; gray (10YR 5/1) clay, dark gray (10YR 4/1) moist; moderate medium angular blocky structure; extremely hard, very firm, sticky and plastic; few fine roots; few slickensides; common medium

weakly and strongly cemented calcium carbonate concretions; calcareous; moderately alkaline; gradual wavy boundary.

Bkss2—38 to 52 inches; grayish brown (2.5Y 5/2) clay, dark grayish brown (2.5Y 4/2) moist; few fine faint yellowish brown mottles; weak coarse angular blocky structure; extremely hard, very firm, sticky and plastic; few fine roots; common slickensides; common fine and medium calcium carbonate concretions; calcareous; moderately alkaline; diffuse boundary.

Bkss3—52 to 80 inches; light yellowish brown (10YR 6/4) clay, yellowish brown (10YR 5/4) moist; few fine faint olive yellow mottles; weak coarse angular blocky structure; extremely hard, very firm, sticky and plastic; few fine roots; common slickensides; many fine and medium calcium carbonate concretions; calcareous; moderately alkaline.

The solum thickness ranges from 60 to more than 80 inches. When dry, these soils have cracks up to one inch wide that extend from the surface to depths 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. In undisturbed areas there is gilgai microrelief. The microknolls range from 4 to 10 inches higher than the microdepressions. Texture throughout the solum is clay or silty clay. The solum is calcareous and moderately alkaline.

The A horizon is very dark gray (10YR 3/1), dark gray (10YR 4/1), or gray (10YR 5/1).

The Bkss1 and Bkss2 horizons are grayish brown (2.5Y 5/2, 10YR 5/2) or dark gray (10YR 4/1). Fine mottles in shades of brown and yellow range from few to common.

The Bkss3 horizon is brown (10YR 5/3), light yellowish brown (10YR 6/4), brown (10YR 5/3), or very pale brown (10YR 7/3). Fine mottles in shades of brown, yellow, or gray range from few to common.

## Sunev Series

The Sunev series consists of very deep, well drained, nearly level and very gently sloping soils on low terraces and bottom lands. They formed in loamy alluvial sediments (fig. 11). Slopes are 0 to 3 percent.

A typical pedon of Sunev loam, rarely flooded; from the intersection of U.S. Highway 281 and Farm Road 580 in Lampasas, 14.5 miles west on Farm Road 580, 0.9 mile north on unpaved road, and 500 feet west in idle cropland.

Ap—0 to 6 inches; dark grayish brown (10YR 4/2) loam, very dark grayish brown (10YR 3/2) moist; moderate fine granular structure; hard, friable; many fine roots; many fine and medium pores; calcareous; moderately alkaline; abrupt smooth boundary.

A—6 to 16 inches; dark grayish brown (10YR 4/2) loam, very dark grayish brown (10YR 3/2) moist; strong fine and medium subangular blocky structure; hard, friable; many fine roots; common fine and medium pores; few earthworm casts and channels; few films and threads of calcium carbonate; calcareous; moderately alkaline; gradual smooth boundary.

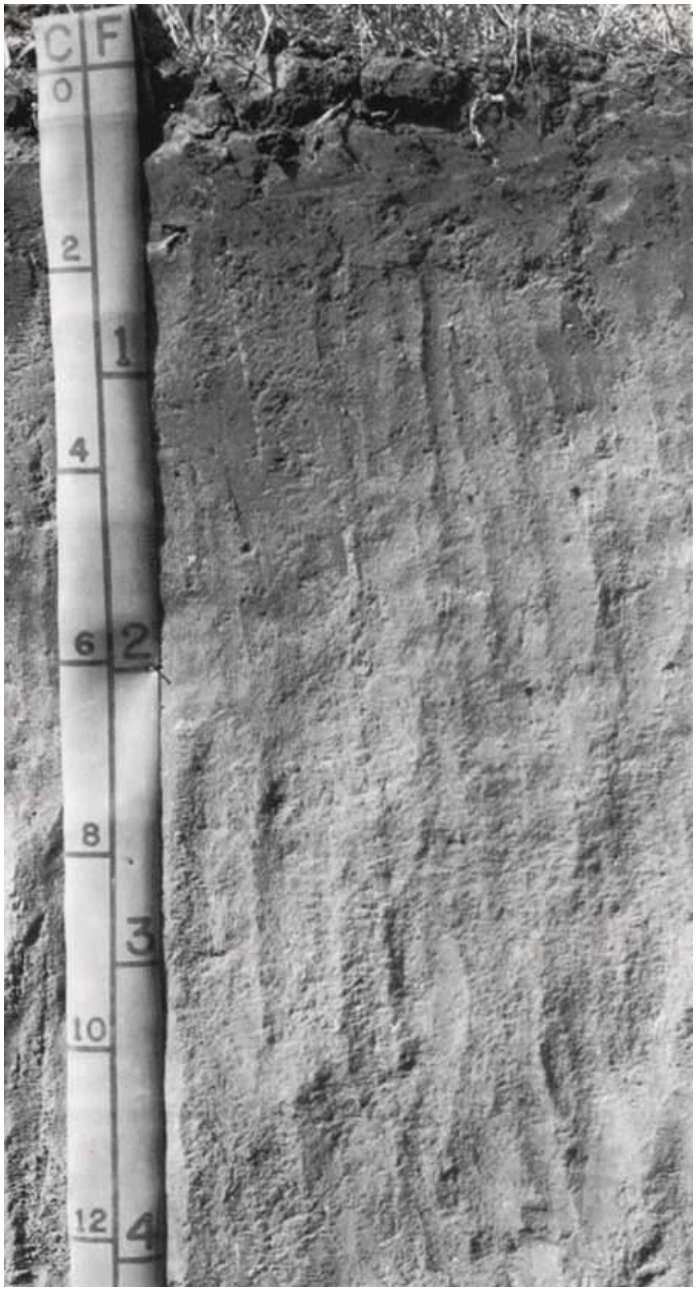



**Figure 11.—A profile of Sunev loam. The dark color of the surface layer is caused by organic matter. The subsoil has a lighter color because it has a low amount of organic matter and a high amount of calcium carbonate (lime).**

Bk1—16 to 31 inches; brown (10YR 5/3) silty clay loam, dark brown (10YR 4/3) moist; moderate very fine and fine subangular blocky structure; hard, friable; few fine

roots; common fine pores; many films and threads of calcium carbonate; calcareous; moderately alkaline; gradual smooth boundary.

Bk2—31 to 60 inches; light yellowish brown (10YR 6/4) clay loam, yellowish brown (10YR 5/4) moist; moderate very fine and fine subangular blocky structure; hard, friable; few fine roots; common fine pores; many films and threads of calcium carbonate; few soft masses of calcium carbonate; calcareous; moderately alkaline; abrupt smooth boundary.

Bk3—60 to 80 inches; light yellowish brown (10YR 6/4) silty clay loam, yellowish brown (10YR 5/4) moist; weak fine subangular blocky structure; hard, friable; common fine pores; contains about 10 percent, by volume, soft masses of calcium carbonate; many films and threads of calcium carbonate.

Thickness of the solum ranges from 40 to 80 inches. The calcium carbonate equivalent in the control section ranges from 40 to 70 percent. The silicate clay content of the solum ranges from 18 to 35 percent. The solum is calcareous and moderately alkaline throughout.

The A horizon is very dark grayish brown (10YR 3/2) and dark grayish brown (10YR 4/2). The texture is loam, clay loam, fine sandy loam, or silty clay loam.

The Bk horizons are brown (7.5YR 5/4, 10YR 5/3), yellowish brown (10YR 5/4), pale brown (10YR 6/3), or light yellowish brown (10YR 6/4). The texture is loam, clay loam, or silty clay loam.

## Tarpley Series

The Tarpley series consists of shallow, well drained, undulating soils on uplands. They formed in calcareous, clayey sediments weathered from indurated limestone. Slopes are 1 to 8 percent.

A typical pedon of Tarpley clay in an area of Tarpley-Rock outcrop complex, 1 to 8 percent slopes, stony; from the intersection of U.S. Highway 281 and U.S. Highway 190 in Lampasas, 11.6 miles north on U.S. Highway 281, 7.2 miles east and northeast on Farm Road 1690, and 1.7 miles southeast on private road on top of hill in rangeland.

A—0 to 6 inches; very dark grayish brown (10YR 3/2) cobbly clay, very dark brown (10YR 2/2) moist; moderate fine angular blocky structure; hard, firm, sticky and plastic; common fine and medium roots; common fine pores; contains about 15 percent, by volume, cobble size limestone and chert fragments; about 5 percent of the surface is covered with limestone cobbles and stones; dry weather vertical cracks 1/2 inch wide extend through the horizon; neutral; clear smooth boundary.

Bt—6 to 15 inches; dark reddish brown (2.5YR 3/4) clay, dark reddish brown (2.5YR 2.5/4) moist; strong medium angular blocky structure; hard, firm, sticky and plastic; common fine roots; common fine pores; common clay films on ped faces; dry weather cracks 1/2 inch wide extend vertically to the bedrock; neutral; abrupt smooth boundary.

R—15 to 18 inches; porous, coarse-grained, indurated limestone bedrock.

Thickness of the solum ranges from 13 to 19 inches. Reaction of the soil ranges from slightly acid to slightly alkaline. The clay content of the subsoil ranges from 60 to 80 percent. When the soil is dry, cracks up to 3/4 inch wide in the surface layer extend into the subsoil where they are 1/8 to 1/2 inch wide. The mollic epipedon ranges from 7 inches thick in some pedons to the entire thickness of the solum in others.

The A horizon is dark reddish brown (5YR 3/2), dark brown (7.5YR 4/2), very dark grayish brown (10YR 3/2), or dark grayish brown (10YR 4/2). It is clay or clay loam or their cobbly counterparts.

The Bt horizon is dark reddish brown (2.5YR 3/4, 5YR 3/3), reddish brown (2.5YR 4/4, 5YR 4/3), or dark reddish gray (5YR 4/2). It is clay or cobbly clay with a clay content of 60 to 80 percent.

The R layer is coarse-grained, indurated, limestone bedrock.

## Topsey Series

The Topsey series consists of very deep, well drained, gently sloping soils on uplands. They formed in weakly consolidated shale and marl. Slopes are 1 to 5 percent.

A typical pedon of Topsey clay loam, 1 to 5 percent slopes; from the intersection of Farm Road 581 and U.S. Highway 183 in Lometa, 4.3 miles northwest on U.S. Highway 183, 2.4 miles north and 0.4 mile east on county road, and 190 feet south of fence in pasture.

A—0 to 10 inches; dark grayish brown (10YR 4/2) clay loam, very dark grayish brown (10YR 3/2) moist; weak very fine granular and subangular blocky structure; slightly hard, friable; common fine roots; common fine and very fine limestone fragments; few fossil shell fragments; common fossil shell fragments on surface; calcareous; moderately alkaline; clear smooth boundary.

Bwl—10 to 14 inches; very pale brown (10YR 7/4) clay loam, light yellowish brown (10YR 6/4) moist; moderate very fine granular and subangular blocky structure; hard, friable; few fine roots; common fine pores; few fine and very fine concretions and soft masses of calcium carbonate; few caliche fragments; about 2 percent fossil shells; calcareous; moderately alkaline; clear smooth boundary.

Bw2—14 to 19 inches; pale yellow (2.5Y 7/4) clay loam, light yellowish brown (2.5Y 6/4) moist; moderate medium subangular blocky structure; hard, friable; few fine roots; common fine pores; few fine concretions, threads, and soft masses of calcium carbonate; about 5 to 10 percent fossil shells; calcareous; moderately alkaline; clear smooth boundary.

Bk—19 to 30 inches; pale yellow (2.5Y 7/4) gravelly clay loam, light yellowish brown (2.5Y 6/4) moist; weak medium and coarse subangular blocky structure; hard, friable; few fine roots; common fine pores; common fine, medium, and coarse soft masses and concretions of calcium carbonate; about 15 percent fossil shells; calcareous; moderately alkaline; gradual smooth boundary.

2C—30 to 80 inches; pale yellow (2.5Y 7/4) silty clay loam, light yellowish brown (2.5Y 6/4) moist; very hard, friable; thin discontinuous strata of olive yellow (2.5Y 6/6) shale that has a texture of silty clay; about 75 percent concretions and soft masses of calcium carbonate; few fossil shells; calcareous; strongly alkaline.

Thickness of the solum ranges from 20 to 40 inches. The calcium carbonate equivalent ranges from 50 to 80 percent. The silicate clay content ranges from 20 to 35 percent.

The A horizon is dark grayish brown (10YR 4/2) or dark brown (10YR 4/3). Thickness ranges from 10 to 14 inches. The texture is clay loam or silty clay loam.

The Bw1 horizon is light brown (7.5YR 6/4), brown (10YR 5/3), pale brown (10YR 6/3), very pale brown (10YR 7/4), or pale yellow (2.5YR 7/4). Texture is clay loam or silty clay loam. Fossil shells range from few to about 30 percent by volume.

The Bw2 horizon is light yellowish brown (10YR 6/4, 2.5Y 6/4), very pale brown (10YR 7/4), pale yellow (2.5Y 7/4), or yellow (2.5Y 7/6). Fossil shells range from 5 to 30 percent by volume.

The Bk horizon is light yellowish brown (2.5Y 6/4), olive yellow (2.5Y 6/6), pale yellow (2.5Y 7/4), or yellow (2.5Y 7/6). The texture is clay loam, silty clay loam or their gravelly counterparts. Fossil shells range from few to about 20 percent by volume.

The 2C horizon is brownish yellow (10YR 6/8), light brownish gray (2.5Y 6/2), olive yellow (2.5Y 6/6), light gray (2.5Y 7/2), or pale yellow (2.5Y 7/2). Texture is silty clay, silty clay loam, or clay loam. Soft masses and concretions of calcium carbonate are common to many.

## Weswood Series

The Weswood series consists of very deep, well drained, nearly level soils on bottom lands. They formed in calcareous, loamy sediments. Slopes are 0 to 1 percent.

A typical pedon of Weswood silt loam, rarely flooded; from the intersection of U.S. Highway 281 and Farm Road 580 in Lampasas, 19.0 miles west on Farm Road 580, and 75 feet south in cropland field.

Ap—0 to 8 inches; brown (7.5YR 5/4) silt loam, dark brown (7.5YR 4/4) moist; weak fine subangular blocky structure; slightly hard, friable; common fine and medium roots; common medium pores; calcareous; moderately alkaline; abrupt smooth boundary.

Bk1—8 to 18 inches; reddish brown (5YR 5/4) silt loam, reddish brown (5YR 4/4) moist; fine medium subangular blocky structure; slightly hard, friable; common fine roots; many fine pores; common wormcasts; common films and threads of calcium carbonate; calcareous; moderately alkaline; clear smooth boundary.

Bk2—18 to 33 inches; light reddish brown (5YR 6/4) silt loam, reddish brown (5YR 5/4) moist; weak medium subangular blocky structure; slightly hard, friable; few fine roots; many fine and medium pores; common wormcasts; many films and threads of calcium carbonate; few thin bedding planes; calcareous; moderately alkaline; clear smooth boundary.

Bk3—33 to 44 inches; light reddish brown (5YR 6/4) silt loam, reddish brown (5YR 5/4) moist; weak fine subangular blocky structure; slightly hard, friable; many fine and medium pores; common films and threads of calcium carbonate; few bedding planes of fine sandy loam; calcareous; moderately alkaline; clear smooth boundary.

BCk—44 to 80 inches; yellowish red (5YR 5/6) silt loam, yellowish red (5YR 4/6) moist, with bedding planes of silty clay loam and fine sandy loam; weak subangular blocky structure; slightly hard, friable; common films and threads of calcium carbonate; moderately alkaline.

Thickness of the solum ranges from 60 to more than 80 inches. The clay content of the control section ranges from 12 to 18 percent. Thin strata of fine sandy loam, clay loam, and silty clay loam in bedding planes are common below a depth of 20 inches. Threads and films of calcium carbonate in the subsoil and underlying material range from few to many.

The A horizon is brown or reddish brown (7.5YR 5/2, 5/4, 5YR 5/3).

The B horizon is reddish brown (5YR 4/4, 5/4), yellowish red (5YR 5/6), light reddish brown (5YR 6/4), or light brown (7.5YR 6/4).

The C horizon, where present, is yellowish red (5YR 5/6), reddish yellow (5YR 6/6, 7.5YR 6/6), or light brown (7.5YR 6/4).

## Wise Series

The Wise series consists of very deep, well drained, gently sloping and moderately sloping soils on uplands. They formed in sandy, loamy, and shaly marine sediments. Slopes are 3 to 8 percent.

A typical pedon of Wise clay loam, 3 to 8 percent slopes; from the intersection of U.S. Highway 281 and Farm Road 580 in Lampasas, 14.8 miles east on Farm Road 580, 1.2 miles north on private ranch road, 0.7 mile northeast, 0.2 mile east, and 180 feet west in rangeland.

A—0 to 7 inches; brown (10YR 5/3) clay loam, dark brown (10YR 4/3) moist; moderate fine granular and subangular blocky structure; hard, friable; many fine and medium roots; common fine and medium pores; calcareous; moderately alkaline; gradual smooth boundary.

Bw—7 to 18 inches; pale brown (10YR 6/3) clay loam, brown (10YR 5/3) moist; moderate fine granular and subangular blocky structure; hard, friable; common fine and medium roots; few fine pores; few fine concretions of calcium carbonate; calcareous; moderately alkaline; diffuse smooth boundary.

Bk—18 to 32 inches; light brownish gray (10YR 6/2) clay loam, grayish brown (10YR 5/2) moist; few medium distinct light yellowish brown (10YR 6/4) mottles; moderate fine and medium angular blocky structure; hard, friable; few medium roots; few fine pores; few fine and medium soft masses of calcium carbonate; calcareous; moderately alkaline; clear smooth boundary.

C—32 to 60 inches; stratified layers of brown, yellow, and olive sand and shale; massive; hard, friable; few fine and medium soft masses of calcium carbonate; calcareous; moderately alkaline.

Thickness of the solum ranges from 20 to 40 inches. The calcium carbonate equivalent of the control section ranges from 15 to 35 percent. Texture of the solum is clay loam, silty clay loam, or loam. The content of sand that is coarser than very fine sand is less than 15 percent.

The A horizon is dark brown (10YR 4/3), grayish brown (10YR 5/2), or brown (10YR 5/3).

The B horizon is light brown (7.5YR 6/4), pink (7.5YR 7/4), light brownish gray (10YR 6/2), pale brown (10YR 6/3), light yellowish brown (10YR 6/4), or very pale brown (10YR 7/3, 7/4). Some pedons have few to common mottles in shades of olive or yellow.

The C horizon is light gray (10YR 7/2), very pale brown (10YR 7/3, 8/3), or white (10YR 8/2). Some pedons have few to common olive, brownish, or yellowish mottles.

## Yahola Series

The Yahola series consists of very deep, well drained, nearly level soils on bottom land. They formed in loamy, calcareous alluvium. Slopes are 0 to 1 percent.

A typical pedon of Yahola fine sandy loam, frequently flooded; from the intersection of U.S. Highway 183 and U.S. Highway 190 in Lometa, 10.5 miles west on U.S. Highway 190, 1.0 mile southwest on county road to cattle guard, and 0.35 mile southwest in bottom land of the Colorado River.

A—0 to 9 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—9 to 24 inches; reddish brown (5YR 5/4) fine sandy loam, reddish brown (5YR 4/4) moist; massive; slightly hard, very friable; few fine roots; many fine and medium pores; thin strata of loam and fine sand; calcareous; moderately alkaline; gradual smooth boundary.

C2—24 to 36 inches; yellowish red (5YR 5/6) fine sandy loam, yellowish red (5YR 4/6) moist; single grained; slightly hard, very friable; thin strata of loam and silt loam; calcareous; moderately alkaline; gradual smooth boundary.

C3—36 to 80 inches; yellowish red (5YR 5/6) sandy loam, yellowish red (5YR 4/6) moist; single grained; slightly hard, very friable; thin strata of silt loam and loamy fine sand; calcareous; moderately alkaline.

The reaction of the soil is slightly or moderately alkaline.

The A horizon is 6 to 20 inches thick. It is reddish gray (5YR 5/2), reddish brown (5YR 4/4, 5/4), light reddish brown (5YR 6/4), dark brown (7.5YR 4/2), brown (7.5YR 5/2, 5/4), or light brown (7.5YR 6/4). Texture is loam, sandy loam, or fine sandy loam. Some surface deposits of loamy fine sand are 1 to 12 inches thick.

The C horizon is reddish brown (5YR 5/3, 5/4), yellowish red (5YR 5/6), light reddish brown (5YR 6/4), brown (7.5YR 5/4), light brown (7.5YR 6/4), reddish yellow (7.5YR 6/6), or pink (7.5YR 7/4). Texture is loam, fine sandy loam, sandy loam, or loamy fine sand. Clay content of the 10- to 40-inch control section is 5 to 18 percent.

# Formation of the Soils

In this section the factors of soil formation are related to the formation of soils in Lampasas County. Also, the surface geology of the county is described.

## Factors of Soil Formation

Soil is a natural, three-dimensional body on the earth's surface that supports plants. Soil forms through the action and interaction of five main factors. These factors are 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 topography; and the length of time that the forces of soil formation have acted on the soil material.

The effect of any one factor can differ from place to place, but it is the interaction of all the factors that determines the kind of soil that forms. In the following paragraphs the factors of soil formation are discussed as they relate to the soils in the survey area.

### Parent Material

Parent material is the unconsolidated mass from which the soils were formed. It determines the chemical and mineralogical composition of the soil. The parent material is discussed further in the section, "Surface Geology."

### Climate

The climate contributes to the formation of soils in several ways. The high temperatures, periods of high humidity, and rainfall have helped water penetrate deeply into the earth's crust. The moisture and warm temperatures favor deep penetration of plant roots, chemical weathering, and the development of micro-organisms.

In the more humid regions, soils such as Demona and Minwells soils tend to develop a clayey subsoil. Water detaches clay particles from the surface layer as it moves through the soil. These particles are deposited in the subsoil as water movement slows. As clay accumulates, the water moves even slower, the deposition of clay accelerates, and the subsoil becomes more clayey.

Rainfall distribution in Lampasas County causes the soils to be alternately wet and dry. Clay soils such as Leeray and Slidell soils crack when they become dry. Rainfall washes some of the surface layer into the cracks. If wetting continues, the partially filled cracks swell shut and cause upward movement of the soil mass. This alternate shrinking and swelling of the soils causes churning and prevents clay from accumulating in lower horizons.

Wind also affects the formation of soils. The sandy soil material in which the Eufaula and Patilo soils formed has been reworked by wind.

### Plant and Animal Life

Plants, burrowing animals, earthworms, micro-organisms, and human activities directly influence soil formation. Plant and animal life cause gains or losses in organic matter and nitrogen in soils, gains or losses in plant nutrients, and changes in structure and porosity.

Tall and mid grasses have had an important influence on soil development. The grass roots reach deeply into the soil and utilize minerals and water at lower depths. The decomposed plant roots leave channels that increase intake of water and aerate the soil.

Earthworms and burrowing rodents help to mix the material within the soil. Earthworms hasten the decay of organic matter and enhance the movement of air, water, and plant nutrients. Burrowing animals help to mix and aerate loamy and sandy soils. Micro-organisms break down organic matter and improve fertility.

Human activities have also influenced soil formation. Cultivation has encouraged runoff and erosion, reducing the content of organic matter. Tillage and continuous livestock grazing have compacted the soils and reduced aeration, infiltration, and permeability.

### Relief

Relief, or topography, affects soil formation through its influence on drainage, runoff, erosion, plant cover, and soil temperature.

The relief in Lampasas County consists of a dissected plain underlain by hard limestone on the higher ridges and softer limestone and marly clay on the rolling hills and plateaus. The plain is undulating; the steeper slopes are along the Colorado River.

### Time

A great length of time is required for the formation of soils that have distinct horizons. However, the effects of time are modified by the other four factors of soil formation. The differences in the length of time that the parent material has been in place are commonly reflected in the degree of development of the soil profile. Young soils have very little horizon development, and old soils have well-defined horizons.

The soils in Lampasas County range from young to old. Yahola soils, which are young soils, show little evidence of horizon development. The soil horizons still show the evidence of stratification, and there has been little change from the original stream-deposited alluvium. Older soils such as Demona and Minwells soils have well-defined soil horizons. The parent material has been in place for a long time. The downward movement and accumulation of soil particles have resulted in the formation of a very distinct, clayey subsoil horizon.

## Surface Geology

Dr. David L. Amsbury, geologist, National Aeronautic and Space Administration, Seabrook, Texas, prepared this section.

There is a general correspondence between the major kinds of soils of Lampasas County as shown on the general soil map, and the bedrock geology, as shown on the latest Texas geological maps published by the Bureau of Economic Geology at Austin *(5, 6, 12, 14)*.

Bedrock (which here includes ancient stream deposits that are not strictly “rocks”) provided the parent material for soil development. In Lampasas County most soils were formed by the weathering of limestone, calcareous clay and clayey limestone, sand and sandstone, and old stream deposits derived from these rocks. The type of bedrock determines relative resistance to erosion, and thus topographic position; it also affects the chemical composition and physical texture of the soil. Relatively pure limestone and sandstones on steep slopes tend to produce thin, stony soils; whereas clayey units on gentle slopes tend to produce deep clay soils.

### Basic Geological Principles

Rocks that underlie the soils of Lampasas County are sedimentary; that is, the rock-forming material was deposited originally as particles of sand, clay, fossil shell fragments, or lime mud. Most sediments were deposited in the waters of ancient seas that covered Central Texas periodically throughout geological history. Younger sediments were laid down by streams that eroded the older deposits during and after the last glacial age.

Sedimentary rocks are deposited in layers. Where the same kind of rock is exposed all around a hill, it can be assumed that similar material forms a layer that extends under the hill. The assumption can be verified by examining excavations such as road cuts or by drilling. Similarly, when recognizable layers of rock are seen on both sides of a valley, it can be assumed that the layers were once continuous across the valley but have been eroded away.

Within a body of sedimentary rock that was deposited by water, the lowest layers were deposited first. This is the rule of superposition, and it is very helpful in interpreting geological history. The rule works as long as common sense guides interpretations. It is not unusual to find older rocks at a higher elevation than younger rocks. Examples include older rocks that are uplifted by mountain-building forces, younger rocks that are dropped down in a faulted block, and older rocks that are dissected by streams so that younger stream deposits lie in valley bottoms. Actual dating of rock layers is a complex process that includes the study of fossils, laboratory measurements of radioactive elements in rocks, and reconstructions of geological history worldwide.

All of Lampasas County is underlain at some depth by rocks assigned to the Paleozoic Era of geological time, about 550 to 250 million years ago. These rocks are exposed in the western part of the county in the Colorado River valley, and in the southern part of the county in the Sulphur Creek valley *(5)*. In most of the county, rocks representing the Cretaceous Period of the Mesozoic Era overlie those of the Paleozoic Era. The Cretaceous rocks of the county probably formed during a span of several million years, centered at about 95 million years ago. The youngest “rocks” of the county consist of alluvial materials which form stream terraces along the Colorado and Lampasas Rivers and along Bennett, Simms, School, and Sulphur Creeks.

### Recent Epoch

Flood plain deposits of the major streams are the youngest mappable geological units in the county. Also included are low, indistinct terrace deposits. They form relatively narrow bottom lands inset into higher, wider, and older terrace deposits. Major floods overtop the lower portions of terraces and deposit overbank material on them. Most stream deposits consist of material reworked from older alluvium, plus material eroded and transported from valley sides and hilltops within the county. Deposits along the Colorado River contain gravel and sand that were transported from far upstream. Evidence of water transport that can be seen in vertical streambanks and in excavations include relict stream bottom sand bars and gravel lenses, crossbedding, a general upward decrease in gravel content and grain size, and a mixture of materials derived from many older units upstream. Similar alluvial deposits in many parts of Central Texas contain scattered

bones and teeth of mammoths, extinct bison, and other prehistoric animals and rare, ancient Indian spearpoints. Evidently, these deposits have been forming sporadically since the end of the latest ice age about 12,000 years ago.

The parent materials of soils along the Colorado River are different from those along the Lampasas River because they were derived from a different source. Oakalla and Sunev soils formed in Recent alluvium along the Lampasas River and its tributaries, whereas the less clayey Weswood and Yahola soils formed in alluvium along the Colorado River.

### Pleistocene Epoch

Ancient stream terraces occur along the Lampasas River and its tributaries above the modern flood plain. These terraces are formed of gravelly silt and clay materials that are similar to those of the Recent deposits. The terrace deposits are thicker than those of the modern streams. Furthermore, the ancient flood plain was much wider than the modern flood plain and the size of meander loops was much greater. Evidently, the ancient deposits were formed during one or more periods of time when rainfall, and thus stream discharge, was several times greater than at present.

Old, high terraces also occur along the Colorado River. These also are associated with meander scars that are larger than those in the modern flood plain. In places, these terraces are incised into very resistant bedrock but lie 50 feet or more above the modern flood plain. Alluvial material on these terraces, like the modern alluvium, is much sandier than that of the Lampasas drainage and contains exotic gravels carried from far upstream. Soils of the Luckenbach-Minwells-Bastsil general soil map unit formed on the ancient Colorado terraces, whereas soils of the Sunev-Rumley-Oakalla general soil map unit formed on terraces of the Lampasas drainage.

Broad valleys, graded to a level above the ancient terraces are characteristic of Lampasas County. R.T. Hill, “The father of Texas geology,” named this widespread landscape the Lampasas Cut Plain *(11)*. The Lampasas Cut Plain was formed during a period of spectacular valley widening that contrasts with more recent periods of valley deepening *(13)*.

The significance to soil development is that most of the soils in Lampasas County must represent formation over a long period of time (at least a half-million years during much of the Pleistocene Epoch) under conditions that varied greatly in rainfall, temperature, and vegetation. Soil properties that reflect bedrock and parent material have been modified by the effects of changing climate. For example, thick caliche horizons record periods when the climate was much warmer, dryer, and probably had more seasonal rainfall than at present; and the scattered areas of sticky, red, clayey soils formed over limestone represent one or more periods when the climate was both warmer and wetter than at present.

### Cretaceous Period

Most rocks of Lower Cretaceous age in Lampasas County were formed from sediments deposited near the shore of a shallow sea that extended from the ancient Gulf of Mexico through the East Texas Basin and westward across Lampasas County *(1)*. The layers of rock were eventually tilted eastward at a gradient of about 15 feet per mile.

Individual layers of rock are grouped into units that are thick enough to map at a desired scale. The basic, named map unit is the formation. Named or unnamed members may be recognized within formations. The rock name that accompanies a map unit is derived from the most typical exposure or from the rock type at the place where the unit was first named. The Walnut Shale, for example, is mostly shale near Walnut Springs (Bosque County) where it was first named, but in Lampasas County the unit may be more than half limestone of one kind or another.

The geological formations of Cretaceous age that crop out in Lampasas County are described in the following paragraphs in the order of youngest to oldest. The Edwards Limestone, Comanche Peak Limestone, Walnut Formation, and Paluxy Formation make up the Fredericksburg Group *(1, 9)*. Rocks of the Fredericksburg Group are underlain by the Glen Rose Formation. These formations were deposited in near-shore marine and tidal-flat environments. The nonmarine Travis Peak Formation, probably also of Cretaceous age, separates the marine Cretaceous rocks from underlying Paleozoic strata.

**Edwards Limestone.** Thick beds of Edwards Limestone cap a high ridge on the east side of Lampasas County near the Coryell County line and the divide between the Colorado and Lampasas Rivers northwest and southeast of Lometa. Rocks of the Edwards Limestone formed from the skeletons of unusual, thick-shelled, reef-and bank-building clams called rudistids *(15)*. Between mounds of shell debris, thinner beds of fine-grained, but not clayey, limestone were deposited. The thinner beds typically contain abundant nodules of chert (flint). Beds of dolomite, a calcium-magnesium carbonate mineral, also occur within the Edwards Limestone formation. Dolomite of Cretaceous age tends to be much softer and more easily eroded than limestone. It has been conjectured that more than 100 feet of this dolomite formerly overlay the 20 feet or so of Edwards Limestone that remains on hilltops in Lampasas County.

The landscape on which Edwards Limestone crops out includes rocky fields and craggy brush-covered ledges on hilltops. The Eckrant and Tarpley soils in the Eckrant-Real-Tarpley general soil map unit formed over the Edwards Limestone.

**Comanche Peak Limestone.** The Comanche Peak Limestone crops out on steep slopes below the Edwards Limestone. It is white, nodular, fairly soft limestone interbedded with marl and calcareous clay. Internal molds of clams and snails, along with several kinds of oyster shells and echinoids (fat sand dollars), are locally abundant in road cuts and quarries *(15)*. These rocks formed from sediment of lime mud which came from marine algae and finely ground shell debris. Clay was intermittently washed in from far to the north. Clams, snails, and other animals burrowed in these sediments, partially mixing the lime and clay mud. The nodules so characteristic of the Comanche Peak Limestone are the remnants of lumps of pure lime mud that were not completely mixed with clay.

Slopes on Comanche Peak Limestone tend to be thickly mantled by colluvium which is deeply calichified. If the overlying Edwards Limestone did not protect it, the Comanche Peak Limestone probably would form low, rounded hills. Real soils in the Eckrant-Real-Tarpley general soil map unit are underlain by Comanche Peak Limestone.

**Walnut Formation.** Shale, oyster-shell beds, nodular limestone, and flaggy limestone of the Walnut Clay crop out on the middle to upper slopes of the Lampasas drainage basin. In Lampasas County, the Walnut Shale is 70 to 80 feet thick. An upper member, the Keys Valley Marl, is 40 to 50 feet thick. The middle member, Cedar Park Limestone, varies from 15 feet thick in the northwest (near Lometa) to 30 feet in the southeast. A lower member, Bee Cave Marl, is about 15 feet thick.

At the top of the Keys Valley Marl, immediately below the Comanche Peak Limestone, there is a prominent, resistant bed several feet thick composed of gryphaeid oysters. These oysters are 1 to 2 inches long, thick-shelled, reddish brown, and have beaks that curl into the body cavity *(15)*. They form a layer that extends from northern Travis County to north of Fort Worth, and westward through Lampasas and Mills Counties. Below the gryphaeid bed is white, nodular limestone and chalk containing abundant molds of clams, snails, and other fossils. The rest of the Keys Valley Member is dark clay shale with hard, brown flagstone beds.

The Cedar Park Limestone member is characterized by white, nodular limestone similar to the Comanche Peak. The Bee Cave Member contains some nodular limestone, but it also contains interbeds of hard, brown flagstone; oyster beds; and shale. Both members are fossiliferous. They can be observed in an outcrop at the intersection of Farm Road 581 and U.S. Highway 190 near Lometa.

The Walnut Formation forms the parent material for several different soils, depending on rock type, slope, and position on valley sides. Parts of the Brackett-Lampasas general soil map unit and most of the Nuff-Brackett-Cho general soil map unit are underlain by the Walnut Formation.

**Paluxy Formation.** The Paluxy Formation underlies a narrow band of sandy soils at about mid-level within the Lampasas drainage basin. The formation is only 10 to 20 feet thick, but in some places the area of outcrop is wide enough to be mapped as Wise soils. The Paluxy Formation consists of friable, very fine sand to silt; hard, laminated, light-colored sand flagstones; thin beds of greenish, laminated clay; and yellow-brown siltstone. The Paluxy Formation is a convenient marker that separates rocks of the Fredericksburg Group from the underlying Glen Rose Formation. It represents a period of time when dominantly marine limestone deposition in Lampasas County was interrupted by subtidal to intertidal deposition of quartz sand *(16)*.

**Glen Rose Formation.** The Glen Rose Formation crops out on the lower slopes of the Lampasas drainage basin and on intermediate slopes east of the Colorado River. It thickens eastward from about 100 feet along the scarp east of the Colorado River, to more than 200 feet in the subsurface near the Coryell County line. The Glen Rose Formation is a complex unit made up of alternating thin beds of several different rock types. These include very hard, highly cemented beds of shell hash and other carbonate particles; soft, fossiliferous marl; moderately soft dolomite (recognized by sparkling crystal faces much softer than quartz silt); greenish shale; oyster beds; and near the base, sandy and silty beds.

In some areas, the Glen Rose Formation contains abundant dinosaur tracks such as those at Dinosaur Valley State Park in Somervell County, in the bed of the North San Gabriel River in Williamson County, and near Tarpley in Bandera County. Some beds in Lampasas County contain nodules of celestite (strontium carbonate) and strontianite (strontium sulphate), which look like calcite (calcium carbonate) but are heavier and much more dense. The strontium minerals probably replaced original gypsum (calcium sulphate) nodules in tidal-flat sediments. Glen Rose rocks were deposited near the edge of a shallow sea in environments that varied rapidly from fully marine, through lagoons and tidal flats, to dry coastal plains *(10)*.

Most of the soils in the Brackett-Lampasas general soil map unit and some of the soils in the Nuff-Brackett-Cho general soil map unit are underlain by the Glen Rose Formation.

**Travis Peak Formation.** The Travis Peak Formation separates marine, Lower Cretaceous rocks of the Glen Rose Formation from much older Paleozoic rocks. It consists of stream channel gravel and sand, silt, and clay that were deposited on flood plains and in lagoons; and of ancient caliche soils formed in the sediments. The Travis

**Figure 12.—Limestone of the Ellenburger Group underlies the Roughcreek-Eckrant-Rock outcrop general soil map unit.**

Peak Formation gradually filled in a rugged landscape of hills and valleys. North and northwest of Lampasas County, valleys formed by east-flowing streams have been mapped as part of this topography *(4)*, as well as a valley formed by a southeast-flowing stream in western Hamilton and western Coryell Counties *(8)*. The sparse data available suggest that southwestern Lampasas County also was the site of a range of hills, about one hundred feet high, before all the older rocks were buried by Travis Peak sediments and by the succeeding Glen Rose Limestone. Sand beds within the buried valleys form the best aquifers in Central Texas (Hosston Sand and Sycamore Sand) *(8)*.

Rocks of the Travis Peak Formation have very little cement and thus have little resistance to erosion. Some areas of the Brackett-Lampasas and the Nuff-Brackett-Cho general soil map units in the western and southern parts of the county are underlain by the Travis Peak Formation.

### Paleozoic Rocks

Rocks of the Paleozoic Era crop out along the east side of the Colorado River and in the bed of Sulphur Creek just upstream from Lampasas. They were folded into a very large, northeast-trending uplift (termed a "plunging anticline") so that the beds in the eastern outcrops dip northeastward, and the beds in the northwestern outcrops dip northwestward. After folding,

the Paleozoic rocks were broken by faults that trend north-south to northeast-southwest *(5)*. The faults do not cut overlying Cretaceous rocks and therefore formed before the Cretaceous rocks were deposited. During the long period of time after the uplift and faulting, and before deposition of the Travis Peak beds, the Paleozoic rocks were eroded into hills and valleys *(4)*. The Paleozoic Era is represented in Lampasas County by only a few mappable geologic units. They represent a small part of Paleozoic time because of long periods in which there was no erosion between formation of the preserved units *(7)*.

**Strawn Sandstone.** Thick beds of Strawn Sandstone form rugged, low hills north of Farm Road 580 between Nix and Bend. They also form northeast-trending ridges in a small area east of the Colorado River and bisected by U.S. Highway 190. Strawn Sandstone is reddish brown, cross-bedded, locally conglomeratic, and coarse- to fine-grained. The sandstone beds represent channel deposits in westward-flowing currents in contrast to the eastward-flowing streams of the overlying Travis Peak beds. Strawn Sandstone is of Pennsylvanian age. It contains few fossils except in thin limestone beds that are found only northwest of Lampasas County. Strawn Sandstone beds form rocky ledges that are mostly wooded. The Nocken-Lometa-Callahan general soil map unit is underlain by the Strawn Sandstone formation.

**Smithwick Shale.** Small areas of Smithwick Shale crop out southwest of Nix, north of Farm Road 580 about 3 miles west of Nix, and along the north bank of the Colorado River downstream from the bridge at Bend. It is fissile (true shale), dark gray to brown, and contains beds having abundant marine fossils. Smithwick Shale is of Lower Pennsylvanian age.

**Marble Falls Limestone.** Fairly extensive outcrops of Marble Falls Limestone occur west of Lampasas at the junction of Sulphur Creek and Donalson Creek, in an arcuate pattern southwest and west of Nix but east of the Colorado River, and in an area along Salt Creek. The unit is about 300 feet thick and is composed of dark limestone that weathers to light gray. Fossils are locally abundant but can be very difficult to separate from the matrix. Chert nodules and silicified fossils are abundant in small areas. The age is lower Pennsylvanian. The Marble Falls Limestone forms rocky ledges covered with brush. The Roughcreek-Eckrant-Rock outcrop general soil map unit is underlain by the Marble Falls Limestone.

**Mississippian/Devonian Unit.** The Marble Falls Limestone is separated from the underlying Ellenburger Group of rocks by a collection of discontinuous, shaly beds that represent a long period of geologic time *(7)*. They are the remnants of many periods of erosion, deposition of thin marine beds, cave deposits, and soils. The unit is too thin to be an important source of soils, but is important to the geological history in Central Texas.

**Ellenburger Group.** Rocks of the Ellenburger Group occur along Sulphur Creek and Spring Branch about 5 miles west of Lampasas. They also occur in the extreme southwestern corner of the county. They form high limestone bluffs along the Colorado River across from Gorman Falls. The limestone and tightly cemented dolomite are light-colored when broken, in contrast to rocks of the Marble Falls Limestone. Fossils are rare and difficult to extract, although trails and burrows are abundant in some beds. Light-colored chert is locally very abundant. The Ellenburger Group is of Ordovician age. The Roughcreek-Eckrant-Rock outcrop general soil map unit is underlain by Ellenburger rocks (fig. 12).

# References


(1) Adkins, W.S. 1932. The Mesozoic systems in Texas *In* Sellards, E.H., W.S. Adkins, and F.B. Plummer, The Geology of Texas, Vol. 1, Stratigraphy. Univ. Tex. Bur. Econ. Geol. Bull. 3232.

(2) American Association of State Highway and Transportation Officials. 1986. Standard specifications for highway materials and methods of sampling and testing. Ed. 13, 2 vols.

(3) American Society for Testing and Materials. 1993. Standard classification of soils for engineering purposes. ASTM Stand. D 2487.

(4) Bain, J.S. 1973. The nature of the Cretaceous-PreCretaceous contact, north-central Texas. Baylor Univ. Geol. Stud. Bull. 25.

(5) Barnes, V.E., Project Director, Geologic atlas of Texas: Brownwood Sheet, 1976. Univ. Tex. Bur. Econ. Geol.

(6) Barnes, V.E., Project Director, Geologic atlas of Texas: Waco Sheet, 1970. Univ. Tex. Bur. Econ. Geol.

(7) Barnes, V.E., W.C. Bell, S.E. Claybaugh, P.E. Cloud, Jr., R.V. McGehee, P.U. Rodda, and Keith Young. 1972. Geology of the Llano region and Austin Area. Field Excursion. Univ. Tex. Bur. Econ. Geol. Guidebook 13.

(8) Boone, P.A. 1968. Stratigraphy of the basal Trinity (Lower Cretaceous) Sands of Central Texas. Baylor Univ. Geol. Stud. Bull. 15.

(9) Corwin, L.W. 1974. Stratigraphy of the Fredericksburg Group north of the Colorado River, Texas. Baylor Univ. Geol. Stud. Bull. 40.

(10) Davis, K.W. 1974. Stratigraphy and depositional environments of the Glen Rose Formation, north-central Texas. Baylor Univ. Geol. Stud. Bull. 26.

(11) Dolliver, P.N. 1976. The significance of Robert Thomas Hill's contribution to the knowledge of Central Texas geology. Baylor Univ. Geol. Stud. Bull. 31.

(12) Geologic Map of Texas, MM 14. 1932. Univ. Tex. Bur. Econ. Geol.

(13) Hayward, O.T., and P.M. Allen. 1987. Lampasas Cut Plain: Form-Process-Evolution. Field Trip Guidebook, April 1-2, 1987. South-Central Sect. Geol. Soc. America, Baylor Univ.

(14) Kier, R.S., L.E. Garner, and L.F. Brown, Jr. 1977. Land resources of Texas. Univ. Tex. Bur. Econ. Geol.

(15) Matthews, W.H., III. 1960. Texas Fossils: An amateur collector's handbook. Univ. Tex. Bur. Econ. Geol. Guidebook 2.

(16) Owens, M.T. 1979. The Paluxy Sand in north-central Texas. Baylor Univ. Geol. Stud. Bull. 36.

(17) United States Department of Agriculture, Soil Conservation Service. 1961. Land capability classification. U.S. Dep. Agric. Handb. 210.

(18) United States Department of Agriculture, Soil Conservation Service. 1975. Soil taxonomy: A basic system of soil classification for making and interpreting soil surveys. U.S. Dep. Agric. Handb. 436.

(19) United States Department of Agriculture, Soil Conservation Service. 1992. Keys to soil taxonomy. 5th ed. Soil Surv. Staff, Soil Manage. Support Serv. Tech. Monogr. 19.

(20) United States Department of Agriculture, Soil Conservation Service. 1993. Soil survey manual. Soil Surv. Staff, U.S. Dep. Agric. Handb. 18.

# Glossary

**ABC soil.** A soil having an A, a B, and a C horizon.

**AC soil.** A soil having only an A and a C horizon. Commonly, such soil formed in recent alluvium or on steep, rocky slopes.

**Aeration, soil.** The exchange of air in soil with air from the atmosphere. The air in a well aerated soil is similar to that in the atmosphere; the air in a poorly aerated soil is considerably higher in carbon dioxide and lower in oxygen.

**Aggregate, soil.** Many fine particles held in a single mass or cluster. Natural soil aggregates, such as granules, blocks, or prisms, are called peds. Clods are aggregates produced by tillage or logging.

**Alluvium.** Material, such as sand, silt, or clay, deposited on land by streams.

**Animal unit month (AUM).** The amount of forage required by one mature cow of approximately 1,000 pounds weight, with or without a calf, for 1 month.

**Area reclaim** (in tables). An area difficult to reclaim after the removal of soil for construction and other uses. Revegetation and erosion control are extremely difficult.

**Argillic horizon.** A subsoil horizon characterized by an accumulation of illuvial clay.

**Available water capacity (available moisture capacity).** The capacity of soils to hold water available for use by most plants. It is commonly defined as the difference between the amount of soil water at field moisture capacity and the amount at wilting point. It is commonly expressed as inches of water per inch of soil. The capacity, in inches, in a 60-inch profile or to a limiting layer is expressed as:

| | |
|---|---|
| Very low | 0 to 3 |
| Low | 3 to 6 |
| Moderate | 6 to 9 |
| High | 9 to 12 |
| Very high | more than 12 |

**Base saturation.** The degree to which material having cation-exchange properties is saturated with exchangeable bases (sum of Ca, Mg, Na, and K), expressed as a percentage of the total cation-exchange capacity.

**Bedding planes.** Fine strata, less than 5 millimeters thick, in unconsolidated alluvial, eolian, lacustrine, or marine sediment.

**Bedrock.** The solid rock that underlies the soil and other unconsolidated material or that is exposed at the surface.

**Bedrock-controlled topography.** A landscape where the configuration and relief of the landforms are determined or strongly influenced by the underlying bedrock.

**Bottom land.** The normal flood plain of a stream, subject to flooding.

**Boulders.** Rock fragments larger than 2 feet (60 centimeters) in diameter.

**Brush management.** Use of mechanical, chemical, or biological methods to make conditions favorable for reseeding or to reduce or eliminate competition from woody vegetation and thus allow understory grasses and forbs to recover. Brush management increases forage production and thus reduces the hazard of erosion. It can improve the habitat for some species of wildlife.

**Calcareous soil.** A soil containing enough calcium carbonate (commonly combined with magnesium carbonate) to effervesce visibly when treated with cold, dilute hydrochloric acid.

**Caliche.** A more or less cemented deposit of calcium carbonate in soils of warm-temperate, suabhumid to arid areas. Caliche occurs as soft, thin layers in the soil or as hard, thick beds directly beneath the solum, or it is exposed at the surface by erosion.

**Canopy.** The leafy crown of trees or shrubs.

**Capillary water.** Water held as a film around soil particles and in tiny spaces between particles. Surface tension is the adhesive force that holds capillary water in the soil.

**Cation.** An ion carrying a positive charge of electricity. The common soil cations are calcium, potassium, magnesium, sodium, and hydrogen.

**Cation-exchange capacity.** The total amount of exchangeable cations that can be held by the soil, expressed in terms of milliequivalents per 100 grams of soil at neutrality (pH 7.0) or at some other stated pH value. The term, as applied to soils, is synonymous with base-exchange capacity but is more precise in meaning.

**Chemical treatment.** Control of unwanted vegetation through the use of chemicals.

**Chiseling.** Tillage with an implement having one or more soil-penetrating points that shatter or loosen hard, compacted layers to a depth below normal plow depth.

**Clay.** As a soil separate, the mineral soil particles less than 0.002 millimeter in diameter. As a soil textural class, soil material that is 40 percent or more clay, less than 45 percent sand, and less than 40 percent silt.

**Clay film.** A thin coating of oriented clay on the surface of a soil aggregate or lining pores or root channels. Synonyms: clay coating, clay skin.

**Claypan.** A slowly permeable soil horizon that contains much more clay than the horizons above it. A claypan is commonly hard when dry and plastic or stiff when wet.

**Climax plant community.** The stabilized plant community on a particular site. The plant cover reproduces itself and does not change so long as the environment remains the same.

**Coarse textured soil.** Sand or loamy sand.

**Cobble (or cobblestone).** A rounded or partly rounded fragment of rock 3 to 10 inches (7.6 to 25 centimeters) in diameter.

**Cobbly soil material.** Material that is 15 to 35 percent, by volume, rounded or partially rounded rock fragments 3 to 10 inches (7.6 to 25 centimeters) in diameter. Very cobbly soil material has 35 to 60 percent of these rock fragments, and extremely cobbly soil material has more than 60 percent.

**Colluvium.** Soil material or 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 establishing terraces, diversions, and other water-control structures on a complex slope is difficult.

**Complex, soil.** A map unit of two or more kinds of soil or miscellaneous areas in such an intricate pattern or so small in area that it is not practical to map them separately at the selected scale of mapping. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas.

**Compressible** (in tables). Excessive decrease in volume of soft soil under load.

**Concretions.** Cemented bodies with crude internal symmetry organized around a point, a line, or a plane. They typically take the form of concentric layers visible to the naked eye. Calcium carbonate, iron oxide, and manganese oxide are common compounds making up concretions. If formed in place, concretions of iron oxide or manganese oxide are generally considered a type of redoximorphic concentration.

**Conglomerate.** A coarse grained, clastic rock composed of rounded or subangular rock fragments more than 2 millimeters in diameter. It commonly has a matrix of sand and finer textured material. Conglomerate is the consolidated equivalent of gravel.

**Conservation cropping system.** Growing crops in combination with needed cultural and management practices. In a good conservation cropping system, the soil-improving crops and practices more than offset the effects of the soil-depleting crops and practices. Cropping systems are needed on all tilled soils. Soil-improving practices in a conservation cropping system include the use of rotations that contain grasses and legumes and the return of crop residue to the soil. Other practices include the use of green manure crops of grasses and legumes, proper tillage, adequate fertilization, and weed and pest control.

**Conservation tillage.** A tillage system that does not invert the soil and that leaves a protective amount of crop residue on the surface throughout the year.

**Consistence, soil.** Refers to the degree of cohesion and adhesion of soil material and its resistance to deformation when ruptured. Consistence includes resistance of soil material to rupture and to penetration; plasticity, toughness, and stickiness of puddled soil material; and the manner in which the soil material behaves when subject to compression. Terms describing consistence are defined in the “Soil Survey Manual.”

**Contour stripcropping.** Growing crops in strips that follow the contour. Strips of grass or close-growing crops are alternated with strips of clean-tilled crops or summer fallow.

**Control section.** The part of the soil on which classification is based. The thickness varies among different kinds of soil, but for many it is that part of the soil profile between depths of 10 inches and 40 or 80 inches.

**Corrosion.** Soil-induced electrochemical or chemical action that dissolves or weakens concrete or uncoated steel.

**Cover crop.** A close-growing crop grown primarily to improve and protect the soil between periods of regular crop production, or a crop grown between trees and vines in orchards and vineyards.

**Cropping system.** Growing crops according to a planned system of rotation and management practices.

**Crop residue management.** Returning crop residue to the soil, which helps to maintain soil structure, organic matter content, and fertility and helps to control erosion.

**Cutbanks cave** (in tables). The walls of excavations tend to cave in or slough.

**Decreasers.** The most heavily grazed climax range plants.

Because they are the most palatable, they are the first to be destroyed by overgrazing.

**Deferred grazing.** Postponing grazing or resting grazing land for a prescribed period.

**Dense layer** (in tables). A very firm, massive layer that has a bulk density of more than 1.8 grams per cubic centimeter. Such a layer affects the ease of digging and can affect filling and compacting.

**Depth, soil.** Generally, the thickness of the soil over bedrock. Very deep soils are more than 60 inches deep over bedrock; deep soils, 40 to 60 inches; moderately deep, 20 to 40 inches; shallow, 10 to 20 inches; and very shallow, less than 10 inches.

**Depth to rock** (in tables). Bedrock is too near the surface for the specified use.

**Diversion (or diversion terrace).** A ridge of earth, generally a terrace, built to protect downslope areas by diverting runoff from its natural course.

**Drainage class** (natural). Refers to the frequency and duration of wet periods under conditions similar to those under which the soil formed. Alterations of the water regime by human activities, either through drainage or irrigation, are not a consideration unless they have significantly changed the morphology of the soil. Seven classes of natural soil drainage are recognized—*excessively drained, somewhat excessively drained, well drained, moderately well drained, somewhat poorly drained, poorly drained,* and *very poorly drained*. These classes are defined in the "Soil Survey Manual."

**Drainage, surface.** Runoff, or surface flow of water, from an area.

**Draw.** A small stream valley that generally is more open and has broader bottom land than a ravine or gulch.

**Eluviation.** The movement of material in true solution or colloidal suspension from one place to another within the soil. Soil horizons that have lost material through eluviation are eluvial; those that have received material are illuvial.

**Eolian soil material.** Earthy parent material accumulated through wind action; commonly refers to sandy material in dunes or to loess in blankets on the surface.

**Erosion.** The wearing away of the land surface by water, wind, ice, or other geologic agents and by such processes as gravitational creep.

**Erosion** (geologic). Erosion caused by geologic processes acting over long geologic periods and resulting in the wearing away of mountains and the building up of such landscape features as flood plains and coastal plains. Synonym: natural erosion.

**Erosion** (accelerated). Erosion much more rapid than geologic erosion, mainly as a result of human or animal activities or of a catastrophe in nature, such as a fire, that exposes the surface.

**Escarpment.** A relatively continuous and steep slope or cliff breaking the general continuity of more gently sloping land surfaces and resulting from erosion or faulting. Synonym: scarp.

**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.

**Fallow.** Cropland left idle in order to restore productivity through accumulation of moisture. Summer fallow is common in regions of limited rainfall where cereal grain is grown. The soil is tilled for at least one growing season for weed control and decomposition of plant residue.

**Fast intake** (in tables). The rapid movement of water into the soil.

**Fertility, soil.** The quality that enables a soil to provide plant nutrients, in adequate amounts and in proper balance, for the growth of specified plants when light, moisture, temperature, tilth, and other growth factors are favorable.

**Field moisture capacity.** The moisture content of a soil, expressed as a percentage of the ovendry weight, after the gravitational, or free, water has drained away; the field moisture content 2 or 3 days after a soaking rain; also called *normal field capacity, normal moisture capacity,* or *capillary capacity*.

**Fine textured soil.** Sandy clay, silty clay, or clay.

**First bottom.** The normal flood plain of a stream, subject to frequent or occasional flooding.

**Flagstone.** A thin fragment of sandstone, limestone, slate, shale, or (rarely) schist 6 to 15 inches (15 to 38 centimeters) long.

**Flood plain.** A nearly level alluvial plain that borders a stream and is subject to flooding unless protected artificially.

**Fluvial.** Of or pertaining to rivers; produced by river action, as a fluvial plain.

**Foot slope.** The inclined surface at the base of a hill.

**Forb.** Any herbaceous plant not a grass or a sedge.

**Fragile** (in tables). A soil that is easily damaged by use or disturbance.

**Genesis, soil.** The mode of origin of the soil. Refers especially to the processes or soil-forming factors responsible for the formation of the solum, or true soil, from the unconsolidated parent material.

**Gilgai.** Commonly, a succession of microbasins and microknolls in nearly level areas or of microvalleys and microridges parallel with the slope. Typically, the

microrelief of clayey soils that shrink and swell considerably with changes in moisture content.

**Grassed waterway.** A natural or constructed waterway, typically broad and shallow, seeded to grass as protection against erosion. Conducts surface water away from cropland.

**Gravel.** Rounded or angular fragments of rock as much as 3 inches (2 millimeters to 7.6 centimeters) in diameter. An individual piece is a pebble.

**Gravelly soil material.** Material that is 15 to 35 percent, by volume, rounded or angular rock fragments, not prominently flattened, as much as 3 inches (7.6 centimeters) in diameter.

**Green manure crop** (agronomy). A soil-improving crop grown to be plowed under in an early stage of maturity or soon after maturity.

**Ground water.** Water filling all the unblocked pores of the material below the water table.

**Gully.** A 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.

**Hard bedrock.** Bedrock that cannot be excavated except by blasting or by the use of special equipment that is not commonly used in construction.

**Hardpan.** A hardened or cemented soil horizon, or layer. The soil material is sandy, loamy, or clayey and is cemented by iron oxide, silica, calcium carbonate, or other substance.

**High-residue crops.** Such crops as small grain and corn used for grain. If properly managed, residue from these crops can be used to control erosion until the next crop in the rotation is established. These crops return large amounts of organic matter to the soil.

**Hill.** A natural elevation of the land surface, rising as much as 1,000 feet above surrounding lowlands, commonly of limited summit area and having a well defined outline; hillsides generally have slopes of more than 15 percent. The distinction between a hill and a mountain is arbitrary and is dependent on local usage.

**Horizon, soil.** A layer of soil, approximately parallel to the surface, having distinct characteristics produced by soil-forming processes. In the identification of soil horizons, an uppercase letter represents the major horizons. Numbers or lowercase letters that follow represent subdivisions of the major horizons. An explanation of the subdivisions is given in the "Soil Survey Manual." The major horizons of mineral soil are as follows:

*A horizon.*—The mineral horizon at or near the surface in which an accumulation of humified organic matter is mixed with the mineral material. Also, a plowed surface horizon, most of which was originally part of a B horizon.

*E horizon.*—The mineral horizon in which the main feature is loss of silicate clay, iron, aluminum, or some combination of these.

*B horizon.*—The mineral horizon below an A horizon. The B horizon is in part a layer of transition from the overlying A to the underlying C horizon. The B horizon also has distinctive characteristics, such as (1) accumulation of clay, sesquioxides, humus, or a combination of these; (2) prismatic or blocky structure; (3) redder or browner colors than those in the A horizon; or (4) a combination of these.

*C horizon.*—The mineral horizon or layer, excluding indurated bedrock, that is little affected by soil-forming processes and does not have the properties typical of the overlying soil material. The material of a C horizon may be either like or unlike that in which the solum formed. If the material is known to differ from that in the solum, an Arabic numeral, commonly a 2, precedes the letter C.

*Cr horizon.*—Soft, consolidated bedrock beneath the soil.

*R layer.*—Consolidated bedrock beneath the soil. The bedrock commonly underlies a C horizon, but it can be directly below an A or a B horizon.

**Humus.** The well decomposed, more or less stable part of the organic matter in mineral soils.

**Hydrologic soil groups.** Refers to soils grouped according to their runoff potential. The soil properties that influence this potential are those that affect the minimum rate of water infiltration on a bare soil during periods after prolonged wetting when the soil is not frozen. These properties are depth to a seasonal high water table, the infiltration rate and permeability after prolonged wetting, and depth to a very slowly permeable layer. The slope and the kind of plant cover are not considered but are separate factors in predicting runoff.

**Illuviation.** The movement of soil material from one horizon to another in the soil profile. Generally, material is removed from an upper horizon and deposited in a lower horizon.

**Impervious soil.** A soil through which water, air, or roots penetrate slowly or not at all. No soil is absolutely impervious to air and water all the time.

**Increasers.** Species in the climax vegetation that increase in amount as the more desirable plants are reduced by close grazing. Increasers commonly are the shorter plants and the less palatable to livestock.

**Infiltration.** The downward entry of water into the immediate surface of soil or other material, as

contrasted with percolation, which is movement of water through soil layers or material.

**Infiltration capacity.** The maximum rate at which water can infiltrate into a soil under a given set of conditions.

**Infiltration rate.** The rate at which water penetrates the surface of the soil at any given instant, usually expressed in inches per hour. The rate can be limited by the infiltration capacity of the soil or the rate at which water is applied at the surface.

**Intake rate.** The average rate of water entering the soil under irrigation. Most soils have a fast initial rate; the rate decreases with application time. Therefore, intake rate for design purposes is not a constant but is a variable depending on the net irrigation application. The rate of water intake, in inches per hour, is expressed as follows:

Less than 0.2 ..... very low

0.2 to 0.4 ..... low

0.4 to 0.75 ..... moderately low

0.75 to 1.25 ..... moderate

1.25 to 1.75 ..... moderately high

1.75 to 2.5 ..... high

More than 2.5 ..... very high

**Intermittent stream.** A stream, or reach of a stream, that flows for prolonged periods only when it receives ground-water discharge or long, continued contributions from melting snow or other surface and shallow subsurface sources.

**Invaders.** On range, plants that encroach into an area and grow after the climax vegetation has been reduced by grazing. Generally, plants invade following disturbance of the surface.

**Irrigation.** Application of water to soils to assist in production of crops.

**Knoll.** A small, low, rounded hill rising above adjacent landforms.

**Lamella.** A thin, discontinuous or continuous, generally horizontal layer of fine material (especially clay and iron oxides) that has been illuviated within a coarser, eluviated layer.

**Large stones** (in tables). Rock fragments 3 inches (7.6 centimeters) or more across. Large stones adversely affect the specified use of the soil.

**Leaching.** The removal of soluble material from soil or other material by percolating water.

**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-residue crops.** Such crops as corn used for silage, peas, beans, and potatoes. Residue from these crops is not adequate to control erosion until the next crop in the rotation is established. These crops return little organic matter to the soil.

**Low strength.** The soil is not strong enough to support loads.

**Marl.** An earthy, unconsolidated deposit consisting chiefly of calcium carbonate mixed with clay in approximately equal amounts.

**Masses.** Concentrations of substances in the soil matrix that do not have a clearly defined boundary with the surrounding soil material and cannot be removed as a discrete unit. Common compounds making up masses are calcium carbonate, gypsum or other soluble salts, iron oxide, and manganese oxide. Masses consisting of iron oxide or manganese oxide generally are considered a type of redoximorphic concentration.

**Mechanical treatment.** Use of mechanical equipment for seeding, brush management, and other management practices.

**Medium textured soil.** Very fine sandy loam, loam, silt loam, or silt.

**Mesa.** A broad, nearly flat topped and commonly isolated upland mass characterized by summit widths that are more than the heights of bounding erosional scarps.

**Mineral soil.** Soil that is mainly mineral material and low in organic material. Its bulk density is more than that of organic soil.

**Minimum tillage.** Only the tillage essential to crop production and prevention of soil damage.

**Miscellaneous area.** An area that has little or no natural soil and supports little or no vegetation.

**Moderately coarse textured soil.** Coarse sandy loam, sandy loam, or fine sandy loam.

**Moderately fine textured soil.** Clay loam, sandy clay loam, or silty clay loam.

**Mollic epipedon.** A thick, dark, humus-rich surface horizon (or horizons) that has high base saturation and pedogenic soil structure. It may include the upper part of the subsoil.

**Morphology, soil.** The physical makeup of the soil, including the texture, structure, porosity, consistence, color, and other physical, mineral, and biological properties of the various horizons, and the thickness and arrangement of those horizons in the soil profile.

**Mottling, soil.** Irregular spots of different colors that vary in number and size. Descriptive terms are as follows: abundance—*few, common,* and *many;* size—*fine, medium,* and *coarse;* and contrast—*faint, distinct,* and *prominent*. The size measurements are of the diameter along the greatest dimension. *Fine* indicates less than 5 millimeters (about 0.2 inch); *medium,* from

5 to 15 millimeters (about 0.2 to 0.6 inch); and *coarse,* more than 15 millimeters (about 0.6 inch).

**Mudstone.** Sedimentary rock formed by induration of silt and clay in approximately equal amounts.

**Munsell notation.** A designation of color by degrees of three simple variables—hue, value, and chroma. For example, a notation of 10YR 6/4 is a color with hue of 10YR, value of 6, and chroma of 4.

**Neutral soil.** A soil having a pH value of 6.6 to 7.3. (See Reaction, soil.)

**Nodules.** Cemented bodies lacking visible internal structure. Calcium carbonate, iron oxide, and manganese oxide are common compounds making up nodules. If formed in place, nodules of iron oxide or manganese oxide are considered types of redoximorphic concentrations.

**Nutrient, plant.** Any element taken in by a plant essential to its growth. Plant nutrients are mainly nitrogen, phosphorus, potassium, calcium, magnesium, sulfur, iron, manganese, copper, boron, and zinc obtained from the soil and carbon, hydrogen, and oxygen obtained from the air and water.

**Organic matter.** Plant and animal residue in the soil in various stages of decomposition. The content of organic matter in the surface layer is described as follows:

| | |
|---|---|
| Very low | less than 0.5 percent |
| Low | 0.5 to 1.0 percent |
| Moderately low | 1.0 to 2.0 percent |
| Moderate | 2.0 to 4.0 percent |
| High | 4.0 to 8.0 percent |
| Very high | more than 8.0 percent |

**Pan.** A compact, dense layer in a soil that impedes the movement of water and the growth of roots. For example, *hardpan, fragipan, claypan, plowpan,* and *traffic pan*.

**Parent material.** The unconsolidated organic and mineral material in which soil forms.

**Ped.** An individual natural soil aggregate, such as a granule, a prism, or a block.

**Pedon.** The smallest volume that can be called "a soil." A pedon is three dimensional and large enough to permit study of all horizons. Its area ranges from about 10 to 100 square feet (1 square meter to 10 square meters), depending on the variability of the soil.

**Percolation.** The downward movement of water through the soil.

**Percs slowly** (in tables). The slow movement of water through the soil adversely affects the specified use.

**Permeability.** The quality of the soil that enables water or air to move downward through the profile. The rate at which a saturated soil transmits water is accepted as a measure of this quality. In soil physics, the rate is referred to as "saturated hydraulic conductivity," which is defined in the "Soil Survey Manual." In line with conventional usage in the engineering profession and with traditional usage in published soil surveys, this rate of flow continues to be expressed as "permeability." Terms describing permeability, measured in inches per hour, are as follows:

| | |
|---|---|
| Extremely slow | 0.0 to 0.01 inch |
| Very slow | 0.01 to 0.06 inch |
| Slow | 0.06 to 0.2 inch |
| Moderately slow | 0.2 to 0.6 inch |
| Moderate | 0.6 inch to 2.0 inches |
| Moderately rapid | 2.0 to 6.0 inches |
| Rapid | 6.0 to 20 inches |
| Very rapid | more than 20 inches |

**Phase, soil.** A subdivision of a soil series based on features that affect its use and management, such as slope, stoniness, and flooding.

**pH value.** A numerical designation of acidity and alkalinity in soil. (See Reaction, soil.)

**Piping** (in tables). Formation of subsurface tunnels or pipelike cavities by water moving through the soil.

**Plasticity index.** The numerical difference between the liquid limit and the plastic limit; the range of moisture content within which the soil remains plastic.

**Plastic limit.** The moisture content at which a soil changes from semisolid to plastic.

**Plowpan.** A compacted layer formed in the soil directly below the plowed layer.

**Ponding.** Standing water on soils in closed depressions. Unless the soils are artificially drained, the water can be removed only by percolation or evapotranspiration.

**Poor filter** (in tables). Because of rapid or very rapid permeability, the soil may not adequately filter effluent from a waste disposal system.

**Poorly graded.** Refers to a coarse grained soil or soil material consisting mainly of particles of nearly the same size. Because there is little difference in size of the particles, density can be increased only slightly by compaction.

**Poor outlets** (in tables). Refers to areas where surface or subsurface drainage outlets are difficult or expensive to install.

**Potential native plant community.** See Climax plant community.

**Potential rooting depth (effective rooting depth).** Depth to which roots could penetrate if the content of moisture in the soil were adequate. The soil has no properties restricting the penetration of roots to this depth.

**Prescribed burning.** Deliberately burning an area for specific management purposes, under the appropriate conditions of weather and soil moisture and at the proper time of day.

**Productivity, soil.** The capability of a soil for producing a specified plant or sequence of plants under specific management.

**Profile, soil.** A vertical section of the soil extending through all its horizons and into the parent material.

**Proper grazing use.** Grazing at an intensity that maintains enough cover to protect the soil and maintain or improve the quantity and quality of the desirable vegetation. This practice increases the vigor and reproduction capacity of the key plants and promotes the accumulation of litter and mulch necessary to conserve soil and water.

**Range condition.** The present composition of the plant community on a range site in relation to the potential natural plant community for that site. Range condition is expressed as excellent, good, fair, or poor on the basis of how much the present plant community has departed from the potential.

**Rangeland.** Land on which the potential natural vegetation is predominantly grasses, grasslike plants, forbs, or shrubs suitable for grazing or browsing. It includes natural grasslands, savannas, many wetlands, some deserts, tundras, and areas that support certain forb and shrub communities.

**Range site.** An area of rangeland where climate, soil, and relief are sufficiently uniform to produce a distinct natural plant community. A range site is the product of all the environmental factors responsible for its development. It is typified by an association of species that differ from those on other range sites in kind or proportion of species or total production.

**Reaction, soil.** A measure of acidity or alkalinity of a soil, expressed in pH values. A soil that tests to pH 7.0 is described as precisely neutral in reaction because it is neither acid nor alkaline. The degrees of acidity or alkalinity, expressed as pH values, are:

| | |
|---|---|
| Ultra acid | less than 3.5 |
| Extremely acid | 3.5 to 4.4 |
| Very strongly acid | 4.5 to 5.0 |
| Strongly acid | 5.1 to 5.5 |
| Moderately acid | 5.6 to 6.0 |
| Slightly acid | 6.1 to 6.5 |
| Neutral | 6.6 to 7.3 |
| Slightly alkaline | 7.4 to 7.8 |
| Moderately alkaline | 7.9 to 8.4 |
| Strongly alkaline | 8.5 to 9.0 |
| Very strongly alkaline | 9.1 and higher |

**Regolith.** The unconsolidated mantle of weathered rock and soil material on the earth's surface; the loose earth material above the solid rock.

**Relief.** The elevations or inequalities of a land surface, considered collectively.

**Residuum (residual soil material).** Unconsolidated, weathered or partly weathered mineral material that accumulated as consolidated rock disintegrated in place.

**Rill.** A steep-sided channel resulting from accelerated erosion. A rill generally is a few inches deep and not wide enough to be an obstacle to farm machinery.

**Road cut.** A sloping surface produced by mechanical means during road construction. It is commonly on the uphill side of the road.

**Rock fragments.** Rock or mineral fragments having a diameter of 2 millimeters or more; for example, pebbles, cobbles, stones, and boulders.

**Rooting depth** (in tables). Shallow root zone. The soil is shallow over a layer that greatly restricts roots.

**Root zone.** The part of the soil that can be penetrated by plant roots.

**Runoff.** The precipitation discharged into stream channels from an area. The water that flows off the surface of the land without sinking into the soil is called surface runoff. Water that enters the soil before reaching surface streams is called ground-water runoff or seepage flow from ground water.

**Sand.** As a soil separate, individual rock or mineral fragments from 0.05 millimeter to 2.0 millimeters in diameter. Most sand grains consist of quartz. As a soil textural class, a soil that is 85 percent or more sand and not more than 10 percent clay.

**Sandstone.** Sedimentary rock containing dominantly sand-sized particles.

**Saturation.** Wetness characterized by zero or positive pressure of the soil water. Under conditions of saturation, the water will flow from the soil matrix into an unlined auger hole.

**Second bottom.** The first terrace above the normal flood plain (or first bottom) of a river.

**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.

**Sequum.** A sequence consisting of an illuvial horizon and the overlying eluvial horizon. (See Eluviation.)

**Series, soil.** A group of soils that have profiles that are almost alike, except for differences in texture of the

surface layer. All the soils of a series have horizons that are similar in composition, thickness, and arrangement.

**Shale.** Sedimentary rock 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 surface runoff.

**Shrink-swell** (in tables). The shrinking of soil when dry and the swelling when wet. Shrinking and swelling can damage roads, dams, building foundations, and other structures. It can also damage plant roots.

**Silica.** A combination of silicon and oxygen. The mineral form is called quartz.

**Silt.** As a soil separate, individual mineral particles that range in diameter from the upper limit of clay (0.002 millimeter) to the lower limit of very fine sand (0.05 millimeter). As a soil textural class, soil that is 80 percent or more silt and less than 12 percent clay.

**Siltstone.** Sedimentary rock made up of dominantly silt-sized particles.

**Similar soils.** Soils that share limits of diagnostic criteria, behave and perform in a similar manner, and have similar conservation needs or management requirements for the major land uses in the survey area.

**Slickensides.** Polished and grooved surfaces produced by one mass sliding past another. In soils, slickensides may occur at the bases of slip surfaces on the steeper slopes; on faces of blocks, prisms, and columns; and in swelling clayey soils, where there is marked change in moisture content.

**Slippage** (in tables). Soil mass susceptible to movement downslope when loaded, excavated, or wet.

**Slope.** The inclination of the land surface from the horizontal. Percentage of slope is the vertical distance divided by horizontal distance, then multiplied by 100. Thus, a slope of 20 percent is a drop of 20 feet in 100 feet of horizontal distance. In this survey, classes for simple slopes are as follows:

| | |
|---|---|
| Nearly level | 0 to 1 percent |
| Very gently sloping | 1 to 3 percent |
| Gently sloping | 3 to 5 percent |
| Moderately sloping | 5 to 8 percent |
| Strongly sloping | 8to 12 percent |
| Moderately steep | 12 to 20 percent |
| Steep | 20 to 45 percent |

Classes for complex slopes are as follows:

| | |
|---|---|
| Nearly level | 0 to 3 percent |
| Gently undulating | 1 to 5 percent |
| Undulating | 1 to 8 percent |
| Rolling | 5 to 10 percent |
| Strongly rolling | 5 to 16 percent |
| Hilly | 10 to 30 percent |
| Steep | 20 to 45 percent |

**Slope** (in tables). Slope is great enough that special practices are required to ensure satisfactory performance of the soil for a specific use.

**Slow intake** (in tables). The slow movement of water into the soil.

**Slow refill** (in tables). The slow filling of ponds, resulting from restricted permeability in the soil.

**Small stones** (in tables). Rock fragments less than 3 inches (7.6 centimeters) in diameter. Small stones adversely affect the specified use of the soil.

**Soft bedrock.** Bedrock that can be excavated with trenching machines, backhoes, small rippers, and other equipment commonly used in construction.

**Soil.** A natural, three-dimensional body at the earth's surface. It is capable of supporting plants and has properties resulting from the integrated effect of climate and living matter acting on earthy parent material, as conditioned by relief over periods of time.

**Soil separates.** Mineral particles less than 2 millimeters in equivalent diameter and ranging between specified size limits. The names and sizes, in millimeters, of separates recognized in the United States are as follows:

| | |
|---|---|
| Very coarse sand | 2.0 to 1.0 |
| Coarse sand | 1.0 to 0.5 |
| Medium sand | 0.5 to 0.25 |
| Fine sand | 0.25 to 0.10 |
| Very fine sand | 0.10 to 0.05 |
| Silt | 0.05 to 0.002 |
| Clay | less than 0.002 |

**Solum.** The upper part of a soil profile, above the C horizon, in which the processes of soil formation are active. The solum in soil consists of the A, E, and B horizons. Generally, the characteristics of the material in these horizons are unlike those of the material below the solum. The living roots and plant and animal activities are largely confined to the solum.

**Stones.** Rock fragments 10 to 24 inches (25 to 60 centimeters) in diameter if rounded or 15 to 24 inches (38 to 60 centimeters) in length if flat.

**Stony.** Refers to a soil containing stones in numbers that interfere with or prevent tillage.

**Stripcropping.** Growing crops in a systematic arrangement of strips or bands that provide vegetative barriers to wind erosion and water erosion.

**Structure, soil.** The arrangement of primary soil particles into compound particles or aggregates. The principal forms of soil structure are—*platy* (laminated), *prismatic* (vertical axis of aggregates longer than

horizontal), *columnar* (prisms with rounded tops), *blocky* (angular or subangular), and *granular*. *Structureless* soils are either *single grained* (each grain by itself, as in dune sand) or *massive* (the particles adhering without any regular cleavage, as in many hardpans).

**Stubble mulch.** Stubble or other crop residue left on the soil or partly worked into the soil. It protects the soil from wind erosion and water erosion after harvest, during preparation of a seedbed for the next crop, and during the early growing period of the new crop.

**Subsoil.** Technically, the B horizon; roughly, the part of the solum below plow depth.

**Subsoiling.** Tilling a soil below normal plow depth, ordinarily to shatter a hardpan or claypan.

**Substratum.** The part of the soil below the solum.

**Subsurface layer.** Technically, the E horizon. Generally refers to a leached horizon lighter in color and lower in content of organic matter than the overlying surface layer.

**Summer fallow.** The tillage of uncropped land during the summer to control weeds and allow storage of moisture in the soil for the growth of a later crop. A practice common in semiarid regions, where annual precipitation is not enough to produce a crop every year. Summer fallow is frequently practiced before planting winter grain.

**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. Soils are recognized as taxadjuncts only when one or more of their characteristics are slightly outside the range defined for the family of the series for which the soils are named.

**Terrace.** An embankment, or ridge, constructed across sloping soils on the contour or at a slight angle to the contour. The terrace intercepts surface runoff so that water soaks into the soil or flows slowly to a prepared outlet. A terrace in a field generally is built so that the field can be farmed. A terrace intended mainly for drainage has a deep channel that is maintained in permanent sod.

**Terrace** (geologic). An old alluvial plain, ordinarily flat or undulating, bordering a river, a lake, or the sea.

**Texture, soil.** The relative proportions of sand, silt, and clay particles in a mass of soil. The basic textural classes, in order of increasing proportion of fine particles, are *sand, loamy sand, sandy loam, loam, silt loam, silt, sandy clay loam, clay loam, silty clay loam, sandy clay, silty clay,* and *clay*. The sand, loamy sand, and sandy loam classes may be further divided by specifying “coarse,” “fine,” or “very fine.”

**Thin layer** (in tables). Otherwise suitable soil material that is too thin for the specified use.

**Tilth, soil.** The physical condition of the soil as related to tillage, seedbed preparation, seedling emergence, and root penetration.

**Toe slope.** The outermost inclined surface at the base of a hill; part of a foot slope.

**Topsoil.** The upper part of the soil, which is the most favorable material for plant growth. It is ordinarily rich in organic matter and is used to topdress roadbanks, lawns, and land affected by mining.

**Trace elements.** Chemical elements, for example, zinc, cobalt, manganese, copper, and iron, in soils in extremely small amounts. They are essential to plant growth.

**Unstable fill** (in tables). Risk of caving or sloughing on banks of fill material.

**Upland.** Land at a higher elevation, in general, than the alluvial plain or stream terrace; land above the lowlands along streams.

**Valley fill.** In glaciated regions, material deposited in stream valleys by glacial meltwater. In nonglaciated regions, alluvium deposited by heavily loaded streams.

**Weathering.** All physical and chemical changes produced in rocks or other deposits at or near the earth’s surface by atmospheric agents. These changes result in disintegration and decomposition of the material.

**Well graded.** Refers to soil material consisting of coarse grained particles that are well distributed over a wide range in size or diameter. Such soil normally can be easily increased in density and bearing properties by compaction. Contrasts with poorly graded soil.

**Wilting point (or permanent wilting point).** The moisture content of soil, on an ovendry basis, at which a plant (specifically a sunflower) wilts so much that it does not recover when placed in a humid, dark chamber.

# Tables

TABLE 1.--TEMPERATURE AND PRECIPITATION

(Recorded in the period 1961-90 at Lampasas, Texas)

| Month | Temperature | | | | | | Precipitation | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | 2 years in 10 will have-- | | | | 2 years in 10 will have-- | | | |
| | Average daily maximum | Average daily minimum | Average | Maximum temperature higher than-- | Minimum temperature lower than-- | Average number of growing degree days* | Average | Less than-- | More than-- | Average number of days with 0.10 inch or more | Average snowfall |
| | °F | °F | °F | °F | °F | Units | In | In | In | | In |
| January | 57.4 | 29.6 | 43.5 | 82 | 9 | 54 | 1.54 | 0.52 | 2.48 | 3 | 0.4 |
| February | 61.8 | 33.5 | 47.6 | 87 | 14 | 84 | 2.00 | 0.81 | 2.99 | 3 | 0.8 |
| March | 70.0 | 41.7 | 55.8 | 91 | 21 | 233 | 2.08 | 0.79 | 3.16 | 3 | 0.0 |
| April | 78.2 | 50.9 | 64.6 | 95 | 28 | 439 | 2.69 | 1.23 | 3.94 | 4 | 0.0 |
| May | 83.4 | 59.1 | 71.3 | 97 | 40 | 658 | 4.13 | 2.22 | 5.81 | 5 | 0.0 |
| June | 89.9 | 66.3 | 78.1 | 100 | 51 | 844 | 2.91 | 1.08 | 4.44 | 4 | 0.0 |
| July | 94.7 | 69.1 | 81.9 | 104 | 58 | 988 | 1.81 | 0.43 | 3.00 | 2 | 0.0 |
| August | 95.0 | 68.2 | 81.6 | 104 | 57 | 981 | 2.21 | 0.67 | 3.46 | 3 | 0.0 |
| September | 88.3 | 62.8 | 75.6 | 101 | 42 | 767 | 3.07 | 1.37 | 4.53 | 4 | 0.0 |
| October | 79.7 | 51.4 | 65.6 | 95 | 31 | 484 | 3.25 | 1.15 | 5.00 | 4 | 0.0 |
| November | 69.0 | 41.0 | 55.0 | 88 | 20 | 207 | 2.00 | 0.83 | 3.11 | 3 | 0.2 |
| December | 60.4 | 32.4 | 46.4 | 81 | 12 | 74 | 1.65 | 0.63 | 2.51 | 3 | 0.0 |
| Yearly: | | | | | | | | | | | |
| Average | 77.3 | 50.5 | 63.9 | --- | --- | --- | --- | --- | --- | --- | --- |
| Extreme | 110.0 | -4.0 | --- | 106 | 6 | --- | --- | --- | --- | --- | --- |
| Total-- | --- | --- | --- | --- | --- | 5,813 | 29.33 | 23.72 | 34.39 | 41 | 1.6 |

* A growing degree day is a unit of heat available for plant growth. It can be calculated by adding the maximum and minumum daily temperatures, dividing the sum by 2, and subtracting the temperature below which growth is minimal for the principal crops in the area (50 degrees F).

TABLE 2.--FREEZE DATES IN SPRING AND FALL

(Recorded in the period 1961-90 at Lampasas, 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 17 | April 7 | April 16 |
| 2 years in 10 later than-- | March 9 | March 31 | April 11 |
| 5 years in 10 later than-- | February 25 | March 17 | March 31 |
| First freezing temperature in fall: | | | |
| 1 yr in 10 earlier than-- | November 12 | October 29 | October 22 |
| 2 yr in 10 earlier than-- | November 19 | November 4 | October 27 |
| 5 yr in 10 earlier than-- | December 5 | November 16 | November 7 |

TABLE 3.--GROWING SEASON

(Recorded in the period 1961-90 at Lampasas, 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 | 257 | 212 | 199 |
| 8 years in 10 | 266 | 223 | 206 |
| 5 years in 10 | 283 | 244 | 219 |
| 2 years in 10 | 300 | 265 | 232 |
| 1 year in 10 | 309 | 276 | 238 |

TABLE 4.--ACREAGE AND PROPORTIONATE EXTENT OF THE SOILS

| Map symbol | Soil name | Acres | Percent |
|---|---|---|---|
| BaB | Bastsil loamy fine sand, 1 to 5 percent slopes | 828 | 0.2 |
| BeB | Boerne loam, rarely flooded | 1,773 | 0.4 |
| BoB | Bolar clay loam, 1 to 3 percent slopes | 3,990 | 0.9 |
| BoC | Bolar clay loam, 3 to 5 percent slopes | 183 | * |
| BrC | Brackett clay loam, 1 to 5 percent slopes | 1,507 | 0.3 |
| BrD | Brackett gravelly clay loam, 3 to 8 percent slopes | 161,628 | 35.3 |
| BrE | Brackett-Rock outcrop complex, 10 to 30 percent slopes | 27,941 | 6.1 |
| CaC2 | Callahan loam, 3 to 8 percent slopes, eroded | 3,302 | 0.7 |
| ChB | Cho gravelly loam, 1 to 3 percent slopes | 9,515 | 2.1 |
| DeB | Demona fine sand, 0 to 3 percent slopes | 586 | 0.1 |
| DoC | Doss silty clay, 1 to 5 percent slopes | 3,080 | 0.7 |
| ErD | Eckrant-Rock outcrop complex, 1 to 8 percent slopes, very stony | 9,955 | 2.2 |
| ErF | Eckrant-Rock outcrop complex, 10 to 40 percent slopes, very stony | 7,193 | 1.6 |
| EuC | Eufaula fine sand, 1 to 5 percent slopes | 1,622 | 0.4 |
| HeC | Hensley loam, 3 to 5 percent slopes | 303 | 0.1 |
| HeD | Hensley loam, 1 to 8 percent slopes, very stony | 4,093 | 0.9 |
| KrB | Krum silty clay, 1 to 5 percent slopes | 25,544 | 5.6 |
| LaC | Lampasas gravelly clay, 1 to 5 percent slopes | 42,257 | 9.2 |
| LeB | Leeray clay, 1 to 3 percent slopes | 730 | 0.2 |
| LoD | Lometa very gravelly sandy loam, 3 to 12 percent slopes | 4,372 | 1.0 |
| LuB | Luckenbach clay loam, 1 to 3 percent slopes | 4,140 | 0.9 |
| MeB | Mereta clay loam, 1 to 3 percent slopes | 961 | 0.2 |
| MnB | Minwells fine sandy loam, 1 to 3 percent slopes | 786 | 0.2 |
| NoD | Nocken fine sandy loam, 5 to 15 percent slopes, very stony | 6,729 | 1.5 |
| NsC | Nuff silty clay loam, 2 to 6 percent slopes, very stony | 9,791 | 2.1 |
| NuB | Nuff silty clay, 1 to 3 percent slopes | 15,459 | 3.4 |
| NuC | Nuff silty clay, 3 to 5 percent slopes | 591 | 0.1 |
| Oa | Oakalla silty clay loam, rarely flooded | 7,121 | 1.5 |
| OgB | Oglesby silty clay, 0 to 3 percent slopes | 6,300 | 1.4 |
| OwE | Owens clay, 10 to 30 percent slopes, very stony | 212 | * |
| PaB | Patilo fine sand, 1 to 3 percent slopes | 193 | * |
| PeC | Pedernales fine sandy loam, 1 to 5 percent slopes | 1,602 | 0.4 |
| PkB | Pidcoke clay loam, 1 to 3 percent slopes | 537 | 0.1 |
| ReD | Real gravelly clay loam, 1 to 8 percent slopes | 15,966 | 3.5 |
| ReE | Real very gravelly clay loam, 10 to 30 percent slopes | 10,634 | 2.3 |
| RoD | Roughcreek-Rock outcrop complex, 1 to 8 percent slopes | 9,913 | 2.2 |
| RuA | Rumley silty clay loam, 0 to 1 percent slopes | 2,936 | 0.6 |
| RuB | Rumley silty clay loam, 1 to 3 percent slopes | 9,030 | 2.0 |
| SeC | Seawillow clay loam, 3 to 5 percent slopes | 3,481 | 0.8 |
| SlB | Slidell clay, 1 to 3 percent slopes | 2,160 | 0.5 |
| SuA | Sunev loam, rarely flooded | 16,334 | 3.6 |
| SuB | Sunev loam, 1 to 3 percent slopes | 2,168 | 0.5 |
| TaB | Tarpley clay, 1 to 3 percent slopes | 813 | 0.2 |
| TaD | Tarpley-Rock outcrop complex, 1 to 8 percent slopes, stony | 5,714 | 1.2 |
| ToC | Topsey clay loam, 1 to 5 percent slopes | 7,873 | 1.7 |
| We | Weswood silt loam, rarely flooded | 3,548 | 0.8 |
| WsC | Wise clay loam, 3 to 8 percent slopes | 587 | 0.1 |
| Ya | Yahola fine sandy loam, frequently flooded | 576 | 0.1 |
| W | Water (less than 40 acres in size) | 467 | 0.1 |
| | Total | 457,024 | 100.0 |

* Less than 0.1 percent.

TABLE 5.--LAND CAPABILITY AND YIELDS PER ACRE OF CROPS AND PASTURE

(Yields are those that can be expected under a high level of management. Absence of a yield indicates that the soil is not suited to the crop or the crop generally is not grown on the soil)

| Soil name and map symbol | Land capability | Wheat | Oats | Grain sorghum | Sorghum hay | Improved bermuda-grass | Pecans | Peaches |
|---|---|---|---|---|---|---|---|---|
| | | Bu | Bu | Bu | Tons | AUM* | Cwt | Bu |
| BaB---------- Bastsil | IIIe | 35 | 65 | 60 | 5.0 | 5.5 | 4.0 | 90 |
| BeB---------- Boerne | IIe | 15 | 40 | 35 | 4.5 | 4.0 | 3.0 | --- |
| BoB---------- Bolar | IIe | 40 | 40 | 45 | 4.0 | 6.0 | --- | --- |
| BoC---------- Bolar | IIIe | 35 | 35 | 40 | 3.5 | 5.5 | --- | --- |
| BrC---------- Brackett | IVe | 15 | 30 | --- | 2.0 | 2.0 | --- | --- |
| BrD---------- Brackett | VIs | --- | --- | --- | --- | --- | --- | --- |
| BrE**---------- | | | | | | | | |
| Brackett | VIIs | --- | --- | --- | --- | --- | --- | --- |
| Rock outcrop. | VIIIs | --- | --- | --- | --- | --- | --- | --- |
| CaC2---------- Callahan | VIe | --- | --- | --- | --- | 3.0 | --- | --- |
| ChB---------- Cho | IVs | --- | --- | --- | --- | --- | --- | --- |
| DeB---------- Demona | IIIe | --- | 35 | 40 | 3.5 | 6.0 | --- | 80 |
| DoC---------- Doss | IVe | 20 | 35 | --- | 3.0 | 4.0 | --- | --- |
| ErD**, ErF**---- | | | | | | | | |
| Eckrant | VIIs | --- | --- | --- | --- | --- | --- | --- |
| Rock Outcrop. | VIIIs | --- | --- | --- | --- | --- | --- | --- |
| EuC---------- Eufaula | IVs | --- | 20 | --- | 3.0 | 4.0 | --- | --- |
| HeC---------- Hensley | IVe | 15 | 30 | --- | 3.0 | 3.0 | --- | --- |
| HeD---------- Hensley | VIs | --- | --- | --- | --- | --- | --- | --- |
| KrB---------- Krum | IIIe | 40 | 50 | 65 | 6.0 | 6.0 | --- | --- |
| LaC---------- Lampasas | VIs | --- | --- | --- | --- | --- | --- | --- |
| LeB---------- Leeray | IIe | 30 | 45 | 45 | 5.0 | 4.5 | --- | --- |

See footnote at end of table.

TABLE 5.--LAND CAPABILITY AND YIELDS PER ACRE OF CROPS AND PASTURE--Continued

| Soil name and map symbol | Land capability | Wheat | Oats | Grain sorghum | Sorghum hay | Improved bermuda-grass | Pecans | Peaches |
|---|---|---|---|---|---|---|---|---|
| | | Bu | Bu | Bu | Tons | AUM* | Cwt | Bu |
| LoD---------- Lometa | VIs | --- | --- | --- | --- | 3.0 | --- | --- |
| LuB---------- Luckenbach | IIe | 30 | 50 | 54 | 6.0 | 5.0 | --- | 60 |
| MeB---------- Mereta | IIIe | 15 | 40 | 25 | 2.5 | 3.0 | --- | --- |
| MnB---------- Minwells | IIe | 30 | 45 | 45 | 5.0 | 5.5 | --- | 90 |
| NoD---------- Nocken | VIs | --- | --- | --- | --- | --- | --- | --- |
| NsC---------- Nuff | VIs | --- | --- | --- | --- | --- | --- | --- |
| NuB---------- Nuff | IIe | 40 | 70 | 75 | 6.0 | 7.0 | --- | --- |
| NuC---------- Nuff | IIIe | 35 | 60 | 70 | 5.5 | 6.5 | --- | --- |
| Oa---------- Oakalla | I | 30 | 70 | 65 | 7.0 | 6.5 | 4.0 | --- |
| OgB---------- Oglesby | IVs | 30 | 35 | --- | 3.0 | 3.0 | --- | --- |
| OwE---------- Owens | VIIs | --- | --- | --- | --- | --- | --- | --- |
| PaB---------- Patilo | IIIs | --- | 40 | --- | 3.5 | 4.5 | --- | 90 |
| PeC---------- Pedernales | IIIe | 20 | 45 | 35 | 5.0 | 4.5 | --- | 90 |
| PkB---------- Pidcoke | IVs | 15 | 30 | --- | 3.0 | 2.0 | --- | --- |
| ReD---------- Real | VIs | --- | --- | --- | --- | --- | --- | --- |
| ReE---------- Real | VIIs | --- | --- | --- | --- | --- | --- | --- |
| RoD**---------- Roughcreek | VIs | --- | --- | --- | --- | --- | --- | --- |
| Rock outcrop. | VIIIs | --- | --- | --- | --- | --- | --- | --- |
| RuA---------- Rumley | IIc | 50 | 80 | 50 | 6.0 | 7.0 | --- | --- |
| RuB---------- Rumley | IIe | 40 | 75 | 40 | 5.5 | 7.0 | --- | --- |
| SeC---------- Seawillow | IIIe | --- | 40 | 40 | 4.0 | 5.0 | --- | --- |

See footnote at end of table.

TABLE 5.--LAND CAPABILITY AND YIELDS PER ACRE OF CROPS AND PASTURE--Continued

| Soil name and map symbol | Land capability | Wheat | Oats | Grain sorghum | Sorghum hay | Improved bermuda-grass | Pecans | Peaches |
|---|---|---|---|---|---|---|---|---|
| | | Bu | Bu | Bu | Tons | AUM* | Cwt | Bu |
| SlB---------- Slidell | IIe | 40 | 70 | 85 | 6.0 | 7.0 | --- | --- |
| SuA---------- Sunev | IIs | 40 | 60 | 70 | 7.0 | 6.5 | 4.0 | --- |
| SuB---------- Sunev | IIe | 35 | 55 | 55 | 6.0 | 6.5 | --- | --- |
| TaB---------- Tarpley | IVe | --- | 30 | 25 | 3.0 | 3.0 | --- | --- |
| TaD**---------- | | | | | | | | |
| Tarpley | VIs | --- | --- | --- | --- | --- | --- | --- |
| Rock outcrop. | VIIIs | --- | --- | --- | --- | --- | --- | --- |
| ToC---------- Topsey | IIIe | 25 | 40 | --- | 4.5 | 5.0 | --- | --- |
| We---------- Weswood | I | 40 | 80 | 100 | 7.0 | 8.0 | 4.0 | --- |
| WsC---------- Wise | IVe | --- | 30 | --- | 3.0 | 4.0 | --- | --- |
| Ya---------- Yahola | Vw | --- | --- | --- | --- | 7.0 | --- | --- |

* 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.--RANGELAND PRODUCTIVITY

(Only the soils that support rangeland vegetation suitable for grazing are listed)

| Soil name and map symbol | Range site | Potential annual production for kind of growing season | | |
|---|---|---|---|---|
| | | Favorable | Average | Unfavorable |
| | | Lb/acre | Lb/acre | Lb/acre |
| BaB Bastsil | Loamy Sand | 6,500 | 5,000 | 3,500 |
| BeB Boerne | Loamy Bottomland | 6,000 | 4,000 | 2,500 |
| BoB, BoC Bolar | Clay Loam | 6,500 | 5,000 | 3,000 |
| BrC, BrD Brackett | Adobe | 4,000 | 3,200 | 1,800 |
| BrE*: | | | | |
| Brackett | Steep Adobe | 3,000 | 2,200 | 1,500 |
| Rock outcrop. | | --- | --- | --- |
| CaC2 Callahan | Claypan Prairie | 3,500 | 3,000 | 2,600 |
| ChB Cho | Very Shallow | 2,500 | 2,000 | 1,000 |
| DeB Demona | Sandy | 5,000 | 4,000 | 2,500 |
| DoC Doss | Shallow | 4,000 | 3,000 | 1,800 |
| ErD*: | | | | |
| Eckrant | Low Stony Hills | 3,000 | 2,500 | 1,500 |
| Rock outcrop. | | --- | --- | --- |
| ErF*: | | | | |
| Eckrant | Steep Rocky | 1,800 | 1,400 | 800 |
| Rock outcrop. | | --- | --- | --- |
| EuC Eufaula | Deep Sand | 4,000 | 2,800 | 2,000 |
| HeC, HeD Hensley | Redland | 4,500 | 3,500 | 2,500 |
| KrB Krum | Clay Loam | 6,500 | 6,000 | 4,000 |
| LaC Lampasas | Shallow Pe | 3,500 | 2,500 | 1,800 |
| LeB Leeray | Clay Loam | 4,500 | 3,500 | 2,500 |
| LoD Lometa | Gravelly Sandy Loam | 5,000 | 3,500 | 1,500 |

See footnote at end of table.

TABLE 6.--RANGELAND PRODUCTIVITY--Continued

| Soil name and map symbol | Range site | Potential annual production for kind of growing season | | |
|---|---|---|---|---|
| | | Favorable | Average | Unfavorable |
| | | Lb/acre | Lb/acre | Lb/acre |
| LuB Luckenbach | Clay Loam | 5,000 | 4,000 | 3,000 |
| MeB Mereta | Shallow | 3,500 | 2,800 | 2,000 |
| MnB Minwells | Sandy Loam | 4,000 | 3,000 | 2,000 |
| NoD Nocken | Sandstone Hill | 3,500 | 2,800 | 2,000 |
| NsC Nuff | Stony Clay Loam | 5,500 | 4,500 | 2,500 |
| NuB, NuC Nuff | Clay Loam | 6,500 | 5,000 | 3,000 |
| Oa Oakalla | Loamy Bottomland | 5,500 | 4,500 | 2,500 |
| OgB Oglesby | Shallow | 5,000 | 4,500 | 2,500 |
| OwE Owens | Shallow Clay | 1,700 | 1,200 | 900 |
| PaB Patilo | Deep Sand | 3,000 | 2,000 | 1,000 |
| PeC Pedernales | Tight Sandy Loam | 3,500 | 3,000 | 1,500 |
| PkB Pidcoke | Shallow | 4,000 | 3,000 | 1,800 |
| ReD Real | Adobe | 3,500 | 2,500 | 1,500 |
| ReE Real | Steep Adobe | 3,000 | 2,200 | 1,500 |
| RoD*: | | | | |
| Roughcreek | Redland | 3,500 | 2,700 | 2,000 |
| Rock outcrop. | | --- | --- | --- |
| RuA, RuB Rumley | Clay Loam | 6,500 | 5,500 | 3,000 |
| SeC Seawillow | Clay Loam | 5,000 | 4,000 | 2,500 |
| SlB Slidell | Blackland | 6,000 | 5,000 | 3,000 |
| SuA, SuB Sunev | Clay Loam | 7,000 | 5,500 | 3,500 |
| TaB Tarpley | Redland | 5,000 | 3,500 | 2,000 |

See footnote at end of table.

TABLE 6.--RANGELAND PRODUCTIVITY--Continued

| Soil name and map symbol | Range site | Potential annual production for kind of growing season | | |
|---|---|---|---|---|
| | | Favorable | Average | Unfavorable |
| | | Lb/acre | Lb/acre | Lb/acre |
| TaD*: | | | | |
| Tarpley | Redland | 5,000 | 3,500 | 2,000 |
| Rock outcrop. | | --- | --- | --- |
| ToC Topsey | Clay Loam | 6,500 | 5,000 | 3,000 |
| We Weswood | Loamy Bottomland | 8,000 | 6,500 | 5,000 |
| WsC Wise | Clay Loam | 6,000 | 4,500 | 3,000 |
| Ya Yahola | Loamy Bottomland | 7,000 | 4,900 | 3,500 |

* See description of the map unit for composition and behavior characteristics of the map unit

TABLE 7.--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 |
|---|---|---|---|---|
| BaB: Bastsil | Slight | Slight | Moderate: slope. | Slight. |
| BeB: Boerne | Severe: flooding. | Slight | Slight | Slight. |
| BoB, BoC: Bolar | Slight | Slight | Moderate: slope, small stones. | Slight. |
| BrC: Brackett | Slight | Slight | Moderate: slope, small stones. | Slight. |
| BrD: Brackett | Moderate: small stones. | Moderate: small stones. | Severe: small stones. | Slight. |
| BrE*: | | | | |
| Brackett | Severe: slope. | Severe: slope. | Severe: slope, small stones. | Moderate: slope. |
| Rock outcrop | --- | --- | --- | --- |
| CaC2: Callahan | Moderate: percs slowly. | Moderate: percs slowly. | Moderate: slope, small stones, depth to rock. | Slight. |
| ChB: Cho | Severe: cemented pan. | Severe: cemented pan. | Severe: small stones, cemented pan. | Slight. |
| DeB: Demona | Severe: too sandy. | Severe: too sandy. | Severe: too sandy. | Severe: too sandy. |
| DoC: Doss | Severe: depth to rock. | Severe: depth to rock. | Severe: depth to rock. | Moderate: too clayey. |
| ErD*: | | | | |
| Eckrant | Severe: depth to rock. | Severe: depth to rock. | Severe: large stones, small stones, depth to rock. | Moderate: large stones. |
| Rock outcrop | --- | --- | --- | --- |
| ErF*: | | | | |
| Eckrant | Severe: slope, depth to rock. | Severe: slope, depth to rock. | Severe: large stones, small stones, depth to rock. | Severe: slope. |

See footnote at end of table.

TABLE 7.--RECREATIONAL DEVELOPMENT--Continued

| Soil name and map symbol | Camp areas | Picnic areas | Playgrounds | Paths and trails |
|---|---|---|---|---|
| ErF*: | | | | |
| Rock outcrop | --- | --- | --- | --- |
| EuC Eufaula | Severe: too sandy. | Severe: too sandy. | Severe: too sandy. | Severe: too sandy. |
| HeC Hensley | Severe: depth to rock. | Severe: depth to rock. | Severe: depth to rock. | Slight. |
| HeD Hensley | Severe: depth to rock. | Severe: depth to rock. | Severe: large stones, depth to rock. | Moderate: large stones. |
| KrB Krum | Moderate: too clayey. | Moderate: too clayey. | Moderate: slope, small stones. | Moderate: too clayey. |
| LaC Lampasas | Severe: small stones. | Severe: small stones. | Severe: small stones. | Moderate: too clayey. |
| LeB Leeray | Moderate: percs slowly, too clayey. | Moderate: too clayey, percs slowly. | Moderate: slope, too clayey, percs slowly. | Moderate: too clayey. |
| LoD Lometa | Severe: small stones. | Severe: small stones. | Severe: slope, small stones. | Severe: small stones. |
| LuB Luckenbach | Slight | Slight | Moderate: slope. | Slight. |
| MeB Mereta | Severe: cemented pan. | Severe: cemented pan. | Severe: cemented pan. | Slight. |
| MnB Minwells | Slight | Slight | Moderate: slope. | Slight. |
| NoD Nocken | Severe: small stones. | Severe: small stones. | Severe: large stones, slope. | Severe: large stones, erodes easily. |
| NsC Nuff | Moderate: large stones. | Moderate: large stones. | Severe: large stones. | Moderate: large stones. |
| NuB, NuC Nuff | Moderate: too clayey. | Moderate: too clayey. | Moderate: slope, too clayey. | Moderate: too clayey. |
| Oa Oakalla | Severe: flooding. | Slight | Slight | Slight. |
| OgB Oglesby | Severe: depth to rock. | Severe: depth to rock. | Severe: depth to rock. | Moderate: too clayey. |
| OwE Owens | Severe: slope. | Severe: slope. | Severe: large stones, slope. | Severe: slope. |

See footnote at end of table.

TABLE 7.--RECREATIONAL DEVELOPMENT--Continued

| Soil name and map symbol | Camp areas | Picnic areas | Playgrounds | Paths and trails |
|---|---|---|---|---|
| PaB Patilo | Severe: too sandy. | Severe: too sandy. | Severe: too sandy. | Severe: too sandy. |
| PeC Pedernales | Slight | Slight | Moderate: slope. | Slight. |
| PkB Pidcoke | Severe: depth to rock. | Severe: depth to rock. | Severe: depth to rock. | Slight. |
| ReD Real | Severe: depth to rock. | Severe: depth to rock. | Severe: small stones, depth to rock. | Slight. |
| ReE Real | Severe: slope, small stones, depth to rock. | Severe: slope, small stones, depth to rock. | Severe: slope, small stones, depth to rock. | Severe: small stones. |
| RoD*: | | | | |
| Roughcreek | Severe: depth to rock. | Severe: depth to rock. | Severe: large stones, depth to rock. | Severe: large stones. |
| Rock outcrop | --- | --- | --- | --- |
| RuA Rumley | Slight | Slight | Slight | Slight. |
| RuB Rumley | Slight | Slight | Moderate: slope. | Slight. |
| SeC Seawillow | Slight | Slight | Moderate: slope, small stones. | Moderate: slope, small stones. |
| SlB Slidell | Moderate: percs slowly, too clayey. | Moderate: too clayey, percs slowly. | Moderate: slope, too clayey, percs slowly. | Moderate: too clayey. |
| SuA Sunev | Severe: flooding. | Slight | Slight | Slight. |
| SuB Sunev | Slight | Slight | Moderate: slope. | Slight. |
| TaB Tarpley | Severe: depth to rock. | Severe: depth to rock. | Severe: depth to rock. | Moderate: too clayey. |
| TaD*: | | | | |
| Tarpley | Severe: depth to rock. | Severe: depth to rock. | Severe: large stones, depth to rock. | Moderate: too clayey. |
| Rock outcrop | --- | --- | --- | --- |

See footnote at end of table.

TABLE 7.--RECREATIONAL DEVELOPMENT--Continued

| Soil name and map symbol | Camp areas | Picnic areas | Playgrounds | Paths and trails |
|---|---|---|---|---|
| ToC Topsey | Slight | Slight | Moderate: slope, small stones. | Slight. |
| We Weswood | Severe: flooding. | Slight | Slight | Slight. |
| WsC Wise | Slight | Slight | Moderate: slope. | Slight. |
| Ya Yahola | Severe: flooding. | Moderate: flooding. | Severe: flooding. | Moderate: flooding. |

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 8.--WILDLIFE HABITAT

(See text for definitions of "good," "fair," "poor," and "very poor." Absence of an entry indicates that the soil was not rated)

| Soil name and map symbol | Potential for habitat elements: Grain and seed crops | Grasses and legumes | Wild herbaceous plants | Shrubs | Potential as habitat for--: Openland wildlife | Rangeland wildlife |
|---|---|---|---|---|---|---|
| BaB Bastsil | Fair | Fair | Good | Good | Fair | Good. |
| BeB Boerne | Fair | Fair | Good | Fair | Fair | Fair. |
| BoB Bolar | Good | Good | Fair | Fair | Good | Fair. |
| BoC Bolar | Fair | Good | Fair | Fair | Fair | Fair. |
| BrC Brackett | Fair | Good | Fair | Fair | Fair | Fair. |
| BrD Brackett | Poor | Poor | Fair | Fair | Poor | Fair. |
| BrE*: | | | | | | |
| Brackett | Very poor | Very po or | Fair | Fair | Very poor | Fair. |
| Rock outcrop | --- | --- | --- | --- | --- | --- |
| CaC2 Callahan | Poor | Good | Fair | Fair | Fair | Fair. |
| ChB Cho | Poor | Poor | Poor | Poor | Poor | Poor. |
| DeB Demona | Fair | Good | Good | Goo d | Go od | Good. |
| DoC Doss | Fair | Good | Fair | Fair | Fair | Fair. |
| ErD*, ErF*: | | | | | | |
| Eckrant | Very poor | Very po or | Fair | Fair | Poor | Fair. |
| Rock outcrop | --- | --- | --- | --- | --- | --- |
| EuC Eufaula | Poor | Fair | Fair | Good | Fair | Fair. |
| HeC, HeD Hensley | Poor | Poor | Fair | Fair | Poor | Fair. |
| KrB Krum | Fair | Good | Fair | Fair | Fair | Fair. |
| LaC Lampasas | Very poor | Very poo r | Fair | Fair | Poor | Fair. |
| LeB Leeray | Fair | Fair | Fair | Fair | Fair | Fair. |

See footnote at end of table.

TABLE 8.--WILDLIFE HABITAT--Continued

| Soil name and map symbol | Potential for habitat elements: Grain and seed crops | Grasses and legumes | Wild herbaceous plants | Shrubs | Potential as habitat for--: Openland wildlife | Rangeland wildlife |
|---|---|---|---|---|---|---|
| LoD Lometa | Poor | Poor | Fair | Fair | Poor | Fair. |
| LuB Luckenbach | Good | Good | Fair | Good | Go od | Fair. |
| MeB Mereta | Fair | Fair | Fair | Fair | Fair | Fair. |
| MnB Minwells | Good | Good | Good | Good | Goo d | Good. |
| NoD Nocken | Very poor | Very poor | Good | Good | Poor | Good. |
| NsC Nuff | Poor | Fair | Fair | Fair | Fair | Fair. |
| NuB, NuC Nuff | Good | Good | Fair | Fair | Good | Fair. |
| Oa Oakalla | Good | Good | Good | Goo d | Go od | Good. |
| OgB Oglesby | Fair | Fair | Fair | Fair | Fair | Fair. |
| OwE Owens | Very poor | Very poor | Fair | Fair | Very poo r | Poor. |
| PaB Patilo | Fair | Good | Fair | Fair | Fair | Fair. |
| PeC Pedernales | Fair | Good | Good | Good | Good | Good. |
| PkB Pidcoke | Poor | Poor | Poor | Fair | Poor | Poor. |
| ReD Real | Very poor | Poor | Poor | Fair | Poor | Poor. |
| ReE Real | Very poor | Very poor | Poor | Fair | Very po or | Poor. |
| RoD*: | | | | | | |
| Roughcreek | Poor | Poor | Fair | Good | Poor | Fair. |
| Rock outcrop | --- | --- | --- | --- | --- | --- |
| RuA, RuB Rumley | Good | Good | Fair | Fair | Good | Fair. |
| SeC Seawillow | Fair | Good | Fair | Good | Fair | Fair. |
| SlB Slidell | Good | Good | Fair | Fair | Good | Fair. |

See footnote at end of table.

TABLE 8.--WILDLIFE HABITAT--Continued

| Soil name and map symbol | Potential for habitat elements | | | | Potential as habitat for-- | |
|---|---|---|---|---|---|---|
| | Grain and seed crops | Grass es and legumes | Wild herb a- ceous plants | Shrubs | Openland wildlife | Rangeland wildlife |
| SuA, SuB Sunev | Good | Good | Goo d | Go od | G ood | Good. |
| TaB Tarpley | Fair | Fair | Fair | Fair | Fair | Fair. |
| TaD*: | | | | | | |
| Tarpley | Poor | Poor | Fair | Good | Poor | Fair. |
| Rock outcrop | --- | --- | --- | --- | --- | --- |
| ToC Topsey | Fair | Good | Fair | Fair | Fair | Fair. |
| We Weswood | Goo d | Good | Fair | Good | Good | Fair. |
| WsC Wise | Fair | Fair | Fair | Fair | Fair | Fair. |
| Ya Yahola | Poor | Fair | Fair | Good | Fair | Fair. |

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 9.--BUILDING SITE DEVELOPMENT

(Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," and "severe." Absence of an entry indicates that the soil was not rated. The information in this table indicates the dominant soil condition but does not eliminate the need for onsite investigation)

| Soil name and map symbol | Shallow excavations | Dwellings without basements | Dwellings with basements | Small commercial buildings | Local roads and streets | Lawns and landscaping |
|---|---|---|---|---|---|---|
| BaB---------- Bastsil | Slight--------- | Moderate: shrink-swell. | Moderate: shrink-swell. | Moderate: shrink-swell. | Moderate: shrink-swell, low strength. | Slight. |
| BeB---------- Boerne | Slight--------- | Severe: flooding. | Severe: flooding. | Severe: flooding. | Moderate: flooding. | Moderate: excess lime. |
| BoB---------- Bolar | Moderate: depth to rock. | Moderate: shrink-swell. | Moderate: depth to rock, shrink-swell. | Moderate: shrink-swell. | Severe: low strength. | Moderate: thin layer. |
| BoC---------- Bolar | Moderate: depth to rock. | Moderate: shrink-swell. | Moderate: depth to rock, shrink-swell. | Moderate: shrink-swell, slope. | Severe: low strength. | Moderate: thin layer. |
| BrC---------- Brackett | Moderate: too clayey. | Slight--------- | Slight--------- | Slight--------- | Severe: low strength. | Moderate: droughty. |
| BrD---------- Brackett | Moderate: too clayey. | Slight--------- | Slight--------- | Moderate: slope. | Severe: low strength. | Moderate: small stones, droughty. |
| BrE*: | | | | | | |
| Brackett--------- | Severe: slope. | Severe: slope. | Severe: slope. | Severe: slope. | Severe: low strength, slope. | Severe: slope. |
| Rock outcrop----- | --- | --- | --- | --- | --- | --- |
| CaC2---------- Callahan | Moderate: depth to rock, too clayey. | Moderate: shrink-swell. | Moderate: depth to rock, shrink-swell. | Moderate: shrink-swell, slope. | Severe: low strength. | Moderate: depth to rock. |
| ChB---------- Cho | Severe: cemented pan. | Moderate: cemented pan. | Severe: cemented pan. | Moderate: cemented pan. | Moderate: cemented pan. | Severe: cemented pan. |
| DeB---------- Demona | Severe: cutbanks cave, wetness. | Moderate: wetness, shrink-swell. | Severe: wetness. | Moderate: wetness, shrink-swell. | Severe: low strength. | Moderate: wetness, droughty. |
| DoC---------- Doss | Severe: depth to rock. | Moderate: shrink-swell, depth to rock. | Severe: depth to rock. | Moderate: shrink-swell, depth to rock. | Severe: low strength. | Severe: depth to rock, too clayey. |
| ErD*: | | | | | | |
| 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, low strength. | Severe: depth to rock, low strength. |
| Rock outcrop----- | --- | --- | --- | --- | --- | --- |

See footnote at end of table.

TABLE 9.--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 |
|---|---|---|---|---|---|---|
| ErF*: | | | | | | |
| Eckrant | 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, low strength, slope. | Severe: depth to rock, slope, low strength. |
| Rock outcrop | --- | --- | --- | --- | --- | --- |
| EuC Eufaula | Severe: cutbanks cave. | Slight | Slight | Slight | Slight | Moderate: droughty. |
| HeC Hensley | Severe: depth to rock. | Severe: depth to rock. | Severe: depth to rock. | Severe: depth to rock. | Severe: depth to rock, low strength. | Severe: depth to rock. |
| HeD Hensley | Severe: depth to rock. | Severe: depth to rock. | Severe: depth to rock. | Severe: depth to rock. | Severe: depth to rock, low strength. | Severe: large stones, depth to rock. |
| KrB Krum | Moderate: too clayey. | Severe: shrink-swell. | Severe: shrink-swell. | Severe: shrink-swell. | Severe: shrink-swell, low strength. | Severe: too clayey. |
| LaC Lampasas | Slight | Slight | Slight | Slight | Slight | Severe: small stones, droughty, too clayey. |
| LeB Leeray | Severe: cutbanks cave. | Severe: shrink-swell. | Severe: shrink-swell. | Severe: shrink-swell. | Severe: shrink-swell, low strength. | Severe: too clayey. |
| LoD Lometa | Severe: depth to rock. | Moderate: shrink-swell, depth to rock. | Severe: depth to rock. | Moderate: slope, depth to rock. | Moderate: depth to rock, shrink-swell. | Severe: small stones. |
| LuB Luckenbach | Moderate: too clayey. | Moderate: shrink-swell. | Moderate: shrink-swell. | Moderate: shrink-swell. | Severe: low strength. | Slight. |
| MeB Mereta | Severe: cemented pan. | Moderate: shrink-swell, cemented pan. | Severe: cemented pan. | Moderate: shrink-swell, cemented pan. | Severe: low strength. | Severe: cemented pan. |
| MnB Minwells | Severe: cutbanks cave. | Moderate: shrink-swell. | Moderate: shrink-swell. | Moderate: shrink-swell. | Severe: low strength. | Slight. |
| NoD Nocken | Severe: large stones. | Severe: large stones. | Severe: large stones. | Severe: slope, large stones. | Severe: low strength, large stones. | Severe: large stones. |
| NsC Nuff | Moderate: too clayey. | Moderate: shrink-swell. | Moderate: shrink-swell. | Moderate: shrink-swell, slope. | Severe: low strength. | Severe: large stones. |
| NuB Nuff | Moderate: too clayey. | Moderate: shrink-swell. | Moderate: shrink-swell. | Moderate: shrink-swell. | Severe: low strength. | Severe: too clayey. |

See footnote at end of table.

TABLE 9.--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 |
|---|---|---|---|---|---|---|
| NuC Nuff | Moderate: too clayey. | Moderate: shrink-swell. | Moderate: shrink-swell. | Moderate: shrink-swell, slope. | Severe: low strength. | Severe: too clayey. |
| Oa Oakalla | Slight | Severe: flooding. | Severe: flooding. | Severe: flooding. | Severe: low strength. | Slight. |
| OgB Oglesby | 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: depth to rock, too clayey. |
| OwE Owens | Severe: slope. | Severe: shrink-swell, slope. | Severe: slope, shrink-swell. | Severe: shrink-swell, slope. | Severe: shrink-swell, low strength, slope. | Severe: large stones, slope. |
| PaB Patilo | Severe: cutbanks cave. | Slight | Moderate: wetness. | Slight | Slight | Moderate: droughty. |
| PeC Pedernales | Moderate: too clayey. | Moderate: shrink-swell. | Moderate: shrink-swell. | Moderate: shrink-swell. | Severe: low strength. | Slight. |
| PkB Pidcoke | Severe: depth to rock. | Severe: depth to rock. | Severe: depth to rock. | Severe: depth to rock. | Severe: depth to rock. | Severe: depth to rock. |
| ReD Real | Severe: depth to rock, cemented pan. | Moderate: depth to rock, cemented pan. | Severe: depth to rock, cemented pan. | Moderate: slope, depth to rock, cemented pan. | Moderate: depth to rock, cemented pan. | Severe: depth to rock. |
| ReE Real | Severe: depth to rock, cemented pan, slope. | Severe: slope. | Severe: depth to rock, cemented pan, slope. | Severe: slope. | Severe: slope. | Severe: small stones, slope, depth to rock. |
| RoD*: | | | | | | |
| Roughcreek | Severe: depth to rock, large stones. | Severe: shrink-swell, depth to rock. | Severe: depth to rock, shrink-swell, large stones. | Severe: shrink-swell, depth to rock. | Severe: depth to rock, low strength, shrink-swell. | Severe: large stones, depth to rock. |
| Rock outcrop | --- | --- | --- | --- | --- | --- |
| RuA, RuB Rumley | Moderate: too clayey. | Severe: shrink-swell. | Severe: shrink-swell. | Severe: shrink-swell. | Severe: shrink-swell, low strength. | Slight. |
| SeC Seawillow | Slight | Moderate: shrink-swell. | Moderate: shrink-swell. | Moderate: shrink-swell, slope. | Moderate: shrink-swell, slope. | Moderate: large stones. |
| SlB Slidell | Severe: cutbanks cave. | Severe: shrink-swell. | Severe: shrink-swell. | Severe: shrink-swell. | Severe: shrink-swell, low strength. | Severe: too clayey. |
| SuA Sunev | Slight | Severe: flooding. | Severe: flooding. | Severe: flooding. | Moderate: low strength, flooding. | Slight. |

See footnote at end of table.

TABLE 9.--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 |
|---|---|---|---|---|---|---|
| SuB Sunev | Slight | Slight | Slight | Slight | Moderate: low strength. | Slight. |
| TaB 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, shrink-swell, low strength. | Severe: depth to rock, too clayey. |
| TaD*: | | | | | | |
| 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, shrink-swell, low strength. | Severe: depth to rock, too clayey. |
| Rock outcrop | --- | --- | --- | --- | --- | --- |
| ToC Topsey | Slight | Moderate: shrink-swell. | Moderate: shrink-swell. | Moderate: shrink-swell. | Severe: low strength. | Slight. |
| We Weswood | Slight | Severe: flooding. | Severe: flooding. | Severe: flooding. | Severe: low strength. | Slight. |
| WsC Wise | Slight | Moderate: shrink-swell. | Moderate: shrink-swell. | Moderate: shrink-swell, slope. | Severe: low strength. | Moderate: droughty. |
| Ya Yahola | Severe: cutbanks cave. | Severe: flooding. | Severe: flooding. | Severe: flooding. | Severe: flooding. | Severe: flooding. |

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 10.--SANITARY FACILITIES

(Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "good," and other terms. Absence of an entry indicates that the soil was not rated. The information in this table indicates the dominant soil condition but does not eliminate the need for onsite investigation)

| Soil name and map symbol | Septic tank absorption fields | Sewage lagoon areas | Trench sanitary landfill | Area sanitary landfill | Daily cover for landfill |
|---|---|---|---|---|---|
| BaB Bastsil | Moderate: percs slowly. | Moderate: seepage. | Slight | Slight | Good. |
| BeB Boerne | Moderate: flooding. | Severe: seepage. | Severe: seepage. | Severe: seepage. | Poor: excess lime. |
| BoB, BoC Bolar | Severe: depth to rock, percs slowly. | Severe: depth to rock. | Severe: depth to rock. | Severe: depth to rock. | Poor: area reclaim, hard to pack. |
| BrC, BrD Brackett | Severe: percs slowly. | Moderate: seepage, slope. | Moderate: too clayey. | Slight | Fair: too clayey, small stones. |
| BrE*: | | | | | |
| Brackett | Severe: percs slowly, slope. | Severe: slope. | Severe: slope. | Severe: slope. | Poor: slope. |
| Rock outcrop | --- | --- | --- | --- | --- |
| CaC2 Callahan | Severe: depth to rock, percs slowly. | Severe: depth to rock. | Severe: depth to rock, too clayey. | Severe: depth to rock. | Poor: depth to rock, too clayey. |
| ChB Cho | Severe: cemented pan. | Severe: cemented pan. | Moderate: cemented pan, too clayey. | Severe: cemented pan. | Poor: cemented pan, small stones. |
| DeB Demona | Severe: wetness, percs slowly. | Severe: seepage. | Severe: wetness, too clayey. | Severe: seepage. | Poor: too clayey, hard to pack. |
| DoC Doss | Severe: depth to rock. | Severe: depth to rock. | Severe: depth to rock, too clayey. | Severe: depth to rock. | Poor: depth to rock, too clayey. |
| ErD*: | | | | | |
| Eckrant | Severe: depth to rock, large stones. | Severe: depth to rock, large stones. | Severe: depth to rock, too clayey. | Severe: depth to rock. | Poor: depth to rock, too clayey, hard to pack. |
| Rock outcrop | --- | --- | --- | --- | --- |
| ErF*: | | | | | |
| Eckrant | Severe: depth to rock, slope, large stones. | Severe: depth to rock, slope, large stones. | Severe: depth to rock, slope, too clayey. | Severe: depth to rock, slope. | Poor: depth to rock, too clayey, hard to pack. |

See footnote at end of table.

TABLE 10.--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 |
|---|---|---|---|---|---|
| ErF*: | | | | | |
| Rock outcrop | --- | --- | --- | --- | --- |
| EuC Eufaula | Severe: poor filter. | Severe: seepage. | Severe: too sandy, seepage. | Severe: seepage. | Poor: seepage, too sandy. |
| HeC, HeD Hensley | Severe: depth to rock. | Severe: depth to rock. | Severe: depth to rock, too clayey. | Severe: depth to rock. | Poor: depth to rock, too clayey, hard to pack. |
| KrB Krum | Severe: percs slowly. | Moderate: slope. | Severe: too clayey. | Slight | Poor: too clayey, hard to pack. |
| LaC Lampasas | Severe: percs slowly. | Moderate: slope. | Slight | Slight | Poor: seepage, small stones. |
| LeB Leeray | Severe: percs slowly. | Moderate: slope. | Severe: too clayey. | Slight | Poor: too clayey, hard to pack. |
| LoD Lometa | Severe: depth to rock, percs slowly. | Severe: depth to rock, slope. | Severe: depth to rock, too clayey. | Severe: depth to rock. | Poor: depth to rock, too clayey, small stones. |
| LuB Luckenbach | Severe: percs slowly. | Moderate: seepage, slope. | Severe: too clayey. | Slight | Poor: too clayey. |
| MeB Mereta | Severe: cemented pan. | Severe: cemented pan. | Moderate: cemented pan, too clayey. | Severe: cemented pan. | Poor: cemented pan. |
| MnB Minwells | Severe: percs slowly. | Severe: seepage. | Severe: seepage. | Slight | Poor: thin layer. |
| NoD Nocken | Severe: depth to rock, percs slowly. | Severe: depth to rock, slope, large stones. | Severe: depth to rock, too clayey. | Severe: depth to rock. | Poor: depth to rock, too clayey, hard to pack. |
| NsC Nuff | Severe: percs slowly. | Moderate: seepage, slope, large stones. | Severe: too clayey. | Slight | Poor: too clayey, hard to pack. |
| NuB, NuC Nuff | Severe: percs slowly. | Moderate: seepage, slope. | Severe: too clayey. | Slight | Poor: too clayey, hard to pack. |
| Oa Oakalla | Moderate: flooding, percs slowly. | Moderate: seepage. | Moderate: flooding, too clayey. | Moderate: flooding. | Poor: hard to pack. |

See footnote at end of table.

TABLE 10.--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 |
|---|---|---|---|---|---|
| OgB Oglesby | Severe: depth to rock. | Severe: depth to rock. | Severe: depth to rock, too clayey. | Severe: depth to rock. | Poor: depth to rock, too clayey, hard to pack. |
| OwE Owens | Severe: percs slowly, slope. | Severe: slope. | Severe: slope, too clayey. | Severe: slope. | Poor: too clayey, hard to pack, slope. |
| PaB Patilo | Severe: percs slowly, poor filter. | Severe: seepage. | Severe: too sandy. | Severe: seepage. | Poor: seepage, too sandy. |
| PeC Pedernales | Severe: percs slowly. | Moderate: slope. | Severe: too clayey. | Slight | Poor: too clayey, hard to pack. |
| PkB Pidcoke | Severe: depth to rock. | Severe: depth to rock. | Severe: depth to rock. | Severe: depth to rock. | Poor: depth to rock, small stones. |
| ReD Real | Severe: depth to rock, cemented pan. | Severe: depth to rock, cemented pan. | Severe: depth to rock. | Severe: depth to rock, cemented pan. | Poor: depth to rock, small stones. |
| ReE Real | Severe: depth to rock, cemented pan, slope. | Severe: depth to rock, cemented pan, slope. | Severe: depth to rock, slope. | Severe: depth to rock, cemented pan, slope. | Poor: depth to rock, small stones, slope. |
| RoD*: | | | | | |
| Roughcreek | Severe: depth to rock, large stones. | Severe: depth to rock, large stones. | Severe: depth to rock, too clayey. | Severe: depth to rock. | Poor: depth to rock, too clayey, hard to pack. |
| Rock outcrop | --- | --- | --- | --- | --- |
| RuA Rumley | Moderate: percs slowly. | Moderate: seepage. | Severe: too clayey. | Slight | Poor: too clayey, hard to pack. |
| RuB Rumley | Moderate: percs slowly. | Moderate: seepage, slope. | Severe: too clayey. | Slight | Poor: too clayey, hard to pack. |
| SeC Seawillow | Moderate: percs slowly. | Moderate: seepage, slope. | Moderate: too clayey. | Slight | Fair: too clayey, small stones. |
| SlB Slidell | Severe: percs slowly. | Moderate: slope. | Severe: too clayey. | Slight | Poor: too clayey, hard to pack. |
| SuA Sunev | Moderate: flooding, percs slowly. | Moderate: seepage. | Moderate: flooding, too clayey. | Moderate: flooding. | Fair: too clayey, small stones. |

See footnote at end of table.

TABLE 10.--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 |
|---|---|---|---|---|---|
| SuB Sunev | Moderate: percs slowly. | Moderate: seepage, slope. | Moderate: too clayey. | Slight | Fair: too clayey, small stones. |
| TaB Tarpley | Severe: depth to rock. | Severe: depth to rock. | Severe: depth to rock, too clayey. | Severe: depth to rock. | Poor: depth to rock, too clayey, hard to pack. |
| TaD*: | | | | | |
| Tarpley | Severe: depth to rock. | Severe: depth to rock. | Severe: depth to rock, too clayey. | Severe: depth to rock. | Poor: depth to rock, too clayey, hard to pack. |
| Rock outcrop | --- | --- | --- | --- | --- |
| ToC Topsey | Severe: percs slowly. | Moderate: seepage, slope. | Severe: too clayey. | Slight | Poor: too clayey. |
| We Weswood | Moderate: flooding, percs slowly. | Moderate: seepage. | Moderate: flooding. | Moderate: flooding. | Good. |
| WsC Wise | Slight | Severe: seepage. | Severe: seepage. | Severe: seepage. | Fair: too clayey. |
| Ya Yahola | Severe: flooding. | Severe: seepage, flooding. | Severe: flooding, seepage. | Severe: flooding, seepage. | Good. |

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 11.--CONSTRUCTION MATERIALS

(Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "good," "fair," and other terms. Absence of an entry indicates that the soil was not rated. The information in this table indicates the dominant soil condition but does not eliminate the need for onsite investigation)

| Soil name and map symbol | Roadfill | Sand | Gravel | Topsoil |
|---|---|---|---|---|
| BaB Bastsil | Fair: shrink-swell, low strength. | Improbable: excess fines. | Improbable: excess fines. | Good. |
| BeB Boerne | Good | Improbable: excess fines. | Improbable: excess fines. | Poor: excess lime. |
| BoB, BoC Bolar | Poor: area reclaim, low strength. | Improbable: excess fines. | Improbable: excess fines. | Poor: small stones. |
| BrC, BrD Brackett | Poor: thin layer. | Improbable: excess fines. | Improbable: excess fines. | Poor: small stones. |
| BrE*: | | | | |
| Brackett | Poor: thin layer. | Improbable: excess fines. | Improbable: excess fines. | Poor: small stones, slope. |
| Rock outcrop | --- | --- | --- | --- |
| CaC2 Callahan | Poor: depth to rock, low strength. | Improbable: excess fines. | Improbable: excess fines. | Poor: too clayey. |
| ChB Cho | Good | Improbable: excess fines. | Improbable: excess fines. | Poor: cemented pan, small stones, area reclaim. |
| DeB Demona | Poor: low strength. | Improbable: excess fines. | Improbable: excess fines. | Poor: too sandy. |
| DoC Doss | Poor: depth to rock, low strength. | Improbable: excess fines. | Improbable: excess fines. | Poor: depth to rock, too clayey, small stones. |
| ErD*: | | | | |
| Eckrant | Poor: depth to rock, low strength, large stones. | Improbable: excess fines, large stones. | Improbable: excess fines, large stones. | Poor: depth to rock, too clayey, large stones. |
| Rock outcrop | --- | --- | --- | --- |
| ErF*: | | | | |
| Eckrant | Poor: depth to rock, low strength, large stones. | Improbable: excess fines, large stones. | Improbable: excess fines, large stones. | Poor: depth to rock, too clayey, large stones. |

See footnote at end of table.

TABLE 11.--CONSTRUCTION MATERIALS--Continued

| Soil name and map symbol | Roadfill | Sand | Gravel | Topsoil |
|---|---|---|---|---|
| ErF*: | | | | |
| Rock outcrop | --- | --- | --- | --- |
| EuC Eufaula | Good | Probable | Improbable: too sandy. | Poor: too sandy. |
| HeC, HeD Hensley | Poor: depth to rock, low strength. | Improbable: excess fines. | Improbable: excess fines. | Poor: depth to rock, too clayey, small stones. |
| KrB Krum | Poor: shrink-swell, low strength. | Improbable: excess fines. | Improbable: excess fines. | Poor: too clayey. |
| LaC Lampasas | Good | Improbable: small stones. | Probable | Poor: small stones, area reclaim. |
| LeB Leeray | Poor: shrink-swell, low strength. | Improbable: excess fines. | Improbable: excess fines. | Poor: too clayey. |
| LoD Lometa | Poor: depth to rock. | Improbable: excess fines. | Improbable: excess fines. | Poor: too clayey, small stones. |
| LuB Luckenbach | Poor: low strength. | Improbable: excess fines. | Improbable: excess fines. | Poor: too clayey. |
| MeB Mereta | Poor: low strength. | Improbable: excess fines. | Improbable: excess fines. | Poor: cemented pan. |
| MnB Minwells | Good | Probable | Probable | Poor: too clayey. |
| NoD Nocken | Poor: depth to rock, low strength, large stones. | Improbable: excess fines, large stones. | Improbable: excess fines, large stones. | Poor: too clayey, large stones. |
| NsC Nuff | Poor: low strength. | Improbable: excess fines. | Improbable: excess fines. | Poor: large stones. |
| NuB, NuC Nuff | Poor: low strength. | Improbable: excess fines. | Improbable: excess fines. | Fair: too clayey, large stones, thin layer. |
| Oa Oakalla | Poor: low strength. | Improbable: excess fines. | Improbable: excess fines. | Fair: too clayey, small stones. |
| OgB Oglesby | Poor: depth to rock, shrink-swell, low strength. | Improbable: excess fines. | Improbable: excess fines. | Poor: depth to rock, too clayey. |

See footnote at end of table.

TABLE 11.--CONSTRUCTION MATERIALS--Continued

| Soil name and map symbol | Roadfill | Sand | Gravel | Topsoil |
|---|---|---|---|---|
| OwE: Owens | Poor: shrink-swell, low strength, slope. | Improbable: excess fines. | Improbable: excess fines. | Poor: area reclaim, too clayey, small stones. |
| PaB: Patilo | Good | Probable | Improbable: too sandy. | Poor: too sandy. |
| PeC: Pedernales | Poor: low strength. | Improbable: excess fines. | Improbable: excess fines. | Poor: too clayey. |
| PkB: Pidcoke | Poor: depth to rock. | Improbable: excess fines. | Improbable: excess fines. | Poor: depth to rock, small stones. |
| ReD, ReE: Real | Poor: depth to rock. | Improbable: excess fines. | Improbable: excess fines. | Poor: depth to rock, cemented pan, small stones. |
| RoD*: | | | | |
| Roughcreek | Poor: depth to rock, shrink-swell, low strength. | Improbable: excess fines, large stones. | Improbable: excess fines, large stones. | Poor: depth to rock, too clayey, large stones. |
| Rock outcrop | --- | --- | --- | --- |
| RuA, RuB: Rumley | Poor: low strength. | Improbable: excess fines. | Improbable: excess fines. | Poor: too clayey. |
| SeC: Seawillow | Poor: low strength. | Improbable: excess fines. | Improbable: excess fines. | Poor: excess lime. |
| SlB: Slidell | Poor: shrink-swell, low strength. | Improbable: excess fines. | Improbable: excess fines. | Poor: too clayey. |
| SuA, SuB: Sunev | Fair: low strength. | Improbable: excess fines. | Improbable: excess fines. | Fair: too clayey, small stones, area reclaim. |
| TaB: Tarpley | Poor: depth to rock, shrink-swell, low strength. | Improbable: excess fines. | Improbable: excess fines. | Poor: depth to rock, too clayey. |
| TaD*: | | | | |
| Tarpley | Poor: depth to rock, shrink-swell, low strength. | Improbable: excess fines. | Improbable: excess fines. | Poor: depth to rock, too clayey, large stones. |
| Rock outcrop | --- | --- | --- | --- |
| ToC: Topsey | Poor: low strength. | Improbable: excess fines. | Improbable: excess fines. | Poor: too clayey. |

See footnote at end of table.

TABLE 11.--CONSTRUCTION MATERIALS--Continued

| Soil name and map symbol | Roadfill | Sand | Gravel | Topsoil |
|---|---|---|---|---|
| We Weswood | Poor: low strength. | Improbable: excess fines. | Improbable: excess fines. | Good. |
| WsC Wise | Fair: shrink-swell, low strength. | Improbable: excess fines. | Improbable: excess fines. | Fair: too clayey. |
| Ya Yahola | Good | Improbable: excess fines. | Improbable: excess fines. | Good. |

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 12.--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. The information in this table indicates the dominant soil condition but does not eliminate the need for onsite investigation)

| Soil name and map symbol | Limitations for-- Pond reservoir areas | Embankments, dikes and levees | Features affecting-- Irrigation | Terraces and diversions | Grassed waterways |
|---|---|---|---|---|---|
| BaB Bastsil | Moderate: seepage. | Moderate: piping. | Slope, fast intake, soil blowing. | Soil blowing | Favorable. |
| BeB Boerne | Severe: seepage. | Severe: piping. | Favorable | Favorable | Favorable. |
| BoB Bolar | Moderate: seepage, depth to rock. | Moderate: thin layer, hard to pack. | Percs slowly, depth to rock. | Depth to rock, percs slowly. | Depth to rock, percs slowly. |
| BoC Bolar | Moderate: seepage, depth to rock. | Moderate: thin layer, hard to pack. | Percs slowly, depth to rock, slope. | Depth to rock, percs slowly. | Depth to rock, percs slowly. |
| BrC, BrD Brackett | Moderate: seepage, slope. | Moderate: piping. | Slope, droughty. | Favorable | Droughty. |
| BrE*: | | | | | |
| Brackett | Severe: slope. | Moderate: piping. | Slope, droughty. | Slope | Slope, droughty. |
| Rock outcrop | --- | --- | --- | --- | --- |
| CaC2 Callahan | Moderate: depth to rock. | Severe: thin layer. | Slope, percs slowly, depth to rock. | Depth to rock, percs slowly. | Depth to rock, percs slowly. |
| ChB Cho | Severe: cemented pan. | Severe: thin layer. | Droughty, cemented pan. | Cemented pan | Droughty, cemented pan. |
| DeB Demona | Severe: seepage. | Severe: thin layer. | Wetness, droughty. | Wetness, soil blowing, percs slowly. | Droughty, percs slowly. |
| DoC Doss | Severe: depth to rock. | Severe: thin layer. | Slope, slow intake, depth to rock. | Depth to rock | Depth to rock. |
| ErD*: | | | | | |
| Eckrant | Severe: depth to rock. | Severe: hard to pack, large stones. | Slope, large stones, droughty. | Large stones, droughty. | Large stones, droughty, depth to rock. |
| Rock outcrop | --- | --- | --- | --- | --- |
| ErF*: | | | | | |
| Eckrant | Severe: depth to rock, slope. | Severe: hard to pack, large stones. | Slope, large stones, droughty. | Slope, large stones, droughty. | Large stones, slope, depth to rock. |

See footnote at end of table.

TABLE 12.--WATER MANAGEMENT--Continued

| Soil name and map symbol | Limitations for-- Pond reservoir areas | Embankments, dikes and levees | Features affecting-- Irrigation | Terraces and diversions | Grassed waterways |
|---|---|---|---|---|---|
| ErF*: | | | | | |
| Rock outcrop | --- | --- | --- | --- | --- |
| EuC Eufaula | Severe: seepage. | Severe: seepage, piping. | Droughty, fast intake, soil blowing. | Too sandy, soil blowing. | Droughty. |
| HeC Hensley | Severe: depth to rock. | Severe: thin layer. | Slope, droughty, percs slowly. | Depth to rock, erodes easily, percs slowly. | Erodes easily, droughty, depth to rock. |
| HeD Hensley | Severe: depth to rock. | Severe: thin layer. | Slope, droughty, percs slowly. | Large stones, depth to rock, erodes easily. | Large stones, erodes easily, droughty. |
| KrB Krum | Slight | Severe: hard to pack. | Slope, slow intake. | Favorable | Favorable. |
| LaC Lampasas | Moderate: slope. | Severe: seepage. | Slope, droughty, slow intake. | Favorable | Droughty. |
| LeB Leeray | Slight | Severe: hard to pack. | Slow intake, percs slowly. | Percs slowly | Percs slowly. |
| LoD Lometa | Moderate: depth to rock. | Moderate: thin layer. | Slope, droughty, percs slowly. | Droughty, percs slowly. | Droughty, depth to rock. |
| LuB Luckenbach | Slight | Slight | Favorable | Favorable | Favorable. |
| MeB Mereta | Severe: cemented pan. | Slight | Droughty | Cemented pan | Droughty, cemented pan. |
| MnB Minwells | Severe: seepage. | Moderate: thin layer, piping. | Soil blowing, percs slowly. | Soil blowing | Percs slowly. |
| NoD Nocken | Moderate: depth to rock. | Severe: hard to pack, large stones. | Slope, large stones, droughty. | Slope, large stones, depth to rock. | Large stones, slope, erodes easily. |
| NsC Nuff | Moderate: seepage. | Moderate: hard to pack, large stones. | Slope | Large stones | Large stones. |
| NuB Nuff | Moderate: seepage. | Moderate: hard to pack. | Slow intake | Favorable | Favorable. |
| NuC Nuff | Moderate: seepage. | Moderate: hard to pack. | Slope, slow intake. | Favorable | Favorable. |
| Oa Oakalla | Moderate: seepage. | Moderate: piping, hard to pack. | Excess lime | Favorable | Favorable. |

See footnote at end of table.

TABLE 12.--WATER MANAGEMENT--Continued

| Soil name and map symbol | Limitations for-- Pond reservoir areas | Embankments, dikes and levees | Features affecting-- Irrigation | Terraces and diversions | Grassed waterways |
|---|---|---|---|---|---|
| OgB Oglesby | Severe: depth to rock. | Severe: hard to pack. | Slow intake, percs slowly, depth to rock. | Depth to rock, percs slowly. | Depth to rock, percs slowly. |
| OwE Owens | Slight | Moderate: hard to pack. | Slope, droughty. | Slope, erodes easily, percs slowly. | Slope, erodes easily, droughty. |
| PaB Patilo | Severe: seepage. | Severe: seepage, piping. | Droughty, fast intake. | Too sandy, soil blowing. | Droughty. |
| PeC Pedernales | Slight | Moderate: hard to pack. | Slope, soil blowing. | Soil blowing | Favorable. |
| PkB Pidcoke | Severe: depth to rock. | Severe: thin layer. | Depth to rock | Depth to rock | Depth to rock. |
| ReD Real | Severe: depth to rock. | Severe: thin layer. | Slope, droughty, depth to rock. | Depth to rock, cemented pan. | Droughty, depth to rock. |
| ReE Real | Severe: depth to rock, slope. | Severe: thin layer. | Slope, droughty, depth to rock. | Slope, depth to rock, cemented pan. | Slope, droughty, depth to rock. |
| RoD*: | | | | | |
| Roughcreek | Severe: depth to rock. | Severe: hard to pack, large stones. | Slope, large stones, percs slowly. | Large stones, depth to rock. | Large stones, depth to rock. |
| Rock outcrop | --- | --- | --- | --- | --- |
| RuA, RuB Rumley | Moderate: seepage. | Moderate: hard to pack. | Favorable | Erodes easily | Erodes easily. |
| SeC Seawillow | Moderate: seepage. | Moderate: piping. | Slope | Favorable | Favorable. |
| SlB Slidell | Slight | Moderate: hard to pack. | Slow intake, percs slowly. | Percs slowly | Percs slowly. |
| SuA, SuB Sunev | Moderate: seepage. | Moderate: piping. | Soil blowing | Soil blowing | Favorable. |
| TaB Tarpley | Severe: depth to rock. | Severe: hard to pack. | Slow intake, percs slowly. | Depth to rock, percs slowly. | Depth to rock, percs slowly. |
| TaD*: | | | | | |
| Tarpley | Severe: depth to rock. | Severe: hard to pack. | Slope, droughty, slow intake. | Depth to rock, percs slowly. | Droughty, depth to rock. |
| Rock outcrop | --- | --- | --- | --- | --- |
| ToC Topsey | Moderate: seepage. | Slight | Slope, rooting depth. | Favorable | Rooting depth. |

See footnote at end of table.

TABLE 12.--WATER MANAGEMENT--Continued

| Soil name and map symbol | Limitations for-- Pond reservoir areas | Embankments, dikes and levees | Features affecting-- Irrigation | Terraces and diversions | Grassed waterways |
|---|---|---|---|---|---|
| We Weswood | Moderate: seepage. | Severe: piping. | Erodes easily | Erodes easily | Erodes easily. |
| WsC Wise | Severe: seepage. | Severe: piping. | Slope, droughty, erodes easily. | Erodes easily | Erodes easily, droughty. |
| Ya Yahola | Severe: seepage. | Severe: piping. | Favorable | Soil blowing | Favorable. |

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 13.--ENGINEERING INDEX PROPERTIES

(The symbol < means less than; > means more than. Absence of an entry indicates that data were not estimated)

| Soil name and map symbol | Depth | USDA texture | Classification: Unified | Classification: AASHTO | Frag-ments 3-10 inches | Percentage passing sieve number--: 4 | 10 | 40 | 200 | Liquid limit | Plas-ticity index |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | In | | | | Pct | | | | | Pct | |
| BaB---------- Bastsil | 0-7 | Loamy fine sand | SM, SC-SM | A-2-4, A-4 | 0 | 95-100 | 95-100 | 75-95 | 20-50 | <20 | NP-4 |
| | 7-77 | Loam, clay loam, sandy clay loam. | CL, SC | A-6, A-7-6 | 0 | 95-100 | 90-100 | 75-100 | 40-70 | 26-42 | 11-26 |
| BeB---------- Boerne | 0-6 | Loam---------- | CL, SC, CL-ML, SC-SM | A-4, A-6 | 0-3 | 95-100 | 85-100 | 70-95 | 45-75 | 22-35 | 4-15 |
| | 6-60 | Fine sandy loam, loam. | CL, SC, CL-ML, SC-SM | A-4, A-6 | 0-5 | 95-100 | 85-100 | 60-95 | 36-75 | 22-35 | 4-15 |
| BoB---------- Bolar | 0-11 | Clay loam-------- | CL, CH | A-6, A-7 | 0-5 | 85-100 | 78-100 | 70-100 | 55-93 | 35-57 | 18-34 |
| | 11-30 | Loam, clay loam, silty clay loam. | CL, CH | A-6, A-7 | 0-5 | 85-100 | 78-100 | 70-99 | 55-93 | 34-59 | 16-38 |
| | 30-34 | Weathered bedrock | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| BoC---------- Bolar | 0-11 | Clay loam-------- | CL, CH | A-6, A-7 | 0-5 | 85-100 | 78-100 | 70-100 | 55-93 | 35-57 | 18-34 |
| | 11-28 | Loam, clay loam, silty clay loam. | CL, CH | A-6, A-7 | 0-5 | 85-100 | 78-100 | 70-99 | 55-93 | 34-59 | 16-38 |
| | 28-32 | Stony clay loam, very stony clay loam, very stony loam. | CL, CH | A-6, A-7 | 0-30 | 65-94 | 60-89 | 60-89 | 50-79 | 34-59 | 16-38 |
| | 32-36 | Weathered bedrock | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| BrC---------- Brackett | 0-6 | Clay loam-------- | CL | A-6, A-7-6 | 0-3 | 90-100 | 85-100 | 65-94 | 55-84 | 25-43 | 10-26 |
| | 6-16 | Loam, clay loam | CL | A-6, A-7-6 | 0-3 | 90-100 | 85-100 | 65-94 | 60-87 | 25-43 | 10-26 |
| | 16-60 | Loam, clay loam, silty clay. | CL | A-6, A-7-6 | 0-3 | 90-100 | 85-100 | 68-98 | 67-97 | 25-43 | 10-26 |
| BrD---------- Brackett | 0-9 | Gravelly clay loam. | CL, SC, GC | A-6 | 0-15 | 70-99 | 62-88 | 50-79 | 43-72 | 25-40 | 10-23 |
| | 9-17 | Loam, clay loam | CL | A-6, A-7-6 | 0-3 | 90-100 | 85-100 | 65-94 | 60-87 | 25-43 | 10-26 |
| | 17-60 | Loam, clay loam, silty clay. | CL | A-6, A-7-6 | 0-3 | 90-100 | 85-100 | 68-98 | 67-97 | 25-43 | 10-26 |
| BrE*: | | | | | | | | | | | |
| Brackett-------- | 0-6 | Gravelly clay loam. | CL, SC, GC | A-6 | 0-15 | 70-99 | 62-88 | 50-79 | 43-72 | 25-40 | 10-23 |
| | 6-15 | Loam, clay loam | CL | A-6, A-7-6 | 0-3 | 90-100 | 85-100 | 65-94 | 60-87 | 25-43 | 10-26 |
| | 15-60 | Loam, clay loam, silty clay. | CL | A-6, A-7-6 | 0-3 | 90-100 | 85-100 | 68-98 | 67-97 | 25-43 | 10-26 |
| Rock outcrop---- | 0-80 | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| CaC2---------- Callahan | 0-4 | Loam---------- | CL, CL-ML, SC, SC-SM | A-4, A-6 | 0 | 90-100 | 85-100 | 75-95 | 45-75 | 25-35 | 7-16 |
| | 4-38 | Clay, clay loam | CL | A-6, A-7-6 | 0 | 90-100 | 90-100 | 80-100 | 55-85 | 35-50 | 19-30 |
| | 38-60 | Weathered bedrock | --- | --- | --- | --- | --- | --- | --- | --- | --- |

See footnote at end of table.

TABLE 13.--ENGINEERING INDEX PROPERTIES--Continued

| Soil name and map symbol | Depth | USDA texture | Classification: Unified | Classification: AASHTO | Frag- ments 3-10 inches | Percentage passing sieve number--: 4 | 10 | 40 | 200 | Liquid limit | Plas- ticity index |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | In | | | | Pct | | | | | Pct | |
| ChB---------- Cho | 0-9 | Gravelly loam---- | CL, SC, GC | A-6, A-7-6 | 0-5 | 60-85 | 55-80 | 50-80 | 40-70 | 30-50 | 11-26 |
| | 9-13 | Cemented--------- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| | 13-60 | Gravelly loam, gravelly clay loam, very gravelly loam. | SC, GC, GM-GC, SC-SM | A-2, A-4, A-6, A-7-6 | 0-5 | 50-85 | 35-80 | 20-60 | 15-60 | 24-47 | 5-22 |
| DeB---------- Demona | 0-34 | Fine sand-------- | SM, SP-SM, SC-SM | A-2-4, A-3 | 0 | 98-100 | 96-100 | 80-100 | 7-35 | <25 | NP-4 |
| | 34-49 | Sandy clay, clay | CH, CL, SC | A-7-6, A-6 | 0 | 98-100 | 96-100 | 85-100 | 41-85 | 30-60 | 15-40 |
| | 49-87 | Sandy clay, clay, sandy clay loam. | CL, CH, SC | A-7-6, A-6, A-2-6, A-2-7 | 0 | 98-100 | 96-100 | 85-100 | 31-85 | 29-70 | 15-50 |
| DoC---------- Doss | 0-18 | Silty clay------- | CH | A-7-6 | 0-15 | 84-100 | 81-100 | 75-100 | 70-95 | 50-61 | 30-39 |
| | 18-60 | Unweathered bedrock. | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| ErD*, ErF*: | | | | | | | | | | | |
| Eckrant--------- | 0-5 | Very cobbly clay | CL, CH, GC, SC | A-7-6 | 10-50 | 70-95 | 50-95 | 45-95 | 45-94 | 41-60 | 24-40 |
| | 5-8 | Very cobbly clay, very stony clay, extremely stony clay. | CL, GC, CH, SC | A-7-6 | 15-75 | 56-85 | 50-79 | 45-75 | 44-74 | 47-73 | 25-45 |
| | 8-11 | Unweathered bedrock. | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Rock outcrop---- | 0-80 | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| EuC---------- Eufaula | 0-35 | Fine sand-------- | SM, SP-SM | A-2, A-3 | 0 | 100 | 98-100 | 82-98 | 5-25 | <25 | NP-4 |
| | 35-84 | Loamy fine sand, fine sand, fine sandy loam. | SM, SP-SM | A-2, A-3 | 0 | 100 | 98-100 | 82-100 | 5-35 | <25 | NP-4 |
| HeC---------- Hensley | 0-5 | Loam---------- | CL, CL-ML | A-6, A-4 | 0-2 | 80-100 | 75-100 | 70-100 | 60-85 | 20-35 | 5-16 |
| | 5-18 | Clay, clay loam | CL, CH | A-6, A-7 | 0-10 | 80-100 | 75-100 | 70-100 | 60-90 | 35-55 | 18-35 |
| | 18-20 | Unweathered bedrock. | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| HeD---------- Hensley | 0-5 | Very stony loam | CL, CL-ML | A-4, A-6 | 20-40 | 80-100 | 75-100 | 70-100 | 60-90 | 20-40 | 5-20 |
| | 5-16 | Clay, clay loam | CL, CH | A-6, A-7 | 0-10 | 80-100 | 75-100 | 70-100 | 65-95 | 35-55 | 18-35 |
| | 16-20 | Unweathered bedrock. | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| KrB---------- Krum | 0-22 | Silty clay------- | CH, CL | A-7-6 | 0 | 95-100 | 85-100 | 85-100 | 85-95 | 47-65 | 25-42 |
| | 22-80 | Silty clay loam, silty clay, clay. | CH, CL | A-7-6, A-6 | 0 | 85-100 | 75-100 | 70-99 | 65-95 | 36-60 | 20-39 |
| LaC---------- Lampasas | 0-5 | Gravelly clay---- | CH, CL, GC | A-7-6 | 0-2 | 45-70 | 45-60 | 40-60 | 40-60 | 41-70 | 24-42 |
| | 5-13 | Very gravelly clay, extremely gravelly clay, very gravelly clay loam. | CH, CL, GC | A-2-7, A-7-6 | 0-15 | 25-60 | 20-55 | 15-51 | 15-51 | 41-72 | 24-44 |
| | 13-60 | Fragmental material. | GW | A-1 | 5-15 | 5-10 | 0-5 | 0-2 | 0-1 | --- | NP |

See footnote at end of table.

TABLE 13.--ENGINEERING INDEX PROPERTIES--Continued

| Soil name and map symbol | Depth | USDA texture | Classification: Unified | Classification: AASHTO | Frag- ments 3-10 inches | Percentage passing sieve number--: 4 | 10 | 40 | 200 | Liquid limit | Plas- ticity index |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | In | | | | Pct | | | | | Pct | |
| LeB---------- Leeray | 0-50 | Clay---------- | CH, CL | A-7-6 | 0-5 | 97-100 | 96-100 | 85-100 | 75-95 | 45-65 | 30-42 |
| | 50-65 | Clay, silty clay | CH | A-7-6 | 0-5 | 95-100 | 95-100 | 85-100 | 75-95 | 51-70 | 30-45 |
| | 65-80 | Silty clay loam, clay, silty clay. | CH, CL | A-7-6, A-6 | 0-5 | 95-100 | 95-100 | 85-100 | 70-95 | 44-57 | 30-40 |
| LoD---------- Lometa | 0-13 | Very gravelly sandy loam. | GC, SC, GM-GC, SC-SM | A-1, A-2-4, A-2-6 | 0-10 | 35-75 | 15-43 | 15-40 | 10-30 | 20-33 | 4-15 |
| | 13-38 | Very gravelly clay, extremely gravelly clay loam. | GC, GP-GC, SC, SP-SC | A-2-7, A-7-6, A-7-5 | 0-10 | 25-70 | 15-59 | 15-42 | 12-40 | 44-66 | 22-39 |
| | 38-70 | Unweathered bedrock. | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| LuB---------- Luckenbach | 0-12 | Clay loam-------- | CL | A-6 | 0-3 | 95-100 | 95-100 | 75-95 | 55-65 | 29-40 | 14-25 |
| | 12-36 | Clay loam, clay | CL, CH | A-7 | 0-3 | 80-100 | 75-100 | 70-100 | 60-85 | 40-55 | 22-35 |
| | 36-80 | Clay loam, clay | CL | A-6, A-7 | 0-5 | 70-100 | 70-100 | 65-95 | 50-85 | 35-45 | 20-30 |
| MeB---------- Mereta | 0-18 | Clay loam-------- | CL | A-6, A-7-6 | 0-5 | 90-100 | 85-100 | 80-97 | 60-85 | 39-50 | 19-28 |
| | 18-22 | Cemented--------- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| | 22-60 | Loam, clay loam, gravelly clay loam. | CL, SC | A-6, A-7-6 | 0-5 | 80-95 | 75-90 | 60-85 | 45-70 | 38-50 | 18-28 |
| MnB---------- Minwells | 0-6 | Fine sandy loam | CL, CL-ML, SC-SM, SC | A-2, A-4, A-6 | 0 | 96-100 | 90-100 | 80-98 | 30-60 | <30 | NP-15 |
| | 6-54 | Clay, clay loam, sandy clay. | CL | A-7-6, A-6 | 0 | 95-100 | 90-100 | 85-98 | 50-80 | 32-50 | 15-32 |
| | 54-80 | Clay loam, sandy clay loam, gravelly sandy clay loam. | CL, SC | A-6, A-7-6, A-4 | 0 | 85-100 | 80-100 | 65-98 | 45-80 | 23-45 | 8-26 |
| NoD---------- Nocken | 0-13 | Very stony fine sandy loam. | SC, SC-SM | A-1, A-2-4, A-4, A-6 | 10-50 | 70-90 | 55-80 | 40-70 | 20-45 | 20-35 | 4-15 |
| | 13-32 | Very stony sandy clay, very stony clay, very bouldery clay. | SC, CL, CH | A-2, A-6, A-7 | 10-50 | 70-90 | 55-80 | 50-80 | 25-70 | 30-60 | 15-40 |
| | 32-36 | Very stony sandy clay loam, very stony clay loam, very stony clay. | SC, CL, CH | A-2, A-6, A-7 | 10-50 | 70-90 | 55-80 | 45-80 | 25-70 | 35-60 | 20-40 |
| | 36-60 | Weathered bedrock | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| NsC---------- Nuff | 0-13 | Very stony silty clay loam. | CL, CH | A-6, A-7-6 | 35-50 | 94-100 | 90-100 | 80-100 | 65-90 | 35-61 | 15-36 |
| | 13-33 | Silt loam, silty clay loam. | CL, CH | A-6, A-7-6 | 0-3 | 95-100 | 95-100 | 85-100 | 70-95 | 35-55 | 15-29 |
| | 33-60 | Silt loam, silty clay loam, silty clay, shale. | CL, CH | A-6, A-7-6 | 0-5 | 88-100 | 84-100 | 80-100 | 70-95 | 35-61 | 15-36 |

See footnote at end of table.

TABLE 13.--ENGINEERING INDEX PROPERTIES--Continued

| Soil name and map symbol | Depth | USDA texture | Classification: Unified | Classification: AASHTO | Frag- ments 3-10 inches | Percentage passing sieve number--: 4 | 10 | 40 | 200 | Liquid limit | Plas- ticity index |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | In | | | | Pct | | | | | Pct | |
| NuB---------- Nuff | 0-12 | Silty clay------- | CH | A-7-6 | 0-5 | 95-100 | 90-100 | 90-100 | 90-95 | 50-62 | 30-38 |
| | 12-48 | Silt loam, silty clay loam. | CL, CH | A-6, A-7-6 | 0-3 | 95-100 | 95-100 | 85-100 | 70-95 | 35-55 | 15-29 |
| | 48-60 | Silt loam, silty clay loam, silty clay, shale. | CL, CH | A-6, A-7-6 | 0-5 | 88-100 | 84-100 | 80-100 | 70-95 | 35-61 | 15-36 |
| NuC---------- Nuff | 0-16 | Silty clay------- | CH | A-7-6 | 0-5 | 95-100 | 90-100 | 90-100 | 90-95 | 50-62 | 30-38 |
| | 16-40 | Silt loam, silty clay loam. | CL, CH | A-6, A-7-6 | 0-3 | 95-100 | 95-100 | 85-100 | 70-95 | 35-55 | 15-29 |
| | 40-80 | Silt loam, silty clay loam, silty clay, shale, marl. | CL, CH | A-6, A-7-6 | 0-5 | 88-100 | 84-100 | 80-100 | 70-95 | 35-61 | 15-36 |
| Oa---------- Oakalla | 0-6 | Silty clay loam | CL, CH | A-6, A-7-6 | 0-2 | 90-100 | 90-100 | 85-100 | 60-97 | 25-54 | 14-33 |
| | 6-38 | Loam, clay loam, silty clay loam. | CL, CH | A-6, A-7-6 | 0-2 | 85-100 | 80-100 | 70-100 | 60-99 | 28-58 | 13-38 |
| | 38-80 | Loam, clay loam, silty clay loam. | CL, CH | A-4, A-6, A-7-6 | 0-2 | 85-100 | 80-100 | 75-100 | 60-96 | 25-55 | 8-35 |
| OgB---------- Oglesby | 0-16 | Silty clay------- | CH | A-7-6 | 0-5 | 90-100 | 90-100 | 85-100 | 75-100 | 55-75 | 30-45 |
| | 16-20 | Unweathered bedrock. | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| OwE---------- Owens | 0-11 | Very stony clay | CL, CH | A-7-6 | 15-35 | 80-100 | 75-100 | 70-100 | 65-95 | 45-60 | 22-32 |
| | 11-16 | Clay, clay loam, silty clay. | CL, CH | A-7-6 | 0-10 | 80-100 | 80-100 | 80-100 | 75-95 | 45-60 | 22-33 |
| | 16-60 | Clay, shale. | CL, CH | A-7-6 | 0-10 | 90-100 | 85-100 | 80-100 | 65-95 | 45-60 | 25-37 |
| PaB---------- Patilo | 0-6 | Fine sand-------- | SM, SP-SM, SC-SM | A-2-4, A-3 | 0 | 100 | 95-100 | 85-100 | 8-28 | <25 | NP-5 |
| | 6-48 | Fine sand, loamy fine sand. | SM, SP-SM, SC-SM | A-2-4, A-3 | 0 | 100 | 95-100 | 85-100 | 8-28 | <25 | NP-5 |
| | 48-80 | Sandy clay loam, fine sandy loam. | SC | A-2, A-4, A-6 | 0 | 90-100 | 90-100 | 90-100 | 25-50 | 22-36 | 8-20 |
| PeC---------- Pedernales | 0-13 | Fine sandy loam | SM, ML, CL-ML, SC-SM | A-4 | 0 | 95-100 | 90-100 | 70-85 | 35-55 | <25 | NP-7 |
| | 13-44 | Sandy clay, clay | CH, CL, SC | A-7, A-6 | 0 | 90-100 | 90-100 | 80-100 | 45-85 | 38-60 | 20-36 |
| | 44-63 | Sandy clay loam, clay loam, sandy clay. | SC, CL, CH | A-6, A-7 | 0-5 | 90-100 | 90-100 | 80-100 | 45-80 | 32-55 | 13-30 |
| PkB---------- Pidcoke | 0-8 | Clay loam-------- | CL | A-6, A-7-6 | 0 | 90-100 | 85-100 | 80-100 | 65-94 | 32-49 | 13-26 |
| | 8-17 | Gravelly clay loam, gravelly silty clay loam. | CL, SC, GC | A-6, A-7-6 | 0-5 | 55-80 | 45-74 | 36-65 | 36-65 | 32-49 | 13-26 |
| | 17-20 | Unweathered bedrock. | --- | --- | --- | --- | --- | --- | --- | --- | --- |

See footnote at end of table.

TABLE 13.--ENGINEERING INDEX PROPERTIES--Continued

| Soil name and map symbol | Depth | USDA texture | Classification: Unified | Classification: AASHTO | Frag- ments 3-10 inches | Percentage passing sieve number--: 4 | 10 | 40 | 200 | Liquid limit | Plas- ticity index |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | In | | | | Pct | | | | | Pct | |
| ReD---------- Real | 0-6 | Gravelly clay loam. | SM, GM, ML, CL | A-4, A-6, A-7 | 1-5 | 65-90 | 50-77 | 45-65 | 36-60 | 30-55 | 8-25 |
| | 6-14 | Extremely gravelly loam, extremely gravelly clay loam, very gravelly clay loam. | GM, GC, SM, SC | A-2, A-4, A-6, A-7 | 0-15 | 25-75 | 20-50 | 20-45 | 20-40 | 30-55 | 8-25 |
| | 14-16 | Cemented--------- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| | 16-60 | Weathered bedrock, variable. | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| ReE---------- Real | 0-8 | Very gravelly clay loam. | GM, GC, SM, SC | A-2, A-4, A-6, A-7 | 0-15 | 35-85 | 30-50 | 20-45 | 20-40 | 30-55 | 8-25 |
| | 8-16 | Extremely gravelly loam, extremely gravelly clay loam, very gravelly clay loam. | GM, GC, SM, SC | A-2, A-4, A-6, A-7 | 0-15 | 25-75 | 20-50 | 20-45 | 20-40 | 30-55 | 8-25 |
| | 16-18 | Cemented--------- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| | 16-60 | Weathered bedrock, variable. | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| RoD*: | | | | | | | | | | | |
| Roughcreek------ | 0-8 | Very stony clay loam. | CL, CH | A-7 | 25-70 | 85-100 | 80-98 | 75-95 | 65-90 | 40-60 | 20-35 |
| | 8-17 | Very stony clay, stony clay. | CH | A-7 | 25-70 | 85-100 | 85-100 | 85-100 | 60-95 | 51-75 | 35-50 |
| | 17-19 | Unweathered bedrock. | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Rock outcrop---- | 0-80 | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| RuA---------- Rumley | 0-14 | Silty clay loam | CL, CH | A-7 | 0 | 95-100 | 95-100 | 82-99 | 70-95 | 41-55 | 20-33 |
| | 14-32 | Clay loam, silty clay loam, silty clay. | CL, CH | A-6, A-7 | 0 | 95-100 | 95-100 | 70-98 | 70-95 | 38-60 | 20-35 |
| | 32-63 | Clay loam, silty clay loam. | CL, CH | A-6, A-7 | 0 | 85-100 | 85-95 | 70-95 | 65-90 | 30-55 | 11-32 |
| RuB---------- Rumley | 0-14 | Silty clay loam | CL, CH | A-7 | 0 | 95-100 | 95-100 | 82-99 | 70-95 | 41-55 | 20-33 |
| | 14-32 | Clay loam, silty clay loam, silty clay. | CL, CH | A-6, A-7 | 0 | 95-100 | 95-100 | 70-98 | 70-95 | 38-60 | 20-35 |
| | 32-48 | Gravelly clay loam, gravelly silty clay loam, gravelly silty clay. | SC, CL, CH | A-6, A-7 | 0 | 75-100 | 55-80 | 40-80 | 40-75 | 30-55 | 11-32 |
| | 48-63 | Clay loam, silty clay loam. | CL, CH | A-6, A-7 | 0 | 85-100 | 85-95 | 70-95 | 65-90 | 30-55 | 11-32 |

See footnote at end of table.

TABLE 13.--ENGINEERING INDEX PROPERTIES--Continued

| Soil name and map symbol | Depth | USDA texture | Classification: Unified | Classification: AASHTO | Frag- ments 3-10 inches | Percentage passing sieve number--: 4 | 10 | 40 | 200 | Liquid limit | Plas- ticity index |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | In | | | | Pct | | | | | Pct | |
| SeC---------- Seawillow | 0-6 | Clay loam-------- | CL | A-6, A-7-6 | 0-15 | 85-100 | 75-100 | 70-100 | 60-90 | 32-50 | 15-30 |
| | 6-21 | Loam, clay loam, silty clay loam. | CL | A-6, A-7-6 | 0-15 | 85-100 | 65-100 | 60-100 | 51-82 | 30-45 | 14-26 |
| | 21-60 | Loam, clay loam, silty clay loam. | CL | A-4, A-6, A-7-6 | 0-15 | 85-100 | 75-100 | 75-100 | 51-80 | 25-45 | 8-25 |
| SlB---------- Slidell | 0-6 | Clay---------- | CH | A-7-6 | 0 | 95-100 | 95-100 | 95-100 | 85-100 | 50-67 | 31-46 |
| | 6-38 | Silty clay, clay | CH | A-7-6 | 0 | 95-100 | 95-100 | 95-100 | 85-100 | 50-67 | 31-46 |
| | 38-80 | Silty clay, clay | CH, CL | A-7-6, A-6 | 0 | 95-100 | 93-100 | 85-100 | 70-98 | 34-51 | 18-30 |
| SuA---------- Sunev | 0-16 | Loam---------- | SC, CL | A-4, A-6 | 0 | 90-100 | 80-100 | 70-100 | 45-70 | 25-35 | 8-16 |
| | 16-31 | Loam, clay loam, silty clay loam. | CL | A-4, A-6 | 0 | 85-100 | 80-100 | 70-100 | 51-85 | 28-40 | 8-20 |
| | 31-80 | Loam, clay loam, silty clay loam. | CL | A-4, A-6, A-7-6 | 0 | 80-100 | 70-100 | 65-100 | 51-70 | 25-42 | 8-22 |
| SuB---------- Sunev | 0-10 | Loam---------- | SC, CL | A-4, A-6 | 0 | 90-100 | 80-100 | 70-100 | 45-70 | 25-35 | 8-16 |
| | 10-53 | Loam, clay loam, silty clay loam. | CL | A-4, A-6 | 0 | 85-100 | 80-100 | 70-100 | 51-85 | 28-40 | 8-20 |
| | 53-80 | Loam, clay loam, silty clay loam. | CL | A-4, A-6, A-7-6 | 0 | 80-100 | 70-100 | 65-100 | 51-70 | 25-42 | 8-22 |
| TaB---------- Tarpley | 0-7 | Clay---------- | CL, CH | A-7 | 0-3 | 90-100 | 90-100 | 80-95 | 70-90 | 41-60 | 20-38 |
| | 7-18 | Clay---------- | CH | A-7 | 0 | 90-100 | 90-100 | 90-100 | 65-98 | 51-80 | 30-55 |
| | 18-22 | Unweathered bedrock. | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| TaD*: | | | | | | | | | | | |
| Tarpley--------- | 0-6 | Cobbly clay------ | CL, CH | A-7 | 0-15 | 85-100 | 85-98 | 75-95 | 65-90 | 41-60 | 20-38 |
| | 6-15 | Clay, cobbly clay | CH | A-7 | 0-15 | 85-100 | 85-100 | 85-100 | 60-95 | 51-80 | 30-55 |
| | 15-18 | Unweathered bedrock. | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Rock outcrop---- | 0-80 | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| ToC---------- Topsey | 0-10 | Clay loam-------- | CL | A-6, A-7-6 | 0 | 90-100 | 85-100 | 75-100 | 65-94 | 32-49 | 13-25 |
| | 10-19 | Loam, clay loam, silty clay loam. | CL | A-6, A-7-6 | 0 | 80-100 | 80-100 | 70-98 | 65-94 | 32-49 | 13-25 |
| | 19-30 | Gravelly loam, gravelly clay loam. | CL, GC, SC | A-6, A-7-6, A-2-6, A-2-7 | 0 | 55-80 | 47-76 | 36-65 | 33-62 | 32-49 | 13-25 |
| | 30-80 | Silty clay loam, clay loam, silty clay. | CL | A-6, A-7-6 | 0 | 80-100 | 80-100 | 70-98 | 67-95 | 39-49 | 20-29 |
| We---------- Weswood | 0-8 | Silt loam-------- | CL, CL-ML | A-4, A-6 | 0 | 100 | 98-100 | 90-100 | 65-95 | 20-35 | 5-18 |
| | 8-80 | Very fine sandy loam, loam, silt loam. | CL, CL-ML | A-4, A-6 | 0 | 100 | 98-100 | 95-100 | 70-98 | 20-40 | 5-22 |
| WsC---------- Wise | 0-7 | Clay loam-------- | CL, CL-ML | A-6, A-4 | 0 | 95-100 | 95-100 | 85-100 | 75-95 | 17-40 | 5-22 |
| | 7-32 | Clay loam, loam, silty clay loam. | CL, CL-ML | A-6, A-4 | 0 | 95-100 | 95-100 | 85-100 | 75-95 | 17-40 | 5-22 |
| | 32-60 | Stratified very fine sandy loam to silty clay loam, shale. | CL, CL-ML, SC, SC-SM | A-6, A-4 | 0 | 95-100 | 95-100 | 85-100 | 49-85 | 17-40 | 5-22 |

See footnote at end of table.

TABLE 13.--ENGINEERING INDEX PROPERTIES--Continued

| Soil name and map symbol | Depth | USDA texture | Classification: Unified | Classification: AASHTO | Frag- ments 3-10 inches | Percentage passing sieve number--: 4 | 10 | 40 | 200 | Liquid limit | Plas- ticity index |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | In | | | | Pct | | | | | Pct | |
| Ya---------- Yahola | 0-9 | Fine sandy loam | SM, ML, CL-ML, SC-SM | A-4 | 0 | 100 | 95-100 | 90-100 | 36-60 | 15-26 | NP-7 |
| | 9-24 | Fine sandy loam, loam, very fine sandy loam. | SM, ML, CL, SC | A-4 | 0 | 100 | 95-100 | 90-100 | 36-85 | 15-30 | NP-10 |
| | 24-80 | Stratified loam to loamy fine sand. | SM, ML, CL, SC | A-2, A-4 | 0 | 100 | 95-100 | 90-100 | 15-85 | 15-30 | NP-10 |

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 14.--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS

(The symbol < means less than; > means more than. Entries under "Erosion factors--T" apply to the entire profile. Entries under "Wind erodibility group" and "Organic matter" apply only to the surface layer. Absence of an entry indicates that data were not available or were not estimated)

| Soil name and map symbol | Depth | Clay | Moist bulk density | Permeability | Available water capacity | Soil reaction | Shrink-swell potential | Erosion factors K | Erosion factors T | Wind erodibility group | Organic matter |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | In | Pct | G/cc | In/hr | In/in | pH | | | | | Pct |
| BaB---------- | 0-7 | 5-12 | 1.55-1.65 | 2.0-6.0 | 0.07-0.11 | 5.1-7.3 | Low---------- | 0.20 | 5 | 2 | <1 |
| Bastsil | 7-77 | 18-35 | 1.50-1.65 | 0.6-2.0 | 0.12-0.16 | 5.6-7.8 | Moderate----- | 0.32 | | | |
| BeB---------- | 0-6 | 12-23 | 1.35-1.50 | 2.0-6.0 | 0.10-0.15 | 7.9-8.4 | Low---------- | 0.28 | 3 | 4L | .5-1 |
| Boerne | 6-60 | 12-23 | 1.40-1.55 | 2.0-6.0 | 0.10-0.15 | 7.9-8.4 | Low---------- | 0.28 | | | |
| BoB---------- | 0-11 | 20-40 | 1.20-1.50 | 0.6-2.0 | 0.11-0.18 | 7.9-8.4 | Moderate----- | 0.32 | 2 | 4L | 1-3 |
| Bolar | 11-30 | 20-40 | 1.20-1.50 | 0.6-2.0 | 0.11-0.18 | 7.9-8.4 | Moderate----- | 0.32 | | | |
| | 30-34 | --- | --- | 0.06-2.0 | --- | --- | ---------- | ---- | | | |
| BoC---------- | 0-11 | 20-40 | 1.20-1.50 | 0.6-2.0 | 0.11-0.18 | 7.9-8.4 | Moderate----- | 0.32 | 2 | 4L | 1-3 |
| Bolar | 11-28 | 20-40 | 1.20-1.50 | 0.6-2.0 | 0.11-0.18 | 7.9-8.4 | Moderate----- | 0.32 | | | |
| | 28-32 | 20-40 | 1.20-1.50 | 0.6-2.0 | 0.10-0.15 | 7.9-8.4 | Moderate----- | 0.20 | | | |
| | 32-36 | --- | --- | 0.06-2.0 | --- | --- | ---------- | ---- | | | |
| BrC---------- | 0-6 | 10-35 | 1.30-1.50 | 0.6-2.0 | 0.11-0.16 | 7.9-8.4 | Low---------- | 0.32 | 2 | 4L | 1-3 |
| Brackett | 6-16 | 18-35 | 1.30-1.55 | 0.6-2.0 | 0.11-0.16 | 7.9-8.4 | Low---------- | 0.32 | | | |
| | 16-60 | 18-45 | 1.35-1.65 | 0.2-0.6 | 0.10-0.15 | 7.9-8.4 | Low---------- | 0.32 | | | |
| BrD---------- | 0-9 | 10-35 | 1.30-1.50 | 0.6-2.0 | 0.08-0.12 | 7.9-8.4 | Low---------- | 0.17 | 2 | 8 | 1-3 |
| Brackett | 9-17 | 18-35 | 1.30-1.55 | 0.6-2.0 | 0.11-0.16 | 7.9-8.4 | Low---------- | 0.32 | | | |
| | 17-60 | 18-45 | 1.35-1.65 | 0.2-0.6 | 0.10-0.15 | 7.9-8.4 | Low---------- | 0.32 | | | |
| BrE*: | | | | | | | | | | | |
| Brackett-------- | 0-6 | 10-35 | 1.30-1.50 | 0.6-2.0 | 0.08-0.12 | 7.9-8.4 | Low---------- | 0.17 | 2 | 8 | 1-3 |
| | 6-15 | 18-35 | 1.30-1.55 | 0.6-2.0 | 0.11-0.16 | 7.9-8.4 | Low---------- | 0.32 | | | |
| | 15-60 | 18-45 | 1.35-1.65 | 0.2-0.6 | 0.10-0.15 | 7.9-8.4 | Low---------- | 0.32 | | | |
| Rock outcrop---- | --- | --- | --- | --- | --- | --- | ---------- | ---- | --- | --- | --- |
| CaC2---------- | 0-4 | 15-27 | 1.35-1.50 | 0.2-0.6 | 0.15-0.20 | 6.6-8.4 | Low---------- | 0.32 | 3 | 6 | <1 |
| Callahan | 4-38 | 35-50 | 1.40-1.55 | <0.06 | 0.12-0.18 | 7.4-8.4 | Moderate----- | 0.32 | | | |
| | 38-60 | --- | --- | 0.2-2.0 | --- | --- | ---------- | ---- | | | |
| ChB---------- | 0-9 | 20-35 | 1.30-1.50 | 0.6-2.0 | 0.07-0.12 | 7.9-8.4 | Low---------- | 0.17 | 2 | 8 | 1-2 |
| Cho | 9-13 | --- | --- | 0.01-2.0 | --- | --- | ---------- | ---- | | | |
| | 13-60 | 20-35 | 1.40-1.60 | 0.6-2.0 | 0.05-0.10 | 7.9-8.4 | Low---------- | 0.15 | | | |
| DeB---------- | 0-34 | 5-10 | 1.50-1.65 | 2.0-6.0 | 0.05-0.08 | 5.6-7.8 | Low---------- | 0.17 | 5 | 1 | <1 |
| Demona | 34-49 | 35-50 | 1.40-1.60 | 0.06-0.2 | 0.15-0.18 | 5.1-6.5 | Moderate----- | 0.24 | | | |
| | 49-87 | 20-45 | 1.40-1.60 | 0.2-0.6 | 0.14-0.18 | 5.1-6.5 | Moderate----- | 0.24 | | | |
| DoC---------- | 0-18 | 40-48 | 1.25-1.45 | 0.2-0.6 | 0.12-0.16 | 7.9-8.4 | Moderate----- | 0.28 | 2 | 4 | 1-3 |
| Doss | 18-60 | --- | --- | 0.06-2.0 | --- | --- | ---------- | ---- | | | |
| ErD*, ErF*: | | | | | | | | | | | |
| Eckrant--------- | 0-5 | 35-45 | 1.35-1.55 | 0.2-0.6 | 0.05-0.12 | 6.6-8.4 | Moderate----- | 0.15 | 1 | 8 | 2-11 |
| | 5-8 | 40-60 | 1.35-1.60 | 0.2-0.6 | 0.05-0.12 | 6.6-8.4 | Moderate----- | 0.10 | | | |
| | 8-11 | --- | --- | 0.06-2.0 | --- | --- | ---------- | ---- | | | |
| Rock outcrop---- | --- | --- | --- | --- | --- | --- | ---------- | ---- | --- | --- | --- |
| EuC---------- | 0-35 | 2-8 | 1.35-1.50 | 6.0-20 | 0.05-0.08 | 5.1-7.3 | Low---------- | 0.15 | 5 | 1 | .5-1 |
| Eufaula | 35-84 | 2-12 | 1.50-1.70 | 6.0-20 | 0.07-0.13 | 5.1-7.3 | Low---------- | 0.17 | | | |

See footnote at end of table.

TABLE 14.--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS--Continued

| Soil name and map symbol | Depth | Clay | Moist bulk density | Permeability | Available water capacity | Soil reaction | Shrink-swell potential | Erosion factors K | Erosion factors T | Wind erodi-bility group | Organic matter |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | In | Pct | G/cc | In/hr | In/in | pH | | | | | Pct |
| HeC---------- Hensley | 0-5 | 15-30 | 1.30-1.50 | 0.2-0.6 | 0.12-0.18 | 6.1-7.8 | Low---------- | 0.37 | 1 | 6 | .5-2 |
| | 5-18 | 35-55 | 1.25-1.45 | 0.06-0.2 | 0.08-0.15 | 6.6-8.4 | Moderate----- | 0.32 | | | |
| | 18-20 | --- | --- | 0.06-2.0 | --- | --- | ---------- | ---- | | | |
| HeD---------- Hensley | 0-5 | 15-30 | 1.35-1.55 | 0.2-0.6 | 0.08-0.16 | 6.1-7.8 | Low---------- | 0.15 | 1 | 8 | .5-2 |
| | 5-16 | 35-55 | 1.40-1.65 | 0.06-0.2 | 0.10-0.20 | 6.6-8.4 | Moderate----- | 0.43 | | | |
| | 16-20 | --- | --- | 0.06-2.0 | --- | --- | ---------- | ---- | | | |
| KrB---------- Krum | 0-22 | 35-55 | 1.35-1.55 | 0.2-0.6 | 0.15-0.20 | 7.4-8.4 | High--------- | 0.32 | 5 | 4 | 1-3 |
| | 22-80 | 35-60 | 1.30-1.55 | 0.2-0.6 | 0.07-0.18 | 7.9-8.4 | High--------- | 0.32 | | | |
| LaC---------- Lampasas | 0-5 | 35-45 | 1.35-1.55 | 0.2-0.6 | 0.07-0.12 | 6.6-7.8 | Moderate----- | 0.17 | 1 | 8 | 2-5 |
| | 5-13 | 35-45 | 1.35-1.60 | 0.2-0.6 | 0.05-0.11 | 6.6-7.8 | Moderate----- | 0.05 | | | |
| | 13-60 | --- | --- | 0.2-0.6 | 0.-0.02 | 7.9-8.4 | ---------- | ---- | | | |
| LeB---------- Leeray | 0-50 | 40-60 | 1.10-1.40 | <0.06 | 0.12-0.18 | 6.6-7.8 | Very high---- | 0.32 | 5 | 4 | 1-5 |
| | 50-65 | 40-60 | 1.30-1.45 | <0.06 | 0.12-0.18 | 7.9-8.4 | Very high---- | 0.32 | | | |
| | 65-80 | 35-50 | 1.35-1.60 | <0.06 | 0.10-0.15 | 7.9-8.4 | High--------- | 0.32 | | | |
| LoD---------- Lometa | 0-13 | 10-20 | 1.40-1.65 | 0.2-2.0 | 0.06-0.10 | 5.6-7.3 | Low---------- | 0.10 | 2 | 8 | .1-1 |
| | 13-38 | 35-60 | 1.35-1.60 | 0.06-0.2 | 0.07-0.12 | 5.6-8.4 | Moderate----- | 0.10 | | | |
| | 38-70 | --- | --- | 0.2-2.0 | --- | --- | ---------- | ---- | | | |
| LuB---------- Luckenbach | 0-12 | 20-35 | 1.35-1.55 | 0.6-2.0 | 0.15-0.18 | 6.1-7.8 | Low---------- | 0.32 | 5 | 6 | 1-3 |
| | 12-36 | 35-55 | 1.35-1.60 | 0.2-0.6 | 0.13-0.18 | 7.4-8.4 | Moderate----- | 0.32 | | | |
| | 36-80 | 30-50 | 1.40-1.60 | 0.2-0.6 | 0.10-0.15 | 7.9-8.4 | Moderate----- | 0.28 | | | |
| MeB---------- Mereta | 0-18 | 35-40 | 1.25-1.45 | 0.2-0.6 | 0.15-0.20 | 7.9-8.4 | Moderate----- | 0.32 | 2 | 4 | 1-8 |
| | 18-22 | --- | --- | 0.01-0.6 | --- | --- | ---------- | ---- | | | |
| | 22-60 | 30-45 | 1.40-1.65 | 0.6-2.0 | 0.02-0.08 | 7.9-8.4 | Moderate----- | 0.32 | | | |
| MnB---------- Minwells | 0-6 | 10-20 | 1.40-1.55 | 2.0-6.0 | 0.10-0.15 | 6.1-7.8 | Low---------- | 0.24 | 5 | 3 | .1-1 |
| | 6-54 | 35-45 | 1.35-1.60 | 0.06-0.2 | 0.11-0.16 | 5.6-7.8 | Moderate----- | 0.32 | | | |
| | 54-80 | 20-35 | 1.35-1.60 | 0.2-0.6 | 0.10-0.16 | 6.6-8.4 | Moderate----- | 0.32 | | | |
| NoD---------- Nocken | 0-13 | 10-18 | 1.30-1.50 | 0.6-2.0 | 0.04-0.08 | 5.6-7.3 | Low---------- | 0.37 | 2 | 8 | <1 |
| | 13-32 | 40-65 | 1.40-1.60 | 0.2-0.6 | 0.08-0.12 | 5.1-6.5 | Moderate----- | 0.32 | | | |
| | 32-36 | 30-50 | 1.40-1.60 | 0.2-0.6 | 0.08-0.12 | 5.1-6.5 | Moderate----- | 0.32 | | | |
| | 36-60 | --- | --- | 0.2-2.0 | --- | --- | ---------- | ---- | | | |
| NsC---------- Nuff | 0-13 | 25-45 | 1.35-1.55 | 0.2-0.6 | 0.12-0.16 | 7.9-8.4 | Moderate----- | 0.17 | 5 | 8 | 2-4 |
| | 13-33 | 20-40 | 1.35-1.55 | 0.6-2.0 | 0.15-0.18 | 7.9-8.4 | Moderate----- | 0.32 | | | |
| | 33-60 | 25-45 | 1.45-1.69 | 0.2-0.6 | 0.15-0.18 | 7.9-8.4 | Moderate----- | 0.32 | | | |
| NuB---------- Nuff | 0-12 | 40-45 | 1.35-1.55 | 0.2-0.6 | 0.14-0.18 | 7.9-8.4 | Moderate----- | 0.32 | 5 | 4 | 2-4 |
| | 12-48 | 20-40 | 1.35-1.55 | 0.6-2.0 | 0.15-0.18 | 7.9-8.4 | Moderate----- | 0.32 | | | |
| | 48-60 | 25-45 | 1.45-1.69 | 0.2-0.6 | 0.15-0.18 | 7.9-8.4 | Moderate----- | 0.32 | | | |
| NuC---------- Nuff | 0-16 | 40-45 | 1.35-1.55 | 0.2-0.6 | 0.14-0.18 | 7.9-8.4 | Moderate----- | 0.32 | 5 | 4 | 2-4 |
| | 16-40 | 20-40 | 1.35-1.55 | 0.6-2.0 | 0.15-0.18 | 7.9-8.4 | Moderate----- | 0.32 | | | |
| | 40-80 | 25-45 | 1.45-1.69 | 0.2-0.6 | 0.15-0.18 | 7.9-8.4 | Moderate----- | 0.32 | | | |
| Oa---------- Oakalla | 0-6 | 25-43 | 1.30-1.45 | 0.6-2.0 | 0.14-0.19 | 7.9-8.4 | Moderate----- | 0.32 | 5 | 4L | 1-7 |
| | 6-38 | 20-40 | 1.30-1.45 | 0.6-2.0 | 0.12-0.18 | 7.9-8.4 | Moderate----- | 0.32 | | | |
| | 38-80 | 20-40 | 1.35-1.50 | 0.6-2.0 | 0.12-0.16 | 7.9-8.4 | Moderate----- | 0.32 | | | |
| OgB---------- Oglesby | 0-16 | 40-50 | 1.25-1.45 | 0.06-0.2 | 0.13-0.18 | 6.6-7.8 | High--------- | 0.32 | 1 | 4 | 1-3 |
| | 16-20 | --- | --- | 0.06-2.0 | --- | --- | ---------- | ---- | | | |

See footnote at end of table.

TABLE 14.--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS--Continued

| Soil name and map symbol | Depth | Clay | Moist bulk density | Permeability | Available water capacity | Soil reaction | Shrink-swell potential | Erosion factors K | Erosion factors T | Wind erodi-bility group | Organic matter |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | In | Pct | G/cc | In/hr | In/in | pH | | | | | Pct |
| OwE---------- | 0-11 | 35-60 | 1.35-1.55 | <0.06 | 0.10-0.17 | 7.9-8.4 | Moderate----- | 0.10 | 1 | 8 | .5-2 |
| Owens | 11-16 | 35-60 | 1.45-1.65 | <0.06 | 0.13-0.17 | 7.9-8.4 | High--------- | 0.32 | | | |
| | 16-60 | 35-60 | 1.70-2.00 | <0.06 | 0.01-0.05 | 7.9-8.4 | High--------- | 0.37 | | | |
| PaB---------- | 0-6 | 2-7 | 1.50-1.65 | 6.0-20 | 0.05-0.08 | 5.6-7.3 | Low---------- | 0.17 | 5 | 1 | .1-1 |
| Patilo | 6-48 | 2-12 | 1.50-1.65 | 6.0-20 | 0.05-0.10 | 5.6-7.3 | Low---------- | 0.24 | | | |
| | 48-80 | 18-35 | 1.50-1.65 | 0.2-0.6 | 0.14-0.18 | 5.1-6.5 | Low---------- | 0.17 | | | |
| PeC---------- | 0-13 | 5-20 | 1.40-1.50 | 0.6-2.0 | 0.12-0.15 | 6.1-7.8 | Low---------- | 0.28 | 5 | 3 | .5-1 |
| Pedernales | 13-44 | 35-55 | 1.45-1.60 | 0.2-0.6 | 0.13-0.18 | 6.1-7.8 | Moderate----- | 0.32 | | | |
| | 44-63 | 20-50 | 1.45-1.60 | 0.2-0.6 | 0.13-0.18 | 7.9-8.4 | Moderate----- | 0.28 | | | |
| PkB---------- | 0-8 | 20-35 | 1.30-1.50 | 0.2-0.6 | 0.13-0.17 | 7.9-8.4 | Moderate----- | 0.32 | 1 | 4L | 1-3 |
| Pidcoke | 8-17 | 20-35 | 1.30-1.50 | 0.2-0.6 | 0.11-0.15 | 7.9-8.4 | Moderate----- | 0.20 | | | |
| | 17-20 | --- | --- | 0.01-0.6 | --- | --- | ---------- | ---- | | | |
| ReD---------- | 0-6 | 22-40 | 1.25-1.55 | 0.6-2.0 | 0.05-0.10 | 7.9-8.4 | Low---------- | 0.15 | 2 | 8 | 1-4 |
| Real | 6-14 | 22-40 | 1.25-1.55 | 0.6-2.0 | 0.05-0.10 | 7.9-8.4 | Low---------- | 0.10 | | | |
| | 14-16 | --- | --- | 0.2-2.0 | --- | --- | ---------- | ---- | | | |
| | 16-60 | --- | --- | 0.2-2.0 | --- | --- | ---------- | ---- | | | |
| ReE---------- | 0-8 | 22-40 | 1.25-1.55 | 0.6-2.0 | 0.05-0.10 | 7.9-8.4 | Low---------- | 0.10 | 2 | 8 | 1-4 |
| Real | 8-16 | 22-40 | 1.25-1.55 | 0.6-2.0 | 0.05-0.10 | 7.9-8.4 | Low---------- | 0.10 | | | |
| | 16-18 | --- | --- | 0.2-2.0 | --- | --- | ---------- | ---- | | | |
| | 16-60 | --- | --- | 0.2-2.0 | --- | --- | ---------- | ---- | | | |
| RoD*: | | | | | | | | | | | |
| Roughcreek------ | 0-8 | 30-40 | 1.35-1.55 | 0.2-0.6 | 0.10-0.16 | 6.1-7.8 | High--------- | 0.10 | 1 | 8 | 1-3 |
| | 8-17 | 40-60 | 1.40-1.60 | 0.06-0.2 | 0.10-0.18 | 6.1-7.8 | High--------- | 0.10 | | | |
| | 17-19 | --- | --- | 0.06-2.0 | --- | --- | ---------- | ---- | | | |
| Rock outcrop---- | --- | --- | --- | --- | --- | --- | ---------- | ---- | --- | --- | --- |
| RuA---------- | 0-14 | 28-40 | 1.20-1.40 | 0.6-2.0 | 0.16-0.20 | 7.9-8.4 | High--------- | 0.37 | 5 | 4L | 1-3 |
| Rumley | 14-32 | 30-45 | 1.20-1.45 | 0.6-2.0 | 0.14-0.18 | 7.9-8.4 | High--------- | 0.37 | | | |
| | 32-60 | 28-40 | 1.20-1.40 | 0.6-2.0 | 0.14-0.18 | 7.9-8.4 | Moderate----- | 0.37 | | | |
| RuB---------- | 0-14 | 28-40 | 1.20-1.40 | 0.6-2.0 | 0.16-0.20 | 7.9-8.4 | High--------- | 0.37 | 5 | 4L | 1-3 |
| Rumley | 14-32 | 30-45 | 1.20-1.45 | 0.6-2.0 | 0.14-0.18 | 7.9-8.4 | High--------- | 0.37 | | | |
| | 32-48 | 28-40 | 1.20-1.40 | 0.6-2.0 | 0.14-0.18 | 7.9-8.4 | Moderate----- | 0.37 | | | |
| | 48-63 | 28-40 | 1.20-1.40 | 0.6-2.0 | 0.14-0.18 | 7.9-8.4 | Moderate----- | 0.37 | | | |
| SeC---------- | 0-6 | 22-40 | 1.40-1.55 | 0.6-2.0 | 0.12-0.20 | 7.9-8.4 | Moderate----- | 0.28 | 5 | 4L | <1 |
| Seawillow | 6-21 | 22-40 | 1.35-1.55 | 0.6-2.0 | 0.12-0.16 | 7.9-8.4 | Moderate----- | 0.28 | | | |
| | 21-60 | 22-40 | 1.35-1.60 | 0.6-2.0 | 0.12-0.14 | 7.9-8.4 | Low---------- | 0.32 | | | |
| SlB---------- | 0-6 | 40-60 | 1.25-1.55 | <0.06 | 0.15-0.18 | 7.4-8.4 | High--------- | 0.32 | 5 | 4 | 1-4 |
| Slidell | 6-38 | 40-60 | 1.25-1.55 | <0.06 | 0.15-0.18 | 7.4-8.4 | High--------- | 0.32 | | | |
| | 38-80 | 40-60 | 1.35-1.55 | <0.06 | 0.13-0.18 | 7.4-8.4 | High--------- | 0.32 | | | |
| SuA---------- | 0-16 | 15-28 | 1.30-1.50 | 0.6-2.0 | 0.10-0.16 | 7.9-8.4 | Low---------- | 0.28 | 5 | 3 | 1-3 |
| Sunev | 16-31 | 20-40 | 1.40-1.60 | 0.6-2.0 | 0.11-0.16 | 7.9-8.4 | Low---------- | 0.28 | | | |
| | 31-80 | 20-40 | 1.40-1.60 | 0.6-2.0 | 0.11-0.16 | 7.9-8.4 | Low---------- | 0.28 | | | |
| SuB---------- | 0-10 | 15-28 | 1.30-1.50 | 0.6-2.0 | 0.10-0.16 | 7.9-8.4 | Low---------- | 0.28 | 5 | 3 | 1-3 |
| Sunev | 10-53 | 20-40 | 1.40-1.60 | 0.6-2.0 | 0.11-0.16 | 7.9-8.4 | Low---------- | 0.28 | | | |
| | 53-80 | 20-40 | 1.40-1.60 | 0.6-2.0 | 0.11-0.16 | 7.9-8.4 | Low---------- | 0.28 | | | |
| TaB---------- | 0-7 | 30-50 | 1.20-1.40 | 0.2-0.6 | 0.15-0.20 | 6.1-7.8 | High--------- | 0.32 | 1 | 4 | 1-4 |
| Tarpley | 7-18 | 60-80 | 1.15-1.35 | 0.06-0.2 | 0.07-0.14 | 6.1-7.8 | Very high---- | 0.32 | | | |
| | 18-22 | --- | --- | 0.2-2.0 | --- | --- | ---------- | ---- | | | |

See footnote at end of table.

TABLE 14.--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS--Continued

| Soil name and map symbol | Depth | Clay | Moist bulk density | Permeability | Available water capacity | Soil reaction | Shrink-swell potential | Erosion factors K | Erosion factors T | Wind erodi-bility group | Organic matter |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | In | Pct | G/cc | In/hr | In/in | pH | | | | | Pct |
| TaD*: | | | | | | | | | | | |
| Tarpley--------- | 0-6 | 40-50 | 1.30-1.45 | 0.2-0.6 | 0.10-0.16 | 6.1-7.8 | High--------- | 0.17 | 1 | 8 | 1-10 |
| | 6-15 | 60-80 | 1.35-1.50 | 0.06-0.2 | 0.07-0.13 | 6.1-7.8 | Very high---- | 0.32 | | | |
| | 15-18 | --- | --- | 0.2-2.0 | --- | --- | ---------- | ---- | | | |
| Rock outcrop---- | --- | --- | --- | --- | --- | --- | ---------- | ---- | --- | --- | --- |
| ToC---------- Topsey | 0-10 | 20-35 | 1.32-1.50 | 0.6-2.0 | 0.12-0.17 | 7.9-8.4 | Moderate----- | 0.32 | 5 | 4L | 2-8 |
| | 10-19 | 20-35 | 1.32-1.50 | 0.6-2.0 | 0.12-0.17 | 7.9-8.4 | Moderate----- | 0.32 | | | |
| | 19-30 | 20-35 | 1.32-1.50 | 0.6-2.0 | 0.10-0.16 | 7.9-8.4 | Moderate----- | 0.17 | | | |
| | 30-60 | 35-50 | 1.50-1.73 | 0.2-0.6 | 0.09-0.16 | 7.9-8.4 | Moderate----- | 0.32 | | | |
| We---------- Weswood | 0-8 | 8-26 | 1.20-1.35 | 0.6-2.0 | 0.12-0.20 | 7.4-8.4 | Low---------- | 0.43 | 5 | 6 | 1-4 |
| | 8-80 | 10-20 | 1.30-1.55 | 0.6-2.0 | 0.12-0.20 | 7.4-8.4 | Low---------- | 0.43 | | | |
| WsC---------- Wise | 0-7 | 18-30 | 1.30-1.50 | 0.6-2.0 | 0.12-0.15 | 7.4-8.4 | Moderate----- | 0.37 | 3 | 6 | .5-2 |
| | 7-32 | 20-30 | 1.35-1.60 | 0.6-2.0 | 0.09-0.12 | 7.4-8.4 | Moderate----- | 0.37 | | | |
| | 32-60 | 10-30 | 1.35-1.65 | 0.6-6.0 | 0.08-0.12 | 7.4-8.4 | Moderate----- | 0.37 | | | |
| Ya---------- Yahola | 0-9 | 10-18 | 1.30-1.60 | 2.0-6.0 | 0.11-0.15 | 7.4-8.4 | Low---------- | 0.20 | 5 | 3 | .5-1 |
| | 9-24 | 5-18 | 1.40-1.70 | 2.0-6.0 | 0.11-0.20 | 7.9-8.4 | Low---------- | 0.32 | | | |
| | 24-80 | 5-18 | 1.50-1.70 | 2.0-6.0 | 0.07-0.20 | 7.9-8.4 | Low---------- | 0.32 | | | |

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 15.--SOIL AND WATER FEATURES

("Flooding" terms such as "rare," and "brief," are explained in the text. The symbol < means less than; > means more than. Absence of an entry indicates that the feature is not a concern or that data were not estimated)

| Soil name and map symbol | Hydro-logic group | Flooding: Frequency | Flooding: Duration | Flooding: Months | Bedrock: Depth | Bedrock: Hardness | Cemented pan: Depth | Cemented pan: Hardness | Risk of corrosion: Uncoated steel | Risk of corrosion: Concrete |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | In | | In | | | |
| BaB---------- Bastsil | B | None--------- | --- | --- | >60 | --- | --- | --- | Moderate | Low. |
| BeB---------- Boerne | B | Rare--------- | --- | --- | >60 | --- | --- | --- | Moderate | Low. |
| BoB, BoC---------- Bolar | C | None--------- | --- | --- | 20-40 | Soft | --- | --- | High----- | Low. |
| BrC, BrD---------- Brackett | C | None--------- | --- | --- | >60 | --- | --- | --- | High----- | Low. |
| BrE*: | | | | | | | | | | |
| Brackett--------- | C | None--------- | --- | --- | >60 | --- | --- | --- | High----- | Low. |
| Rock outcrop----- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| CaC2---------- Callahan | D | None--------- | --- | --- | 20-40 | Soft | --- | --- | High----- | Low. |
| ChB---------- Cho | C | None--------- | --- | --- | >60 | --- | 7-20 | Thin | High----- | Low. |
| DeB---------- Demona | C | None--------- | --- | --- | >60 | --- | --- | --- | High----- | Moderate. |
| DoC---------- Doss | D | None--------- | --- | --- | 11-20 | Soft | --- | --- | High----- | Low. |
| ErD*, ErF*: | | | | | | | | | | |
| Eckrant---------- | D | None--------- | --- | --- | 8-20 | Hard | --- | --- | High----- | Low. |
| Rock outcrop----- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| EuC---------- Eufaula | A | None--------- | --- | --- | >60 | --- | --- | --- | Low------ | Moderate. |
| HeC, HeD---------- Hensley | D | None--------- | --- | --- | 10-20 | Hard | --- | --- | High----- | Low. |
| KrB---------- Krum | D | None--------- | --- | --- | >60 | --- | --- | --- | High----- | Low. |
| LaC---------- Lampasas | D | None--------- | --- | --- | >60 | --- | --- | --- | Low------ | Low. |
| LeB---------- Leeray | D | None--------- | --- | --- | >60 | --- | --- | --- | High----- | Low. |
| LoD---------- Lometa | C | None--------- | --- | --- | 20-40 | Hard | --- | --- | High----- | Moderate. |
| LuB---------- Luckenbach | C | None--------- | --- | --- | >60 | --- | --- | --- | Moderate | Low. |

See footnote at end of table.

TABLE 15.--SOIL AND WATER FEATURES--Continued

| Soil name and map symbol | Hydrologic group | Flooding: Frequency | Flooding: Duration | Flooding: Months | Bedrock: Depth | Bedrock: Hardness | Cemented pan: Depth | Cemented pan: Hardness | Risk of corrosion: Uncoated steel | Risk of corrosion: Concrete |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | In | | In | | | |
| MeB---------- Mereta | C | None-------- | --- | --- | >60 | --- | 14-20 | Thin | High----- | Low. |
| MnB---------- Minwells | C | None-------- | --- | --- | >60 | --- | --- | --- | High----- | Low. |
| NoD---------- Nocken | C | None-------- | --- | --- | 20-40 | Soft | --- | --- | High----- | Moderate. |
| NsC, NuB, NuC----- Nuff | C | None-------- | --- | --- | >60 | --- | --- | --- | Moderate | Low. |
| Oa---------- Oakalla | B | Rare-------- | --- | --- | >60 | --- | --- | --- | Moderate | Low. |
| OgB---------- Oglesby | D | None-------- | --- | --- | 10-20 | Hard | --- | --- | High----- | Low. |
| OwE---------- Owens | D | None-------- | --- | --- | >60 | --- | --- | --- | High----- | Low. |
| PaB---------- Patilo | A | None-------- | --- | --- | >60 | --- | --- | --- | High----- | Moderate. |
| PeC---------- Pedernales | C | None-------- | --- | --- | >60 | --- | --- | --- | High----- | Low. |
| PkB---------- Pidcoke | D | None-------- | --- | --- | 10-20 | Hard | --- | --- | Moderate | Low. |
| ReD, ReE---------- Real | D | None-------- | --- | --- | 9-20 | Soft | 8-19 | Thin | High----- | Low. |
| RoD*: | | | | | | | | | | |
| Roughcreek------- | D | None-------- | --- | --- | 10-20 | Hard | --- | --- | High----- | Low. |
| Rock outcrop----- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| RuA, RuB---------- Rumley | B | None-------- | --- | --- | >60 | --- | --- | --- | High----- | Low. |
| SeC---------- Seawillow | B | None-------- | --- | --- | >60 | --- | --- | --- | Moderate | Low. |
| SlB---------- Slidell | D | None-------- | --- | --- | >60 | --- | --- | --- | Moderate | Low. |
| SuA---------- Sunev | B | Rare-------- | --- | --- | >60 | --- | --- | --- | High----- | Low. |
| SuB---------- Sunev | B | None-------- | --- | --- | >60 | --- | --- | --- | High----- | Low. |
| TaB---------- Tarpley | D | None-------- | --- | --- | 13-20 | Hard | --- | --- | High----- | Low. |
| TaD*: | | | | | | | | | | |
| Tarpley---------- | D | None-------- | --- | --- | 13-20 | Hard | --- | --- | High----- | Low. |
| Rock outcrop----- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |

See footnote at end of table.

TABLE 15.--SOIL AND WATER FEATURES--Continued

| Soil name and map symbol | Hydro-logic group | Flooding: Frequency | Flooding: Duration | Flooding: Months | Bedrock: Depth | Bedrock: Hardness | Cemented pan: Depth | Cemented pan: Hardness | Risk of corrosion: Uncoated steel | Risk of corrosion: Concrete |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | In | | In | | | |
| ToC---------- Topsey | C | None--------- | --- | --- | >60 | --- | --- | --- | Moderate | Low. |
| We---------- Weswood | B | Rare--------- | --- | --- | >60 | --- | --- | --- | High----- | Low. |
| WsC---------- Wise | C | None--------- | --- | --- | >60 | --- | --- | --- | Moderate | Low. |
| Ya---------- Yahola | B | Frequent---- | Very brief | Apr-Oct | >60 | --- | --- | --- | Low------ | Low. |

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 16.--ENGINEERING INDEX TEST DATA

(Dashes indicate data were not available. Np means nonplastic)

| Soil name, report number, horizon, and depth in inches | Classification | | Grain-size distribution | | | | | | Liquid limit[2] | Plasticity index[2] | Specific gravity | Shrinkage | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Percentage passing sieve-- | | | | | | | | | Limit | Linear | Ratio |
| | AASHTO | Unified | 5/8 inch | 3/8 inch | No. 4 | No. 10 | No. 40 | No. 200 | | | | | | |
| | | | | | | | | | Pct | | g/cc | Pct | Pct | |
| Bastsil loamy fine sand[3] (S81TX-281-004) | | | | | | | | | | | | | | |
| Ap ----- 0-7 | A-2-4(0) | SM | 100 | 100 | 100 | 99 | 95 | 29 | 18 | 2 | 2.61 | 13 | 1.8 | 1.81 |
| Bt1 ----- 7-25 | A-6(10) | SC | 100 | 100 | 100 | 99 | 96 | 58 | 41 | 23 | 2.65 | 14 | 11.5 | 1.88 |
| Bt2 ----- 25-43 | A-6(12) | SC | 100 | 100 | 100 | 98 | 95 | 59 | 42 | 26 | 2.69 | 18 | 11.7 | 1.85 |
| Bt3 ----- 43-68 | A-6(7) | SC | 100 | 100 | 100 | 100 | 98 | 57 | 34 | 17 | 2.62 | 16 | 8.9 | 1.84 |
| Bolar clay loam[4] (S81TX-281-001) | | | | | | | | | | | | | | |
| A ----- 6-11 | A-6(29) | CL | 100 | 100 | 100 | 100 | 97 | 93 | 53 | 27 | 2.65 | 15 | 17.0 | 1.89 |
| Bk1 ----- 11-28 | A-6(24) | CL | 100 | 100 | 99 | 98 | 94 | 91 | 49 | 24 | 2.64 | 16 | 14.5 | 1.86 |
| Bk2 ----- 28-33 | A-6(22) | CL | 100 | 100 | 99 | 93 | 86 | 83 | 48 | 26 | 2.65 | 15 | 14.6 | 1.88 |
| Demona fine sand[3] (S81TX-281-002) | | | | | | | | | | | | | | |
| E ----- 6-34 | A-2-4(0) | SM | 100 | 100 | 100 | 100 | 97 | 8 | 19 | 1 | 2.65 | 17 | 0.0 | 1.72 |
| Bt1 ----- 34-49 | A-7-6(13) | CH | 100 | 100 | 100 | 100 | 98 | 53 | 52 | 32 | 2.69 | 17 | 15.0 | 1.83 |
| Bt2 ----- 49-77 | A-6(0) | SC | 100 | 100 | 100 | 100 | 98 | 31 | 33 | 16 | 2.66 | 20 | 6.3 | 1.73 |
| Eufala fine sand[3] (S81TX-281-007) | | | | | | | | | | | | | | |
| A21 ----- 9-18 | A-2(0) | SP-SM | 100 | 100 | 100 | 100 | 96 | 13 | 21 | 3 | 2.66 | 17 | 0.0 | 1.73 |
| A22 ----- 18-35 | A-2(0) | SP-SM | 100 | 100 | 100 | 100 | 97 | 12 | 20 | 3 | 2.62 | 16 | 0.0 | 1.80 |
| A23 & Bt- 35-84 | A-2(0) | SP-SM | 100 | 100 | 100 | 100 | 97 | 18 | 19 | 4 | 2.61 | 17 | 1.6 | 1.80 |

See footnote at end of table.

TABLE 16.--ENGINEERING INDEX TEST DATA--Continued

| Soil name, report number, horizon, and depth in inches | Classification | | Grain-size distribution: Percentage passing sieve-- | | | | | | Liquid limit[2] | Plasticity index[2] | Specific gravity | Shrinkage: Limit | Linear | Ratio |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | AASHTO | Unified | 5/8 inch | 3/8 inch | No. 4 | No. 10 | No. 40 | No. 200 | | | | | | |
| | | | | | | | | | Pct | | g/cc | Pct | Pct | |
| Lometa very gravelly loam[3] (S81TX-281-004) | | | | | | | | | | | | | | |
| A1 ----- 0-4 | A-1(0) | GC | 77 | 67 | 52 | 41 | 24 | 15 | 28 | 6 | 2.62 | 22 | 2.5 | 1.66 |
| A2 ----- 4-13 | A-2-6(0) | SM-SC | 75 | 63 | 45 | 31 | 16 | 10 | 22 | 6 | 2.63 | 15 | 4.1 | 1.86 |
| Bt1 ----- 13-24 | A-7-6(0) | GP-GC | 75 | 68 | 55 | 43 | 26 | 23 | 88 | 56 | 2.69 | 22 | 22.5 | 1.74 |
| Bt2 ----- 24-38 | A-7-6(23) | GP-GC | 89 | 84 | 76 | 71 | 54 | 47 | 100 | 63 | 2.72 | 16 | 27.5 | 1.91 |
| Oakalla silty clay loam[3] (S81TX-281-008) | | | | | | | | | | | | | | |
| A2 ----- 6-38 | A-7-6(36) | CL | 100 | 100 | 100 | 100 | 100 | 97 | 54 | 33 | 2.69 | 16 | 17.0 | 1.93 |
| C1 ----- 38-58 | A-7-6(31) | CL | 100 | 100 | 100 | 100 | 100 | 93 | 49 | 32 | 2.69 | 14 | 16.0 | 1.98 |
| C2 ----- 58-84 | A-7-6(29) | CL | 100 | 100 | 100 | 100 | 100 | 96 | 46 | 29 | 2.61 | 15 | 14.6 | 1.95 |
| Sunev loam[3] (S81TX-281-005) | | | | | | | | | | | | | | |
| A2 ----- 6-16 | A-4(6) | SC | 100 | 100 | 100 | 100 | 98 | 57 | 32 | 16 | 2.61 | 19 | 6.8 | 1.78 |
| Bk1 ----- 16-31 | A-6(6) | CL | 100 | 100 | 100 | 100 | 98 | 56 | 31 | 16 | 2.65 | 18 | 7.0 | 1.81 |
| Bk2 ----- 31-60 | A-6(9) | CL | 100 | 100 | 100 | 100 | 98 | 66 | 34 | 18 | 2.67 | 17 | 8.7 | 1.85 |
| IIBk ---- 60-80 | A-6(16) | CL | 100 | 100 | 99 | 97 | 94 | 70 | 42 | 26 | 2.67 | 15 | 12.3 | 1.89 |

See footnote at end of table.

TABLE 16.--ENGINEERING INDEX TEST DATA--Continued

| Soil name, report number, horizon, and depth in inches | Classification | | Grain-size distribution: Percentage passing sieve-- | | | | | | Liquid limit[2] | Plasticity index[2] | Specific gravity | Shrinkage: Limit | Linear | Ratio |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | AASHTO | Unified | 5/8 inch | 3/8 inch | No. 4 | No. 10 | No. 40 | No. 200 | | | | | | |
| | | | | | | | | | Pct | | g/cc | Pct | Pct | |
| Weswood silty clay loam[5] (S81TX-281-003) | | | | | | | | | | | | | | |
| B1 ----- 8-28 | A-4(12) | CL | 100 | 100 | 100 | 99 | 99 | 78 | 33 | 17 | 2.68 | 16 | 8.6 | 1.88 |
| B2 ----- 28-43 | A-4(12) | CL | 100 | 100 | 100 | 99 | 99 | 79 | 34 | 17 | 2.68 | 16 | 9.1 | 1.85 |
| B3 ----- 43-80 | A-4(9) | CL | 100 | 100 | 100 | 98 | 98 | 72 | 32 | 16 | 2.65 | 14 | 9.8 | 1.99 |

[1] For soil material 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.

[2] Liquid limit and plastic index values were based on AASHTO-89 and AASHTO-90 methods repectively, except that soil was added to water.

[3] Location of pedon sample is the same as the pedon given as typical for series in "Soil Series and Their Morphology."

[4] Location of pedon sample: From intersection of U.S. Highway 190 and U.S. Highway 183 in Lometa, 10.7 miles west on U.S. Highway 190, 0.4 mile south and southwest along trail to a gate at the southeast corner of field, 150 feet northwest in field.

TABLE 17.--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 |
|---|---|
| Bastsil | Fine-loamy, siliceous, thermic Udic Paleustalfs |
| Boerne | Coarse-loamy, carbonatic, thermic Fluventic Ustochrepts |
| Bolar | Fine-loamy, carbonatic, thermic Udic Calciustolls |
| Brackett | Fine-loamy, carbonatic, thermic Udic Ustochrepts |
| Callahan | Fine, mixed, thermic Typic Haplustalfs |
| Cho | Loamy, carbonatic, thermic, shallow Petrocalcic Calciustolls |
| Demona | Clayey, mixed, thermic Aquic Arenic Paleustalfs |
| Doss | Loamy, carbonatic, thermic, shallow Typic Calciustolls |
| Eckrant | Clayey-skeletal, montmorillonitic, thermic Lithic Haplustolls |
| Eufaula | Sandy, siliceous, thermic Psammentic Paleustalfs |
| Hensley | Clayey, mixed, thermic Lithic Rhodustalfs |
| *Krum | Fine, montmorillonitic, thermic Udertic Haplustolls |
| Lampasas | Fragmental, mixed, thermic Udic Haplustolls |
| Leeray | Fine, montmorillonitic, thermic Typic Haplusterts |
| Lometa | Clayey-skeletal, mixed, thermic Typic Paleustalfs |
| Luckenbach | Fine, mixed, thermic Typic Argiustolls |
| Mereta | Clayey, mixed, thermic, shallow Petrocalcic Calciustolls |
| Minwells | Fine, mixed, thermic Udic Paleustalfs |
| Nocken | Clayey-skeletal, mixed, thermic Ultic Paleustalfs |
| Nuff | Fine-silty, carbonatic, thermic Udic Calciustolls |
| Oakalla | Fine-loamy, carbonatic, thermic Cumulic Haplustolls |
| Oglesby | Clayey, montmorillonitic, thermic Lithic Haplustolls |
| Owens | Fine, mixed, thermic Typic Ustochrepts |
| Patilo | Loamy, siliceous, thermic Grossarenic Paleustalfs |
| Pedernales | Fine, mixed, thermic Typic Paleustalfs |
| Pidcoke | Loamy, carbonatic, thermic Lithic Calciustolls |
| Real | Loamy-skeletal, carbonatic, thermic, shallow Petrocalcic Calciustolls |
| Roughcreek | Clayey-skeletal, montmorillonitic, thermic Lithic Argiustolls |
| Rumley | Fine-loamy, carbonatic, thermic Udic Calciustolls |
| Seawillow | Fine-loamy, carbonatic, thermic Udic Ustochrepts |
| Slidell | Fine, montmorillonitic, thermic Udic Haplusterts |
| Sunev | Fine-loamy, carbonatic, thermic Udic Calciustolls |
| Tarpley | Clayey, montmorillonitic, thermic Lithic Argiustolls |
| Topsey | Fine-loamy, carbonatic, thermic Udic Calciustolls |
| Weswood | Coarse-silty, mixed, thermic Fluventic Ustochrepts |
| Wise | Fine-silty, siliceous, thermic Udic Ustochrepts |
| Yahola | Coarse-loamy, mixed (calcareous), thermic Udic Ustifluvents |

# NRCS Accessibility Statement

The Natural Resources Conservation Service (NRCS) is committed to making its information accessible to all of its customers and employees. If you are experiencing accessibility issues and need assistance, please contact our Helpdesk by phone at 1-800-457-3642 or by e-mail at helpdesk@helpdesk.itc.nrcs.usda.gov. For assistance with publications that include maps, graphs, or similar forms of information, you may also wish to contact our State or local office. You can locate the correct office and phone number at http://offices.sc.egov.usda.gov/locator/app.