SOIL SURVEY OF

Parker County, Texas

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

This is a publication of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and agencies of the States, usually the Agricultural Experiment Stations. In some surveys, other Federal and local agencies also contribute. 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 the period 1965–71. Soil names and descriptions were approved in 1973. Unless otherwise indicated, statements in the publication refer to conditions in the county in 1973. This survey was made cooperatively by the Soil Conservation Service and the Texas Agricultural Experiment Station. It is part of the technical assistance furnished to the Hood-Parker Soil and Water Conservation District.

HOW TO USE THIS SOIL SURVEY

THIS SOIL SURVEY contains information that can be applied in managing farms and ranches; in selecting sites for roads, ponds, buildings, and other structures; and in judging the suitability of tracts of land for farming, industry, and recreation.

Locating Soils

All the soils of Parker County are shown on the detailed map at the back of this publication. This map consists of many sheets made from aerial photographs. Each sheet is numbered to correspond with a number on the Index to Map Sheets.

On each sheet of the detailed map, soil areas are outlined and are identified by symbols. All areas marked with the same symbol are the same kind of soil. The soil symbol is inside the area if there is enough room; otherwise, it is outside and a pointer shows where the symbol belongs.

Finding and Using Information

The "Guide to Mapping Units" can be used to find information. This guide lists all the soils of the county in alphabetic order by map symbol and gives the capability classification of each. It also shows the page where each soil is described and the page for the range site in which the soil has been placed.

Individual colored maps showing the relative suitability or degree of limitation of soils for many specific purposes can be developed by using the soil map and the information in the text. Translucent material can be used as an overlay over the soil map and colored to show soils that have the same limitation or suitability. For example, soils that have a slight limitation for a given use can be colored green, those with a moderate limitation can be colored yellow, and those with a severe limitation can be colored red.

Farmers and those who work with farmers can learn about use and management of the soils from the soil descriptions and from the discussions of the capability units, the range sites, and the pasture groups.

Game managers, sportsmen, and others can find information about soils and wildlife in the section "Wildlife."

Ranchers and others can find, under "Range," groupings of the soils according to their suitability for range, and also the names of many of the plants that grow on each range site.

Community planners and others can read about soil properties that affect the choice of sites for dwellings, industrial buildings, and for recreation areas in the sections "Recreation" and "Engineering."

Engineers and builders can find, under "Engineering," tables that contain test data, estimates of soil properties, and information about soil features that affect engineering practices.

Scientists and others can read about how the soils formed and how they are classified in the section "Formation and Classification of Soils."

Newcomers in Parker County may be especially interested in the section "General Soil Map," where broad patterns of soils are described. They may also be interested in the information about the county given at the beginning of the publication and in the section "Environmental Features that Affect Soil Use."

Cover: Grass in excellent condition on native range. The soils are of the Aledo series.

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SOIL SURVEY OF PARKER COUNTY TEXAS

BY JAMES M. GREENWADE, J. DAVID KELLEY, AND HAROLD W. HYDE
SOIL CONSERVATION SERVICE[1]

UNITED STATES DEPARTMENT OF AGRICULTURE, SOIL CONSERVATION SERVICE,
IN COOPERATION WITH THE TEXAS AGRICULTURAL EXPERIMENT STATION

PARKER COUNTY is in north-central Texas (fig. 1). It has a total area of 905 square miles, or 579,200 acres, of which 1,536 are water. Weatherford, the county seat and largest town, is located in the center of the county. The population of Weatherford, according to 1970 U.S. Census, is 11,750. Other towns in Parker County include Aledo, Azle, Cool, Millsap, Reno, Springtown, Willow Park, and part of Mineral Wells.

Throughout the history of the county, farming and ranching have been the means of livelihood of most of the people. In 1970 the total population of the county was 33,888, an increase of 48 percent from 1960. The population of Parker County continues to increase as the Fort Worth metropolitan area expands westward. Many people live in Parker County and commute to work in Fort Worth. The principal farm enterprises in order of importance are beef cattle, dairying, poultry and products, fruits and vegetables, and peanuts. Other crops include melons, grains, pecans, and cotton.

The eastern and southern third of the county consists of open prairie. In this area nearly level to rolling, shallow to deep clayey and loamy soils formed in limestone under grass vegetation. This is chiefly used as range.

The northern and central third of the county consists of timbered savanna. In this area mainly gently undulating to gently rolling deep sandy and loamy soils formed under grass and hardwood timber. Many areas are eroded, and gullies are common.

The western third of the county consists of mixed timbered and open prairie areas. In this area mainly gently undulating to steep, shallow to deep, sandy to clayey soils formed under grass and timber. Many areas are stony and some are eroded.

The Brazos River meanders through the southwest part of the county. Soils along the river are mostly of alluvial origin. The western and southern parts of the county are within the Brazos River watershed. The eastern and northern parts are in the Trinity River watershed, where many flood control structures control flooding and prevent erosion.

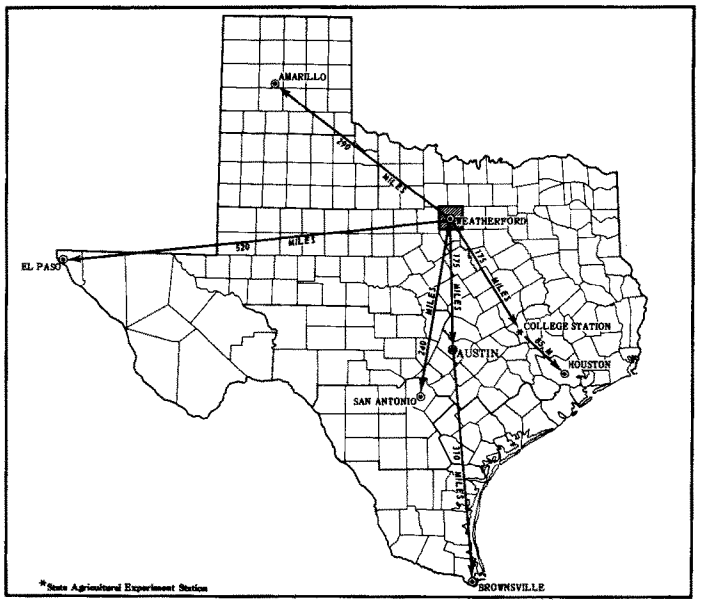

Figure 1.—Location of Parker County in Texas.

How This Survey Was Made

Soil scientists made this survey to learn what kinds of soil are in Parker County, where they are located, and how they can be used. The soil scientists went into the county knowing they likely would find many soils they had already seen and perhaps some they had not. They observed the steepness, length, and shape of slopes, the size and speed of streams, the kinds of native plants or crops, the kinds of rock, and many facts about the soils. They dug many holes to expose soil profiles. A profile is the sequence of natural layers, or horizons, in a soil; it extends from the surface down into the parent material that has not been changed much by leaching or by the action of plant roots.

The soil scientists made comparisons among the profiles they studied, and they compared these profiles with those in counties nearby and in places more dis-

[1] JAMES E. BOWER also contributed to the fieldwork for this survey.

tant. They classified and named the soils according to nationwide, uniform procedures. The *soil series* and the *soil phase* are the categories of soil classification most used in a local survey.

Soils that have profiles almost alike make up a soil series. Except for different texture in the surface layer, all the soils of one series have major horizons that are similar in thickness, arrangement, and other important characteristics. Each soil series is named for a town or other geographic feature near the place where a soil of that series was first observed and mapped. Aledo and Weatherford, for example, are the names of two soil series. All the soils in the United States having the same series name are essentially alike in those characteristics that affect their behavior in the undisturbed landscape.

Soils of one series can differ in texture of the surface layer and in slope, stoniness, or some other characteristic that affects use of the soils by man. On the basis of such differences, a soil series is divided into phases. The name of a soil phase indicates a feature that affects management. For example, Bastrop fine sandy loam, 0 to 1 percent slopes, is one of several phases within the Bastrop series.

After a guide for classifying and naming the soils had been worked out, the soil scientists drew the boundaries of the individual soils on aerial photographs. These photographs show woodlands, buildings, field borders, trees, and other details that help in drawing boundaries accurately. The soil map at the back of this publication was prepared from aerial photographs.

The areas shown on a soil map are called mapping units. On most maps detailed enough to be useful in planning the management of farms and fields, a mapping unit is nearly equivalent to a soil phase. It is not exactly equivalent, because it is not practical to show on such a map all the small, scattered bits of soil of some kind that have been seen within an area that is dominantly of a recognized soil phase.

Some mapping units are made up of soils of different series, or of different phases within one series. Three such kinds of mapping units are shown on the soil map of Parker County: soil complexes, soil associations, and undifferentiated groups.

A soil complex consists of areas of two or more soils, so intricately mixed or so small in size that they cannot be shown separately on the soil map. Each area of a complex contains some of each of the two or more dominant soils, and the pattern and relative proportions are about the same in all areas. Generally, the name of a soil complex consists of the names of the dominant soils, joined by a hyphen. Owens-Truce complex, 5 to 30 percent slopes, is an example.

A soil association is made up of adjacent soils that occur as areas large enough to be shown individually on the soil map but are shown as one unit because the time and effort of delineating them separately cannot be justified. There is a considerable degree of uniformity in pattern and relative extent of the dominant soils, but the soils may differ greatly one from another. Aledo association, undulating, is an example.

An undifferentiated group is made up of two or more soils that could be delineated individually but are shown as one unit because, for the purpose of the soil survey, there is little value in separating them. The pattern and proportion of soils are not uniform. An area shown on the map may be made up of only one of the dominant soils, or of two or more. If there are two or more dominant series represented in the group, the name of the group ordinarily consists of the names of the dominant soils, joined by "and." Duffau and Weatherford soils, 1 to 5 percent slopes, is an example.

In most areas surveyed there are places where the soil material is so rocky, so shallow, so severely eroded, or so variable that it has not been classified by soil series. These places are described in the survey, but they are called land types and are given descriptive names. Urban land is an example.

While a soil survey is in progress, soil scientists take soil samples needed for laboratory measurements and for engineering tests. Laboratory data from the same kinds of soil in other places are also assembled. Data on yields of crops under defined practices are assembled from farm records and from field or plot experiments on the same kinds of soil. Yields under defined management are estimated for all the soils.

Soil scientists observe how soils behave when used as a growing place for native and cultivated plants and as material for structures, foundations for structures, or covering for structures. They relate this behavior to properties of the soils. For example, they observe that filter fields for onsite disposal of sewage fail on a given kind of soil, and they relate this to the slow permeability of the soil or its high water table. They see that streets, road pavements, and foundations for houses are cracked on a named kind of soil and they relate this failure to the high shrink-swell potential of the soil material. Thus, they use observation and knowledge of soil properties, together with available research data, to predict limitations or suitability of soils for present and potential uses.

After data have been collected and tested for the key, or benchmark, soils in a survey area, the soil scientists set up trial groups of soils. They test these groups by further study and by consultation with farmers, agronomists, engineers, and others. They then adjust the groups according to the results of their studies and consultation. Thus, the groups that are finally evolved reflect up-to-date knowledge of the soils and their behavior under current methods of use and management.

General Soil Map

The general soil map at the back of this survey shows, in color, the soil associations in Parker County. A soil association is a landscape that has a distinctive proportional pattern of soils. It normally consists of one or more major soils and at least one minor soil, and it is named for the major soils. The soils in one association may occur in another, but in a different pattern.

A map showing soil associations is useful to people who want a general idea of the soils in a county, who want to compare different parts of a county, or who want to know the location of large tracts that are suitable for a certain kind of land use. Such a map is a useful general guide in managing a watershed, a wooded tract, or a wildlife area, or in planning engineering works, recreational facilities, and community

developments. It is not a suitable map for planning the management of a farm or field, or for selecting the exact location of a road, building, or similar structure, because the soils in any one association ordinarily differ in slope, depth, stoniness, drainage, and other characteristics that affect their management.

The soil associations in this survey have been grouped into three general kinds of landscape for broad interpretative purposes. Each of the three broad groups and the soil associations in them are described on the following pages. The terms for texture used in the title of the associations apply to the texture of the surface layer. For example, in the title of association 1, the words, loamy and sandy refer to the texture of the surface layer.

Neutral to Slightly Acid Loamy and Sandy Soils on Uplands

The soils in this group are deep and moderately deep. In places they are stony, and in places eroded. Vegetation is commonly post oak and blackjack oak trees and other woody plants. Many areas are in pasture and range. Some areas are used for crops and orchards.

1. Windthorst-Duffau-Weatherford association

Gently sloping to sloping, deep loamy or sandy soils over weakly cemented sandstone or clay

This association is in loamy to sandy timbered areas on uplands. Many areas are eroded, and gullies are common over much of the association.

This association makes up about 42 percent of the county. It is about 34 percent Windthorst soils, 17 percent Duffau soils, 9 percent Weatherford soils, and 40 percent soils of minor extent (fig. 2).

The gently sloping to sloping Windthorst soils occupy the upper slopes of hillsides and ridges. Many of the stronger slopes are eroded. The surface layer is grayish brown fine sandy loam about 4 inches thick. The next layer is light yellowish brown fine sandy loam about 6 inches thick. Next, in sequence downward, is about 28 inches of red and yellowish red sandy clay and about 12 inches of mottled red, yellowish brown, and pale brown sandy clay loam. The underlying material is light gray clay that has coarse red and yellow mottles.

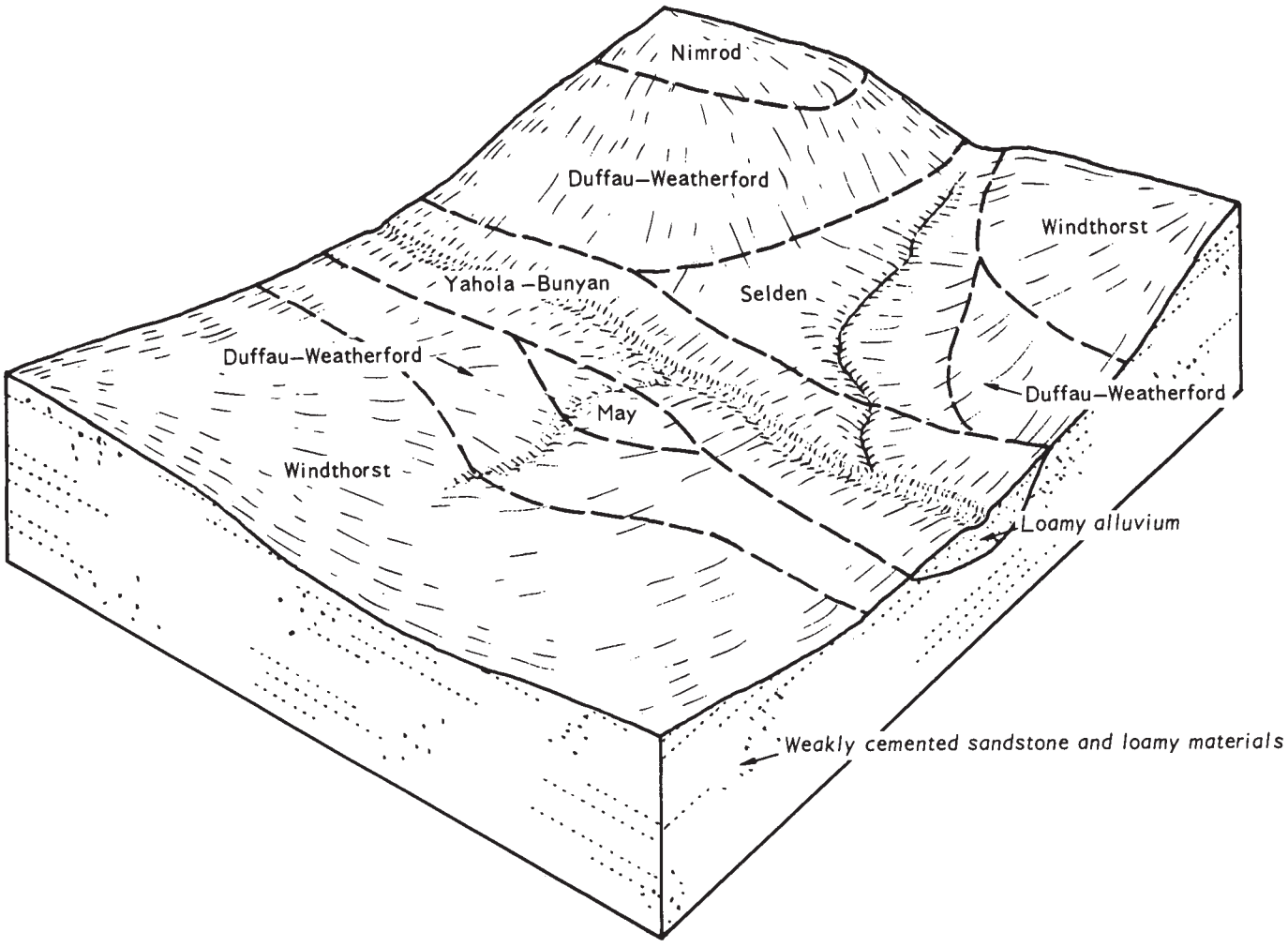

***Figure 2.*—Pattern of soils and parent material in the Windthorst-Duffau-Weatherford association.**

The gently sloping to sloping Duffau and Weatherford soils occupy the mid and lower positions on hillsides. Many of the stronger slopes are eroded or gullied. The Duffau soil has a surface layer of light brown loamy fine sand about 9 inches thick. The next layers are about 31 inches of red sandy clay loam, 25 inches of yellowish red sandy clay loam, and 10 inches of reddish yellow sandy clay loam. The underlying material is white weakly cemented sandstone and fine sandy loam.

The Weatherford soil has a surface layer of brown fine sandy loam about 4 inches thick. The next layer is light brown fine sandy loam about 6 inches thick. Next is 35 inches of yellowish red and reddish yellow sandy clay loam. The underlying material is pink weakly cemented sandstone.

Of minor extent in the association are Blanket, Brackett, Bosque, Bunyan, Frio, Heaton, May, Nimrod, Patilo, Selden, and Yahola soils. Blanket and May soils are on foot slopes. Brackett soils are on hills and ridges. Bosque, Bunyan, Frio, and Yahola soils are on flood plains along streams. Heaton, Nimrod, and Selden soils are on hillsides, foot slopes, and ridges. Areas of Urban land and gullied areas are also in the association.

The association is used chiefly as pasture and range, and a small acreage is used for crops. Some areas are in improved pasture, and some areas that were formerly cultivated are now idle. A small percentage of the association is used for urban development, roads, and sites for farmsteads and other structures. The trend in recent years has been to use small acreages for housing for people who work in the larger cities.

This association is well suited to orchards, and a considerable acreage is used for this purpose.

Native vegetation was a post oak savanna of scattered post oak and blackjack oak trees and an understory of grasses.

2. *Chaney-Truce-Bonti association*

Gently sloping to moderately steep, deep and moderately deep sandy or loamy soils over sandstone, shaly clay, or sandy clay

This association is in loamy or sandy, timbered and open areas on uplands.

This association makes up 12 percent of the county. It is about 22 percent Chaney soils, 21 percent Truce soils, 13 percent Bonti soils, and 44 percent soils of minor extent.

The gently sloping Chaney soils are on ridges and plains. Some areas are eroded. The surface layer is dark grayish brown loamy fine sand about 4 inches thick. The next layer is pale brown loamy fine sand about 12 inches thick. Next, in sequence downward, is 6 inches of red sandy clay mottled with gray, 10 inches of reddish yellow sandy clay mottled with red and light brownish gray, and about 10 inches of light yellowish brown sandy clay mottled with red and gray. The underlying material is light gray sandy clay.

The gently sloping to moderately steep Truce soils are on side slopes and hills. Some areas are stony, and some are eroded. The surface layer is brown fine sandy loam about 8 inches thick. Below this is about 16 inches of reddish brown clay and 24 inches of brown clay. The underlying material is pale olive shaly clay.

The gently sloping to sloping Bonti soils are on ridges and the upper part of side slopes. Some areas are stony, and some are eroded. The surface layer is light brown fine sandy loam about 10 inches thick. The next layer is about 22 inches of yellowish red clay. The underlying material is reddish yellow strongly cemented sandstone.

Of minor extent in the association are Hassee, Selden, Owens, Reap, and Thurber soils. Hassee, Reap, and Thurber soils are along foot slopes and in slightly depressed areas. Selden soils are along foot slopes and ridge breaks. Owens soils are mostly on hillsides.

About 75 percent of this association is used as range or pasture. A small percentage is used for crops and urban development. The trend in recent years is to establish more improved pastures.

Native vegetation was a post oak savanna of scattered trees and an understory of grasses.

3. *Truce-Bonti association*

Gently sloping to steep, deep and moderately deep loamy soils over sandstone or shaly clay

This association is in timbered and open areas on hills and ridges. Stones and boulders are common throughout much of the area.

This association makes up 6 percent of the county. It is 47 percent Truce soils, 15 percent Bonti soils, and 38 percent soils of minor extent (fig. 3).

The gently sloping to steep Truce soils are on hills and the lower part of side slopes. Some areas have stones and large boulders on the surface. The surface layer is brown fine sandy loam about 8 inches thick. The next layer is reddish brown clay about 16 inches thick. Below this is about 24 inches of brown clay. The underlying material is pale olive shaly clay.

The gently sloping to sloping Bonti soils are on ridges. Many areas have a stony surface layer. The surface layer is light brown fine sandy loam about 10 inches thick. The next 22 inches is yellowish red clay. The underlying material is reddish yellow strongly cemented sandstone.

Of minor extent in the association are Bosque, Bunyan, Chaney, Hassee, Owens, Selden, Thurber, and Yahola soils. Bosque, Bunyan, and Yahola soils are on flood plains along major streams. Chaney and Selden soils are on plains and foot slopes. Hassee and Thurber soils are on foot slopes and broad plains and in slightly depressed areas. Owens soils are on hillsides and breaks.

This association is used chiefly as range and pasture. Only a small percentage is used for crops.

Native vegetation was post oak and blackjack oak trees and an understory of grasses.

Neutral to Moderately Alkaline Loamy Soils on Uplands

The soils in this group are very shallow to deep. In places they are cobbly or stony. Vegetation is commonly native prairie grasses. Live oak trees are along breaks and scattered throughout the landscape. Most areas are used as range. Some areas are used for crops and pasture.

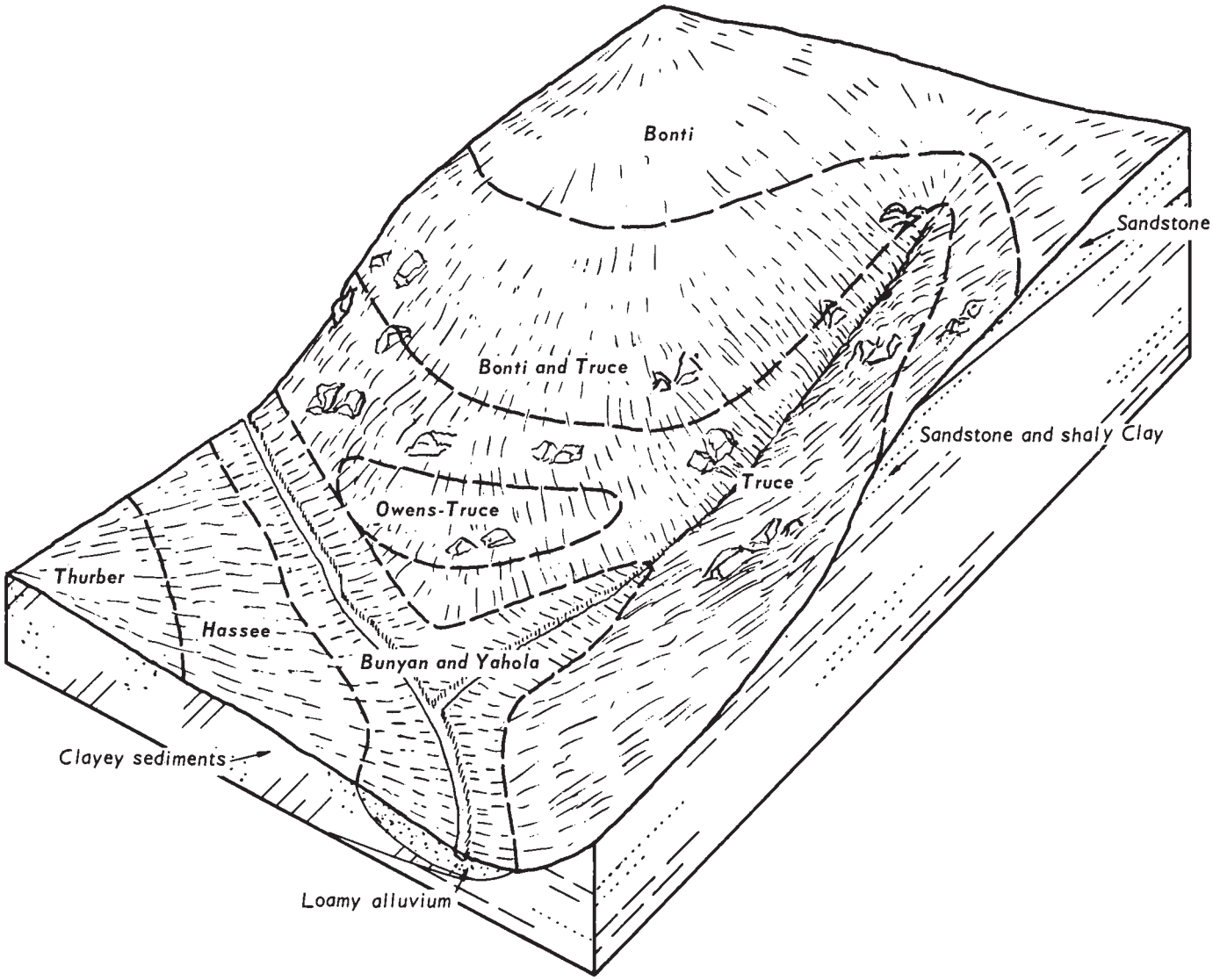

***Figure 3.*—Pattern of soils in the Truce-Bonti association.**

4. Aledo-Venus-Bolar association

Gently sloping to sloping and undulating, very shallow to deep loamy soils over limestone or clay loam

This association is in open prairies on uplands. Some areas contain coarse limestone fragments.

This association occupies 30 percent of the county. It is 26 percent Aledo soils, 24 percent Venus soils, 4 percent Bolar soils, and 46 percent soils of minor extent (fig. 4).

The gently sloping to sloping Aledo soils are on hills and ridges. The surface layer is dark grayish brown clay loam about 4 inches thick. The next layer is grayish brown very gravelly clay loam about 12 inches thick. The underlying material is fractured indurated limestone.

The gently sloping to sloping Venus soils are on foot slopes and hillsides. The surface layer is brown clay loam about 9 inches thick. The next layer is very dark grayish brown clay loam about 7 inches thick. Below this is about 34 inches of light brown clay loam. The underlying material is also light brown clay loam.

The gently sloping to sloping Bolar soils are on ridges and lower side slopes. The surface layer is grayish brown clay loam about 16 inches thick. The next layer is light brownish gray clay loam about 10 inches thick. Below this is about 4 inches of white clay loam. The underlying material is indurated limestone bedrock.

Of minor extent in the association are Brackett, Denton, Frio, Krum, Lamar, Maloterre, and Purves soils. Brackett and Maloterre soils are on breaks. Denton, Krum, Lamar, and Purves soils are on lower slopes. Frio soils are on flood plains along major streams.

Most of this association is used as range. A few areas are used for crops and pasture. In recent years a few areas have been used for suburban development.

Native vegetation was grasses and a few scattered trees.

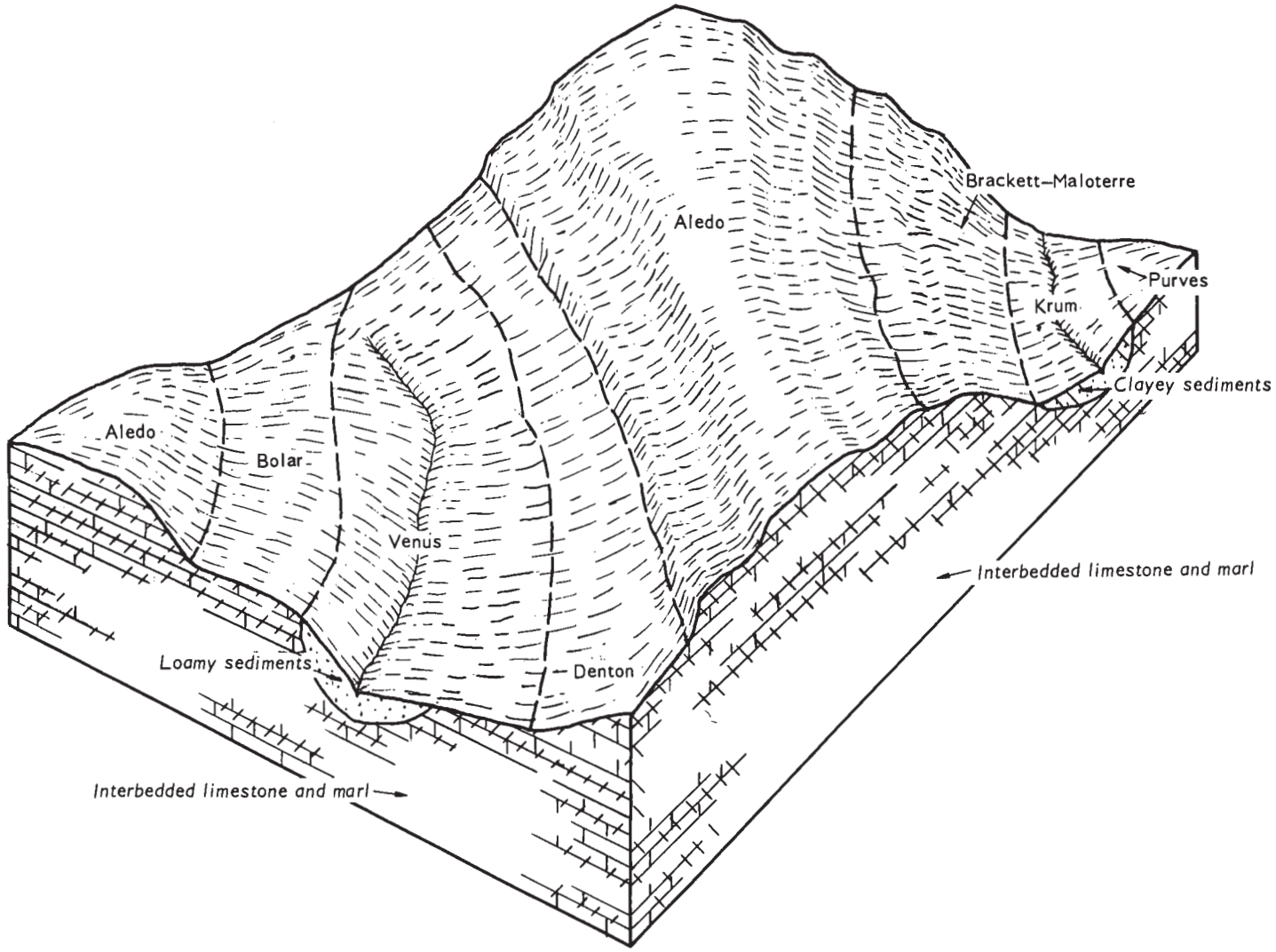

***Figure 4.*—Pattern of soils in the Aledo-Venus-Bolar association.**

5. Hensley-Lindy association

Nearly level to gently sloping, shallow to moderately deep loamy soils over limestone

This association is in mostly open areas on uplands. Many areas have coarse fragments on the surface.

This association makes up 2 percent of the county. It is 49 percent Hensley soils, 17 percent Lindy soils, and 34 percent soils of minor extent.

The nearly level to gently sloping Hensley soils are on ridges. The surface layer is reddish brown clay loam about 6 inches thick. The next layer is reddish brown clay about 8 inches thick. It is underlain by indurated limestone bedrock.

The gently sloping Lindy soils are on ridges and plains. The surface layer is reddish brown loam about 10 inches thick. The next layer is reddish brown clay about 15 inches thick. The underlying material is indurated platy limestone.

Of minor extent in the association are Bonti, Owens, Thurber, and Truce soils. Bonti soils are on ridges. Owens and Truce soils are on breaks and hills. Thurber soils are on lower slopes and in slight depressions.

This association is used mostly as range. A few small fields are cultivated.

Native vegetation was scattered live oak and elm trees and an understory of grasses.

Slightly Acid to Moderately Alkaline Loamy and Clayey Soils on Bottom Land and Terraces

The soils in this group are deep. They are free of stones, but are eroded in places. Most of these areas have been used for crops. Many areas are now in pasture.

6. Bastrop-Norwood-Yomont association

Nearly level to gently sloping, deep loamy soils over sandy clay loam, silt loam, or very fine sandy loam

This association is mostly on stream terraces and

bottom land. It is a long, narrow band of alluvial soils and includes the Brazos River. Some areas are flooded frequently.

This association makes up 4 percent of the county. It is 16 percent Bastrop soils, 14 percent Norwood soils, 11 percent Yomont soils, and 59 percent soils of minor extent (fig. 5).

The nearly level to gently sloping Bastrop soils are on stream terraces that are slightly higher than the associated soils. The surface layer is brown fine sandy loam about 12 inches thick. The next layer is yellowish red sandy clay loam about 38 inches thick. The next layer is red sandy clay loam to a depth of 75 inches.

The nearly level Norwood soils are on bottom land near the Brazos River. The surface layer is brown silt loam about 6 inches thick. The underlying material is stratified reddish yellow silt loam to a depth of 60 inches.

The nearly level Yomont soils are on bottom land along banks of the Brazos River. The surface layer is yellowish red very fine sandy loam about 8 inches thick. The next layer is reddish yellow very fine sandy loam about 37 inches thick. The underlying material is light reddish brown very fine sandy loam.

Of minor extent in the association are Bunyan, Hardeman, Heaton, Lincoln, Nimrod, Selden, Ships, and Yahola soils. Hardeman soils are in narrow bands along breaks that extend from the bottom land to the uplands. Heaton soils are on ridges and side slopes. Lincoln soils are on bottom land along the Brazos River. Nimrod and Selden soils are on the smoother parts of stream terraces. Ships soils are in slightly depressed bottom land. Bunyan and Yahola soils are on flood plains of small tributaries of the Brazos River.

This association is used mostly for crops, improved pasture, and recreation. Much of the area along the river is being developed for recreation. The soils are also suitable for pecan orchards.

7. *Frio-Krum association*

Nearly level to gently sloping, deep loamy or clayey soils over silty clay loam or clay

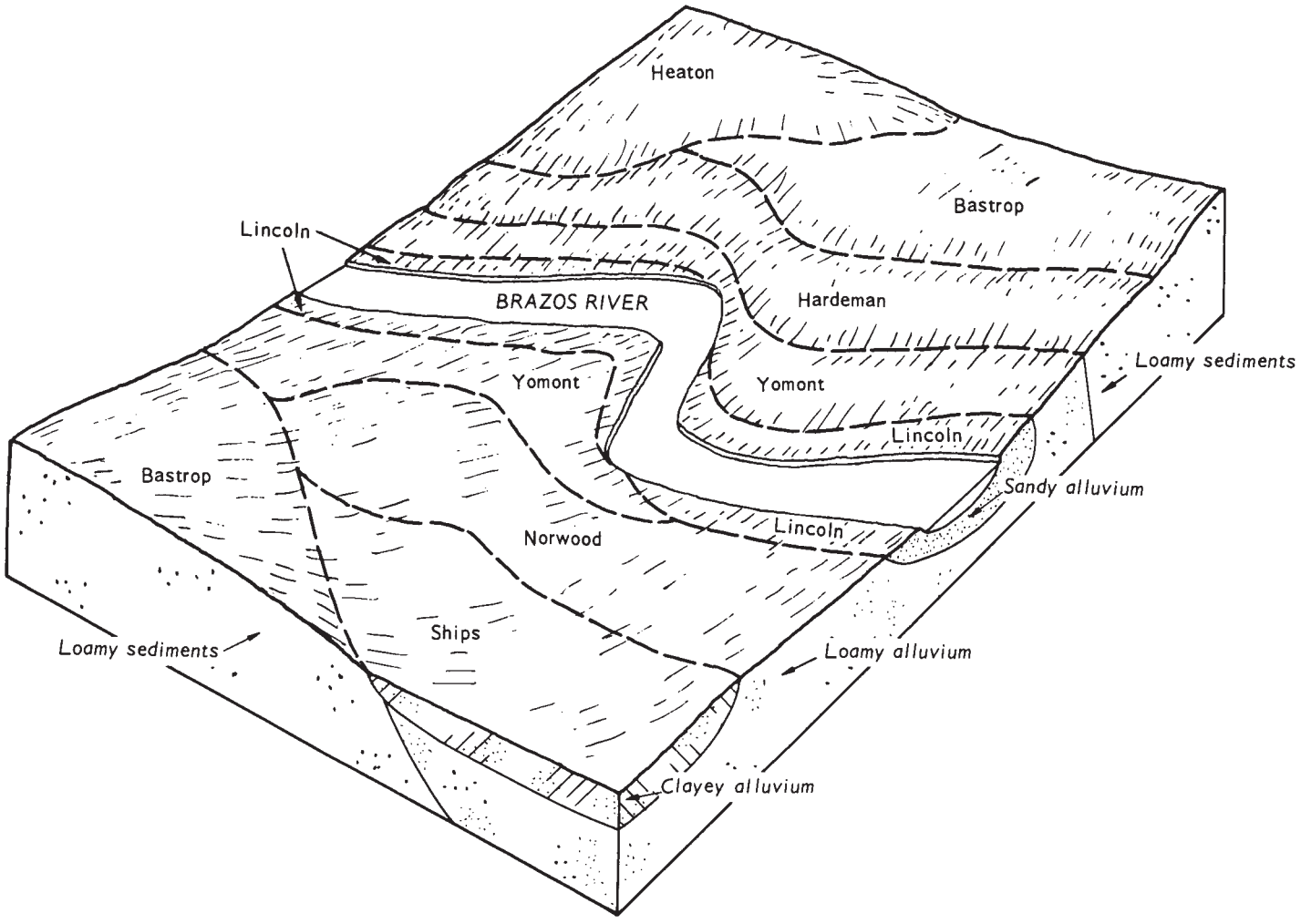

Figure 5.—**Pattern of soils in the Bastrop-Norwood-Yomont association.**

This association is mostly along major drains of the county on bottom land and upland areas. Where flooding is not a problem, it is mostly suited to cultivation.

This association makes up 4 percent of the county. It is 58 percent Frio soils, 40 percent Krum soils, and 2 percent soils of minor extent.

The nearly level Frio soils are on bottom land of flood plains along major streams. The surface layer is very dark grayish brown clay loam about 18 inches thick. The next layer is very dark grayish brown silty clay about 28 inches thick. The underlying material is grayish brown silty clay loam.

The nearly level to gently sloping Krum soils are in low-lying upland valleys. The surface layer is very dark grayish brown and dark grayish brown clay about 24 inches thick. Below this is about 20 inches of grayish brown clay. The next layer is also grayish brown clay.

Of minor extent in this association are Aledo, Bolar, Bosque, Bunyan, Denton, Lamar, and Venus soils. Aledo soils are on shallow ridges. Bolar and Denton soils are on foot slopes and side slopes. Lamar and Venus soils are on foot slopes and terraces. Bosque and Bunyan soils are in bottom land.

This association is used chiefly for crops. Some areas are in pasture or range or used for other purposes. Some areas of Frio soils are subject to flooding, but receive some protection from flood control structures.

Descriptions of the Soils

This section describes the soil series and mapping units in Parker County. Each soil series is described in detail, and then, briefly, each mapping unit in that series. Unless it is specifically mentioned otherwise, it is to be assumed that what is stated about the soil series holds true for the mapping units in that series. Thus, to get full information about any one mapping unit, it is necessary to read both the description of the mapping unit and the description of the soil series to which it belongs.

An important part of the description of each soil series is the soil profile, that is, the sequence of layers from the surface downward to rock or other underlying material. Each series contains two descriptions of this profile. The first is brief and in terms familiar to the layman. The second is much more detailed and is for those who need to make thorough and precise studies of soils. Color terms are for dry soil unless otherwise stated. The profile described in the series is representative of all mapping units in that series. If the profile of a given mapping unit is different from the one described, these differences are stated in describing the mapping unit or they are apparent in the name of the mapping unit.

As mentioned in the section "How This Survey Was Made," not all mapping units are members of a soil series. Urban land, for example, does not belong to a soil series, but nevertheless, is listed in alphabetic order along with the soil series.

Preceding the name of each mapping unit is a symbol, which identifies the mapping unit on the detailed soil map. Listed at the end of each description of a mapping unit is the capability unit, range site, and pasture group in which the mapping unit has been placed. The page for the description of each capability unit or range site can be found by referring to the "Guide to Mapping Units" at the back of this survey.

The acreage and proportionate extent of each mapping unit are shown in table 1. Many of the terms used in describing soils can be found in the Glossary at the end of this survey, and more detailed information about the terminology and methods of soil mapping can be obtained from the Soil Survey Manual.[2]

[2] United States Department of Agriculture. 1951. Soil Survey Manual. U.S. Dep. Agric. Handb. 18, 503 pp., illus.

TABLE 1.—*Approximate acreage and proportionate extent of the soils*

Soil	Acres	Percent
Aledo association, undulating	103,520	17.8
Bastrop fine sandy loam, 0 to 1 percent slopes	1,070	.2
Bastrop fine sandy loam, 1 to 3 percent slopes	1,060	.2
Bastrop fine sandy loam, 2 to 5 percent slopes, eroded	1,720	.3
Blanket clay loam, 1 to 3 percent slopes	3,430	.6
Bolar clay loam, 1 to 3 percent slopes	1,020	.2
Bolar clay loam, 3 to 5 percent slopes	4,720	.8
Bolar clay loam, 5 to 8 percent slopes	2,530	.4
Bonti fine sandy loam, 1 to 3 percent slopes	3,480	.6
Bonti fine sandy loam, 3 to 5 percent slopes	2,110	.4
Bonti fine sandy loam, 1 to 5 percent slopes, eroded	3,910	.7
Bonti and Truce soils, 1 to 8 percent slopes	11,690	2.0
Bosque loam, occasionally flooded	3,560	.6
Brackett-Urban land complex, 3 to 12 percent slopes	470	.1
Brackett and Maloterre soils, 3 to 12 percent slopes	24,110	4.2
Brackett and Maloterre soils, 12 to 30 percent slopes	5,310	.9
Bunyan fine sandy loam, occasionally flooded	3,980	.7
Chaney loamy fine sand, 1 to 5 percent slopes	16,290	2.8
Chaney loamy fine sand, 3 to 5 percent slopes, eroded	2,030	.4
Denton clay, 1 to 3 percent slopes	11,830	2.0
Duffau-Orthents complex, 3 to 8 percent slopes, severely eroded	5,270	.9
Duffau-Urban land complex, 3 to 8 percent slopes	630	.1
Duffau and Weatherford soils, 1 to 5 percent slopes	10,820	1.9
Duffau and Weatherford soils, 2 to 5 percent slopes, eroded	29,960	5.2
Duffau and Weatherford soils, 5 to 8 percent slopes, eroded	27,300	4.7

TABLE 1.—*Approximate acreage and proportionate extent of the soils*—Continued

Soil	Acres	Percent
Duffau and Weatherford soils, 2 to 8 percent slopes, severely eroded	9,620	1.7
Frio clay loam, occasionally flooded	8,220	1.4
Frio clay loam, frequently flooded	6,290	1.1
Hardeman very fine sandy loam, 0 to 2 percent slopes	820	.1
Hardeman very fine sandy loam, 6 to 12 percent slopes	710	.1
Hassee fine sandy loam, 0 to 1 percent slopes	1,850	.3
Heaton fine sand, 1 to 5 percent slopes	1,380	.2
Hensley complex, 0 to 3 percent slopes	6,010	1.0
Krum clay, 0 to 1 percent slopes	2,450	.4
Krum clay, 1 to 3 percent slopes	9,030	1.6
Lamar clay loam, 3 to 5 percent slopes	2,090	.4
Lamar clay loam, 5 to 8 percent slopes	4,840	.8
Lincoln soils, frequently flooded	2,010	.3
Lindy loam, 1 to 3 percent slopes	2,150	.4
Maloterre soils, 2 to 5 percent slopes	2,980	.5
May fine sandy loam, 1 to 3 percent slopes	5,490	.9
Nimrod fine sand, 1 to 5 percent slopes	12,320	2.1
Nimrod fine sand, 5 to 8 percent slopes	1,550	.3
Norwood silt loam	3,350	.6
Owens clay, 3 to 12 percent slopes	2,030	.4
Owens-Truce complex, 5 to 30 percent slopes	3,060	.5
Patilo complex, 1 to 5 percent slopes	1,600	.3
Purves clay, 1 to 3 percent slopes	3,610	.6
Purves clay, 3 to 5 percent slopes	4,390	.8
Purves-Urban land complex, 1 to 5 percent slopes	190	(1)
Reap clay, 1 to 3 percent slopes	1,080	.2
Selden loamy fine sand, 1 to 5 percent slopes	9,630	1.7
Selden loamy fine sand, 1 to 5 percent slopes, eroded	4,640	.8
Selden-Urban land complex, 1 to 5 percent slopes	140	(1)
Ships silty clay	1,430	.2
Thurber clay loam, 1 to 3 percent slopes	5,610	1.0
Truce fine sandy loam, 1 to 3 percent slopes	5,710	1.0
Truce fine sandy loam, 3 to 5 percent slopes	1,110	.2
Truce fine sandy loam, 2 to 5 percent slopes, eroded	9,660	1.7
Truce fine sandy loam, 5 to 8 percent slopes, eroded	1,030	.2
Truce stony soils, 5 to 20 percent slopes	10,120	1.7
Venus clay loam, 1 to 3 percent slopes	6,620	1.1
Venus clay loam, 3 to 5 percent slopes	22,910	4.0
Venus clay loam, 5 to 8 percent slopes	13,530	2.2
Venus-Urban land complex, 3 to 8 percent slopes	610	.1
Windthorst loamy fine sand, 1 to 5 percent slopes	7,420	1.3
Windthorst fine sandy loam, 1 to 3 percent slopes	3,770	.7
Windthorst fine sandy loam, 3 to 5 percent slopes	3,370	.6
Windthorst fine sandy loam, 1 to 5 percent slopes, eroded	40,470	7.0
Windthorst fine sandy loam, 5 to 8 percent slopes	16,860	2.9
Windthorst-Urban land complex, 2 to 8 percent slopes	534	.1
Windthorst soils, 1 to 8 percent slopes, severely eroded	11,610	2.0
Yahola and Bunyan soils, frequently flooded	17,210	3.0
Yomont very fine sandy loam	2,280	.4
Yomont very fine sandy loam, frequently flooded	450	.1
Water areas of more than 40 acres	1,536	.3
Total area in the county	579,200	100.0

[1] Less than 0.05 percent.

Aledo Series

The Aledo series consists of shallow to very shallow, undulating, calcareous loamy soils on uplands. These soils formed in interbedded limestone and marl.

In a representative profile the upper 4 inches of the surface layer is dark grayish-brown, calcareous clay loam. The next 12 inches is grayish-brown, calcareous, very gravelly clay loam. The underlying material is fractured indurated limestone.

These soils are well drained. Runoff is rapid. Permeability is moderate, and the available water capacity is very low.

Aledo soils are used mostly as native range.

Representative profile of Aledo clay loam in an area of Aledo association, undulating, in native range pasture 4 miles southeast of Weatherford. From the junction of Farm Road 51 and State Highway 171 south of Weatherford, 0.65 mile southeast on State Highway 171, then 0.3 mile east on county road, 500 feet south of road:

A11—0 to 4 inches, dark grayish-brown (10YR 4/2) clay loam, very dark grayish brown (10YR 3/2) moist; strong, fine, granular structure; hard, friable, sticky; many fine roots and pores; about 10 percent limestone fragments less than 3 inches in size; 45 percent calcium carbonate equivalent; calcareous; moderately alkaline; clear, irregular boundary.

A12—4 to 16 inches, grayish-brown (10YR 5/2) very gravelly clay loam, very dark grayish brown (10YR 3/2) moist; strong, fine and medium, granular structure; hard, friable; common roots and pores; about 65 percent limestone fragments mostly less than 6 inches across the long axis; 55 percent cal-

cium carbonate equivalent; calcareous; moderately alkaline; abrupt, wavy boundary.
R—16 to 20 inches, fractured indurated limestone.

The A horizon is dark grayish brown, grayish brown, very dark grayish brown, dark brown, or brown and is 8 to 20 inches thick. The A11 horizon is clay loam, loam, gravelly clay loam, or gravelly loam and contains 5 to 40 percent limestone fragments. The A12 horizon is gravelly loam, gravelly clay loam, very gravelly loam, or very gravelly clay loam, and it contains 50 to 80 percent limestone fragments. The R horizon is strongly cemented to indurated limestone.

ALE—Aledo association, undulating. This association occupies limestone areas on uplands. Slopes are complex, and topography is benched. Slopes range from 1 to 8 percent but are dominantly 2 to 8 percent. Areas are irregular in shape and cover 25 to more than 1,000 acres. The Aledo soils in this association are 40 to 70 percent limestone fragments, and about 20 percent of their surface is covered with fragments.

This association is generally made up of about 44 percent Aledo soils and 56 percent soils of minor extent; however, Aledo soils make up from 20 to 68 percent of individual areas. Of minor extent are the Bolar, Brackett, Krum, Venus, and Maloterre soils.

Aledo soils and similar shallow soils are along side slopes and ridges in bands 300 to 700 feet wide. Other soils are in narrow bands along benches and foot slopes. They are not mapped separately because they are similar in use and management to Aledo soils. Bolar soils are along benches, ridges, and foot slopes. Sloping Brackett soils are along breaks at higher elevations. Krum and Venus soils are along foot slopes and valleys below stony ridges. Maloterre soils are on ridgetops near breaks.

Included with this association in mapping is a soil that is similar to Aledo soil but is deeper over limestone and has fewer rock fragments and a similar soil that is lighter colored. Also included are areas where the slope is more than 8 percent and a few limestone outcrops along ridges.

The composition of this association is more variable than that of other mapping units in the county, but it has been controlled well enough for the expected use of the soils.

Most of the acreage is used as range. The hazard of water erosion is moderate. Capability unit VIs–1; Shallow range site; not assigned to a pasture group.

Bastrop Series

The Bastrop series consists of deep, nearly level to gently sloping, noncalcareous loamy soils on stream terraces along the Brazos River. These soils formed in ancient loamy sediments.

In a representative profile the surface layer is brown, slightly acid fine sandy loam about 12 inches thick. The next 38 inches is yellowish-red, slightly acid sandy clay loam. Below this is red neutral sandy clay loam to a depth of 75 inches.

These soils are well drained. Runoff is medium. Permeability is moderate, and the available water capacity is high.

Bastrop soils are used mostly for crops. They are well suited to most locally grown crops. A few areas are being planted to improved grasses for pasture, and some areas are used as range.

Representative profile of Bastrop fine sandy loam, 0 to 1 percent slopes, in a cultivated field 12 miles southwest of Weatherford. From the Brazos River bridge on Farm Road 1543 at Dennis, east on paved county road 1.5 miles, then 0.5 mile south on dirt road, 150 feet east of road:

Ap—0 to 12 inches, brown (7.5YR 5/4) fine sandy loam, dark brown (7.5YR 4/4) moist; weak, fine, subangular blocky structure; hard, friable; slightly acid; abrupt, smooth boundary.
B21t—12 to 35 inches, yellowish-red (5YR 5/6) sandy clay loam, yellowish red (5YR 4/6) moist; moderate, fine, subangular blocky structure; very hard, friable; few thin clay films; few pores; slightly acid; gradual, wavy boundary.
B22t—35 to 50 inches, yellowish-red (5YR 5/6) sandy clay loam, yellowish red (5YR 4/6) moist; weak, medium, subangular blocky structure; very hard, friable; few thin clay films; slightly acid; gradual, wavy boundary.
B23t—50 to 70 inches, red (2.5YR 5/6) sandy clay loam, red (2.5YR 5/6) moist; weak, medium, subangular blocky structure; very hard, friable; few thin clay films; neutral; gradual, wavy boundary.
B3t—70 to 75 inches, red (2.5YR 5/6) sandy clay loam; red (2.5YR 4/6) moist; weak, medium, subangular blocky structure; very hard, firm; pockets of fine sandy loam; neutral.

The A horizon is brown, grayish brown, or reddish brown. It is 6 to 15 inches thick, and is medium acid to neutral.

The Bt horizon ranges from reddish yellow, yellowish red, or red to reddish brown. It is sandy clay loam or clay loam and is slightly acid to neutral.

Stratified C horizon is at a depth of more than 60 inches. It is light brown or reddish yellow to yellowish red and is sandy clay loam, loam, or fine sandy loam. It is neutral to moderately alkaline.

BaA—Bastrop fine sandy loam, 0 to 1 percent slopes. This nearly level soil is on high terraces of the Brazos River. Areas are broad and extensive. Mapped areas are round to irregular in shape. They average about 150 acres in size. This soil has the profile described as representative of the series.

Included with this soil in mapping are weakly concave areas and Ships soils and small areas of Truce, Duffau, Hardeman, Norwood, and Yomont soils. Also included are a few small areas of Bastrop soils that have a loamy fine sand and very fine sandy loam surface layer and areas of a similar soil that is underlain by stratified fine sandy loam at depths of less than 60 inches.

This Bastrop soil is used mostly for crops (fig. 6). It is well suited to cultivation. The hazard of water erosion is slight. The hazard of soil blowing is slight. Capability unit I–2; Sandy Loam range site; pasture group 8C.

BaB—Bastrop fine sandy loam, 1 to 3 percent slopes. This gently sloping soil is on upland terraces along the Brazos River. Areas are long and weakly convex. They range from 10 to more than 100 acres in size, but average about 30 acres.

The surface layer is brown fine sandy loam about 12 inches thick. The next layer is reddish-brown sandy clay loam about 43 inches thick. The next 5 inches is yellowish-red sandy clay loam.

Included with this soil in mapping are small, nearly

Figure 6.—**Peanuts growing on cultivated area of Bastrop fine sandy loam, 0 to 1 percent slopes.**

level to undulating areas of Yahola fine sandy loam and soils that are similar to Norwood and Hardeman soils, but have a fine sandy loam surface layer. Also included are areas of Truce and Duffau soils along ridges; a few small areas of Bastrop soils that have a loamy fine sand surface layer; small areas of Bastrop fine sandy loam that have a slope of less than 1 percent; and small eroded areas.

Most of the acreage is used for crops. Improved pasture has been established in some areas. In cultivated areas the hazards of water erosion and soil blowing are slight. Capability unit IIe–3; Sandy Loam range site; pasture group 8C.

BaC2—Bastrop fine sandy loam, 2 to 5 percent slopes, eroded. This gently sloping soil is on uplands near the Brazos River. Areas are mostly cultivated fields, many of which are no longer farmed. They are dissected by small drains or gullies and show evidence of sheet erosion. Gullies 100 to 300 feet apart are 5 to 30 feet wide and a few inches to 5 feet deep and are mostly crossable with farm machinery. Mapped areas follow slope contours above associated streams. They are irregular in shape and average 30 acres in size.

The surface layer is brown fine sandy loam about 8 inches thick. Some of the lower layer has been mixed with the plowed layer in most places. The next layer is reddish-brown sandy clay loam about 17 inches thick. Below this is 40 inches of yellowish-red sandy clay loam. The underlying material is light-brown sandy clay loam.

Included with this soil in mapping are small areas of uneroded Bastrop soil and a few areas in which the depth to the underlying material is less than 60 inches. Included in slightly higher parts of the landscape are areas of Duffau, Truce, and Windthorst soils.

Most of the acreage was once cultivated, but is now used for established grass or is idle. The hazard of water erosion is moderate. Capability unit IIIe–1; Sandy Loam range site; pasture group 8C.

Blanket Series

The Blanket series consists of deep, gently sloping, noncalcareous loamy soils on uplands. These soils formed in loamy and clayey calcareous sediments.

In a representative profile the surface layer is dark grayish-brown clay loam about 10 inches thick. Next in sequence downward is 12 inches of very dark grayish-brown clay loam, 18 inches of brown clay that

contains a few calcium carbonate concretions in the lower part, and 10 inches of pale-brown calcareous clay. The underlying material is light-gray calcareous clay loam.

These soils are well drained. Runoff is slow. Internal drainage is slow, and permeability is moderately slow. The available water capacity is high.

Blanket soils are used mostly for crops. They are well suited to most crops grown locally. Improved pastures have been established in some areas.

Representative profile of Blanket clay loam, 1 to 3 percent slopes, in a cultivated field 8.5 miles southwest of Weatherford. From Brock Junction 1.7 miles east along the south service road of I–20, 225 feet south of fence:

Ap—0 to 10 inches, dark grayish-brown (10YR 4/2) clay loam, very dark grayish brown (10YR 3/2) moist; weak, subangular blocky structure; hard, friable; many fine roots and pores, few insect casts and burrows; neutral; abrupt, smooth boundary.

A1—10 to 22 inches, very dark grayish-brown (10YR 3/2) clay loam, very dark brown (10YR 2/2) moist; weak, subangular blocky structure; hard, firm; few fine roots and pores; neutral; clear, wavy boundary.

B21t—22 to 28 inches, brown (10YR 5/3) clay, dark brown (10YR 3/3) moist; moderate, medium, subangular blocky structure; very hard, firm; few fine roots and pores; patchy clay films on faces of peds; neutral; gradual, wavy boundary.

B22t—28 to 40 inches, brown (10YR 5/3) clay, brown (10YR 4/3) moist; moderate and strong, medium, cubangular blocky structure; very hard, firm; nearly continuous clay films on faces of peds; few calcium carbonate concretions; mildly alkaline; clear, smooth boundary.

B3t—40 to 50 inches, pale-brown (10YR 6/3) clay, brown (10YR 5/3) moist; moderate, medium, subangular blocky structure; hard, firm; common, fine calcium carbonate concretions, films, and threads; calcareous, moderately alkaline; gradual, wavy boundary.

C—50 to 62 inches, light-gray (10YR 7/2) clay loam, pale brown (10YR 6/3) moist; hard, firm; calcareous, moderately alkaline.

The A horizon is very dark brown, very dark grayish brown, or dark grayish brown to grayish brown. It is neutral to mildly alkaline and is 10 to 20 inches thick.

The Bt horizon is very dark brown, very dark grayish-brown, grayish-brown, pale-brown, brown, or dark-brown clay or clay loam. It is 15 to 36 inches thick. Calcium carbonate concretions, films, and threads are common below a depth of 30 inches. Reaction is neutral to moderately alkaline.

The C horizon is clay or clay loam. It is about 20 percent, by volume, films, threads, and concretions of calcium carbonate.

BbB—Blanket clay loam, 1 to 3 percent slopes. This gently sloping soil occupies upland valleys. Mapped areas are irregular to round in shape. They range from 5 to more than 150 acres in size, but average 18 acres. Areas follow slope contours above drainageways and below the higher lying soils on uplands.

Included with this soil in mapping are small areas of eroded Blanket soils and some loamy areas. Also included are a few areas along natural drains having a slope of less than 1 percent; small areas of gently sloping Duffau and Windthorst soils along low ridges; small areas of gently sloping Krum and Venus soils along upper slopes; and Thurber and Hassee soils in small depressions.

Most of the acreage is cultivated. Some areas are used as pasture. The hazard of water erosion is moderate. Capability unit IIe–1; Clay Loam range site; pasture group 7C.

Bolar Series

The Bolar series consists of moderately deep, gently sloping to sloping, calcareous loamy soils on uplands. These soils formed in interbedded limestone and calcareous marls.

In a representative profile the surface layer is grayish-brown, calcareous clay loam about 16 inches thick. The next layer is light brownish-gray, calcareous clay loam about 10 inches thick. Below this is about 4 inches of white calcareous clay loam. It is underlain by indurated limestone bedrock.

These soils are well drained. Runoff is medium. Permeability is moderate, and the available water capacity is medium.

Bolar soils are mostly used as range. A few areas are used for crops or pasture.

Representative profile of Bolar clay loam, 3 to 5 percent slopes, 8 miles south of Aledo. From the bridge over Bear Creek, on U.S. Highway 377 southwest 0.2 mile, then south 0.35 mile on county road, 50 feet southeast of corner in road:

A11—0 to 6 inches, grayish-brown (10YR 5/2) clay loam, very dark grayish brown (10YR 3/2) moist; moderate, fine, granular structure; hard, firm; common fine roots; few fine calcium carbonate concretions and limestone fragments; calcareous, moderately alkaline; clear, wavy boundary.

A12—6 to 16 inches, grayish-brown (10YR 5/2) clay loam, very dark grayish brown (10YR 3/2) moist; moderate, medium, subangular blocky structure; hard, firm; common fine roots; few fine calcium carbonate concretions and few limestone fragments; calcareous, moderately alkaline; clear, wavy boundary.

B2—16 to 26 inches, light brownish-gray (10YR 6/2) clay loam, grayish brown (10YR 5/2) moist; moderate, medium, subangular blocky structure; hard, firm; few fine roots and pores; common calcium carbonate concretions and soft masses of carbonate; about 10 percent limestone fragments; calcareous, moderately alkaline; clear, smooth boundary.

B3ca—26 to 30 inches, white (10YR 8/2) clay loam, light gray (10YR 7/2) moist; hard, firm; about 40 percent by volume of films, threads, soft masses, and concretions of calcium carbonate; approximately 10 percent limestone fragments; calcareous, moderately alkaline; abrupt, wavy boundary.

R—30 to 40 inches. indurated limestone bedrock.

The A horizon is 10 to 20 inches thick. It is very dark grayish brown, dark grayish brown, brown, or grayish brown. Content of coarse limestone fragments ranges from 5 to 10 percent, but is as much as 15 percent in places.

The B horizon is 5 to 20 inches thick. It is brown, grayish-brown, pale-brown, light yellowish-brown, light brownish-gray, yellow, white, or very pale brown loam, clay loam, or silty clay loam. It is 5 to 20 inches thick. Approximately 5 to 10 percent of this horizon is limestone fragments.

The R horizon is at a depth of 20 to 40 inches. It is indurated limestone. In some areas the limestone bedrock is interbedded with calcareous clayey marl.

BcB—Bolar clay loam, 1 to 3 percent slopes. This gently sloping soil is on uplands. It is associated with higher lying shallow soils on ridges. Mapped areas are weakly convex. They range from 5 to 50 acres in size, but average about 20 acres.

The surface layer is dark grayish-brown clay loam about 12 inches thick. The next lower layer is brown clay loam about 6 inches thick. Below this is about 12 inches of pale-brown clay loam. The underlying material is indurated limestone.

Included with this soil in mapping are areas on slightly higher parts of the landscape that have slopes greater than 3 percent. Also included is a soil similar to the Bolar soil, but that contains between 15 and 35 percent coarse fragments throughout; a soil that is more than 40 inches deep over rock; Denton soils in small slightly depressed areas; areas of Purves clay and Aledo soils along upper slopes, and small inclusions of Blanket, Krum, and Venus soils.

Most of this soil is used as range. Some areas are used for crops. The hazard of water erosion is moderate. Capability unit IIe–1; Clay Loam range site; pasture group 7C.

BcC—Bolar clay loam, 3 to 5 percent slopes. This gently sloping soil is on concave foot slopes on uplands. It is associated with higher lying shallow soils. Mapped areas follow the contour of slopes and range from 10 to 40 acres in size. This soil has the profile described as representative of the series.

Included with this soil in mapping are a few small, less sloping areas; areas of a soil that is similar to Bolar soil but more than 40 inches deep over rock; and, along the upper slopes, areas of a similar soil that contains more rock fragments. Also included are areas of more sloping Aledo, Brackett, and Purves soils along ridges; small areas of Lamar and Venus soils along the lower slopes; small areas of eroded Bolar soils; and a few gullies along drains.

Most of the acreage is used as range. Some small areas are cultivated. The hazard of water erosion is moderate. Capability unit IIIe–5; Clay Loam range site; pasture group 7C.

BcD—Bolar clay loam, 5 to 8 percent slopes. This sloping soil is on uplands. Mapped areas are irregular to elongated in shape and follow the contour of higher lying shallow ridges. Areas range from 5 to more than 100 acres in size, but average about 20 acres.

The surface layer is dark grayish-brown, calcareous clay loam about 10 inches thick. The next lower layer is grayish-brown, calcareous clay loam about 12 inches thick. It is underlain by indurated platy limestone bedrock.

Included with this soil in mapping are small areas of eroded Bolar soils; a few small areas that have a slope of less than 5 percent, and some areas of a soil that is similar to Bolar soil but has more coarse fragments. Small areas of Aledo, Brackett, and Purves soils are along upper slopes and narrow ridges. Small areas of Denton and Venus soils are along foot slopes. Also included are a few small gullies along intermittent drainageways.

Most of the acreage is used as range. Only a few small areas are cultivated. The hazard of water erosion is severe. Capability unit IVe–2; Clay Loam range site; pasture group 7D.

Bonti Series

The Bonti series consists of moderately deep, gently sloping to sloping, noncalcareous loamy soils on uplands. These soils formed in material weathered from strongly cemented sandstone.

In a representative profile the surface layer is light-brown, slightly acid fine sandy loam about 10 inches thick. The next 22 inches is medium acid, yellowish-red clay. It is underlain by reddish-yellow strongly cemented sandstone.

These soils are well drained. Runoff is rapid. Permeability is moderately slow, and the available water capacity is medium.

Bonti soils are used mostly as range. Some areas are used for crops or are in pasture.

Representative profile of Bonti fine sandy loam, 1 to 3 percent slopes, northwest of Cool and 12 miles west of Weatherford. From the junction of U.S. Highway 180 and Farm Road 113 at Cool, east 0.3 mile, then 1.2 miles north and west on county road, 200 feet from fence east of road:

Ap—0 to 10 inches, light-brown (7.5YR 6/4) fine sandy loam, brown (7.5YR 5/4) moist; weak, fine, subangular blocky structure; hard, friable; few fine roots and pores; few siliceous pebbles; few strongly cemented sandstone fragments; slightly acid; abrupt, wavy boundary.

B21t—10 to 24 inches, yellowish-red (5YR 5/8) clay, yellowish red (5YR 4/8) moist; moderate, medium, subangular blocky structure; very hard, firm; distinct clay films; few siliceous pebbles; few strongly cemented sandstone fragments; medium acid; gradual, wavy boundary.

B22t—24 to 32 inches, yellowish-red (5YR 5/6) clay, yellowish red (5YR 4/6) moist; few, fine, faint, yellowish-brown mottles; moderate, medium, blocky structure; very hard, firm; distinct clay films; few strongly cemented sandstone fragments; medium acid; abrupt, smooth boundary.

R—32 to 34 inches, reddish-yellow strongly cemented sandstone.

The A1 horizon is light brown, brown, yellowish brown, or dark yellowish brown. It is 2 to 6 inches thick, neutral to medium acid, and in places is 10 to 30 percent strongly cemented sandstone fragments. The A2 horizon is brown, pale brown, light brown, light yellowish brown, or reddish yellow. It is 2 to 6 inches thick, slightly acid to medium acid, and is 10 to 30 percent coarse sandstone fragments.

The B2t horizon is yellowish-red, red, reddish-brown, or reddish-yellow clay or sandy clay and commonly has yellowish-brown and strong-brown mottles in the lower part. It is 10 to 26 inches thick and is strongly acid to medium acid.

Depth to the R horizon is 20 to 40 inches.

BfB—Bonti fine sandy loam, 1 to 3 percent slopes. This gently sloping soil is on upland ridges. Mapped areas are irregular to round in shape. They range from 20 to more than 100 acres in size, but average about 35 acres. This soil is associated with more sloping and stony soils. It has the profile described as representative of the series.

Included with this soil in mapping are small areas of an eroded Bonti soil and areas of a soil that is similar to Bonti soil but is less than 20 inches deep over rock. Also included are small areas of Truce soils and small outcrops of sandstone rock along breaks; gently sloping Chaney and Selden soils; and small, slightly depressed areas of Thurber and Hassee soils.

Only a small part of the acreage is cultivated. Most areas were cultivated at one time, but have been reseeded or abandoned. The hazard of water erosion is

moderate. Capability unit IIe–2; Sandy Loam range site; pasture group 8A.

BfC—Bonti fine sandy loam, 3 to 5 percent slopes. This gently sloping soil is on upland ridges. Mapped areas are irregular in shape and range from 20 to over 100 acres in size. This soil is associated with more sloping stony soils along breaks.

The surface layer is brown fine sandy loam about 6 inches thick. Below this is about 8 inches of light yellowish-brown fine sandy loam and 12 inches of yellowish-red clay. The underlying material is strongly cemented sandstone bedrock.

Included with this soil in mapping are small areas of Bonti soils that are less sloping and some small areas that are eroded. In some areas, and near slope breaks, is a soil that is similar to Bonti soil but is less than 20 inches deep over bedrock. Also included are small areas of Truce soils along the lower slopes and a few areas of Chaney and Selden soils.

Most of the acreage was once cultivated, but is now in pasture or is idle. A few areas are used as range. The hazard of water erosion is severe. Capability unit IIIe–2; Sandy Loam range site; pasture group 8A.

BfC2—Bonti fine sandy loam, 1 to 5 percent slopes, eroded. This gently sloping soil is on uplands. Mapped areas follow the contour of cultivated fields, many of which are no longer farmed. Areas are dissected by gullies or rills. The gullies are 10 to 40 feet wide, 1 to 3 feet deep, and 50 to 200 feet apart. Mapped areas range from 20 to more than 100 acres in size.

The surface layer is light-brown fine sandy loam about 5 inches thick. The next layer is red clay about 24 inches thick. In most places, some of this lower layer has been mixed into the plowed layer. The underlying material is strongly cemented sandstone.

Included with this soil in mapping are small areas of uneroded soils between gullies and areas where the surface layer is loamy fine sand or sandy clay loam. Also included are small sandstone outcrops; areas of a soil that is similar to Bonti soil, but is less than 20 inches deep over sandstone; and areas of Truce soils.

Most of the acreage was cultivated, but now is seeded to grass or is idle. The hazard of water erosion is severe. Capability unit IIIe–2; Sandy Loam range site; pasture group 8A.

BnD—Bonti and Truce soils, 1 to 8 percent slopes. The gently sloping to sloping stony soils in this mapping unit are on uplands. Areas follow the contours of hills and ridges. They are long, are 100 to 500 yards wide, and range from 20 to more than 300 acres in size. Slopes are complex, but are mostly convex and are dominantly 2 to 8 percent. Sandstone fragments ranging from cobbles to boulders cover 10 to 30 percent of the surface (fig. 7).

The composition of this mapping unit is variable, and the soils are difficult to separate at the scale of mapping. Bonti and similar soils, which make up 50 to 70 percent of mapped acreage, are along the upper slopes and ridges. Truce and similar soils, which make up 30 to 50 percent of mapped areas, are along the lower slopes. Both soils may occur in a particular area. Average composition of an area is 42 percent Bonti soils, 39 percent Truce soils, and 19 percent soils of minor extent.

A typical Bonti soil in this mapping unit has a surface layer of brown stony fine sandy loam about 4 inches thick. Next, in sequence downward, is about 6 inches of brown stony fine sandy loam, 11 inches of reddish-brown clay, and 14 inches of red clay. The underlying material is reddish strongly cemented sandstone.

The surface layer of the Truce soil is brown stony fine sandy loam about 5 inches thick. Below this is 5 inches of pale-brown stony fine sandy loam, about 15 inches of yellowish-red clay, and about 13 inches of yellowish-brown clay. The underlying material is pale-olive shaly clay.

Included in mapping this unit are small areas of Bonti and Truce soils that are not stony, a few areas that are eroded, and some areas where slope is as much as 12 percent. Areas of Chaney soils are along ridges, and Owens soils are along breaks to more sloping areas. A few areas contain inclusions of Lindy and Hensley soils. Most areas have inclusions of a soil that is similar to Bonti soil but is less than 20 inches deep over bedrock. Also included are a few rock outcrops.

Most of the acreage of this mapping unit is used as range. It is not suitable for cultivation. The hazard of water erosion is moderate. Capability unit VIs–2; pasture group 8A; Truce part in Tight Sandy Loam range site and Bonti part in Sandy Loam range site.

Bosque Series

The Bosque series consists of deep, nearly level, calcareous loamy soils on bottom lands. These soils formed in calcareous loamy alluvial sediments along small streams.

In a representative profile the surface layer is grayish-brown calcareous loam about 10 inches thick. The next 15 inches is dark grayish-brown, calcareous loam. Below this is 30 inches of grayish-brown calcareous clay loam. It is underlain by brown calcareous sandy clay loam.

These soils are well drained. Runoff is slow. Permeability is moderate, and the available water capacity is high.

Bosque soils are used for crops and pasture.

Representative profile of Bosque loam, occasionally flooded, 10 miles southwest of Weatherford and northeast of Dennis. From the Brazos River bridge at Dennis, north and east on Farm Road 1543 for 2 miles, then east on county road for 0.2 mile, 200 feet north of road:

Ap—0 to 10 inches, grayish-brown (10YR 5/2) loam, very dark grayish brown (10YR 3/2) moist; weak, fine, subangular blocky structure; slightly hard, friable; common fine roots; calcareous, moderately alkaline; abrupt, smooth boundary.

A1—10 to 25 inches, dark grayish-brown (10YR 4/2) loam, very dark grayish brown (10YR 3/2) moist; weak, fine, subangular blocky and granular structure; hard, friable; common very fine roots and pores; few films and threads of calcium carbonate; calcareous, moderately alkaline; gradual, wavy boundary.

B2—25 to 55 inches, grayish-brown (10YR 5/2) clay loam, dark grayish brown (10YR 4/2) moist; weak, fine,

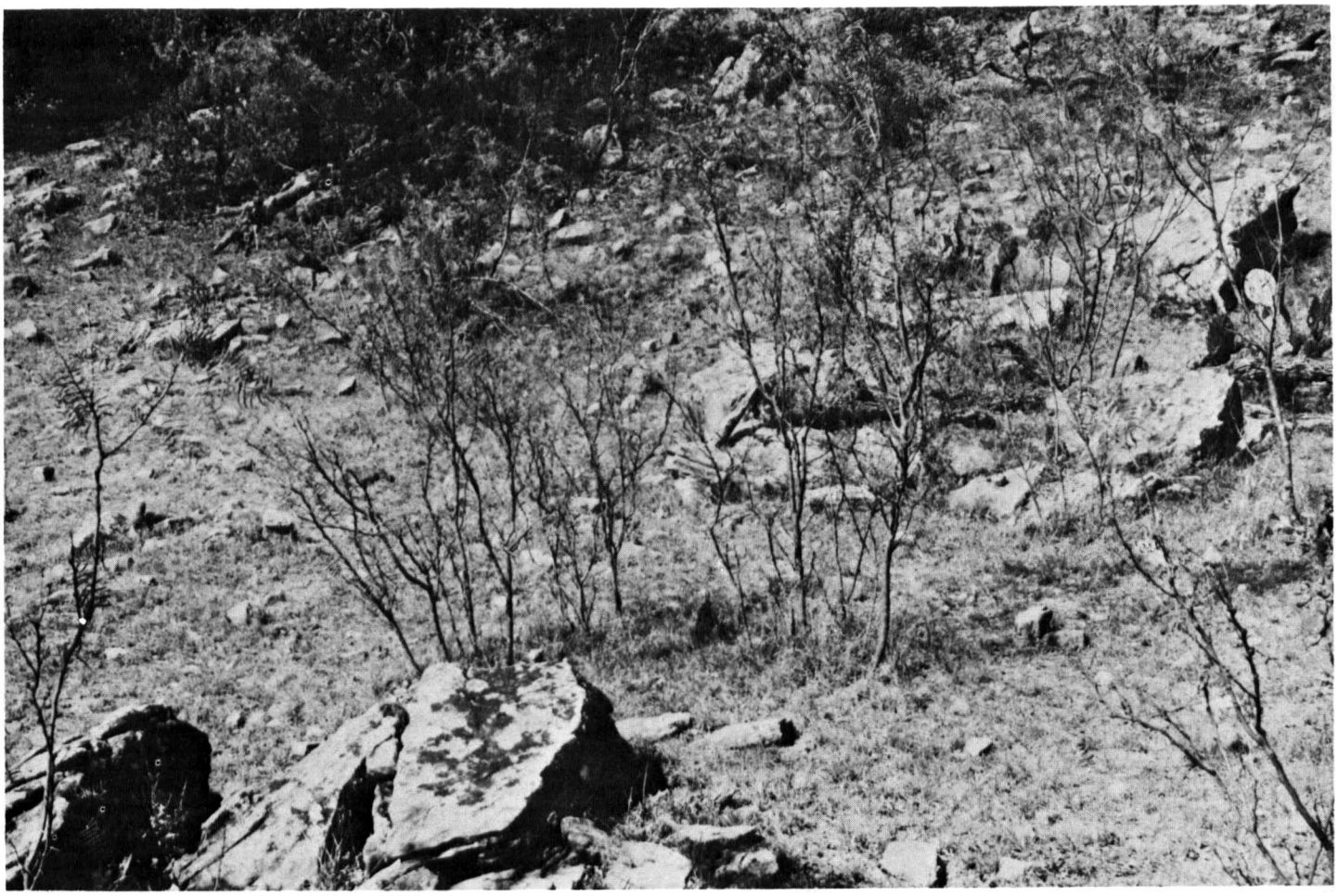

Figure 7.—**Bonti and Truce soils, 1 to 8 percent slopes. Sandstone outcrop in foreground.**

subangular blocky structure; hard, firm; common very fine roots and pores; many very fine threads and films of calcium carbonate; calcareous, moderately alkaline; gradual, wavy boundary.

IIBb—55 to 60 inches, brown (10YR 5/3) sandy clay loam, brown (10YR 4/3) moist; massive; very hard, friable; many films, threads, and soft masses of calcium carbonate; calcareous, moderately alkaline.

The A horizon is dark grayish brown, grayish brown, brown, dark brown, or very dark grayish brown. It is 20 to 35 inches thick.

The B2 horizon is brown, grayish brown, or light brownish gray. It is fine sandy loam, loam, or clay loam.

The depth to the buried horizon is 24 to more than 60 inches.

Bo—Bosque loam, occasionally flooded. This nearly level soil is on bottom land that is occasionally flooded. Mapped areas are elongated and follow the contour of drainageways. Areas range from 5 to more than 200 acres in size, but average about 25 acres. Slopes are 0 to 1 percent.

Included with this soil in mapping is a soil that is similar to the Bosque soil but has a lighter colored surface layer; a few areas of fine sandy loam; small areas of Blanket, Krum, and Venus soils along slightly higher positions; and small areas of Bunyan and Frio soils Also included are small areas of a soil that is similar to the Bosque soil but has less than 24 inches of recent overburden. Inclusions make up less than 20 percent of any one mapped area.

The hazard of water erosion is slight, but soil areas are subject to flooding. They are flooded as often as one or more times in 4 to 10 years, mainly in May or September. Most areas are flooded for 24 hours or less.

Most of the acreage is for crops. Some areas are established to pasture. Capability unit IIw–1; Loamy Bottom Land range site; pasture group 2A.

Brackett Series

The Brackett series consists of shallow, gently sloping to steep, calcareous loamy soils on uplands. These soils formed in material weathered from interbedded limestone and calcareous clay loam.

In a representative profile the surface layer is light brownish-gray, calcareous clay loam about 4 inches thick. The next 10 inches is light-gray calcareous loam. The underlying material is weakly cemented limestone and calcareous pale-yellow clay loam.

These soils are well drained. Runoff is rapid. Permeability is moderately slow, and the available water capacity is very low.

Brackett soils are used mainly as range. A few areas in and near Weatherford are used for urban development.

Representative profile of Brackett clay loam, in an area of Brackett and Maloterre soils, 3 to 12 percent slopes, 5.3 miles southwest of Springtown via Farm Road 51, then 0.7 mile west, then north and east 2 miles on county road, then west of road 75 feet from fence:

A1—0 to 4 inches, light brownish-gray (10YR 6/2) clay loam, brown (10YR 5/3) moist; moderate, fine, granular structure; hard, friable; many fine pores; few fossil shells and rock fragments; about 60 percent calcium carbonate equivalent; calcareous, moderately alkaline; clear, wavy boundary.

B2—4 to 14 inches, light-gray (10YR 7/2) loam, pale brown (10YR 6/3) moist; moderate, medium, subangular blocky structure; hard, friable; few pores; 60 percent calcium carbonate equivalent; common fine calcium carbonate concretions and limestone shell fragments; calcareous, moderately alkaline; abrupt, wavy boundary.

C—14 to 30 inches, thinly interbedded, weakly and strongly cemented fossil limestone and calcareous pale-yellow clay loam.

The soil is 5 to 35 percent coarse limestone fragments and more than 40 percent calcium carbonate. The A horizon is 3 to 12 inches thick. It is light brownish gray, light gray, grayish brown, or brown and is clay loam, loam, or gravelly loam.

The B horizon is 4 to 16 inches thick. It is light gray, light brownish gray, pale yellow, yellowish brown, light yellowish brown, very pale brown, or pale brown.

Depth to the C horizon is 10 to 20 inches. It is light brownish gray, very pale brown, or pale yellow and is loam, clay loam, or marl intermixed with limestone fragments.

BrE—Brackett-Urban land complex, 3 to 12 percent slopes. This mapping unit occurs as gently sloping to strongly sloping breaks throughout the city of Weatherford. It is about 45 percent Brackett soils, 20 percent Urban land, and 35 percent soils of minor extent. Areas are long and irregular in shape and follow the contour of ridges and other landforms. They range from 5 to more than 150 acres in size.

In an undisturbed area Brackett soil has a surface layer of light brownish-gray gravelly clay loam about 4 inches thick. The next 10 inches is light-gray loam. The underlying material is limestone and pale-yellow clay loam.

Urban land is developed for single-unit dwellings and streets, driveways, sidewalks, and patios. Small businesses and paved parking lots are in a few areas. Most structures are on the less sloping narrow ridges and foot slopes.

Included with this unit in mapping are small areas of Aledo, Maloterre, and Purves soils on ridgetops and small areas of Bolar, Lamar, and Venus soils on foot slopes. Also included are a few rock outcrops along ridgetops.

Urban development has been less on this mapping unit than elsewhere in the county. Where urban structures have been planned, soils and landforms were altered to prepare sites, create trafficways, or provide a better environment for growing lawns and landscape plants. Cuts and fills 2 to 6 feet deep were made in places to prepare building foundations or to level yards. Stones were removed, and yards were topdressed with imported soil. The main concern in urban development is shaping the underlying limestone and marl preparatory to site leveling, street construction, or trenching for utilities. Other limitations are slope, stoniness, and seasonal seepage. Not assigned to a capability unit, range site, or pasture group.

BsE—Brackett and Maloterre soils, 3 to 12 percent slopes. This gently sloping to strongly sloping mapping unit is on upland ridges. Areas are longer than they are wide and follow the contour of hills and ridges (fig. 8). Areas range from 5 to 400 acres in size, but are mostly about 70 acres.

Average composition of this mapping unit is 50 percent Brackett soil, 22 percent Maloterre soil, and 28 percent soils of minor extent, but composition is variable. Brackett soils are dominant and make up 40 to 80 percent of mapped areas. They are along side slopes and usually have a slope of 5 to 12 percent. Maloterre soils, where present, make up 10 to 40 percent of the mapped areas. They are along the more nearly level ridgetops and usually have a slope of 3 to 5 percent.

Brackett soils have the profile described as representative of the Brackett series. They are as much as 35 percent limestone gravel, cobbles, and fossil fragments. Maloterre soils have a surface layer of grayish-brown gravelly clay loam about 8 inches thick. The underlying material is indurated limestone that contains many fossil shells.

Included with this unit in mapping are a few small areas where slopes are as much as 20 percent; areas of a soil that is similar to Brackett soil but that contains more coarse limestone fragments; small areas of Bolar, Lamar, and Venus soils along foot slopes; and small areas of Aledo soils along slightly higher ridges.

Most of this mapping unit is used as range. It is also suited to cultivation. The hazard of water erosion is moderate. Capability unit VIs–1; Steep Adobe range site; not assigned to a pasture group.

BsG—Brackett and Maloterre soils, 12 to 30 percent slopes. This moderately steep to steep mapping unit is on ridges and hills in the uplands. Areas are elongated and follow the contour of sloping ridges. They range from 10 to more than 50 acres in size, but average about 30 acres.

Average composition of this mapping unit is 57 percent Brackett soils, 20 percent Maloterre soils, and 23 percent soils of minor extent, but composition is variable. Brackett soils are dominant and make up 40 to 80 percent of the unit. They are on the more sloping sides of ridges. Maloterre soils, where present, make up 10 to 30 percent of areas. They are along ridgetops.

Brackett soils contain as much as 35 percent gravel and cobble-size fragments. As much as 35 percent of their surface is covered by limestone gravel, cobbles, and shell fragments. The surface layer is grayish-brown clay loam about 4 inches thick. The next 12 inches is light yellowish-brown clay loam. The underlying material is calcareous pale-yellow marl.

Maloterre soils have a surface layer of grayish-brown gravelly clay loam about 4 inches thick. The underlying material is indurated limestone and imbedded fossil shells.

Included with this unit in mapping are small areas where slopes are less than 12 percent; areas of a soil that is similar to Brackett soil but that contains more coarse fragments; small areas of Bolar, Lamar, and Venus soils along foot slopes; and small areas of Aledo and Purves soils along narrow ridges.

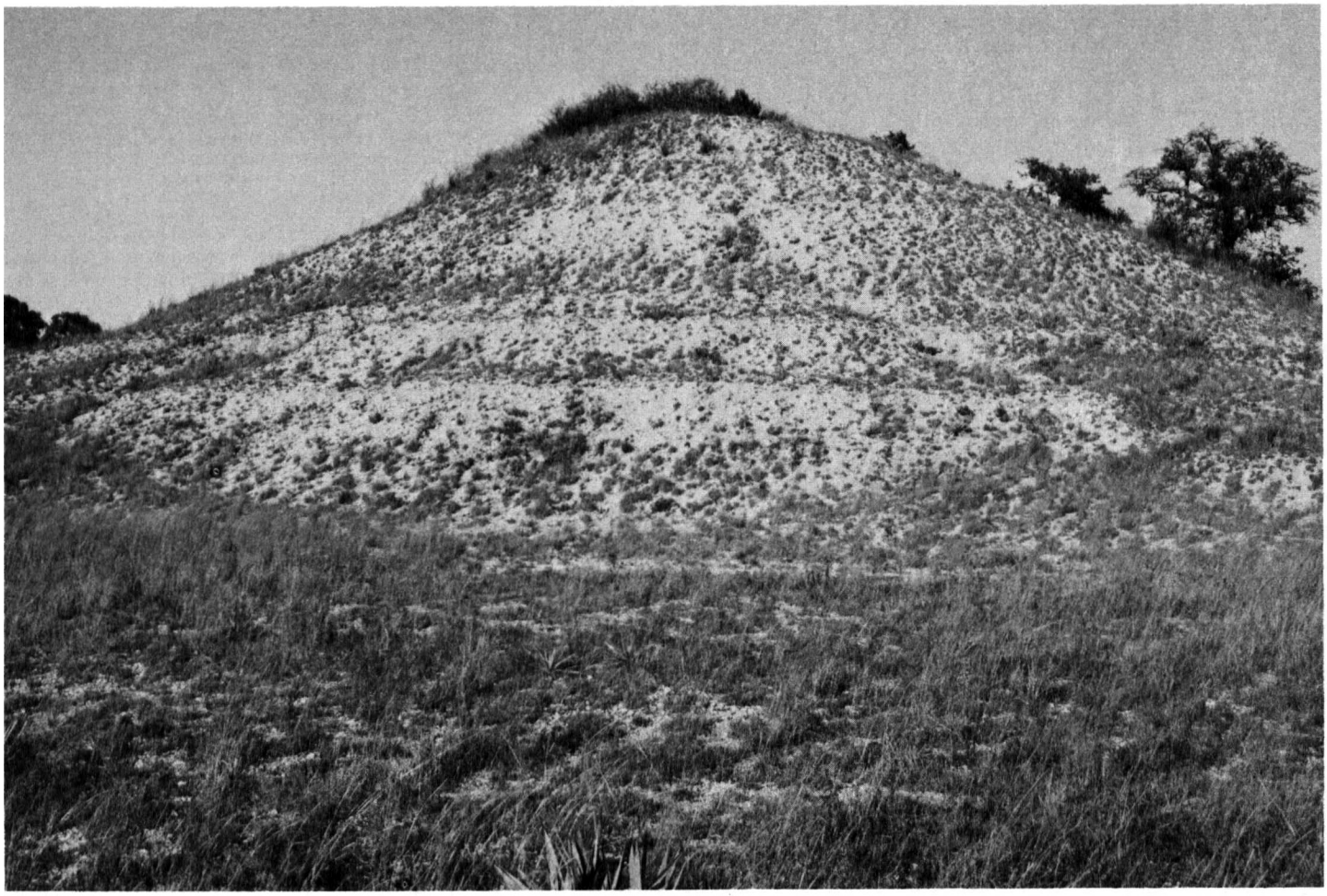

Figure 8.—**Thin stand of grasses on shallow Brackett and Maloterre soils, 3 to 12 percent slopes.**

Most of the acreage is used as range. This mapping unit is not suited to cultivation. The hazard of water erosion is moderate. Capability unit VIIs–1; Steep Adobe range site; not assigned to a pasture group.

Bunyan Series

The Bunyan series consists of deep, nearly level, noncalcareous loamy soils on bottom lands. These soils formed in stratified loamy alluvial sediments.

In a representative profile the surface layer is brown, neutral fine sandy loam about 10 inches thick. The underlying material to a depth of 60 inches is stratified, slightly acid sandy clay loam. It is light brown in the upper part and brown in the lower part.

These soils are well drained. Runoff is slow. Permeability is moderate, and the available water capacity is high.

Bunyan soils are used for crops and pasture.

Representative profile of Bunyan fine sandy loam, occasionally flooded, 12 miles southwest of Weatherford. From the junction of Interstate Highway 20 and Farm Road 1543 at Brock Junction, southwest along the south service road for 0.8 mile, south of road, 200 feet from fence:

Ap—0 to 10 inches, brown (10YR 5/3) fine sandy loam, dark brown (10YR 4/3) moist; weak, fine, subangular blocky structure; slightly hard, friable; common roots and pores; neutral; abrupt, smooth boundary.

C1—10 to 30 inches, light-brown (7.5YR 6/4) sandy clay loam, brown (7.5YR 5/4) moist; single grained; hard, friable; few fine roots; thin strata of brown (7.5YR 4/2) fine sandy loam about 1 inch thick; slightly acid; abrupt, smooth boundary.

C2—30 to 60 inches, brown (7.5YR 5/4) sandy clay loam, brown moist; single grained; hard, friable; few roots; slightly acid.

The A horizon is pale brown, brown, light brownish gray, or dark grayish brown. It is 6 to 18 inches thick and slightly acid to neutral.

The C horizon is pale brown, light yellowish brown, grayish brown, brown, yellowish brown, or light brown; thin strata of dark grayish brown and very dark grayish brown occur below a depth of 10 inches. It is stratified sandy clay loam, loam, or fine sandy loam and contains thin strata of loamy fine sand in places. It ranges from medium acid in the upper part to moderately alkaline in the lower part. Some areas have thin calcareous strata below a depth of 40 inches.

Bu—Bunyan fine sandy loam, occasionally flooded. This nearly level soil is on bottom land that is occasionally flooded. Mapped areas are elongated and fol-

low the contours of drainageways. They range from 10 to more than 150 acres in size, but average about 25 acres. Slopes are 0 to 1 percent.

Included with this soil in mapping are Lincoln and Yahola soils in small, slightly higher areas along stream banks. Also included are small areas of Bosque and Frio soils.

The hazard of water erosion is slight, but soil areas are subject to occasional flooding. Areas are flooded as often as one or more times in 4 to 10 years, mainly in May or September. Most areas are flooded for 24 hours or less.

Bunyan soils are used mostly for crops. Pasture is established in some areas. Capability unit IIw–1; Loamy Bottom Land range site; pasture group 2A.

Chaney Series

The Chaney series consists of deep, gently sloping, noncalcareous sandy soils on uplands. These soils formed in sandy and clayey materials.

In a representative profile the surface layer is dark grayish-brown, slightly acid loamy fine sand about 4 inches thick. Below this, in sequence downward, is 12 inches of pale-brown, slightly acid loamy fine sand; 6 inches of red, medium acid sandy clay mottled with gray; 10 inches of reddish-yellow sandy clay mottled with red and light brownish gray; and 10 inches of light yellowish-brown, medium acid sandy clay mottled with red and gray. The underlying material is light-gray, neutral sandy clay.

These soils are moderately well drained. Runoff is slow. Permeability is slow, and the available water capacity is medium.

Chaney soils are used for crops and pasture. A few areas are in range.

Representative profile of Chaney loamy fine sand, 1 to 5 percent slopes, in a wooded pasture 15 miles southwest of Weatherford. From Brock, west 2.1 miles, then south 0.8 mile, 375 feet east of road:

Ap—0 to 4 inches, dark grayish-brown (10YR 4/2) loamy fine sand, very dark grayish brown (10YR 3/2) moist; weak, subangular blocky structure; slightly hard, friable; common fine and medium roots; few, fine, siliceous pebbles; slightly acid; gradual, wavy boundary.

A2—4 to 16 inches, pale-brown (10YR 6/3) loamy fine sand, brown (10YR 5/3) moist; single grained; soft, very friable; common, fine and medium, siliceous pebbles; slightly acid; abrupt, wavy boundary.

B21t—16 to 22 inches, red (2.5YR 4/6) sandy clay, dark red (2.5YR 3/6) moist; common, fine, distinct, gray (10YR 6/1) mottles, weak, medium, blocky structure; very hard, very firm; few fine and medium roots; many prominent clay films on faces of peds; few, fine siliceous pebbles; medium acid; clear, smooth boundary.

B22t—22 to 32 inches, reddish-yellow (7.5YR 6/6) sandy clay, strong brown (7.5YR 5/6) moist; mottles of red (2.5YR 4/6) and light brownish gray (10YR 6.2); weak, angular blocky structure; very hard, very firm; many prominent clay films on faces of peds; few, fine siliceous pebbles; medium acid; gradual, smooth boundary.

B3t—32 to 42 inches, light yellowish-brown (10YR 6/4) sandy clay, yellowish-brown (10YR 5/4) moist; prominent mottles of red (2.5YR 5/8) and gray (10YR 6/1); weak, medium, subangular blocky structure; very hard, very firm; few clay films; medium acid; gradual, wavy boundary.

C—42 to 60 inches, light-gray (5Y 7/1) sandy clay, gray (5Y 6/1) moist; few, fine, faint mottles of red (2.5YR 5/8) and yellowish red (5YR 5/8); massive; neutral.

The A horizon is 6 to 20 inches thick. It is neutral to medium acid. The A1 horizon is very pale brown, dark grayish brown, grayish brown, pale brown, or brown. The A2 horizon is pale brown, very pale brown, or light gray. Content of siliceous pebbles ranges from none to about 20 percent.

The Bt horizon is dark red, red, light yellowish brown, reddish brown, light gray, brownish yellow, yellowish red, or reddish yellow and is clay or sandy clay. It has prominent grayish or brownish mottles. Some profiles have a mottled matrix of red, yellow, brown, and gray. Reaction is medium acid to neutral.

The C horizon is at a depth of 40 to more than 50 inches. It is gray, olive yellow, reddish gray, light gray, or olive and is shaly clay or sandy clay. In some areas it contains strata of sandstone or gravel.

ChC—Chaney loamy fine sand, 1 to 5 percent slopes. This gently sloping soil is on uplands. Mapped areas are irregular in shape. They range from about 20 to more than 100 acres in size, but average about 75 acres.

This soil has the profile described as representative of the series.

Included with this soil in mapping are small areas of eroded Chaney soils and, in the slightly higher positions, areas of Bonti, Nimrod, Selden, and Truce soils. Also included are areas of Hassee and Thurber soils in slight depressions.

Most of the acreage is used for crops. Pasture has been established in some areas. The hazard of water erosion is slight, and the hazard of soil blowing is severe. Capability unit IIIe–4; Sandy range site; pasture group 9A.

ChC2—Chaney loamy fine sand, 3 to 5 percent slopes, eroded. This gently sloping soil is on uplands. Mapped areas often follow the contour of field boundaries. They range from 10 to over 50 acres in size, but average about 25 acres. Part of the surface layer has been removed in most areas. Small rills and gullies are common. They are 10 to 20 feet wide and 1 to 2 feet deep and are spaced 50 to 200 feet apart.

The surface layer is grayish-brown loamy fine sand about 7 inches thick. The next layer is about 8 inches of red clay that has gray mottles. Some of this lower layer has been mixed with the surface layer in most places. Below this is about 30 inches of dark-red clay that has gray mottles. The underlying material is olive-yellow and reddish-gray shaly clay.

Included with this soil in mapping are areas of uneroded Chaney soils, small areas where the subsoil is exposed, and areas of sand accumulation. Also included are small areas of Bonti, Nimrod, Selden, and Truce soils.

Most of the acreage was once cultivated but now is used as pasture. The hazard of water erosion is moderate. The hazard of soil erosion is severe. Capability unit IIIe–10; Sandy range site; pasture group 9A.

Denton Series

The Denton series consists of moderately deep, gently sloping, calcareous clayey soils on uplands. These soils formed in a mantle of clayey materials over limestone and interbedded marls.

In a representative profile the surface layer is very dark grayish-brown calcareous clay about 16 inches thick. The next 19 inches is dark grayish-brown calcareous clay. It is underlain by indurated limestone bedrock.

These soils are well drained. Runoff is medium. Permeability is slow, and the available water capacity is medium.

Denton soils are used mostly for crops. Some areas are used as range, and some areas are used for improved pasture.

Representative profile of Denton clay, 1 to 3 percent slopes, in a cultivated field, 4.5 miles northwest of Weatherford via Farm Road 920, 300 feet west of road:

AP—0 to 6 inches, very dark grayish-brown (10YR 3/2) clay, very dark brown (10YR 2/2) moist; moderate, medium, granular structure; very hard, firm; common fine roots and pores; calcareous, moderately alkaline; abrupt, smooth boundary.

A11—6 to 16 inches, very dark grayish-brown (10YR 3/2) clay, very dark brown (10YR 2/2) moist; strong, fine and medium, granular structure; very hard, firm; few fine roots and pores; few fine calcium carbonate concretions; calcareous, moderately alkaline; clear, smooth boundary.

A12ca—16 to 35 inches, dark grayish-brown (10YR 4/2) clay, very dark grayish brown (10YR 3/2) moist; moderate, medium, granular and subangular blocky structure; very hard, firm; few fine roots and pores; common, fine and medium, calcium carbonate concretions; common films and threads of calcium carbonate; calcareous, moderately alkaline; abrupt, irregular boundary.

R—35 to 36 inches, indurated limestone bedrock.

The A horizon is brown, dark grayish brown, very dark grayish brown, or dark brown, and is 12 to 40 inches thick.

Some profiles have a B2ca horizon. It is light brownish gray, grayish brown, or brown and is silty clay or clay. Calcium carbonate content of this horizon or the lower part of the A horizon is more than 15 percent. Limestone fragments are present in the lower part of some profiles.

The depth to the R horizon is 22 to 40 inches.

DeB—Denton clay, 1 to 3 percent slopes. This gently sloping soil is in slightly concave areas on uplands. Mapped areas follow the contour of the landscape in association with more sloping shallow soils. They range from 10 to 80 acres in size, but average about 50 acres.

Included with this soil in mapping are a few small areas of eroded Denton soils and areas of a soil that is similar to Denton soil but is more gray. Also included are small areas of soils that have slopes of less than 1 percent; small areas of Krum and Venus soils along lower slopes and along small drains; and small areas of Purves soils along narrow ridges.

Most of the acreage is used for crops. Improved pasture has been established in some areas, and some areas are in native range. The hazard of erosion is moderate. Capability unit IIe–1; Clay Loam range site; pasture group 7C.

Duffau Series

The Duffau series consists of deep, gently sloping to sloping, noncalcareous sandy and loamy soils on uplands. These soils formed in weakly cemented sandstone and sandy and loamy materials.

In a representative profile the surface layer is light-brown, neutral loamy fine sand about 9 inches thick. The next 31 inches is red, slightly acid sandy clay loam. Below this is 25 inches of yellowish-red, slightly acid sandy clay loam, and then about 10 inches of reddish-yellow, slightly acid sandy clay loam. The underlying material is white, neutral, weakly cemented sandstone and fine sandy loam.

These soils are well drained. Runoff is slow to rapid. Permeability is moderate, and the available water capacity is high.

Duffau soils are used mostly as pasture and range. Some areas are in orchards, and other areas are used for crops.

Representative profile of Duffau loamy fine sand in an area of Duffau and Weatherford soils, 1 to 5 percent slopes, in a cultivated field, 1.7 miles west of the junction of Farm Road 920 and Farm Road 3107 at Poolville, 100 feet south of road:

Ap—0 to 9 inches, light-brown (7.5YR 6/4) loamy fine sand, brown (7.5YR 5/4) moist; weak, fine, subangular blocky structure; soft, very friable; common roots; neutral; abrupt, smooth boundary.

B21t—9 to 40 inches, red (2.5YR 5/6) sandy clay loam, red (2.5YR 4/6) moist; moderate, medium, blocky structure; very hard, friable; few fine roots; many prominent clay films; slightly acid; gradual, wavy boundary.

B22t—40 to 65 inches, yellowish-red (5YR 5/6) sandy clay loam, yellowish red (5YR 4/6) moist; moderate, fine and medium, subangular blocky structure; very hard, friable; many distinct clay films; slightly acid; gradual, wavy boundary.

B3t—65 to 75 inches, reddish-yellow (7.5YR 6/6) sandy clay loam, strong brown (7.5YR 5/6) moist; weak, medium, subangular blocky structure; very hard, friable; few thin clay films; slightly acid; gradual, wavy boundary.

C—75 to 95 inches, white (10YR 8/2) weakly cemented sandstone and fine sandy loam mottled with reddish yellow (7.5YR 6/6); very hard, firm; neutral.

The A horizon is 6 to 20 inches thick. The A1 horizon is grayish brown, light brown, brown, pale brown, light yellowish brown, or yellowish brown. The A2 horizon, where present, is lighter colored than the A1 horizon. It is loamy fine sand or fine sandy loam and is slightly acid to mildly alkaline.

The Bt horizon is reddish brown, reddish yellow, yellowish red, strong brown, or red and is sandy clay loam or clay loam. It is slightly acid to mildly alkaline.

Depth to the C horizon is 60 to 80 inches. This horizon is white, reddish yellow, or pale yellow and is weakly cemented sandstone, sandy clay loam, or fine sandy loam.

DgD3—Duffau-Orthents complex, 3 to 8 percent slopes, severely eroded. This gently sloping to sloping, severely eroded soil is on gullied hillsides. Mapped areas were once-cultivated fields but now have many large gullies (fig. 9). Areas range from 5 to 100 acres in size, but average about 20 acres.

This mapping unit is 42 percent Duffau soils, 44 percent Orthents, and 14 percent soils of minor extent. Duffau soils are mostly along mid and lower slopes and occupy the areas between gullies. Orthents are on gully slides and in gully channels. The Duffau soils and Orthents are so intricately mixed that it is not practical to separate them at the scale of mapping used.

The surface layer of the Duffau soil is brown fine sandy loam about 6 inches thick. The next 36 inches is yellowish-red sandy clay loam. Below this is 32 inches of reddish-yellow sandy clay loam. The underlying material is reddish-yellow and white packsand.

Orthents are similar in characteristics to Duffau

Figure 9.—Severely gullied area of Duffau-Orthents complex, 3 to 8 percent slopes, severely eroded.

soils, but their profiles are thinner. Gullies are 3 to 30 feet wide and 2 to 20 feet deep. Narrow bands of eroded soil separate the gullies.

Of minor extent are eroded and severely eroded Weatherford and Windthorst soils and, along lower slopes, small areas of Selden and May soils.

This mapping unit is suitable only for range. Pasture is difficult to establish because extensive shaping is needed. Runoff is medium. These areas are critical silt sources. The hazard of water erosion is severe. Capability unit VIIe–1; Sandy Loam range site; not assigned to a pasture group.

DhD—Duffau-Urban land complex, 3 to 8 percent slopes. This gently sloping to sloping mapping unit is on upland hillsides in the City of Weatherford. Mapped areas are rounded to irregular in shape.

This unit is about 50 percent Duffau soils, 40 percent Urban land, and 10 percent soils of minor extent. Duffau soils dominate, but are in patterns so intricately mixed with Urban land that it is not practical to separate them at the scale of mapping used.

In an undisturbed area of Duffau soil, the surface layer is light-brown loamy fine sand about 10 inches thick. The next 31 inches is red sandy clay loam. Below this is 25 inches of yellowish-red sandy clay loam, then about 10 inches of reddish-yellow sandy clay loam. The underlying material is white, weakly cemented sandstone.

Urban land is used for works and structures, such as buildings, streets, driveways, sidewalks, and patios. It is also used for parts of some shopping centers, service stations, small shops and businesses, and the accompanying parking areas.

Included with this unit in mapping are small areas of Lamar, May, Weatherford, and Windthorst soils.

Some areas have been cut and shaped for building sites and lot leveling. Cuts vary from a few inches to several feet, depending on slope and the size and type of building to be constructed. Because most cuts and fills were made in the original soil, the thickness of horizons in the existing profile may vary widely from the profile described as representative of the series. However, the basic characteristics of the soil remain much the same. In many places imported soil materials are used for leveling. Runoff is rapid.

The main soil characteristics that affect urban development are permeability, slope, and erodibility. Not assigned to a capability unit, range site, or pasture group.

DmC—Duffau and Weatherford soils, 1 to 5 per-

cent slopes. These gently sloping soils are on upland hillsides. Mapped areas are mid and lower slopes. Areas are elongated in shape and follow the contour of hillsides. They range from 10 to 150 acres in size, but most are about 35 acres (fig. 10).

The composition of this unit is variable, and the pattern in which soils occur is not uniform. Average composition of this mapping unit is 50 percent Duffau soils, 35 percent Weatherford soils, and 15 percent soils of minor extent. Duffau soils are dominant. They make up 40 to 60 percent of the mapped acreage. They are present in all areas, mostly along lower slopes. Weatherford soils make up 30 to 40 percent of the mapped acreage, and are mostly along upper slopes. Surface texture is variable. About 70 percent of the mapped areas have a surface layer of loamy fine sand, and about 30 percent of the areas have a surface layer of fine sandy loam.

The Duffau soil has the profile described as representative of the Duffau series.

The surface layer of Weatherford soils is light brown loamy fine sand about 10 inches thick. The next 5 inches is reddish-brown sandy clay loam. Below this is 15 inches of yellowish-red sandy clay loam, and then 16 inches of reddish-yellow sandy clay loam. The underlying material is white, weakly cemented packsand.

Of minor extent are small areas of Chaney, Heaton, Selden, and Windthorst soils. Chaney and Selden soils are along lower slopes and valleys. Heaton and Windthorst soils are along upper slopes and ridges. Also included with this unit in mapping are a few small areas of soils that have slopes of as much as 8 percent.

This mapping unit is used for pasture, crops, and orchards. Some areas are in range. Runoff is slow. The hazard of water erosion is slight, but the hazard of soil blowing is severe. Capability unit IIIe–4; Sandy range site; pasture group 9A.

DwC2—Duffau and Weatherford soils, 2 to 5 percent slopes, eroded. These gently sloping soils are on eroded upland hillsides. Mapped areas are mostly once-cultivated fields that were farmed for a time and then had much of the surface layer removed by water erosion. Areas are irregular in shape. They range from 10 to more than 100 acres in size, but average about 30 acres.

The composition of this unit is variable, and the pattern in which soils occur is not uniform. Average composition of this mapping unit is 50 percent Duffau soils, 35 percent Weatherford soils, and 15 percent

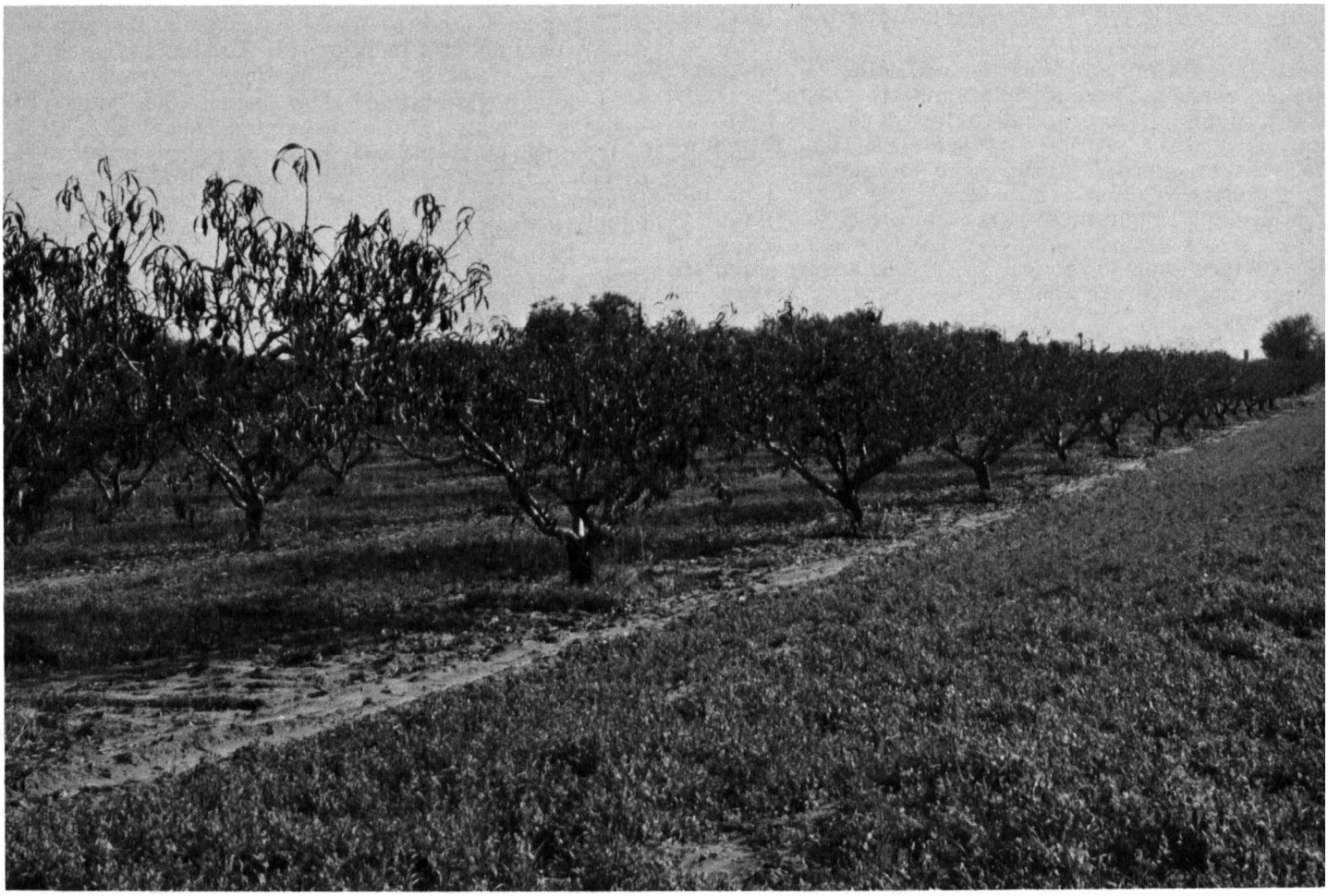

Figure 10.—**Orchard and cover crop of oats and winter peas on Duffau and Weatherford soils, 1 to 5 percent slopes.**

soils of minor extent. Duffau soils are dominant. They make up 37 to 60 percent of the mapped area. They are present in all areas, mostly along lower slopes. Weatherford soils make up 15 to 40 percent of the mapped areas, and are mostly on the more convex slopes.

The surface layer of Duffau soils is brown fine sandy loam about 6 inches thick. The next 12 inches is yellowish-red sandy clay loam. Below this is 42 inches of red sandy clay loam. The underlying material is reddish-yellow sandy clay loam.

The surface layer of Weatherford soils is brown fine sandy loam about 4 inches thick. Next, in sequence downward, is 2 inches of light-gray fine sandy loam, 22 inches of yellowish-red sandy clay loam, and 16 inches of brown sandy clay loam. The underlying material is pinkish white, weakly cemented packsand.

Included with this unit in mapping are some small areas of May, Selden, and Windthorst soils. May and Selden soils are along less sloping foot slopes, and Windthorst soils are along upper slopes and ridges. Also included are a few areas of uneroded Duffau and Weatherford soils, some areas where the surface layer is loamy fine sand, and a few small gullies and rills.

This mapping unit is used mostly for pasture, crops, and orchards. Some areas are used as range. The hazard of water erosion is moderate. Runoff is medium. Capability unit IIIe–1; Sandy Loam range site; pasture group 8C.

DwD2—Duffau and Weatherford soils, 5 to 8 percent slopes, eroded. These sloping soils are on upland hillsides. Much of the original surface layer has been removed by water erosion. Mapped areas have thin surface layers, exposed subsoils, and occasional small rills and gullies. Gullies are mostly along natural drains and are 200 to 500 feet apart, 2 to 6 feet deep, and 10 to 20 feet wide. Lower layers have been mixed with the surface layer in many areas. Areas are irregular in shape, and most are about 35 acres in size. Slopes are complex.

The composition of this unit is variable, and the pattern in which soils occur is not uniform. The average composition of this mapping unit is 51 percent Duffau soils, 22 percent Weatherford soils, and 27 percent soils of minor extent. Duffau soils are dominant. They make up to 40 to 60 percent of the mapped acreage, and are along foot slopes and lower parts of slopes. Weatherford soils make up 15 to 40 percent of mapped areas. They are along breaks and upper parts of slopes, but are not present in all areas.

The surface layer of Duffau soils is pale-brown fine sandy loam about 6 inches thick. The next 22 inches is yellowish-red sandy clay loam. Below this is 15 inches of reddish-yellow sandy clay loam, and then 25 inches of strong-brown sandy clay loam. The underlying material is pale-yellow, weakly cemented packsand.

The Weatherford soil has the profile described as representative of the Weatherford series.

Included with this unit in mapping are small sloping areas of Chaney, Selden, and Windthorst soils. Chaney and Selden soils are along lower slopes in slightly concave positions. Windthorst soils are along ridges and breaks. Some areas have small inclusions of rock outcrops. Also included are a few areas of loamy fine sand, some uneroded areas, and a few large gullies along natural drains.

This mapping unit is used mostly as range. Some areas are in pasture or crops and a few are in orchards. The hazard of water erosion is severe. Runoff is medium. Capability unit IVe–1; Sandy Loam range site; pasture group 8C.

DyD3—Duffau and Weatherford soils, 2 to 8 percent slopes, severely eroded. These gently sloping to sloping, severely eroded soils are on upland hillsides. Over three-fourth of the original surface layer has been removed by water erosion, and small gullies and rills are common in mapped areas. Gullies are 2 to 7 feet deep, 3 to 15 feet wide, 50 to 200 feet apart, and occur in branching patterns. Gullies make up 5 to 20 percent of mapped areas.

The composition of this unit is variable, and the pattern in which soils occur is not uniform. Average composition of the unit is 55 percent Duffau soils, 31 percent Weatherford soils, and 14 percent soils of minor extent. Duffau soil is dominant and makes up to 50 to 60 percent of mapped areas. Weatherford soils make up 20 to 40 percent of mapped areas.

The surface layer of Duffau soils is brown fine sandy loam about 6 inches thick. The next 60 inches is reddish-yellow sandy clay loam. The underlying material is white, weakly cemented packsand.

The surface layer of Weatherford soils is brown fine sandy loam about 4 inches thick. The next 11 inches is yellowish-red sandy clay loam. Below this is 30 inches of reddish-yellow sandy clay loam. The underlying material is white, weakly cemented packsand.

Included with this unit in mapping are small areas of Chaney, Selden, and Windthorst soils. Chaney and Selden soils are along lower slopes, and Windthorst soils are along ridges. Also included are areas of loamy fine sand, areas where the surface layer and lower layers have been mixed to form more clayey textures, some areas of soils that are only slightly eroded, and a few deep gullies.

This mapping unit is used mostly for range. It is not suited to cultivation. The hazard of water erosion is severe. Runoff is medium. Capability unit VIe–1; Sandy Loam range site; not assigned to a pasture group.

Frio Series

The Frio series consists of deep, nearly level, calcareous loamy soils on bottom lands. These soils formed in calcareous loamy to clayey alluvial sediments.

In a representative profile the surface layer is very dark grayish-brown calcareous clay loam about 18 inches thick. The next 28 inches is very dark grayish-brown, calcareous silty clay. The underlying material is grayish-brown, calcareous silty clay loam.

These soils are well drained. Runoff is slow. Permeability is moderately slow, and the available water capacity is high.

Frio soils are used for crops and pasture.

Representative profile of Frio clay loam, frequently flooded, in a cultivated field, north of a county road, 1

mile west and southwest of the post office at Aledo, 1,050 feet north of road:

Ap—0 to 6 inches, very dark grayish-brown (10YR 3/2) clay loam, very dark brown (10YR 2/2) moist; moderate, medium, subangular blocky structure; very hard, firm; common fine roots and pores; few fine concretions; common insect casts and burrows; calcareous, moderately alkaline; abrupt, smooth boundary.

A11—6 to 18 inches, very dark grayish-brown (10YR 3/2) clay loam, very dark brown (10YR 2/2) moist; moderate, medium, subangular blocky structure; very hard, firm; few fine roots; few fine concretions; calcareous, moderately alkaline; gradual, wavy boundary.

A12—18 to 46 inches, very dark grayish-brown (10YR 3/2) silty clay, very dark brown (10YR 2/2) moist; moderate, medium, subangular blocky structure; very hard, firm; few fine roots; few fine concretions and films of calcium carbonate; calcareous, moderately alkaline; clear, wavy boundary.

C—46 to 60 inches, grayish-brown (10YR 6/2) silty clay loam, grayish brown (10YR 5/2) moist; massive; very hard, firm; few concretions and common films and threads of calcium carbonate; calcareous, moderately alkaline.

The A horizon is dark grayish-brown, very dark grayish brown, brown, or grayish brown and is 22 to 58 inches thick.

The B horizon is present in some profiles and is lighter colored than in the A horizon.

The C horizon is grayish brown or very dark brown to very dark grayish brown clay, clay loam, or silty clay loam. Some areas have underlying gravel or limestone at a depth of 6 to 20 feet.

Fc—Frio clay loam, occasionally flooded. This nearly level soil is along drainageways on occasionally flooded bottom land. Mapped areas are elongated in shape and some areas are more than a mile long. Areas are 10 to more than 100 acres in size, but average about 30 acres.

The surface layer is brown calcareous clay loam about 12 inches thick. The next 28 inches is very dark grayish-brown calcareous clay. The underlying material is very dark brown calcareous clay.

Included with this soil in mapping are small, slightly higher areas of Bosque and Bunyan soils along stream banks. Also included were a few small areas of Frio clay loam, frequently flooded.

The hazard of water erosion is slight, but soil areas are subject to flooding. They were flooded as often as one or more times in 4 to 10 years, mainly in May and September.

The acreage is used as pasture. Some areas are used for crops. Capability unit IIw–2; Loamy Bottom Land range site; pasture group 1C.

Ff—Frio clay loam, frequently flooded. This nearly level soil is on frequently flooded bottom land. Areas are elongated—they are narrow and, in many places, are several miles long. They are flooded at least once every 1 to 3 years, mostly in May or September and remain flooded for periods of 1 to 3 days. Mapped areas range from 10 to more than 100 acres in size, but average about 45 acres. This soil has the profile described as representative of the series.

Included with this soil in mapping are small areas of Bosque, Bunyan and Yahola soils near streambanks. Also included are areas of sloping soils along streambanks and a few small areas of Frio clay loam, occasionally flooded.

As a result of the severe flooding hazard, this soil is not suited to cultivation. Most areas are used as pasture or range (fig. 11). Capability unit Vw–1; Loamy Bottom Land range site; pasture group 1C.

Hardeman Series

The Hardeman series consists of deep, nearly level to strongly sloping, low lying, calcareous loamy soils on uplands. These soils formed in loamy sediments.

In a representative profile the surface layer is reddish-brown, calcareous very fine sandy loam about 10 inches thick. The next 40 inches is yellowish-red, calcareous very fine sandy loam. The underlying material is reddish-yellow calcareous fine sandy loam.

These soils are well drained. Runoff is slow to medium. Permeability is moderately rapid, and the available water capacity is medium.

Hardeman soils are used mostly for crops. Some areas are used as pasture and range.

Representative profile of Hardeman very fine sandy loam, 6 to 12 percent slopes, in a pasture, 0.65 mile east of the junction of a county road and Farm Road 1543 just south of the Brazos River bridge at Dennis, 250 feet north of road:

A1—0 to 10 inches, reddish-brown (5YR 4/4) very fine sandy loam, reddish brown (5 YR 4/4) moist; weak, fine, subangular blocky structure; slightly hard, friable; few fine roots and pores; calcareous, moderately alkaline; clear, smooth boundary.

B2—10 to 50 inches, yellowish-red (5YR 5/6) very fine sandy loam, yellowish red (5YR 4/6) moist; weak, medium, subangular blocky structure; slightly hard, friable; few fine roots and pores; few films and threads of calcium carbonate; calcareous, moderately alkaline; diffuse, wavy boundary.

C—50 to 60 inches, reddish-yellow (5YR 6/8) fine sandy loam, yellowish red (5YR 5/8) moist; few films, threads, and soft masses of calcium carbonate; calcareous, moderately alkaline.

The depth to visible carbonates is 10 to 34 inches.

The A horizon is brown, reddish brown, or light reddish brown. It is 8 to 30 inches thick, and is mildly alkaline or moderately alkaline.

The B and C horizons are yellowish red, reddish yellow, or reddish brown. Films, threads, and soft masses of calcium carbonate are common.

HaB—Hardeman very fine sandy loam, 0 to 2 percent slopes. This nearly level to gently sloping soil is on low lying uplands. Mapped areas are mostly about 35 acres in size. They are mostly between higher lying terrace soils and flood plains of the Brazos River.

The surface layer is light reddish-brown calcareous very fine sandy loam about 10 inches thick. The next 35 inches is reddish-brown, calcareous very fine sandy loam. The underlying material is reddish-brown, calcareous very fine sandy loam.

Included with the soil in mapping are a few small breaks where slopes are more than 2 percent and small areas of Bastrop soils along slight ridges.

Most of the acreage is used for crops. Some areas are used as improved pasture. Runoff is slow. The hazard of water erosion is slight, and the hazard of soil blowing is moderate. Capability unit IIe–4; Sandy Loam range site; pasture group 8C.

HaE—Hardeman very fine sandy loam, 6 to 12 percent slopes. This sloping to strongly sloping soil is on

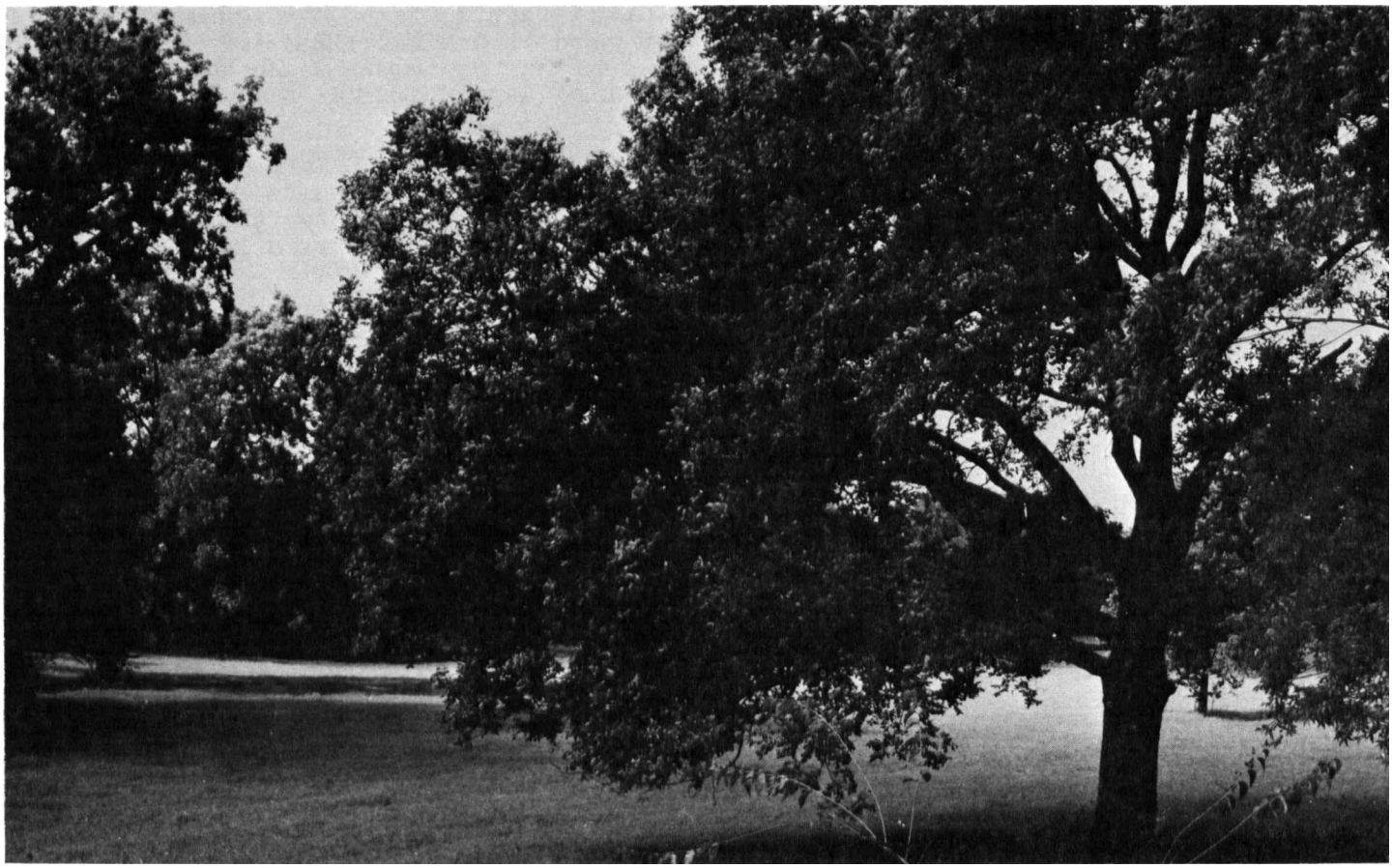

Figure 11.—Coastal bermudagrass and pecan trees on Frio clay loam, frequently flooded.

low lying upland terraces of the Brazos River. Mapped areas are long, narrow breaks paralleling the river. Most areas are about 30 acres in size. This soil has the profile described as representative of the series.

Included with this soil in mapping are areas where slopes are as much as 20 percent and some gullies that cross the mapped areas. Also included are Bastrop soils along slight ridges and small areas of Lincoln and Yahola soils along lower slopes.

Most of the acreage is used as range. It is not suitable for cultivation. Runoff is medium. The hazard of soil blowing is moderate, and the hazard of water erosion is severe. Capability unit VIe–2; Sandy Loam range site; not assigned to a pasture group.

Hassee Series

The Hassee series consists of deep, nearly level, noncalcareous loamy soils on uplands. These soils formed in clayey sediments.

In a representative profile the surface layer is grayish-brown fine sandy loam about 8 inches thick. Next, in sequence downward, is 6 inches of grayish-brown loam, 1 inch of light-gray loam, 21 inches of dark grayish-brown clay, and 14 inches of light brownish-gray clay. The underlying material is light brownish-gray clay loam.

These soils are somewhat poorly drained. Runoff is very slow. Permeability is very slow, and the available water capacity is high.

Most of the Hassee soils are used as pasture. A few areas are cultivated.

Representative profile of Hassee fine sandy loam, 0 to 1 percent slopes, 8 miles west of Weatherford via U.S. Highway 80, to a county road 1 mile east of Brock Junction, 0.09 mile north on county road, east of road, 400 feet from fence:

Ap—0 to 8 inches, grayish-brown (10YR 5/2) fine sandy loam, very dark grayish brown (10YR 3/2) moist; massive; very hard, friable; common fine roots; slightly acid; abrupt, smooth boundary.

A1—8 to 14 inches, grayish-brown (10YR 5/2) loam, very dark grayish brown (10YR 3/2) moist; massive; hard, friable; common fine roots and pores; slightly acid; clear, smooth boundary.

A2g—14 to 15 inches, light-gray (10YR 7/1) loam, gray (10YR 5/1) moist; massive; hard, friable; few roots and pores; slightly acid; clear, wavy boundary.

B21t—15 to 24 inches, dark grayish-brown (10YR 4/2) clay, very dark grayish brown (10YR 3/2) moist; moderate, medium, subangular blocky structure; extremely hard, very firm; few fine roots and pores; slightly acid; gradual, smooth boundary.

B22t—24 to 36 inches, dark grayish-brown (10YR 4/2) clay, very dark grayish brown (10YR 3/2) moist; common, fine, distinct mottles of red, yellow, and brown; moderate, medium, subangular structure; extremely hard, very firm; few fine iron and manganese concretions; slightly acid; clear, smooth boundary.

B3tca—36 to 50 inches, light brownish-gray (10YR 6/2) clay, grayish brown (10YR 5/2) moist; moderate, medium, subangular blocky structure; extremely hard, firm; few small calcium carbonate concretions and soft masses; calcareous, moderately alkaline; clear, smooth boundary.

Cca—50 to 64 inches, light brownish-gray (2.5Y 6/2) clay loam, grayish brown (2.5Y 5/2) moist; very hard, firm; common yellowish-brown and olive-yellow mottles; few small calcium carbonate concretions and soft masses; calcareous, moderately alkaline.

Depth to calcium carbonate concretions or soft masses is 28 to 50 inches.

The A1 or Ap horizon is very dark grayish brown, grayish brown, or dark grayish brown and is 9 to 16 inches thick. The A2g horizon is light brownish gray, grayish brown, or light gray and is 1 to 6 inches thick. The A horizon is fine sandy loam or loam and is slightly acid or neutral.

The Bt horizon is dark grayish brown, very dark grayish brown, light brownish gray, or dark gray and is slightly acid to moderately alkaline. Mottles in shades of red, brown, or yellow are common in the lower part.

The C horizon is clay or clay loam.

HeA—Hassee fine sandy loam, 0 to 1 percent slopes. This nearly level soil is on slightly depressed uplands. Mapped areas are round in shape. They range from 5 to more than 30 acres in size, but most are about 20 acres.

Included with this soil in mapping are small areas of soils that have slopes of more than 1 percent; small areas of Blankett and Thurber soils; and areas of Bonti, Chaney, and Truce soils along slight ridges.

Water is ponded in many areas, and the surface layer is saturated in places during wet seasons. The hazard of water erosion is slight.

Most of the acreage is used as pasture. Some areas are used for crops or range. Capability unit IIIw–1; Claypan range site; pasture group 8A.

Heaton Series

The Heaton series consists of deep, gently sloping, noncalcareous sandy soils on uplands. These soils formed in deep loamy materials.

In a representative profile the surface layer is light-brown fine sand about 20 inches thick. Next, in sequence downward, is 10 inches of pink fine sand, 30 inches of red sandy clay loam, 10 inches of yellowish-red sandy clay loam, and 8 inches of yellowish-red sandy clay loam. Below this is yellowish-red sandy clay loam that has strong-brown mottles. The profile is slightly acid throughout.

These soils are well drained. Runoff is slow. Permeability is moderate, and the available water capacity is low.

Heaton soils are used mainly for crops. Some areas are used as pasture.

Representative profile (fig. 12) of Heaton fine sand, 1 to 5 percent slopes, in a cultivated field, 14 miles southwest of the courthouse in Weatherford to the intersection of Interstate Highway 20 and Farm Road 113, west on the south service road of Interstate Highway 20 for 1.1 miles, then south on county road for 1 mile, continue south on private road for 0.7 mile, 100 feet west of road:

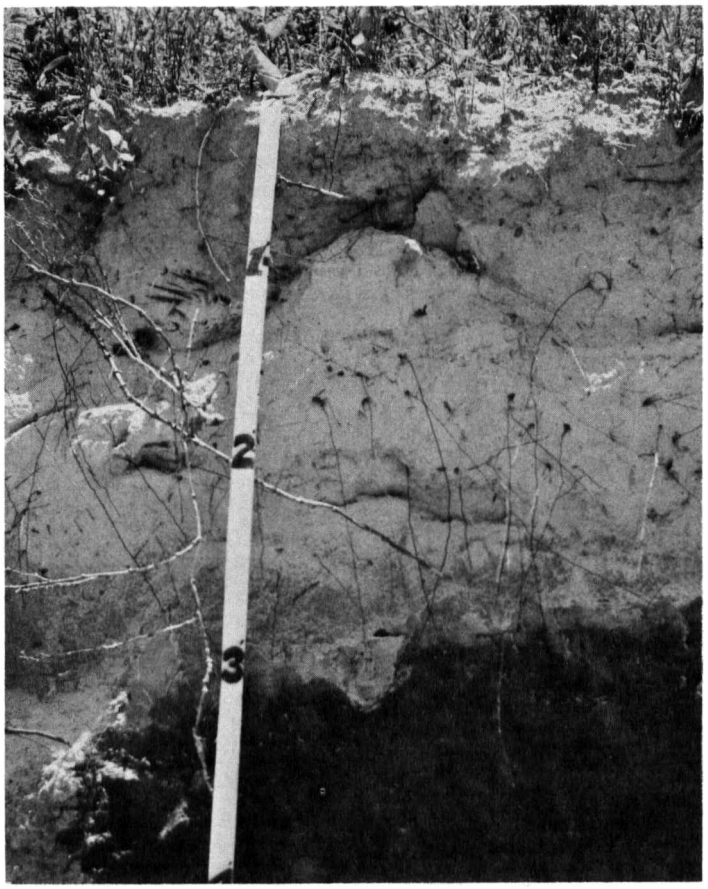

Figure 12.—**Profile of Heaton fine sand, 1 to 5 percent slopes.**

Ap—0 to 20 inches, light-brown (7.5YR 6/4) fine sand, brown (7.5YR 5/4) moist; single grained; loose; few fine roots; slightly acid; abrupt, smooth boundary.

A2—20 to 30 inches, pink (7.5YR 8/4) fine sand, light brown (7.5YR 6/4) moist; single grained; loose; slightly acid; abrupt, wavy boundary.

B21t—30 to 60 inches, red (2.5YR 5/6) sandy clay loam, red (2.5YR 4/6) moist; moderate, medium, subangular blocky structure; hard, firm; patchy clay films on faces of peds; slightly acid; gradual, wavy boundary.

B22t—60 to 70 inches, yellowish-red (5YR 5/6) sandy clay loam, yellowish red (5YR 4/6) moist; moderate, medium, subangular blocky structure; hard, firm; patchy clay films on faces of peds; few skeletans and clean sand grains; slightly acid; gradual, wavy boundary.

B23t—70 to 78 inches, yellowish-red (5YR 4/6) sandy clay loam, yellowish red (5YR 4/6) moist; moderate, medium, subangular blocky structure; slightly hard, friable; common light brown skeletans; slightly acid; abrupt, smooth boundary.

B24t—78 to 90 inches, yellowish-red (5YR 5/6) sandy clay loam, yellowish red (5YR 4/6) moist; common, medium, faint, strong-brown (7.5YR 5/6) mottles; moderate, medium, subangular blocky structure; hard, friable; slightly acid.

The solum is more than 60 inches thick. The A horizon is 20 to 40 inches thick and is slightly acid or neutral. The Ap or A1 horizon is light brown, brown, pink, very pale brown, or pale brown. The A2 horizon is lighter than the Ap or A1 horizons.

The Bt horizon is yellowish red, red, reddish brown, or reddish yellow. It is sandy clay loam or clay loam and is slightly acid to neutral. Some profiles lack brownish mottles

in the lower part, and most profiles have skeletans and clean sand grains in the lower part of the Bt horizon.

HfC—Heaton fine sand, 1 to 5 percent slopes. This gently sloping soil is on uplands. Mapped areas are irregular in shape. They range from 10 to more than 100 acres in size, but are mostly about 50 acres.

Included with this soil in mapping are small eroded areas and areas of a soil that is similar to Heaton soil but has a surface layer less than 20 inches thick. Also included are small areas of Bastrop, Duffau, Nimrod, Patilo, and Windthorst soils.

Most of the acreage is used for crops. Some areas are used as pasture. The hazard of water erosion is slight, and the hazard of soil blowing is severe. Capability unit IIIe–4; Sandy range site; pasture group 9A.

Hensley Series

The Hensley series consists of shallow, nearly level to gently sloping, noncalcareous loamy soils on uplands. These soils formed in material weathered from limestone bedrock.

In a representative profile the surface layer is reddish-brown, mildly alkaline clay loam about 6 inches thick. The next 8 inches is reddish-brown, mildly alkaline clay. It is underlain by indurated limestone bedrock.

These soils are well drained. Runoff is slow. Permeability is slow, and the available water capacity is low.

Hensley soils are used mostly for range. A few areas are used as pasture.

Representative profile of Hensley clay loam in an area of Hensley complex, 0 to 3 percent slopes, 16 miles southwest of Weatherford, via U.S. Highway 80 and Interstate 20, then 3.5 miles south and 0.05 mile west on county road, 50 feet north of road:

A1—0 to 6 inches, reddish-brown (5YR 4/4) clay loam, dark reddish brown (5YR 3/4) moist; moderate, medium, subangular blocky structure; hard, friable; limestone fragments, mostly 6 to 12 inches along the long axis, cover 10 percent of surface; mildly alkaline; clear, wavy boundary.

B2t—6 to 14 inches, reddish-brown (2.5YR 4/4) clay, dark reddish brown (2.5YR 3/4) moist; moderate, medium, subangular blocky structure; very hard, firm; 10 percent limestone fragments; mildly alkaline; abrupt, wavy boundary.

R—14 to 15 inches, indurated limestone bedrock.

The content of coarse limestone fragments ranges from none to 30 percent.

The A horizon is reddish brown or brown, and it is slightly acid to mildly alkaline.

The Bt horizon is reddish brown, dark reddish brown, red, or dark red. It is clay loam or clay and is neutral to moderately alkaline.

Depth to limestone bedrock is 10 to 20 inches.

HnB—Hensley complex, 0 to 3 percent slopes. This mapping unit consists of nearly level to gently sloping stony soils on uplands. Mapped areas are round, and they range from 20 to more than 800 acres in size. Limestone cobbles cover 0 to 30 percent of the surface.

About 52 percent of this unit is Hensley stony clay loam and 48 percent is similar soils. Hensley soils dominate, and the other soils in the unit are too intricately mixed to be separated at the scale of mapping used.

Included with this unit in mapping is a soil along slope breaks that is similar to Hensley soils but is calcareous and shallower. Also included are areas of Purves soils in slightly concave positions, areas of a soil that is similar to Hensley soil but less red, and small areas of rock outcrop.

Most of the acreage is used as range. The hazard of water erosion is moderate. Several large limestone quarries have been opened. Capability unit VIs–1; Redland range site; pasture group 13A.

Krum Series

The Krum series consists of deep, nearly level to gently sloping, calcareous clayey soils on uplands. These soils formed in thick beds of calcareous clayey sediments.

In a representative profile the surface layer is very dark grayish-brown and dark grayish-brown calcareous clay about 24 inches thick. Below this is 20 inches of grayish-brown calcareous clay, then grayish-brown calcareous clay with common calcium carbonate concretions.

These soils are well drained. Runoff is slow to medium. Permeability is moderately slow, and the available water capacity is high.

Most areas of these soils are used for crops. Improved pasture has been established in some areas and some are used as range.

Representative profile of Krum clay, 1 to 3 percent slopes, northeast of Weatherford. From the courthouse in Weatherford, 4 miles east on U.S. Highway 180, 7 miles north on Farm Road 1707, 50 feet east of field gate on east side of road:

Ap—0 to 6 inches, very dark grayish-brown (10YR 3/2) clay, very dark brown (10YR 2/2) moist; weak, fine and medium, subangular blocky structure; hard, firm; common fine roots; few fine cemented calcium carbonate concretions; calcareous, moderately alkaline; abrupt, smooth boundary.

A11—6 to 12 inches, very dark grayish-brown (10YR 3/2) clay, very dark brown (10YR 2/2) moist; moderate, medium, subangular blocky structure; hard, firm; few fine cemented calcium carbonate concretions; calcareous, moderately alkaline; gradual, wavy boundary.

A12—12 to 24 inches, dark grayish-brown (10YR 4/2) clay, very dark grayish brown (10YR 3/2) moist; moderate, fine and medium, subangular blocky structure; very hard, firm; few fine roots and pores; few fine calcium carbonate concretions; calcareous, moderately alkaline; gradual, wavy boundary.

B2—24 to 44 inches, grayish-brown (10YR 5/2) clay, dark grayish brown (10YR 4/2) moist; moderate, medium, subangular blocky structure; very hard, firm; few roots; few fine calcium carbonate concretions; calcareous, moderately alkaline; gradual, smooth boundary.

B2ca—44 to 60 inches, grayish-brown (10YR 5/2) clay, dark grayish brown (10YR 4/2) moist; moderate, medium, subangular blocky structure; hard, firm; common, fine and medium, strongly cemented calcium carbonate concretions; calcareous, moderately alkaline.

These soils crack to a depth of 24 to 48 inches when dry. Some profiles contain a few limestone fragments.

The A horizon is brown, dark grayish brown, very dark grayish brown, grayish brown, or dark brown.

The B horizon is brown, light brown, grayish brown, or reddish brown. It is clay, silty clay, or clay loam.

The C horizon is pale-brown or light yellowish-brown silty clay loam or clay. It contains 2 to 20 percent calcium carbonate.

KcA—Krum clay, 0 to 1 percent slopes. This nearly level, low-lying soil is on uplands. Mapped areas are long, and range from about 10 to more than 70 acres in size. They follow the contour of more sloping limestone soils.

The surface layer is very dark grayish-brown calcareous clay about 8 inches thick. The next 27 inches is reddish-brown calcareous clay. Below this is grayish-brown calcareous clay to a depth of 60 inches or more.

Included with this soil in mapping are a few areas of Krum soil that has a slope of more than 1 percent; areas of Blanket and Frio soils in slight depressions; and areas of Denton, Purves, and Venus soils along slight ridges. Also included are a few small rock outcrops, and some soils that have a clay loam surface layer.

Most of the acreage is used for crops. Some areas are in improved pasture and range. Runoff is slow, and the hazard of water erosion is slight. Capability unit IIs–1; Clay Loam range site; pasture group 7C.

KcB—Krum clay, 1 to 3 percent slopes. This gently sloping soil is on uplands. Mapped areas are long. They range from 5 to more than 70 acres in size, but average about 35 acres. This soil has the profile described as representative of the series.

Included with this soil in mapping are areas where the slope is less than 1 percent; small areas of Aledo, Denton, Purves, and Venus soils along slight ridges and upper slopes; and small areas of Frio soils along drainageways.

Most of the acreage is used for crops. Some areas are used as pasture and range. Runoff is medium. The hazard of water erosion is moderate. Capability unit IIe–1; Clay Loam range site; pasture group 7C.

Lamar Series

The Lamar series consists of deep, gently sloping to sloping, calcareous loamy soils on uplands. These soils formed in calcareous loamy sediments.

In a representative profile the surface layer is brown calcareous clay loam about 6 inches thick. The next 34 inches is pale-brown, calcareous silty clay loam. The underlying material is white calcareous silty clay loam.

These soils are well drained. Runoff is rapid. Permeability is moderate, and the available water capacity is medium.

Lamar soils are mostly in native range. Some areas are used for crops.

Representative profile of Lamar clay loam, 5 to 8 percent slopes, in a pasture, 4 miles east of the courthouse at Weatherford via U.S. Highway 180, 1.2 miles south and west on county road, then 0.5 mile east, 200 feet north of road:

A1—0 to 6 inches, brown (10YR 5/3) clay loam, dark brown (10YR 4/3) moist; moderate, medium, granular structure; hard, friable, sticky and plastic; calcareous, moderately alkaline; clear, smooth boundary.

B2—6 to 40 inches, pale-brown (10YR 6/3) silty clay loam, brown (10YR 5/3) moist; moderate, medium, subangular blocky and granular structure; hard, friable; calcareous, moderately alkaline; clear, smooth boundary.

C—40 to 60 inches, white (10YR 8/2) silty clay loam, light gray (10YR 7/2) moist; massive; common, soft masses of calcium carbonate and about 10 percent limestone fragments; calcareous, moderately alkaline.

The combined A and B horizon is 20 to 50 inches thick. The content of calcium carbonate is less than 40 percent.

The A horizon is grayish brown, brown, or pale brown. It is 3 to 9 inches thick.

The B and C horizons are light gray, light brownish gray, very pale brown, pale brown, or white. They are loam, clay loam, or silty clay loam. Films, threads, and concretions of calcium carbonate range from few to about 20 percent. Gravel beds and marl several feet thick occur below a depth of 40 inches in some profiles.

LaC—Lamar clay loam, 3 to 5 percent slopes. This gently sloping soil is on convex uplands along major streams. Mapped areas are irregular to elongated in shape. They range from 5 to 40 acres in size, but average about 20 acres.

The surface layer is pale-brown, calcareous clay loam about 6 inches thick. The next 20 inches is very pale brown calcareous clay loam. Below this is 10 inches of very pale brown calcareous loam. The underlying material is calcareous marl containing about 30 percent gravel.

Included with this soil in mapping are small gently sloping to sloping areas of Aledo, Brackett, and Purves soils; small areas of Krum and Venus soils along foot slopes; and small areas of Duffau, Windthorst, and Weatherford soils. Also included are a few small gullies and eroded areas.

Most of the acreage was once used for crops, but is now used as pasture and range. The hazard of water erosion is moderate. Capability unit IIIe–5; Clay Loam range site; pasture group 7C.

LaD—Lamar clay loam, 5 to 8 percent slopes. This sloping soil is on uplands along major drains. Mapped areas are long and follow the slope contour. They range from 5 to 50 acres in size, but average about 30 acres. This soil has the profile described as representative of the series.

Included with this soil in mapping are small areas of Aledo, Brackett, and Purves soils along upper slopes; small areas of Bolar, Krum, and Venus soils along foot slopes; and a few small gullies and eroded areas. Also included are small areas of Duffau, Weatherford, and Windthorst soils in some places.

Most of the acreage was once cultivated but is now used as pasture and range. The hazard of water erosion is severe. Capability unit IVe–2; Clay Loam range site; pasture group 7D.

Lincoln Series

The Lincoln series consists of deep, nearly level to gently sloping, calcareous sandy soils on bottom lands. These soils formed in recent sandy alluvium along the Brazos River.

In a representative profile the surface layer is pale-brown, calcareous loamy fine sand about 7 inches thick. The underlying material is very pale brown, calcareous, stratified fine sand.

These soils are somewhat excessively drained. Runoff is slow. Permeability is rapid, and the available water capacity is low. Depth to the water table is 5 to 8 feet.

Lincoln soils are used mostly as pasture or range. Many areas are used for recreation.

Representative profile of Lincoln loamy fine sand, in an area of Lincoln soils, frequently flooded, in a wooded pasture, approximately 16 miles southwest of Weatherford. From the south end of the Brazos River bridge on Farm Road 1543 at Dennis, east on a county road 0.63 mile, 0.44 mile north of road:

A1—0 to 7 inches, pale-brown (10YR 6/3) loamy fine sand, brown (10YR 4/3) moist; weak, medium, subangular blocky structure; soft, very friable; common fine roots; thin strata of silt loam and fine sand; calcareous, moderately alkaline; gradual, wavy boundary.

C—7 to 60 inches, very pale brown (10YR 8/3) fine sand, pale brown (10YR 6/3) moist; single grained; loose; thin strata of very fine sandy loam and loamy fine sand; calcareous, moderately alkaline.

The A horizon is brown, pale brown, light yellowish brown, light brown, or reddish yellow, and is loamy fine sand, fine sand, and some fine sandy loam. It is 6 to 14 inches thick.

The C horizon is pink, light brown, pinkish white, very pale brown, or white and is mainly fine sand or loamy fine sand. It contains a few thin strata of fine sandy loam or very fine sandy loam.

Lf—Lincoln soils, frequently flooded. These nearly level to gently sloping soils are on the natural levee and adjacent bottom land of the Brazos River. Slopes are 0 to 5 percent. Mapped areas are flooded one or more times every 1 to 4 years. Floods occur mostly in May and September and areas remain flooded for periods of 1 day to several weeks. Mapped areas are long and narrow along riverbanks. They range from 10 to 60 acres in size, but average 45 acres.

Included with this soil in mapping are small areas of Yomont soils, areas of Hardeman soils along slightly higher positions, and Norwood and Ships soils in slight depressions.

Most of the acreage is used as pasture and wildlife areas. Many areas along Lake Granbury and in other places have been developed for recreation uses. The hazards of flooding and soil blowing are severe. Capability unit Vw–2; Sandy Bottom Land range site; pasture group 3A.

Lindy Series

The Lindy series consists of moderately deep, gently sloping, noncalcareous loamy soils on uplands. These soils formed in loamy to clayey materials over thick beds of limestone.

In a representative profile the surface layer is reddish-brown, neutral loam about 10 inches thick. The next 15 inches is reddish-brown, slightly acid clay. It is underlain by indurated platy limestone.

These soils are well drained. Runoff is moderate. Permeability is slow, and the available water capacity is medium.

Lindy soils are used mostly as range. A few areas are used for crops.

Representative profile of Lindy loam, 1 to 3 percent slopes, in native range, 18 miles southwest of Weatherford. From the Brazos River bridge on Interstate Highway 20, west 0.8 mile, then south on a county road for 2.1 miles, 50 feet west of push gate:

A1—0 to 10 inches, reddish-brown (5YR 4/4) loam, dark reddish brown (5YR 3/4) moist; weak, subangular blocky structure; slightly hard when dry, friable when moist; many fine roots and pores; few fine quartz pebbles; neutral; clear, wavy boundary.

B2t—10 to 25 inches, reddish-brown (2.5YR 5/4) clay, reddish brown (2.5YR 4/4) moist; moderate, fine and medium, subangular blocky structure; very hard when dry, firm when moist; few fine roots and pores; common, distinct clay films; few fine iron and manganese concretions; slightly acid; abrupt, wavy boundary.

R—25 to 27 inches, indurated platy limestone.

The content of coarse fragments throughout the soil ranges from 0 to 10 percent.

The A horizon is reddish brown, brown, or dark brown. It is 5 to 12 inches thick and is slightly acid to mildly alkaline.

The B horizon is reddish brown, brown, red, or yellowish red. It is clay loam or clay and is slightly acid to mildly alkaline.

Depth to the R horizon is 20 to 40 inches.

LnB—Lindy loam, 1 to 3 percent slopes. This gently sloping soil is on uplands. Mapped areas are irregular to round in shape. They range from 5 to 100 acres in size, but average about 35 acres.

Included with this soil in mapping are small areas of Aledo and Hensley soils, a few small areas of Bonti and Truce soils near breaks, a few rock outcrops, and a soil that is similar to Lindy but that contains more coarse fragments.

This soil is used mainly as range. A few areas are used for pasture and crops. In several areas the limestone under this soil is quarried for use as road base. The hazard of water erosion is moderate. Capability unit IIIe–8; Deep Redland range site; pasture group 7C.

Maloterre Series

The Maloterre series consists of very shallow, gently sloping to steep, calcareous gravelly loamy soils on uplands. These soils formed in material weathered from limestone containing many imbedded fossil shells.

In a representative profile the surface layer is grayish brown, calcareous gravelly clay loam about 7 inches thick. It is underlain by indurated limestone containing many fossil shells.

These soils are somewhat excessively drained. Runoff is rapid. Permeability is moderately slow, and the available water capacity is very low.

Maloterre soils are used as range.

Representative profile of Maloterre gravelly clay loam, in an area of Maloterre soils, 2 to 5 percent slopes, in native range, 7 miles north of Weatherford. From the courthouse in Weatherford, north on Farm Road 51 for 5.5 miles, then west on county road for 0.3 miles, then north for 1.1 miles, 50 feet west of road:

A1—0 to 7 inches, grayish-brown (10YR 5/2) gravelly clay loam, dark grayish brown (10YR 4/2) moist; moderate, fine, granular structure; hard, firm; approximately 15 percent fine shell and limestone fragments; few limestone fragments 3 to 8 inches in diameter; calcareous, moderately alkaline; abrupt boundary.

R—7 to 10 inches, indurated limestone containing many fossil shells.

The A horizon is grayish brown, dark grayish brown, brown, pale brown, or very pale brown and is gravelly clay loam, clay loam, or gravelly clay. Content of limestone fragments, mostly of pebble size, ranges from 5 to 35 percent. Depth to the R horizon is 3 to 10 inches.

MaC—Maloterre soils, 2 to 5 percent slopes. These gently sloping soils are on uplands. Mapped areas follow the contour of ridgetops. They range from 5 to more than 100 acres in size, but average about 40 acres.

Included with this soil in mapping are areas of Aledo, Bolar, and Purves soils and areas of Brackett soils along breaks. Also included is as much as 10 percent rock outcrop.

Most of the acreage is used as range. Some areas are used only for wildlife and recreation. The hazard of water erosion is moderate. Capability unit VIIs–1; Very Shallow range site; pasture group 13A.

May Series

The May series consists of deep, gently sloping, noncalcareous loamy soils on uplands. These soils formed in local loamy alluvium.

In a representative profile the surface layer is brown, neutral fine sandy loam about 12 inches thick. The next 14 inches is brown sandy clay loam. Below this is 14 inches of light yellowish-brown sandy clay loam. The next lower layer to a depth of 60 inches is light brownish-gray clay loam.

These soils are well drained. Runoff is slow. Permeability is moderate, and the available water capacity is high.

May soils are used mostly as pasture and range. Some areas are used for crops.

Representative profile of May fine sandy loam, 1 to 3 percent slopes, in a cultivated field, 2 miles south of the Farm Road 1543 river bridge at Dennis, then 0.33 mile west on county road, 100 feet south of road:

Ap—0 to 12 inches, brown (7.5YR 5/4) fine sandy loam, dark brown (7.5YR 4/4) moist; weak, medium, subangular blocky structure; slightly hard, friable; few fine roots and pores, few fine quartz pebbles; neutral; abrupt, smooth boundary.

B21t—12 to 26 inches, brown (10YR 5/3) sandy clay loam, brown (10YR 4/3) moist; weak, subangular blocky structure; hard, friable; few fine roots and pores; common, distinct clay films; mildly alkaline; gradual, wavy boundary.

B22t—26 to 40 inches, light yellowish-brown (10YR 6/4), sandy clay loam, yellowish brown (10YR 5/4) moist; moderate, medium, subangular blocky structure; very hard, firm; common, distinct clay films; common insect casts and burrows; mildly alkaline; clear, smooth boundary.

IIB23t—40 to 60 inches, light brownish-gray (10YR 6/2) clay loam, dark brown (10YR 4/3) moist; moderate, medium, blocky structure; very hard, firm; few faint red and brown mottles and few fine iron and manganese concretions; mildly alkaline.

The A horizon is brown or grayish brown. It is 8 to 16 inches thick and is slightly acid or neutral.

The B2 horizon is dark grayish brown, yellowish brown, light yellowish brown, or brown. It is sandy clay loam, loam, or clay loam and is neutral to mildly alkaline.

Depth to the IIB2t or C horizon ranges from 40 to more than 60 inches. Texture is sandy clay loam, clay loam, or clay, and reaction is neutral to mildly alkaline.

MfB—May fine sandy loam, 1 to 3 percent slopes. This gently sloping soil is on upland foot slopes and in valleys. Mapped areas are elongated and follow the contour of higher lying hills. They range from 5 to 100 acres in size, but average about 15 acres.

Included with this soil in mapping are small areas of May soils that have less than one percent slope and a few small rills and eroded places. Also included are areas of gently sloping Duffau, Weatherford, and Windthorst soils along upper slopes of ridges, small areas of Bunyan and Yahola soils near natural drains, and Blanket and Hassee soils in slightly depressed areas.

Most of the acreage is used as pasture and range. Some areas are used for crops. This May soil is suited to all crops grown in the area. The hazard of water erosion is slight. Capability unit IIe–3; Sandy Loam range site; pasture group 8C.

Nimrod Series

The Nimrod series consists of deep, gently sloping to sloping, noncalcareous sandy soils on uplands. These soils formed in sandy and loamy materials reworked by wind.

In a representative profile the surface layer is light gray, neutral fine sand about 8 inches thick. The next 20 inches is very pale brown, slightly acid fine sand. Below this is 17 inches of brownish-yellow, medium acid sandy clay loam mottled with light gray and red, then light gray, medium acid sandy clay mottled with dark red.

These soils are moderately well drained. Runoff is very slow. Permeability is moderately slow, and the available water capacity is low. The surface absorbs water rapidly, and the soil has a perched water table at a depth of 20 to 40 inches for short periods after rains.

These soils are used mostly for crops and pasture. Some areas are in native range and timber.

Representative profile of Nimrod fine sand, 1 to 5 percent slopes, southwest of Poolville. From the junction of Farm Road 920 and Farm Road 3107 at Poolville, west 0.5 mile, then south and west on county road for 2.5 miles, 50 feet south of road:

A1—0 to 8 inches, light-gray (10YR 7/2) fine sand, light brownish gray (10YR 6/2) moist; single grained; loose; common fine roots; neutral; clear, wavy boundary.

A2—8 to 28 inches, very pale brown (10YR 7/3) fine sand, pale brown (10YR 6/3) moist; single grained; loose; slightly acid; abrupt, wavy boundary.

B21t—28 to 45 inches, brownish-yellow (10YR 6/6) sandy clay loam; common, coarse, distinct mottles of light gray (10YR 6/1) and red (2.5YR 4/6); moderate, medium, blocky structure; very hard, firm; common, distinct clay films on faces of peds; medium acid; gradual, wavy boundary.

B22t—45 to 65 inches, light-gray (10YR 7/2) sandy clay, light brownish gray (10YR 6/2) moist; common, coarse, distinct mottles of dark red (2.5YR 3/6); moderate, medium, blocky structure; extremely hard, firm; medium acid.

The A horizon is 20 to 40 inches thick and is slightly acid to neutral. The A1 horizon is light gray, grayish brown, pale brown, or yellowish brown. The A2 horizon is pale brown, very pale brown, or light yellowish brown.

The Bt horizon is 20 to more than 50 inches thick. It is light gray, reddish yellow, red, or brownish yellow and has common, coarse mottles of yellowish red, red, dark red, strong brown, pale brown, yellowish brown, light gray, or

light brownish gray. It is clay loam or sandy clay loam and is strongly acid to medium acid.

In places there is an underlying C horizon that is reddish-yellow to light-gray clay, sandy clay, sandy loam, or sand.

NdC—Nimrod fine sand, 1 to 5 percent slopes. This gently sloping soil is on uplands. Mapped areas are irregular to somewhat round in shape. They range from 10 to 300 acres in size, but average about 45 acres. This soil has the profile described as representative of the series.

Included with this soil in mapping are small areas of Heaton and Patilo soils on ridges; small areas of Duffau, Weatherford, and Windthorst soils along narrow ridges and more sloping areas; and small areas of Chaney and Selden soils. Also included are some areas of a soil that is similar to Nimrod soils but has a more clayey subsoil.

Most of the acreage is used for pasture. Some areas are used for crops and range. The hazard of water erosion is slight, but the hazard of soil blowing is severe. Capability unit IIIe–4; Sandy range site; pasture group 9A.

NdD—Nimrod fine sand, 5 to 8 percent slopes. This sloping soil is on uplands. Mapped areas are mostly round and encompass entire small hills and ridges. These areas range from 10 to 50 acres in size, but average about 20 acres.

The surface layer is grayish brown, slightly acid fine sand about 6 inches thick. The next 24 inches is light gray, slightly acid fine sand. Below this is 15 inches of red, strongly acid sandy clay loam mottled with light brownish gray, then about 20 inches of reddish-yellow sandy clay loam mottled with light gray. The underlying material is reddish-yellow fine sandy loam and loamy fine sand.

Included with this soil in mapping are small areas of Duffau, Weatherford, and Windthorst soils and, along ridges. small areas of Patilo and Selden soils.

Most of the acreage is used as pasture and range. A few areas are used for crops. The hazard of water erosion is moderate, and the hazard of soil blowing is severe. Capability unit IVe–3; Sandy range site; pasture group 9A.

Norwood Series

The Norwood series consists of deep, nearly level, calcareous loamy soils on bottom land. These soils formed in stratified calcareous loamy alluvium.

In a representative profile the surface layer is brown, calcareous silt loam about 6 inches thick. The underlying material to a depth of 60 inches is stratified, reddish-yellow, calcareous silt loam.

These soils are well drained. Runoff is slow. Permeability is moderate, and the available water capacity is high.

Norwood soils are used mostly for crops. Some areas are used as pasture. Some areas are being developed for recreation.

Representative profile of Norwood silt loam, 13 miles south of Weatherford. From the courthouse in Weatherford, south on State Highway 171, then south on Farm Road 1884 for 9 miles, then south and west on Horseshoe Bend Road for 4.2 miles, east of road 350 feet from fence:

Ap—0 to 6 inches, brown (7.5YR 5/4) silt loam, brown (7.5YR 4/4) moist; weak, subangular blocky structure; slightly hard, friable; common fine roots and pores; calcareous, moderately alkaline; abrupt, smooth boundary.

C—6 to 60 inches, reddish-yellow (5YR 6/6) silt loam, yellowish red (5YR 5/6) moist; massive; slightly hard, friable; few fine roots and pores; few thin bedding planes that have textures of silty clay loam and silty clay; calcareous, moderately alkaline.

The A horizon is 6 to 16 inches thick. It is yellowish red, reddish brown, light brown, or brown.

The underlying C horizon is reddish yellow, yellowish red, reddish brown, or brown. It is silt loam, silty clay loam, or loam and is moderately alkaline and calcareous.

Nr—Norwood silt loam. This nearly level soil is on bottom lands along the Brazos River. Mapped areas are weakly concave, broad or elongated flood plains. They range from 10 to 130 acres in size, but average about 55 acres. Slopes are 0 to 1 percent.

Included with this soil in mapping are small areas of Ships soils in depressions, small areas of Yomont and Lincoln soils, and small areas of Bastrop and Hardeman soils along slightly higher positions.

This soil is used mostly for crops. Some areas are used as improved pasture. The hazard of water erosion is slight. The soil is flooded about once in 10 to 15 years. Some areas are being developed for recreation. Capability unit I–1; Loamy Bottom Land range site; pasture group 2A.

Orthents

Orthents are shallow to deep, gently sloping to sloping, neutral sandy and loamy soil materials on uplands. They formed in weakly cemented sandstone. They are on very severely eroded gully sides and bottoms. Much of the original soil has eroded away leaving soil materials that have little horizonation.

The surface layer is typically yellowish-red sandy clay loam about 25 inches thick. The next 10 inches is reddish-yellow sandy clay loam. The underlying material is reddish-yellow and white packsand.

These soils are well drained. Permeability is moderate, and the available water capacity is low.

Orthents are used mostly as range. They are mapped only with the Duffau soils.

Owens Series

The Owens series consists of shallow, gently sloping to steep, calcareous clayey stony soils on uplands. These soils formed in materials weathered from shale.

In a representative profile the surface layer is light olive-brown, calcareous clay about 6 inches thick. The next 12 inches is light brownish-gray calcareous clay. Below this is 11 inches of light olive-gray, calcareous shaly clay. The underlying material is weak-red calcareous shaly clay containing strata of light olive gray and brownish yellow.

These soils are well drained. Runoff is rapid. Permeability is very slow, and the available water capacity is low.

Owens soils are used mostly as range. They are not suited to cultivated crops.

Representative profile of Owens clay in an area of Owens-Truce complex, 5 to 30 percent slopes, in a pasture, 2 miles south of Farm Road 1543 river bridge at Dennis, then 5.4 miles west on county road to pasture gate, then north 0.42 mile:

A1—0 to 6 inches, light olive-brown (2.5YR 5/4) clay, olive brown (2.5Y 4/4) moist; moderate, fine and medium, granular and subangular blocky structure; very hard, very firm, sticky and plastic; many fine roots; common, fine and medium calcium carbonate concretions; few stones on surface; calcareous, moderately alkaline; clear, smooth boundary.

B2ca—6 to 18 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; few fine roots; common fine calcium carbonate concretions; calcareous, moderately alkaline; gradual, wavy boundary.

C1—18 to 29 inches, light olive-gray (5Y 6/2) shaly clay, olive (5Y 5/3) moist; massive; extremely hard, extremely firm; few soft masses and concretions of calcium carbonate; few limestone fragments; calcareous, moderately alkaline; gradual, wavy boundary.

C2—29 to 40 inches, weak-red (10R 5/4) shaly clay, weak red (10R 4/4) moist; mottles and strata of light olive gray (5Y 6/2) and brownish yellow (10YR 6/6); massive; extremely hard, extremely firm; few calcium carbonate concretions; calcareous, moderately alkaline.

The A horizon is light olive brown, light brownish gray, olive, brown, or reddish brown. Large limestone and sandstone rocks, stones, and cobbles cover as much as 30 percent of the surface.

The Bca horizon is light brownish gray, olive, light olive brown, light yellowish brown, brown, or olive brown. It is clay or shaly clay. Concretions and soft masses of calcium carbonate are common.

The C horizon is at a depth of 15 to 20 inches. It is light olive gray, weak red, red, gray, olive yellow, reddish brown, or olive brown and is clay or shaly clay. Lumps of calcium carbonate are common.

OcE—Owens clay, 3 to 12 percent slopes. This gently sloping to strongly sloping soil is on uplands. Mapped areas are irregular to somewhat round in shape, and they follow the contour of slopes. Areas range from 10 to 50 acres in size, but average about 20 acres.

The surface layer is light brownish-gray calcareous clay about 6 inches thick. The next 12 inches is brown calcareous clay containing soft calcium carbonate masses. The underlying material is calcareous shaly clay.

Included with this soil in mapping are small areas of Bonti and Hensley soils along ridges, areas of Reap and Truce soils along foot slopes, a few gullies along drains, and some areas that have rock outcrops and stony surfaces.

This soil is used only as range. The hazard of water erosion is severe. Capability unit VIe–3; Shallow Clay range site; not assigned to a pasture group.

OtG—Owens-Truce complex, 5 to 30 percent slopes. These sloping to steep, stony soils are on hillsides and breaks. Slopes are dominantly 5 to 12 percent, but some are as much as 30 percent. Mapped areas are irregular in shape and follow the contour of hills. They range from 5 to 100 acres in size, but average about 25 acres (fig. 13).

About 60 percent of this complex is Owens soils, 34 percent is Truce soils, and 6 percent is included soils. Owens soils dominate the complex and have the stronger, convex slopes. Truce soils are along less sloping foot slopes and near upper slope breaks. Owens and Truce soils are both in every mapped area. They occur in patterns so intricately mixed that they cannot be separated at the scale of mapping used.

The profile of the Owens soil is that described as representative of the Owens series.

The surface layer of Truce soils is pale-brown, slightly acid fine sandy loam about 5 inches thick. The next 15 inches is yellowish-red, slightly acid clay. Below this is about 25 inches of strong-brown, mildly alkaline clay. The underlying material is light olive-brown, moderately alkaline shaly clay.

Included with this unit in mapping are small areas of Bonti, Hensley, and Lindy soils along ridges and upper slopes; Reap and Thurber soils along lower slopes in small concave positions; areas of limestone and sandstone rock outcrops; and a few gullies.

The unit is used only for range and for wildlife. The hazard of water erosion is severe. Capability unit VIIs–2; Shallow Clay range site; not assigned to a pasture group.

Patilo Series

The Patilo series consists of deep, gently sloping, noncalcareous sandy soils on uplands. These soils formed in thick beds of sandy material apparently reworked by wind.

In a representative profile the surface layer is very pale brown, slightly acid fine sand about 6 inches thick. The next layer is very pale brown, medium acid fine sand about 42 inches thick. Below this layer to a depth of 70 inches is yellowish-red, medium acid sandy clay loam that has light brownish-gray and yellowish-brown or light yellowish-brown mottles.

These soils are moderately well drained, and runoff is very slow. The surface layer absorbs water rapidly, and there is a perched water table during some seasons. Permeability is moderately slow, and available water capacity is low.

Patilo soils are used mainly as range and pasture. Some areas are used for crops.

Representative profile of Patilo fine sand, in an area of Patilo complex, 1 to 5 percent slopes, 5.5 miles north of the courthouse in Weatherford via Farm Road 51, then 1.4 miles northeast on county road, then 0.3 mile east on county road, 100 feet north of road and 210 feet west of a north-south property line fence:

A1—0 to 6 inches, very pale brown (10YR 7/3) fine sand, pale brown (10YR 6/3) moist; single grained; loose; few fine roots; slightly acid; clear, wavy boundary.

A2—6 to 48 inches, very pale brown (10YR 8/3) fine sand, very pale brown (10YR 7/3) moist; single grained; loose; few roots; medium acid; abrupt, wavy boundary.

B21t—48 to 60 inches, yellowish-red (5YR 5/8) sandy clay loam; many, medium, distinct mottles of light brownish gray (10YR 6/2) and yellowish brown (10YR 5/6); weak, medium, subangular blocky structure; hard, firm; common, prominent, clay films; medium acid; gradual, wavy boundary.

B22t—60 to 70 inches, yellowish-red (5YR 5/8) sandy clay loam; many, medium, distinct mottles of light

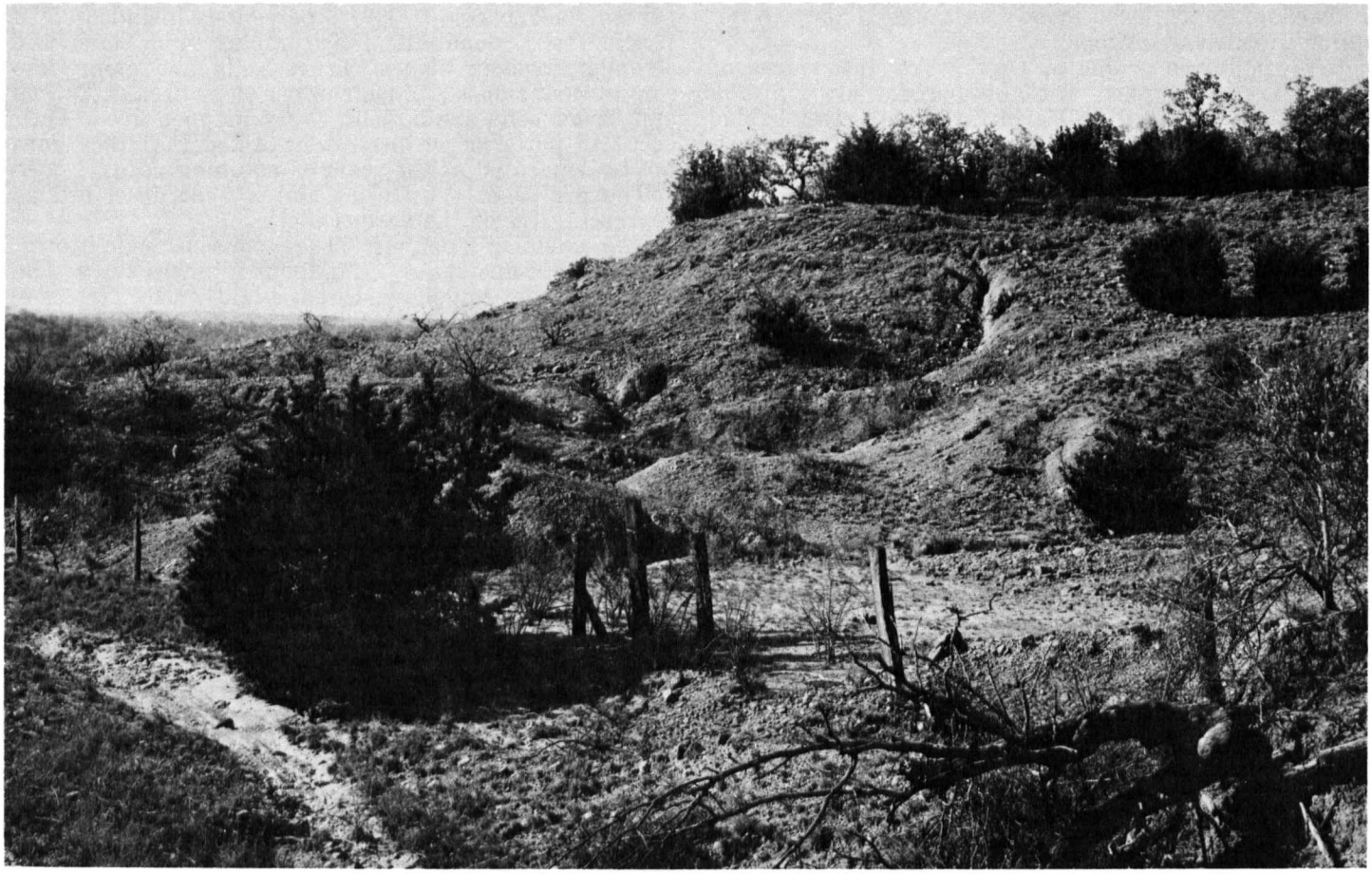

Figure 13.—Landscape of Owens-Truce complex, 5 to 30 percent slopes.

brownish gray (10YR 6/2) and light yellowish brown (2.5Y 6/4); weak, coarse, blocky structure; hard, firm; common, prominent clay films; medium acid.

The A horizon is 40 to 70 inches thick. The A1 horizon is very pale brown, grayish brown, pale brown, brown, or light brown. The A2 horizon is light yellowish brown, light brown, very pale brown, light gray, or white. It is fine sand or loamy fine sand and is neutral to medium acid.

The Bt horizon is dominantly yellowish red or red and has prominent mottles in shades of light yellowish brown, yellowish brown, light brownish gray, light gray, or very pale brown. It is clay loam or sandy clay loam and is slightly acid to strongly acid. Some profiles are dominantly yellow or gray and have many coarse reddish mottles. Clayey textures are in the lower part in places.

PaC—Patilo complex, 1 to 5 percent slopes. The gently sloping soils in this mapping unit are on upland hilltops. The slopes are complex. Mapped areas are irregular to rounded in shape and range from 5 to more than 100 acres in size. Most areas are about 40 acres.

This mapping unit is about 45 percent Patilo fine sand and 55 percent other closely similar soils. The similar Heaton and Nimrod soils that have a sandy, thinner surface layer than the Patilo soils make up about 20 percent of mapped areas. Heaton soils are on narrow ridges, and Nimrod soils are intermixed with Patilo soils on the less sloping plains. Another soil similar to Patilo soil but which has fine sand extending below a depth of 80 inches makes up 35 percent of the mapped areas. Patilo soils are along lower slopes and are dominant in larger areas. The other soils are mostly along undulating ridges in patterns so intricately mixed that they cannot be separated from the Patilo soils. A few areas of Patilo soils that have slopes of as much as 10 percent are also included.

This mapping unit is used mainly as range and pasture. A few small areas are used for crops. A perched water table is at a depth of 3 to 7 feet in some areas after heavy rains. The hazard of water erosion is slight. The hazard of soil blowing is severe. Capability unit IIIe–7; Deep Sand range site; pasture group 9B.

Purves Series

The Purves series consists of shallow, gently sloping, calcareous clayey soils on uplands. These soils formed in interbedded hard limestone and calcareous marls.

In a representative profile the surface layer is dark grayish brown, calcareous clay about 15 inches thick. It contains a few limestone fragments in the lower part. It is underlain by limestone bedrock that has few fractures.

These soils are well drained. Runoff is moderate. Permeability is moderately slow, and the available water capacity is low.

Purves soils are used mostly as range. Some areas are cultivated.

Representative profile of Purves clay, 1 to 3 percent slopes, in native range, 5.5 miles north of the courthouse in Weatherford via Farm Road 51, then west on a county road for 0.3 mile, then north 0.3 mile, 100 feet west of road:

Ap—0 to 10 inches, dark grayish-brown (10YR 4/2) clay, very dark grayish brown (10YR 3/2) moist; moderate, medium, granular structure; extremely hard, very firm, very sticky and very plastic; common roots and worm casts; common fine concretions and small limestone fragments; calcareous, moderately alkaline; clear, smooth boundary.

A1—10 to 15 inches; dark grayish-brown (10YR 4/2) clay, very dark grayish brown (10YR 3/2) moist; moderate, medium, granular structure; extremely hard, very firm, very sticky and very plastic; approximately 20 percent small limestone fragments; few thin coatings of soft lime on rock fragments; few films, threads, and soft masses of calcium carbonate; calcareous, moderately alkaline; abrupt, wavy boundary.

R—15 to 16 inches, limestone bedrock that has few fractures.

The A horizon is 12 to 20 inches thick. It is dark grayish brown, very dark grayish brown, brown, or dark gray. The lower part of the A horizon contains limestone fragments that have coatings of soft calcium carbonate.

Depth to the R horizon is 12 to 20 inches. It is strongly cemented to indurated limestone bedrock.

PcB—Purves clay, 1 to 3 percent slopes. This gently sloping soil is on upland ridges. Mapped areas are round in shape. They range from 5 to 100 acres in size, but average about 20 acres. This soil has the profile described as representative of the series.

Included with this soil in mapping are small areas of Aledo and Bolar soils on ridges; small areas of Krum, Denton, and Venus soils along lower slopes and valleys; a few small rock outcrops; a few eroded areas; and a few small areas of soils that have a slope of less than 1 percent in depressions.

Most of the acreage is used as range. A few small areas are used for crops. The hazard of water erosion is moderate. Capability unit IIIe–6; Shallow range site; pasture group 13A.

PcC—Purves clay, 3 to 5 percent slopes. This gently sloping soil is on upland prairies. Mapped areas follow the contour of the landscape. They range from 10 to 50 acres in size, but average about 20 acres.

The surface layer is very dark grayish-brown calcareous clay about 6 inches thick. The next 8 inches is very dark grayish-brown clay. The underlying material is indurated limestone bedrock.

Included with this soil in mapping are areas of Aledo and Bolar soils on ridges; small areas of Denton, Krum, and Venus soils along lower slopes and near drains; some rock outcrops; and some small eroded spots.

Most of the acreage is used as range. A few areas are used for crops. The hazard of water erosion is severe. Capability unit IVe–4; Shallow range site; pasture group 13A.

PuC—Purves-Urban land complex, 1 to 5 percent slopes. This gently sloping mapping unit is in urban areas throughout the city of Weatherford. Mapped areas are irregular to somewhat round in shape.

This mapping unit is about 60 percent Purves soils, 30 percent Urban land, and 10 percent soils of minor extent. The soils and urban areas are so intricately mixed that it is not practical to separate them at the scale of mapping used.

In undisturbed areas the Purves soil has a surface layer of dark grayish-brown clay about 10 inches thick. The next 5 inches is dark grayish-brown clay containing a few rock fragments. The underlying material is limestone bedrock that has a few fractures.

Urban land is used for works and structures. These are mostly single unit dwellings, streets, sidewalks, driveways, and patios. Also included are commercial buildings, shopping centers, schools, and parking areas.

Of minor extent in the unit are small areas of Aledo, Bolar, Denton, and Maloterre soils.

Many areas were disturbed for building construction. Cuts and fills were made for site leveling. Most cuts were made to depth of bedrock, and site leveling was done by making fills. Although the thickness of the soil horizons varies on these leveled sites, the basic soil characteristics remain much the same. Many lawns have an imported thin loamy surface layer.

The main soil characteristics that affect urban development are depth to bedrock and shrink-swell properties. Not assigned to a capability unit, range site, or pasture group.

Reap Series

The Reap series consists of deep, gently sloping, calcareous clayey soils on uplands. These soils formed in clayey and shaly sediments.

In a representative profile the surface layer is brown calcareous clay about 10 inches thick. The next 45 inches is yellowish-brown, calcareous clay. The underlying material is yellowish-brown shaly clay.

These soils are well drained. Runoff is medium. Permeability is very slow. The soil absorbs water very rapidly when it is dry and cracked but very slowly when it is wet. The available water capacity is high.

Reap soils are used mostly as range. A few small areas are used for crops.

Representative profile of Reap clay, 1 to 3 percent slopes, in range, 13 miles southwest of Weatherford. From the junction of Interstate Highway 20 and Farm Road 113 southwest of Weatherford, north on Farm Road 113 for 0.9 mile, 700 feet east of road:

A11—0 to 4 inches, brown (7.5YR 5/4) clay, dark brown (7.5YR 4/4) moist; moderate, medium, blocky structure; very hard, firm; calcareous, moderately alkaline; clear, wavy boundary.

A12—4 to 10 inches, brown (7.5YR 5/4) clay, dark brown (7.5YR 4/4) moist; moderate, fine, granular and subangular blocky structure; very hard, firm; common calcium carbonate concretions; few fine siliceous pebbles; calcareous, moderately alkaline; clear, wavy boundary.

AC—10 to 55 inches, yellowish-brown (10YR 5/4) clay, dark yellowish brown (10YR 4/4) moist; moderate, medium, subangular blocky structure; very hard, firm; common intersecting slickenslides and pressure faces; calcareous, moderately alkaline; clear, wavy boundary.

C—55 to 64 inches, yellowish-brown (10YR 5/4) shaly clay, dark yellowish brown (10YR 4/4) moist; rock structure; very hard, firm; calcareous, moderately alkaline.

The A1 horizon is 9 to 20 inches thick. The A and AC

horizons combined are 40 to more than 60 inches thick. The A1 horizon is brown or grayish brown. The AC horizon is yellowish brown, brown, or grayish brown.

The C horizon is brown, yellowish brown, and grayish brown and is clay, shaly clay or shale.

ReB—Reap clay, 1 to 3 percent slopes. This gently sloping soil is on upland plains. Mapped areas are somewhat round to irregular in shape, and they are along lower slopes of clayey hills. They range from 10 to 100 acres in size, but average about 20 acres.

Included with this soil in mapping are small areas of Chaney, Owens, Thurber, and Truce soils. Chaney soils are along upper slopes of narrow ridges. Owens and Truce soils are along breaks. Thurber soils are in weak depressions on lower slopes. Also included is a soil that is similar to Reap soil but has a redder color.

Most of the acreage is used as range. A few areas are used for crops. The hazard of water erosion is moderate. Capability unit IIIe–3; Clay Flat range site; pasture group 7A.

Selden Series

The Selden series consists of deep, gently sloping, noncalcareous sandy soils on uplands. These soils formed in loamy materials.

In a representative profile the surface layer is grayish-brown loamy fine sand about 4 inches thick. The next 14 inches is pale-brown loamy fine sand. Below this is 10 inches of brownish-yellow sandy clay loam that has grayish mottles. Below this, to a depth of 65 inches, is yellow sandy clay loam that has light gray mottles.

These soils are moderately well drained. Runoff is slow. Permeability is moderately slow, and the available water capacity is medium.

Selden soils are used mostly for crops and pasture.

Representative profile of Selden loamy fine sand, 1 to 5 percent slopes, 9 miles southwest of Weatherford. From Brock Junction east 0.6 mile, then south 0.43 mile on county road, 250 feet east of road:

A1—0 to 4 inches, grayish-brown (10YR 5/2) loamy fine sand, brown (10YR 4/3) moist; single grained; soft, very friable; few rounded siliceous pebbles; neutral; abrupt, wavy boundary.

A2—4 to 18 inches, pale-brown (10YR 6/3) loamy fine sand, brown (10YR 5/3) moist; weak, subangular blocky structure; soft, very friable; few rounded siliceous pebbles; neutral; abrupt, wavy boundary.

B21t—18 to 28 inches, brownish-yellow (10YR 6/6) sandy clay loam, yellowish brown (10YR 5/6) moist; few, faint, grayish mottles; weak, subangular blocky structure; hard, friable; slightly acid; gradual, wavy boundary.

B22t—28 to 50 inches, yellow (10YR 7/8) sandy clay loam; mottles of light gray (10YR 7/2); moderate, medium, blocky structure; hard, friable; slightly acid; gradual, wavy boundary.

B23t—50 to 65 inches, yellow (10YR 7/8) sandy clay loam; common medium mottles of light gray (2.5YR 7/1); weak, medium, subangular blocky structure; very hard, friable; medium acid.

The A horizon is 6 to 20 inches thick, and is slightly acid to neutral. The A1 horizon is light grayish brown, grayish brown, light yellowish brown, or pale brown. The A2 horizon is very pale brown, light brown, or pale brown.

The Bt horizon is 45 to 60 inches thick. It is sandy clay loam or clay loam and is slightly acid to medium acid. It is brownish yellow, yellow, yellowish red, or reddish yellow. Mottles are in shades of red, yellow, or gray.

Depth to the C horizon is more than 60 inches.

SdC—Selden loamy fine sand, 1 to 5 percent slopes. This gently sloping soil is on upland plains. Areas are irregular to oval shaped. They range from 5 to 100 acres in size, but average about 35 acres. This soil has the profile described as representative of the series.

Included with this soil in mapping are small areas of Duffau and Windthorst soils on ridges; small areas of Chaney, Nimrod, and Patilo soils along lower positions; a few small eroded areas; isolated small gullies; and a few areas that have a slope of as much as 8 percent.

Most of the acreage was once used for crops. Much is now used as pasture. The hazard of water erosion is slight, and the hazard of soil blowing is severe. Capability unit IIIe–4; Sandy range site; pasture group 9A.

SdC2—Selden loamy fine sand, 1 to 5 percent slopes, eroded. This gently sloping eroded soil is on uplands. Mapped areas are irregular in shape, and often follow the contour of slope and old field boundaries. Soil blowing and water erosion have removed much of the surface layer, and only 4 to 10 inches remain in most areas. Some areas have small gullies and rills 1 to 4 feet deep and 5 to 20 feet wide, mostly crossable with farm machinery. Areas range from 10 to 80 acres in size, but average about 30 acres.

The surface layer is pale-brown loamy fine sand about 8 inches thick. The next 17 inches is yellowish-red and gray sandy clay loam. Some of the lower layer has been mixed with the surface layer in most places. Below this is 25 inches of yellowish-red sandy clay loam that has gray mottles. Below this is 15 inches of reddish-yellow sandy clay loam that has gray mottles. The underlying material is sand.

Included with this soil in mapping are Duffau, Weatherford, and Windthorst soils on small ridges; Chaney and Nimrod soils along concave foot slopes; a few deep gullies; and a few uneroded areas.

Most of the acreage was once used for crops, but much is now in pasture. The hazard of soil blowing is severe, and the hazard of water erosion is moderate. Capability unit IIIe–10; Sandy range site; pasture group 9A.

SuC—Selden-Urban land complex, 1 to 5 percent slopes. This gently sloping unit is in urban areas throughout the City of Weatherford. Mapped areas are round in shape.

This mapping unit is about 50 percent Selden loamy fine sand, 40 percent Urban land, and 10 percent soils of minor extent. Soil and urban areas are so intricately mixed that it is not practical to separate them at the scale of mapping used.

In an undisturbed area of Selden soil the surface layer is pale-brown loamy fine sand about 12 inches thick. Below this, to a depth of 60 inches, is brownish yellow, red, and gray mottled sandy clay loam. The underlying material is sandy earth.

Urban land is used for works and structures, such as buildings, streets, driveways, parking lots, sidewalks, and patios. Also included are small business and shopping centers and parking areas.

Included with this unit in mapping are small areas of Chaney, Duffau, Nimrod, Weatherford, and Wind-

thorst soils. Chaney and Nimrod soils are in less sloping concave areas; Duffau, Weatherford, and Windthorst soils are along ridges and breaks.

Many areas were disturbed for building construction. Cuts and fills were made for site leveling. Cuts vary in depth from a few inches to several feet, and fill material has been imported for leveling many yards. Many areas remain undisturbed, however, and have much the same basic soil characteristics as the builtup areas.

The soil characteristics that affect urban development are chiefly permeability, texture, and reaction. Not assigned to a capability unit, range site, or pasture group.

Ships Series

The Ships series consists of deep, nearly level, calcareous clayey soils on bottom lands. These soils formed in stratified clayey alluvial sediments.

In a representative profile the surface layer is reddish-brown, calcareous silty clay and clay about 18 inches thick. The next 34 inches is reddish-brown, calcareous clay that has common calcium carbonate concretions below a depth of 30 inches. The underlying material is light reddish-brown, calcareous very fine sandy loam.

These soils are moderately well drained. Runoff is slow. Permeability is very slow, and the available water capacity is high.

Ships soils are used mostly for crops. Improved pasture is established in many areas.

Representative profile of Ships silty clay, in a bottom land field, 0.65 mile south of the Hightower Bridge on the Brazos River near Tin Top, west and north along pasture road for 3.5 miles, 300 feet east of fence:

Ap—0 to 8 inches, reddish-brown (5YR 5/3) silty clay, reddish brown (5YR 4/3) moist; moderate, medium, subangular blocky structure; very hard, very firm, very sticky and very plastic; common roots; calcareous, moderately alkaline; abrupt, smooth boundary.

A1—8 to 18 inches, reddish-brown (5YR 4/3) clay, dark reddish brown (5YR 3/3) moist; moderate, medium, angular blocky structure; extremely hard, sticky and very plastic; common fine roots; shiny pressure faces; calcareous, moderately alkaline; gradual, wavy boundary.

B2—18 to 52 inches, reddish-brown (5YR 4/4) clay, dark reddish brown (5YR 3/4) moist; moderate, medium, angular blocky structure; extremely hard, extremely firm, very sticky and very plastic; shiny pressure faces; few small slickensides; common soft calcium carbonate concretions and masses below a depth of 30 inches; calcareous, moderately alkaline; clear, wavy boundary.

IIC—52 to 60 inches, light reddish-brown (5YR 6/4) very fine sandy loam, reddish brown (5YR 5/4) moist; massive; common soft calcium carbonate masses; strata of clay; calcareous, moderately alkaline.

The A horizon is 12 to 50 inches thick. It is reddish brown, brown, or dark reddish brown.

The B2 horizon is not present in all profiles. It is reddish brown, light reddish brown, dark reddish brown, or red.

Depth to the C or IIC horizon is 40 to more than 60 inches. It is reddish brown, light reddish brown, or dark reddish brown and is clay, silty clay, very fine sandy loam, or silt loam.

Sw—Ships silty clay. This nearly level soil is on weakly concave bottom land along the Brazos River. Mapped areas are irregular in shape. They range from 10 to 500 acres in size, but average about 40 acres.

Included with this soil in mapping are areas of Yomont, Norwood, and Hardeman soils. Also included is a soil that is similar to Ships soil but has less clay.

Most of the acreage is used for crops. Improved pasture has been established in some areas. The hazard of water erosion is slight. The hazard of flooding is severe, but floods occur only once in 10 to 15 years. Some areas are being developed for recreation. Capability unit IIs–2; Clayey Bottom Land range site; pasture group 1A.

Thurber Series

The Thurber series consists of deep, gently sloping, noncalcareous loamy soils on uplands. These soils formed in calcareous clayey and loamy ancient alluvial sediments.

In a representative profile the surface layer is dark grayish-brown neutral clay loam about 8 inches thick. The next 10 inches is dark grayish-brown, mildly alkaline clay. Below this is 14 inches of grayish-brown, calcareous clay. Below this is 5 inches of brown, calcareous clay. The underlying material is very pale brown calcareous clay loam in its upper 13 inches and pale-brown, calcareous clay loam to a depth of 64 inches.

These soils are moderately well drained. Runoff is slow. Permeability is very slow, and the available water capacity is high.

Thurber soils were once used mostly for crops. Many areas are now in pasture and range.

Representative profile of Thurber clay loam, 1 to 3 percent slopes, in a field approximately 15 miles southwest of Weatherford. From Brock west on county road for 3 miles, 150 feet south of road:

Ap—0 to 8 inches, dark grayish-brown (10YR 4/2) clay loam, very dark grayish brown (10YR 3/2) moist; moderate, medium, subangular blocky structure; very hard, very firm; few fine roots and pores; neutral; abrupt, smooth boundary.

B21t—8 to 18 inches, dark grayish-brown (10YR 4/2) clay, very dark grayish brown (10YR 3/2) moist; moderate, medium, subangular blocky structure; very hard, firm; common, prominent clay films; mildly alkaline; gradual, wavy boundary.

B22t—18 to 32 inches, grayish-brown (10YR 5/2) clay, dark grayish brown (10YR 4/2) moist; moderate, medium, subangular blocky structure; very hard, firm; common, prominent clay films; few soft masses of calcium carbonate; calcareous, moderately alkaline; gradual, wavy boundary.

B3t—32 to 37 inches, brown (10YR 5/3) clay, brown (10YR 4/3) moist; weak, medium, subangular blocky structure; very hard, firm; few faint clay films, few films, threads, and soft masses of calcium carbonate; calcareous, moderately alkaline; clear, wavy boundary.

Cca—37 to 50 inches, very pale brown (10YR 7/3) clay loam, pale brown (10YR 6/3) moist; massive; hard, firm; common fine films, threads, and soft masses of calcium carbonate; calcareous, moderately alkaline; diffuse, wavy boundary.

C—50 to 64 inches, pale-brown (10YR 6/3) clay loam, brown (10YR 5/3) moist; massive; hard, firm; few films of calcium carbonate; calcareous, moderately alkaline.

Depth to films, threads, or soft masses of calcium carbonate is 15 to 28 inches.

The A horizon is dark grayish brown, very dark grayish brown, dark brown, or brown, and it is slightly acid to mildly alkaline.

The Bt horizon is grayish brown, light olive brown, brown, dark grayish brown, or very dark grayish brown. It is clay, sandy clay, or clay loam and has a clay content of 35 to 55 percent. It is neutral to moderately alkaline.

Depth to the C or Cca horizon is 30 to 60 inches. These horizons are very pale brown, pale brown, or olive gray and are clay loam, clay, or shale.

ThB—Thurber clay loam, 1 to 3 percent slopes. This gently sloping soil is in weakly concave valleys. Mapped areas are irregular to round in shape. They range from 5 to 50 acres in size, but average about 20 acres.

Included with this soil in mapping are small areas of Bonti, Chaney, and Truce soils along narrow ridges; small areas of Blanket and Hassee soils in slightly higher positions; and areas of Thurber soil with slopes of less than one percent in slight depressions. Also included are areas of a soil that is similar to Thurber soil but has a sandy loam, silt loam, and loam surface layer.

Most of the acreage was once used for crops, but pasture and range are now established in many areas. The hazard of water erosion is moderate. Capability unit IIIe–3; Claypan range site; pasture group 7H.

Truce Series

The Truce series consists of deep, gently sloping to steep, noncalcareous loamy soils on uplands. These soils formed in loamy to clayey materials weathered from shales and sandstone.

In a representative profile the surface layer is brown, slightly acid fine sandy loam about 8 inches thick. The next 16 inches is reddish brown, slightly acid clay. Below this is 24 inches of brown mildly alkaline clay. The underlying material is pale-olive moderately alkaline shaly clay.

These soils are well drained. Runoff is rapid. Permeability is slow, and the available water capacity is medium.

Truce soils are used mostly as range. Some areas are in pasture and crops.

Representative profile of Truce fine sandy loam, 1 to 3 percent slopes, southwest of Millsap. From the Farm Road 113 railroad crossing in Millsap, south for 1.2 miles, then west and south on county road for 1.2 miles, west of road, 100 feet from fence:

Ap—0 to 8 inches, brown (10YR 5/3) fine sandy loam, dark brown (10YR 4/3) moist; weak, fine, subangular blocky structure; hard, friable; slightly acid; abrupt, smooth boundary.

B21t—8 to 24 inches, reddish-brown (5YR 4/4) clay, dark brown (5YR 4/3) moist; moderate, fine and medium, subangular blocky structure; extremely hard, very firm; common clay films on faces of peds; slightly acid; gradual, wavy boundary.

B22t—24 to 48 inches, brown (7.5YR 5/4) clay, dark brown (7.5YR 4/4) moist; moderate, medium, subangular blocky structure; extremely hard, very firm; common clay films on faces of peds; mildly alkaline; gradual, wavy boundary.

C—48 to 60 inches, pale-olive (5Y 6/3) shaly clay, olive (5Y 5/3) moist; massive to weak platy; calcareous, moderately alkaline.

The A horizon is 4 to 13 inches thick. The A1 and Ap horizons are brown, pale brown, yellowish brown, or dark grayish brown. The A2 horizon, where present, is 1 or 2 units of value lighter than the A1 horizon. The A horizon is slightly acid to neutral. Some profiles contain up to 20 percent sandstone fragments.

The B21t horizon is reddish brown, yellowish red, or dark reddish brown. The B22t horizon is brown, strong brown, yellowish brown, reddish yellow, reddish brown, or light olive brown. The B horizon is slightly acid to moderately alkaline and is clay, clay loam, or sandy clay.

Depth to the C horizon is 40 to 60 inches. This horizon is clayey shale, shaly clay, or shale and is pale olive, olive, gray, olive yellow, or light olive brown. Strata of sandstone as well as sandstone fragments are common in some profiles.

TrB—Truce fine sandy loam, 1 to 3 percent slopes. This gently sloping soil is on upland foot slopes. Mapped areas follow the contour of hills. They range from 5 to more than 100 acres in size, but average about 35 acres. This soil has the profile described as representative of the series.

Included with this soil in mapping are small areas of Bonti, Chaney, Hassee, and Thurber soils. Bonti soil occupies the higher ridges. Chaney soils are along undulating ridges. The less sloping Hassee and Thurber soils are on slightly depressed lower slopes. Also included, in the southwest part of the county near Dennis, is a soil that is similar to Truce soil but is redder and more permeable.

Most of the acreage was cultivated at one time but is now in pasture and range. The hazard of water erosion is moderate. Capability unit IIe–2; Tight Sandy Loam range site; pasture group 8A.

TrC—Truce fine sandy loam, 3 to 5 percent slopes. This gently sloping soil is on upland foot slopes. Mapped areas are irregular in shape and follow the contour of associated hills. They range from 5 to 40 acres in size, but average about 20 acres.

The surface layer is brown fine sandy loam about 8 inches thick. The next 12 inches is reddish-brown clay. Below this is about 22 inches of brown clay. The underlying material is pale-olive shaly clay.

Included with this soil in mapping are small areas of Bonti, Chaney, Hassee, Owens, and Thurber soils. Bonti and Chaney soils are along ridgetops. Hassee and Thurber soils are in slight depressions along lower foot slopes. Owens soils are along side slopes of hills. Also included are a few eroded areas and areas of Truce soils that are stony.

Most of the acreage is used as range. A few areas are used as pasture. The hazard of water erosion is severe. Capability unit IIIe–9; Tight Sandy Loam range site; pasture group 8A.

TrC2—Truce fine sandy loam, 2 to 5 percent slopes, eroded. This gently sloping, eroded soil is on upland foot slopes and hills. Areas have a few rills and gullies. So much of the original surface layer has been lost through erosion in most areas that only a few inches remain. Mapped areas often follow the contour of old field boundaries. They range from 10 to more than 100 acres in size, but average about 40 acres.

The surface layer is pale-brown fine sandy loam about 4 inches thick. The next 16 inches is reddish brown clay. Some of this lower layer has been mixed with the surface layer in most places. Below this is 28

inches of yellowish-brown clay. The underlying material is gray shaly clay.

Included with this soil in mapping are small areas of Bonti, Chaney, Hassee, and Owens soils. Bonti soils are along narrow ridges. Chaney soils are along lower slopes in weak depressions. Owens soils occupy small hillsides. Also included were areas of uneroded Truce soils, some stony areas, and some areas of a soil that is similar to Truce soil but is redder and is more permeable.

Most of the acreage was once cultivated but is now used as range or is idle. The hazard of water erosion is severe. Capability unit IIIe–9; Tight Sandy Loam range site; pasture group 8A.

TrD2—Truce fine sandy loam, 5 to 8 percent slopes, eroded. This sloping eroded soil is on upland hills. More than 50 percent of the surface layer has been removed through erosion and a few areas have small gullies. Mapped areas range from 10 to more than 100 acres in size, but average about 50 acres.

The surface layer is pale-brown, slightly acid fine sandy loam about 4 inches thick. Next, in sequence downward, is 16 inches of reddish brown neutral clay, 15 inches of brown mildly alkaline clay, and 10 inches of light olive brown moderately alkaline clay. The underlying material is olive shaly clay.

Included with this soil in mapping are small areas of Bonti, Chaney, and Owens soils. Bonti and Chaney soils are on ridges and breaks. Owens soils are on small sloping hillsides and upper slopes. Some areas have many siliceous pebbles throughout the soil profile. Also included are Truce soils that contain sandstone fragments, some areas that have slopes of as much as 10 percent, some uneroded areas, and areas of a soil that is similar to Truce soils but is redder and more permeable.

The acreage is used as range. The hazard of water erosion is severe. Capability unit VIe–4; Tight Sandy Loam range site; pasture group 8B.

TuF—Truce stony soils, 5 to 20 percent slopes. These sloping to moderately steep stony soils are on upland hills (fig. 14). Mapped areas are 100 to 600 yards wide and in many places, as much as a mile long. They are breaks of sandstone hills. Areas have sandstone rocks and boulders on the surface.

The surface layer is brown stony fine sandy loam about 10 inches thick. The next 15 inches is reddish-brown clay. Below this is 10 inches of reddish-yellow clay. Below this is 13 inches of light olive-brown clay. The underlying material is olive-yellow shaly clay.

Average composition of this mapping unit is 50 percent Truce soils and 50 percent soils of minor extent. Truce soils make up 30 to 70 percent of the mapped areas.

Included with this unit in mapping are small areas of Bonti and Owens soils. Bonti soils are along ridges and stony upper slopes. Owens soils are on steeper hillsides. Also included are areas along the upper part of slopes where fine sandy loam is underlain by sandstone at a depth of 10 to 20 inches; areas that are loamy fine sand; and a few small areas that are not stony.

The acreage is used only for range and wildlife. The hazard of water erosion is severe. Capability unit VIIs–2; Sandstone Hill range site; not assigned to a pasture group.

Figure 14.—Landscape of Truce stony soils, 5 to 20 percent slopes.

Urban Land

Urban land is mapped only with Brackett, Duffau, Purves, Selden, Venus, and Windthorst soils. It is chiefly in the central business district of Weatherford. About 80 to 95 percent of the acreage is used for public works and business structures, such as the Parker County Courthouse, shopping centers, parking lots, streets, and sidewalks. The rest is used for single-unit dwellings and attendant structures.

The installation of structures in Urban land has so altered and obscured the original soil characteristics that they no longer resemble those described in the soil series of the county.

Venus Series

The Venus series consists of deep, gently sloping to sloping, calcareous loamy soils on uplands. These soils formed in thick beds of unconsolidated calcareous loamy sediments.

In a representative profile the upper part of the surface layer is brown, calcareous clay loam about 9 inches thick. The lower part of the surface layer is 7 inches of very dark grayish brown, calcareous clay loam. Below this is 34 inches of light brown, calcareous clay loam. The underlying material is light brown, calcareous clay loam containing common films and threads of calcium carbonate.

These soils are well drained. Runoff is medium. Permeability is moderate, and the available water capacity is high.

Venus soils are used for crops, pasture, and range.

Representative profile of Venus clay loam, 3 to 5

percent slopes, 4.5 miles southwest of Weatherford. From the junction of U.S. Highways 180 and 80 in Weatherford, southwest 4.5 miles on U.S. Highway 80, 100 feet north of fence along Interstate Highway 20 access road:

Ap—0 to 9 inches, brown (10YR 4/3) clay loam, dark brown (10YR 3/3) moist; moderate, medium, subangular blocky and weak, fine, granular structure; hard, friable; common fine roots and pores; few fine calcium carbonate concretions; calcareous, moderately alkaline; abrupt, smooth boundary.

A1—9 to 16 inches, very dark grayish-brown (10YR 3/2) clay loam, very dark brown (10YR 2/2) moist; moderate, medium, subangular and weak, fine, granular structure; hard, firm; few fine roots and pores; few fine films and threads of calcium carbonate; calcareous, moderately alkaline; gradual, smooth boundary.

B2—16 to 50 inches, light-brown (7.5YR 6/4) clay loam, brown (7.5YR 5/4) moist; hard, firm; moderate, fine, subangular blocky structure; few fine roots and pores; few films, threads, and soft masses of calcium carbonate; 17 percent calcium carbonate equivalent; calcareous; moderately alkaline; diffuse, wavy boundary.

Cca—50 to 62 inches, light-brown (7.5YR 6/4) clay loam, brown (7.5YR 5/4) moist; hard, firm; common films, threads, and soft masses of calcium carbonate; calcareous, moderately alkaline.

The A horizon is 10 to 20 inches thick. It is dark grayish brown, brown, grayish brown, very dark grayish brown, or dark brown.

The B horizon is brown, pale brown, light brownish gray, light brown, or light yellowish brown. It is clay loam, silty clay loam, or loam and is moderately alkaline and calcareous. The calcium carbonate equivalent is 15 to 40 percent.

Depth to the C horizon is 40 to 60 inches. This horizon is light gray, white, pale brown, light brown, yellow, light yellowish brown, very pale brown, or pink. It is clay loam, loam, or marl. Some profiles contain limestone fragments. Films, threads, and soft masses of calcium carbonate are common. The calcium carbonate equivalent is 10 to 50 percent.

VeB—Venus clay loam, 1 to 3 percent slopes. This gently sloping soil is on upland foot slopes and in valleys. Mapped areas follow the slope contour along lower slopes. They range from 10 to 100 acres in size, but average about 20 acres.

The surface layer is grayish-brown, calcareous clay loam about 12 inches thick. The next 26 inches is pale brown, calcareous clay loam. Below this is 22 inches of light-brown, calcareous clay loam.

Included with this soil in mapping are areas of Aledo, Bolar, Denton, Lamar, Krum, and Purves soils. Aledo, Bolar, Denton, and Purves soils are on narrow ridges and breaks. Krum soils are along lower slopes. Also included are small areas of Frio soils along small drains and areas of loam and silty clay loam.

Most of the acreage is used for crops. Improved pasture has been established in some areas, and a few areas are in range. The hazard of water erosion is moderate. Capability unit IIe–1; Clay Loam range site; pasture group 7C.

VeC—Venus clay loam, 3 to 5 percent slopes. This gently sloping soil is on upland foot slopes. Mapped areas follow the contour along weakly convex foot slopes. Areas range from 10 to more than 150 acres in size, but average about 30 acres. This soil has the profile described as representative of the series.

Included with this soil in mapping are small areas of Aledo, Bolar, Krum, Lamar, and Purves soils. Aledo, Bolar, and Purves soils are along upper slopes and ridges. Krum soils are along lower slopes. Lamar soils are along small knobs and hillsides. Also included are a few eroded areas of Venus soils.

Most of the acreage is used as range. Some areas are used for crops and pasture. The hazard of water erosion is moderate. Capability unit IIIe–5; Clay Loam range site; pasture group 7C.

VeD—Venus clay loam, 5 to 8 percent slopes. This sloping soil is on foot slopes and side slopes of upland hills. Mapped areas are irregular in shape. They range from 20 to 150 acres in size, but average about 35 acres.

The surface layer is dark grayish-brown, calcareous clay loam about 16 inches thick. The next 14 inches is brown, calcareous clay loam. Below this is 15 inches of light yellowish-brown, calcareous clay loam. The underlying material is light yellowish-brown, calcareous clay loam that contains common soft masses of calcium carbonate.

Included with this soil in mapping are small areas of Aledo, Bolar, Brackett, Lamar, and Purves soils. Aledo, Bolar, and Purves soils are along ridges and breaks of upper slopes. Brackett soils are on small strongly sloping ridge breaks. Lamar soils are along side slopes on slight knolls. Also included are small eroded areas and areas of silt loam and silty clay loam.

Most of the acreage is used as range. The hazard of water erosion is severe. Capability unit IVe–2; Clay Loam range site; pasture group 7D.

VuD—Venus-Urban land complex, 3 to 8 percent slopes. This gently sloping to sloping mapping unit is on upland hillsides and side slopes throughout the city of Weatherford. Mapped areas are long and irregular in shape. They follow the contour of hills and ridges.

This unit is about 45 percent Venus soils, 40 percent Urban land, and 15 percent soils of minor extent. Soil and Urban land areas are so intricately mixed that it is not practical to separate them at the scale of mapping used. In an undisturbed area of Venus soils, the surface layer is dark-brown clay loam about 16 inches thick. The next 34 inches is light-brown clay loam. The underlying material is pink calcareous clay loam.

Urban land is used for works and structures, mostly single unit dwellings, streets, driveways, sidewalks, and patios. It is also used for small shopping centers and paved parking areas.

Of minor extent in this unit are Bolar, Denton, and Lamar soils. Bolar and Denton soils are along ridges and foot slopes. Lamar soils are along more convex slopes.

Many areas were disturbed for building construction. Cuts and fills made for site leveling used mostly the existing clay loam soils. Although the thickness of soil horizons had been altered, the basic soil characteristics remained much the same. Many yards have been covered with a thin surface layer of imported soil material.

The main soil characteristics that affect urban development are shrink-swell potential, corrosivity, and alkalinity. Not assigned to a capability unit, range site, or pasture group.

Weatherford Series

The Weatherford series consists of deep, gently sloping to sloping, noncalcareous sandy to loamy soils on uplands. These soils formed in interbedded loamy materials and weakly cemented sandstone.

In a representative profile the surface layer is brown, slightly acid fine sandy loam about 4 inches thick. The next 6 inches is light brown, slightly acid fine sandy loam. Below this is 35 inches of yellowish-red and reddish-yellow, slightly acid sandy clay loam. The underlying material is pink, slightly acid, weakly cemented sandstone (fig. 15).

These soils are well drained. Runoff is medium. Permeability is moderate, and the available water capacity is high.

Weatherford soils are used mostly as range and pasture. Some areas are in orchards and crops. These soils are mapped only with Duffau soils.

Representative profile of Weatherford fine sandy loam in an area of Duffau and Weatherford soils, 5 to 8 percent slopes, eroded, 7.5 miles west of the courthouse in Weatherford via U.S. Highway 180, then south on county road 0.1 mile, west of road 10 feet from fence.

Figure 15.—**Profile of Weatherford fine sandy loam.**

A1—0 to 4 inches, brown (7.5YR 5/2) fine sandy loam, dark brown (7.5YR 4/2) moist; weak, medium, granular structure; slightly hard, very friable; many fine roots and pores; slightly acid; clear, smooth boundary.

A2—4 to 10 inches, light-brown (7.5YR 6/4) fine sandy loam, brown (7.5YR 5/4) moist; weak, fine, subangular blocky structure; slightly hard, very friable; common fine roots and pores; slightly acid; clear, wavy boundary.

B21t—10 to 28 inches, yellowish-red (5YR 5/6) sandy clay loam, yellowish red (5YR 4/6) moist; moderate, medium, subangular blocky structure; very hard, friable; common fine roots and pores; patchy clay films on surfaces of peds; slightly acid; gradual, wavy boundary.

B22t—28 to 45 inches, reddish-yellow (5YR 6/8) sandy clay loam, yellowish red (5YR 5/8) moist; weak, coarse, subangular blocky structure; very hard, friable; few patchy clay films on surfaces of peds; slightly acid; clear, wavy boundary.

C—45 to 70 inches, pink (7.5YR 8/4) weakly cemented sandstone, pink (7.5YR 7/4) moist; massive; hard, friable; slightly acid.

The A horizon is fine sandy loam or loamy fine sand and is slightly acid to neutral. The A1 horizon is pale brown, light brown, brown, dark brown, grayish brown, light brownish gray, or reddish yellow. The A2 horizon is very pale brown, pink, pale brown, light brown, light brownish gray, light gray, white, or reddish yellow.

The B21t horizon is reddish brown or yellowish red. It is clay loam or sandy clay loam and is medium acid to slightly acid.

The B22t horizon is reddish brown, yellowish red, reddish yellow, or brown and is sandy clay loam or fine sandy loam.

Depth to the C horizon is 40 to 60 inches. It is pink, white, or pinkish white. It is weakly cemented sandstone, packsand, or fine sandy loam.

Windthorst Series

The Windthorst series consists of deep, gently sloping to sloping, noncalcareous sandy and loamy soils on uplands. These soils formed in weakly cemented sandstone and stratified clayey and loamy sediments.

In a representative profile the surface layer is grayish-brown, slightly acid fine sandy loam about 4 inches thick. Next, in sequence downward, is 6 inches of light yellowish-brown slightly acid fine sandy loam; 28 inches of red and yellowish-red, medium acid sandy clay; and 12 inches of mottled red, yellowish-brown, and pale-brown slightly acid sandy clay loam. The underlying material is light-gray, slightly acid clay that has coarse red and yellow mottles.

These soils are moderately well drained. Runoff is medium to high. Permeability is moderately slow, and the available water capacity is high.

Windthorst soils are used for range, pasture, crops, and orchards.

Representative profile of Windthorst fine sandy loam, 1 to 3 percent slopes, in wooded range, 5.2 miles southwest of the Parker County courthouse in Weatherford via U.S. Highway 80, 800 feet west of the junction of the Dennis road and U.S. Highway 80, 150 feet north of fence:

A1—0 to 4 inches, grayish-brown (10YR 5/2) fine sandy loam, very dark grayish brown (10YR 3/2) moist; weak, fine, subangular blocky and weak, fine, granular structure; soft, very friable; slightly acid; clear, smooth boundary.

A2—4 to 10 inches, light yellowish-brown (10YR 6/4) fine sandy loam, yellowish brown (10YR 5/4) moist; massive; soft, very friable; slightly acid; abrupt, smooth boundary.

B21t—10 to 18 inches, red (2.5YR 4/6) sandy clay, red (2.5YR 4/6) moist; strong, fine and medium, blocky structure; extremely hard, very firm; nearly continuous clay films on faces of most peds; medium acid; gradual, smooth boundary.

B22t—18 to 38 inches, yellowish-red (5YR 5/6) sandy clay, yellowish red (5YR 4/6) moist; many, medium, faint, strong-brown (7.5YR 5/6) mottles, many, distinct, brownish-yellow (10YR 6/6) mottles; moderate, coarse, blocky structure; extremely hard, very firm; common, discontinuous clay films on faces of peds; medium acid; gradual, wavy boundary.

B3t—38 to 50 inches, coarsely and prominently mottled red (2.5YR 4/8), yellowish-brown (10YR 5/8), and pale-brown (10YR 6/3) sandy clay loam; thin lenses and pockets of sandy loam; weak, coarse, blocky structure; extremely hard, very firm; slightly acid; gradual, wavy boundary.

C—50 to 60 inches, light-gray (10YR 7/2) clay; prominent, coarse mottles of red (2.5YR 5/6) and yellow (2.5Y 5/6); massive; slightly acid.

The A horizon is 6 to 19 inches thick. It is fine sandy loam to loamy fine sand and is slightly acid to neutral. The A1 horizon is light brownish gray, grayish brown, light yellowish brown, pale brown, or brown. The A2 horizon is light gray, light brownish gray, pale brown, light yellowish brown, or very pale brown.

The B2t horizon is red, reddish brown, or yellowish red. It is sandy clay or clay and is slightly acid to medium acid. Base saturation in some part of the Bt horizon is over 75 percent. The lower part of the B2t horizon is mottled in shades of brown, yellow, gray, and red.

The B3t horizon is prominently mottled with red, yellowish red, reddish yellow, pale brown, yellowish brown, or yellow. It is clay, sandy clay, clay loam, or sandy clay loam and is medium acid to moderately alkaline. Some profiles have films and threads of calcium carbonate in the lower part.

Depth to the C horizon is 35 to 60 inches. This horizon is white, light gray, olive yellow, or reddish yellow. It is massive clay, sandy clay loam, or fine sandy loam and is medium acid to moderately alkaline. Some profiles are underlain by weakly cemented sandstone and packsand.

WnC—Windthorst loamy fine sand, 1 to 5 percent slopes. This gently sloping soil is on uplands. Mapped areas are on hilltops and upper slopes and are irregular in shape. They range from 10 to 50 acres in size, but average about 30 acres.

The surface layer is grayish-brown loamy fine sand about 8 inches thick. The next 7 inches is pale-brown loamy fine sand. Below this is 20 inches of red clay. The underlying material is light-gray clay.

Included with this soil in mapping are small areas of Duffau, Chaney, Selden, and Weatherford soils. Duffau and Weatherford soils are along side slopes and foot slopes. Chaney and Selden soils are in slightly concave areas.

Most of the acreage is used for pasture and crops. Some areas are in orchards and range. Runoff is medium. The hazard of water erosion is slight. The hazard of soil blowing is severe. Capability unit IIIe–4; Sandy range site; pasture group 9A.

WoB—Windthorst fine sandy loam, 1 to 3 percent slopes. This gently sloping soil is on convex hills and the upper part of side slopes. Mapped areas are irregular in shape. They range from 5 to 150 acres in size, but average about 20 acres. This soil has the profile described as representative of the series (fig. 16).

Figure 16.—Profile of Windthorst fine sandy loam, 1 to 3 percent slopes.

Included with this soil in mapping are small areas of Duffau, Chaney, May, Selden, and Weatherford soils. Duffau, May, and Weatherford soils are along lower slopes and breaks below ridges. Chaney and Selden soils are on slightly concave side slopes and in depressed areas. Also included are small eroded areas, a few isolated gullies, areas of loamy fine sand, and areas that have a slope of less than 1 percent or as much as 4 percent.

Most of the acreage is used for pasture and crops. Some areas are in orchards and range. Runoff is medium. The hazard of water erosion is moderate. Capability unit IIe–2; Sandy Loam range site; pasture group 8A.

WoC—Windthorst fine sandy loam, 3 to 5 percent slopes. This gently sloping soil is on convex upland

hills and ridges. Mapped areas are irregular in shape. They range from 10 to 40 acres in size, but average about 20 acres.

The surface layer is brown fine sandy loam about 8 inches thick. The next 10 inches is red sandy clay. Below this is 20 inches of yellowish-red sandy clay, and then 22 inches of yellow sandy clay.

Included with this soil in mapping are small areas of Duffau, Chaney, Selden, and Weatherford soils. Duffau and Weatherford soils are along lower slopes and hillsides. Chaney and Selden soils are in slight depressions. Also included are areas of loamy fine sand, a few small gullies, and a few small eroded areas.

Most of the acreage is used for pasture and crops. Some areas are in orchards and range. Runoff is medium. The hazard of water erosion is severe. Capability unit IIIe–2; Sandy Loam range site; pasture group 8A.

WoC2—Windthorst fine sandy loam, 1 to 5 percent eroded. This gently sloping, eroded soil is on upland hills and ridges. Mapped areas are mostly old cultivated fields from which some of the surface soil has been eroded. Areas are crossed by a few small gullies and rills. They range from 10 to more than 100 acres in size, but average about 35 acres.

The surface layer is light brownish gray fine sandy loam about 6 inches thick. The next 16 inches is red clay about 16 inches thick. Some of this lower layer has been mixed with the surface layer in most places. Below this is 22 inches of yellowish-red clay. The underlying material is olive-yellow stratified fine sandy loam and clay loam.

Included with this soil in mapping are small areas of uneroded Windthorst soils, some areas of sandy clay loam and loamy fine sand, and some areas of Duffau, Weatherford, Chaney, and Selden soils. Duffau and Weatherford soils are along lower parts of hillsides and side slopes. Chaney and Selden soils are in slightly depressed areas.

Most of the acreage is used as range and pasture. Some areas are used for orchards and crops. Runoff is medium. The hazard of water erosion is severe. Capability unit IIIe–2; Sandy Loam range site; pasture group 8A.

WoD—Windthorst fine sandy loam, 5 to 8 percent slopes. This sloping soil is on upland hills and ridges. Mapped areas are irregular in shape. They range from 10 to more than 100 acres in size, but average about 50 acres.

The surface layer is brown fine sandy loam about 3 inches thick. The next 5 inches is pale-brown fine sandy loam. Below this is 16 inches of red sandy clay, then 12 inches of yellow sandy clay. The underlying material is reddish-yellow stratified fine sandy loam and clay.

Included with this soil in mapping are small areas of eroded Windthorst soils, a few uncrossable gullies along natural drains, small areas of Duffau and Weatherford soils along breaks and lower slopes, and Chaney and Selden soils in slight depressions. Also included are a few small ridges of Bonti and Truce soils and small areas of loamy fine sand.

Most of the acreage is used as range. Some areas are in pasture and crops. Runoff is rapid. The hazard of water erosion is severe. Capability unit IVe–1; Sandy Loam range site; pasture group 8B.

WuD—Windthorst-Urban land complex, 2 to 8 percent slopes. This gently sloping to sloping mapping unit is on convex upland hills and ridges throughout the city of Weatherford. Mapped areas are irregular in shape and make up entire hills.

This unit is about 45 percent Windthorst soils, 40 percent Urban land, and 15 percent Duffau, Selden, and Weatherford soils. Soil and Urban land areas are so intricately mixed that it is not practical to separate them at the scale of mapping used.

In undisturbed areas of Windthorst soils the surface layer is grayish-brown fine sandy loam about 4 inches thick. Next, in sequence downward, is 6 inches of light yellowish-brown fine sandy loam; 8 inches of red sandy clay; 20 inches of yellowish-red sandy clay; and 12 inches of mottled red, yellowish-brown, and pale brown sandy clay loam. The underlying material is light-gray clay that has coarse red and yellow mottles.

Urban land is used for works and structures, mostly single unit dwellings, streets, driveways, sidewalks, and patios. It is also used for some small shops, shopping centers, service stations, and paved parking areas.

The more sloping parts of this complex have been cut and shaped for building sites and lot leveling. Cuts and fills vary from a few inches to several feet depending upon the slope. Most cuts and fills were made using original soil materials. Many yards and lots have a thin surface layer of imported soil material.

The main soil characteristics that affect urban development are permeability, shrink-swell potential, and soil reaction. Not assigned to a capability unit, range site, or pasture group.

WvD3—Windthorst soils, 1 to 8 percent slopes, severely eroded. These gently sloping to sloping, severely eroded soils are on upland hills and ridges. Areas are mostly old fields where more than 75 percent of the original surface layer has eroded away. The texture of the surface layer is variable. Small V-shaped gullies are common. Gullies make up 10 to 25 percent of mapped areas. They are 2 to 7 feet deep and 3 to 15 feet wide. Mapped areas range from 5 to 50 acres in size, but average about 20 acres.

The surface layer is pale-brown fine sandy loam about 6 inches thick. The next 8 inches is red clay. Below this is 12 inches of yellowish-red clay, and then 11 inches of white sandy clay. The underlying material is white sandy loam and clay loam.

Included with this soil in mapping are small areas of slightly eroded Windthorst soils; small eroded areas of Duffau, Selden, and Weatherford soils; and a few isolated deep gullies.

The acreage is used as range. Runoff is rapid. The hazard of water erosion is severe. Capability unit VIe–1; Sandy Loam range site; pasture group 8B.

Yahola Series

The Yahola series consists of deep, nearly level, calcareous loamy soils on bottom lands. These soils formed in calcareous, loamy alluvial sediments.

In a representative profile the surface layer is brown fine sandy loam about 8 inches thick. Next in sequence

downward, is 4 inches of pale-brown loamy fine sand, 18 inches of light-brown fine sandy loam, and 6 inches of light-brown sandy clay loam. Below this is light-brown fine sandy loam.

These soils are well drained. Runoff is slow. Permeability is moderately rapid, and the available water capacity is medium.

Yahola soils are used mostly as pasture. A few areas are range.

Representative profile of Yahola fine sandy loam, in an area of Yahola and Bunyan soils, frequently flooded, 2 miles north of intersection of U.S. Highway 180 and Farm Road 51 in Weatherford, then 1 mile east on county road, 250 feet south of bridge over Willow Creek:

A1—0 to 8 inches, brown (7.5YR 5/2) fine sandy loam, dark brown (7.5YR 4/2) moist; weak, subangular blocky structure; slightly hard, friable; calcareous, moderately alkaline; abrupt, smooth boundary.

C1—8 to 12 inches, pale-brown (10YR 6/3) loamy fine sand, brown (10YR 5/3) moist; single grained; loose, very friable; calcareous, moderately alkaline; abrupt, wavy boundary.

C2—12 to 30 inches, light-brown (7.5YR 6/4) fine sandy loam, brown (7.5YR 4/4) moist; massive; soft, friable; prominent bedding planes; calcareous, moderately alkaline; abrupt, wavy boundary.

C3—30 to 36 inches, light-brown (7.5YR 6/4) sandy clay loam, brown (7.5YR 4/4) moist; massive; slightly hard, friable; calcareous, moderately alkaline; abrupt, wavy boundary.

C4—36 to 60 inches, light-brown (7.5YR 6/4) fine sandy loam, brown (7.5YR 4/4) moist; massive; soft, friable; thin strata of loamy fine sand and sandy clay loam; calcareous, moderately alkaline.

The A horizon is 4 to 10 inches thick. It is brown, dark brown, pale brown, grayish brown, or very pale brown and is fine sandy loam or loamy fine sand.

The C horizon is pale brown, light yellowish brown, brown, light brown, very pale brown, and pink. It is fine sandy loam or loamy fine sand and some sandy clay loam and clay loam.

Yb—Yahola and Bunyan soils, frequently flooded. These nearly level soils are in long bottom-land areas. In many places mapped areas 200 feet to one-half mile wide extend for several miles along major streams. Slopes are less than one percent. Areas range from 10 to more than 300 acres in size. Flooding occurs at least once every 1 to 3 years, and areas remain flooded from a few hours to several days. Floods occur mostly in May and September.

The average composition of this mapping unit is 38 percent Yahola soils, 23 percent Bunyan soils, and 39 percent soils of minor extent; but composition is variable. Yahola soils are dominant and make up 10 to 60 percent of mapped areas. They are on the slightly higher natural stream levees that have convex slopes. Bunyan soils are not in all areas, but they make up as much as 40 percent of the mapped areas. They are in lower lying concave areas that receive extra water.

The surface layer of Bunyan soil in this unit is brown, neutral fine sandy loam about 6 inches thick. The next 4 inches is pale-brown sandy clay loam. Below this is 5 inches of very dark grayish-brown sandy clay loam. The underlying material is brown sandy clay loam that has thin strata of lighter colored fine sandy loam.

Included with this unit in mapping are small areas of Bosque, Frio, and Lincoln soils. Bosque and Frio soils are in the lower, slightly concave areas along the outer edges of mapped areas. Lincoln soils are along stream banks. Also included are small areas of a soil that is similar to Bunyan soil but is calcareous and a soil on creek banks that has a slope of as much as 20 percent.

Most of the acreage is used as pasture and range. Because of flood hazards, these soils are not used for crops. Capability unit Vw–3; Loamy Bottom Land range site; pasture group 2A.

Yomont Series

The Yomont series consists of deep, nearly level, calcareous loamy soils on bottom lands. These soils formed in calcareous stratified loamy alluvium.

In a representative profile the surface layer is yellowish-red, calcareous very fine sandy loam about 8 inches thick. The next 37 inches is reddish-yellow, calcareous very fine sandy loam. Below this is light reddish-brown, calcareous very fine sandy loam.

These soils are well drained. Runoff is slow. Permeability is moderately rapid, and the available water capacity is high.

Yomont soils are used for crops, pasture, range, and recreation.

Representative profile of Yomont very fine sandy loam, 14 miles south of Weatherford. From the junction of Farm Road 1884 and a county road at Tin Top, south and southwest for 1.65 mile, 700 feet west and 500 feet north of corner in road:

Ap—0 to 8 inches, yellowish-red (5YR 5/6) very fine sandy loam, yellowish red (5YR 4/6) moist; weak, subangular blocky structure; slightly hard, friable; few fine roots; calcareous, moderately alkaline; abrupt, smooth boundary.

C1—8 to 45 inches, reddish-yellow (5YR 6/8) very fine sandy loam, yellowish red (5YR 5/8) moist; massive; soft, friable; calcareous, moderately alkaline; abrupt, smooth boundary.

C2—45 to 80 inches, light reddish-brown (5YR 6/4) very fine sandy loam, reddish brown (5YR 5/4) moist; massive; soft, friable; calcareous, moderately alkaline.

The A horizon is reddish brown, light reddish brown, or yellowish red. It is 7 to 10 inches thick.

The C horizon is yellowish red, light reddish brown, or reddish yellow. It is very fine sandy loam or silt loam and has thin strata of loamy very fine sand. Average clay content is less than 18 percent.

Yo—Yomont very fine sandy loam. This nearly level soil is on bottom lands. Mapped areas are irregular in shape. They range from 10 to more than 100 acres in size, but average about 40 acres. Slopes range from 0 to 1 percent. Areas are flooded for short periods only once every 10 to 15 years. This soil has the profile described as representative of the series.

Included with this soil in mapping are small areas of Lincoln soils, slightly depressed areas of Norwood and Ships soils, and, along slightly higher ridges, areas of Bastrop and Hardeman soils. Also included are some areas that have a surface layer of fine sandy loam or silt loam and a few areas that have a slope of 1 to 5 percent.

Most of the acreage is used for crops. Some areas are in pasture or are being developed for recreation.

The hazard of water erosion is slight, and the hazard of soil blowing is moderate. Capability unit IIe–4; Loamy Bottom Land range site; pasture group 2A.

Ym—Yomont very fine sandy loam, frequently flooded. This nearly level soil is on bottom lands. Slopes range from 0 to 1 percent. Areas flood one or more times in 1 to 4 years. They are long and follow the contour of riverbanks along natural levees adjacent to the river channel. They range from 10 to more than 100 acres in size, but average about 50 acres.

The surface layer is reddish brown, calcareous very fine sandy loam about 7 inches thick. The underlying material is stratified calcareous very fine sandy loam that is yellowish red in the upper part and light reddish brown in the lower part.

Included with this soil in mapping are small areas of Lincoln, Norwood, and Yahola soils. Lincoln and Yahola soils are on the slightly higher knolls. Norwood soils are in small slightly depressed areas. Also included are areas where the surface layer is loamy fine sand and silt loam and areas where slope is as much as 5 percent.

The acreage is used as pasture and range. Some areas are being developed for recreation, but the hazard of flooding is severe. The hazard of soil blowing is moderate. Capability unit Vw–3; Loamy Bottom Land range site; pasture group 2A.

Use and Management of Soils

This section explains the system of capability grouping used by the Soil Conservation Service and describes the management of the soils of Parker County by capability units for dryland crop production. Estimated yields for selected crops and pasture are given. Also described is the management of soils for pasture and hayland, range, and wildlife and use of the soils for recreation and engineering.

Capability Grouping

Capability grouping shows, in a general way, the suitability of soils for most kinds of field crops. The soils are grouped according to their limitations when used for field crops, the risk of damage when they are used, and the way they respond to treatment. The grouping does not take into account major and generally expensive landforming that would change slope, depth, or other characteristics of the soils; does not take into consideration possible but unlikely major reclamation projects; and does not apply to rice, cranberries, horticultural crops, or other crops requiring special management.

Those familiar with the capability classification can infer from it much about the behavior of soils when used for other purposes, but this classification is not a substitute for interpretations designed to show suitability and limitations of groups of soils for range, for forest trees, or for engineering.

In the capability system, the kinds of soil are grouped at three levels: the capability class, the subclass, and the unit. These levels are described in the following paragraphs.

CAPABILITY CLASSES, the broadest groups, are designated by Roman numerals I to VIII. The numerals indicate progressively greater limitations and narrower choices for practical use, 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, require special conservation practices, or both.
- Class IV soils have very severe limitations that reduce the choice of plants, require very careful management, or both.
- Class V soils are subject to little or no erosion but have other limitations, impractical to remove, that limit their use largely to pasture, range, woodland, or wildlife.
- Class VI soils have severe limitations that make them generally unsuitable for cultivation and limit their use largely to pasture or range, woodland, or wildlife.
- Class VII soils have very severe limitations that make them unsuitable for cultivation and restrict their use largely to pasture or range, woodland, or wildlife.
- Class VIII soils and landforms have limitations that preclude their use for commercial crop production and restrict their use to recreation, wildlife, water supply, or to esthetic purposes.

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

In class I there are no subclasses, because the soils of this class have few limitations. Class V can contain, at the most, only the subclasses indicated by *w*, *s*, and *c*, because the soils in class V are subject to little or no erosion, though they have other limitations that restrict their use largely to pasture, range, woodland, wildlife, or recreation.

CAPABILITY UNITS are soil groups within the subclasses. The soils in one capability unit are enough alike to be suited to the same crops and pasture plants, to require similar management, and to have similar productivity and other responses to management. Thus, the capability unit is a convenient grouping for making many statements about management of soils. Capability units are generally designated by adding an Arabic numeral to the subclass symbol, for example, IIe–4 or IIIe–6. Thus, in one symbol, the Roman numeral designates the capability class, or degree of limitation; the small letter indicates the subclass, or kind of limitation, as defined in the foregoing para-

graph; and the Arabic numeral specifically identifies the capability unit within each subclass.

On the following pages the capability units in Parker County are described and suggestions for the use and management of the soils are given.

CAPABILITY UNIT I-1

The only soil in this capability unit is Norwood silt loam, a deep, moderately permeable, nearly level soil on bottom lands. This soil has a surface layer of silt loam and lower layers of stratified silt loam, silty clay loam, or loam. The available water capacity is high. The hazard of water erosion is slight, and areas are occasionally flooded.

Forage sorghum and small grain are the main crops. Small acreages of cotton and grain sorghum are also grown, and some areas are in alfalfa.

Maintaining and improving soil tilth and conserving moisture are the main management objectives. Use of a cropping system that includes high-residue crops improves tilth. Using minimum tillage as needed helps to conserve moisture.

CAPABILITY UNIT I-2

The only soil in this capability unit is Bastrop fine sandy loam, 0 to 1 percent slopes, a deep, moderately permeable, nearly level soil on stream terraces. This soil has a surface layer of fine sandy loam and lower layers of sandy clay loam. The available water capacity is high. The hazard of water erosion is slight. The hazard of soil blowing is slight.

Peanuts and forage sorghum are the main crops. Some acreage is planted to small grains, cotton, and grain sorghums.

Maintaining and improving soil tilth and conserving moisture are the main management objectives. Use of a cropping system that includes high-residue crops improves tilth and conserves moisture. Using minimum tillage also helps to conserve moisture.

CAPABILITY UNIT IIe-1

This capability unit consists of deep to moderately deep, moderately permeable to slowly permeable, gently sloping soils on uplands. These soils have a surface layer of clay or clay loam and lower layers of clay or clay loam. The available water capacity is medium to high. The hazard of water erosion is moderate.

Forage sorghums and small grains are the main crops (fig. 17). Some acreage is in grain sorghum and cotton.

Maintaining soil tilth and soil structure and controlling erosion are the main management objectives. Use of a cropping system that includes high-residue crops

Figure 17.—**Thick stand of oats growing on Denton clay, 1 to 3 percent slopes.**

helps in maintaining soil tilth. Varying the plow depth helps to eliminate compaction. Terraces and contour farming are needed to help control water erosion. Grassed waterways and diversions are needed in places to control runoff.

CAPABILITY UNIT IIe-2

This capability unit consists of deep or moderately deep, slowly permeable or moderately slowly permeable, gently sloping soils on uplands. The surface layer is fine sandy loam, and the lower layers are clay or sandy clay. The available water capacity is medium to high. The hazard of water erosion is moderate, and the surface layer is hard and crusty when dry.

Forage sorghums, peanuts, and small grains are the main crops.

Maintaining and improving soil tilth, controlling water erosion, and conserving moisture are the main management objectives. Use of a cropping system that includes high-residue crops and soil-improving crops helps to improve tilth and conserve moisture. Varying the plow depth helps to eliminate compaction. Terraces and contour farming are needed to help control water erosion. Grassed waterways and diversions are needed in places to control runoff.

CAPABILITY UNIT IIe-3

This capability unit consists of deep, moderately permeable, gently sloping soils on uplands. The surface layer is fine sandy loam, and the lower layers are sandy clay loam or clay loam. The available water capacity is high. The hazard of water erosion is slight to moderate.

Forage sorghums, oats, and peanuts are the main crops.

Maintaining and improving soil tilth, controlling erosion, and conserving moisture are the main management objectives. Use of a cropping system that includes high-residue crops and soil-improving crops helps to improve tilth and conserve moisture. Varying the plow depth helps to eliminate compaction. Terraces and contour farming are needed to help control water erosion. Grassed waterways and diversions are needed in places to control runoff.

CAPABILITY UNIT IIe-4

This capability unit consists of deep, moderately rapidly permeable, nearly level to gently sloping soils on low-lying uplands and bottom lands. The surface layer and lower layers are very fine sandy loam. The available water capacity is medium to high. The hazard of water erosion is slight, and some areas are subject to occasional flooding. The hazard of soil blowing is moderate.

Forage sorghums and small grains are the main crops. Some acreage is used for grain sorghum and alfalfa.

Maintaining and improving soil tilth, conserving moisture, and controlling soil blowing are the main management objectives. Use of a cropping system that includes high-residue crops and soil-improving crops helps to improve tilth and conserve moisture. Growing close spaced crops and winter cover crops helps to control soil blowing. Terraces and grassed waterways are needed in places to control runoff.

CAPABILITY UNIT IIs-1

The only soil in this capability unit is Krum clay, 0 to 1 percent slopes, a deep, moderately slowly permeable, nearly level soil on uplands. The surface layer and lower layers are clay or silty clay. The available water capacity is high. The hazard of water erosion is slight.

Forage sorghums and small grains are the main crops. Some acreage is in grain sorghums and cotton.

Maintaining and improving soil tilth and soil structure are the main management objectives. Use of a cropping system that includes high-residue crops helps to maintain and improve tilth and soil structure. Varying the plow depth helps to eliminate compacted layers. Grassed waterways and diversions are needed in places to control runoff.

CAPABILITY UNIT IIs-2

The only soil in this capability unit is Ships silty clay, a deep, very slowly permeable, nearly level soil on bottom land. The surface layer is silty clay, and the lower layers are clay. The available water capacity is high. The hazard of water erosion is slight, but areas are subject to occasional flooding.

Forage sorghum and small grains are the main crops. Some acreage is in alfalfa and grain sorghum.

Maintaining and improving soil tilth and soil structure are the main management objectives. Use of a cropping system that includes high-residue crops and close spaced crops helps to improve tilth and structure. Using minimum but timely tillage and varying the plow depth help to eliminate compaction. Diversion terraces are needed in places.

CAPABILITY UNIT IIw-1

This capability unit consists of deep, moderately permeable, nearly level soils on bottom land. The surface layer is loam or fine sandy loam, and lower layers are clay loam or sandy clay loam. The available water capacity is high. The hazard of water erosion is slight, and areas are occasionally flooded.

Forage sorghum and small grain are the main crops. Some acreage is in peanuts.

Maintaining and improving soil tilth and conserving moisture are the main management objectives. Use of a cropping system that includes high-residue crops improves tilth and conserves moisture. Using minimum tillage as needed and varying the plow depth help eliminate compaction. Grassed waterways and diversions are needed in places to control runoff.

CAPABILITY UNIT IIw-2

The only soil in this capability unit is Frio clay loam, occasionally flooded, a deep, moderately slowly permeable, nearly level soil on bottom land. The surface layer is clay loam, and the lower layers are clay loam, clay, or silty clay. The available water capacity is high. The hazard of water erosion is slight, but areas are subject to occasional flooding.

Forage sorghums and small grains are the main crops. Some acreage is in alfalfa and grain sorghum.

Maintaining and improving soil tilth, soil structure, and organic-matter content are the main management objectives. Use of a cropping system that includes high-residue crops helps improve tilth, structure, and organic-matter content. Varying the plow depth helps eliminate compaction. Grassed waterways and diversions are needed in places to control runoff from higher lying areas.

CAPABILITY UNIT IIIe-1

This capability unit consists of deep, moderately permeable, gently sloping, eroded soils on uplands. The surface layer is fine sandy loam, and the lower layers are sandy clay loam. The available water capacity is high. The hazard of water erosion is moderate.

Forage sorghums, small grains, and peanuts are the main crops. Some acreage is in grain sorghum, vegetables, or orchards.

Maintaining and improving soil tilth, conserving moisture, and controlling water erosion are the main management objectives. Use of a cropping system that includes high-residue crops and close spaced soil-improving crops helps to improve tilth, conserve moisture, and control erosion. Terraces and contour farming are needed to help control erosion. Grassed waterways and diversions are needed in places to control runoff.

CAPABILITY UNIT IIIe-2

This capability unit consists of deep and moderately deep, moderately slowly permeable, gently sloping soils on uplands. Some areas are eroded. The surface layer is fine sandy loam, and the lower layers are clay, sandy clay, sandy clay, or sandy clay loam. The available water capacity is medium to high. The hazard of water erosion is severe. These soils tend to crust and are hard when dry.

Forage sorghums, small grains, and peanuts are the main crops. Some areas are in orchards and vegetables.

Maintaining and improving soil tilth, conserving moisture, and controlling erosion are the main management objectives. Use of a cropping system that includes high-residue crops and close spaced soil-improving crops helps improve tilth and conserve moisture. Terraces and contour farming are needed to help control erosion. Grassed waterways and diversions are needed in places to help control erosion.

CAPABILITY UNIT IIIe-3

This capability unit consists of deep, very slowly permeable, gently sloping soils on uplands. The surface layer is clay to clay loam, and the lower layers are clay. The available water capacity is high. The hazard of water erosion is moderate. These soils are droughty and crust when dry.

Forage sorghums and small grains are the main crops.

Maintaining and improving soil tilth, conserving moisture, and controlling erosion are the main management objectives. Use of a cropping system that includes high-residue crops and close spaced soil-improving crops helps to improve tilth, conserve moisture, and control erosion. Terraces and contour farming are needed to help control erosion. Grassed waterways and diversions are needed in places to control runoff.

CAPABILITY UNIT IIIe-4

This capability unit consists of deep, moderately permeable to slowly permeable, gently sloping soils on uplands. The surface layer is loamy fine sand or fine sand, and the lower layers are sandy clay loam, sandy clay, or clay. The available water capacity is low to high. The hazard of water erosion is slight, and the hazard of soil blowing is severe.

Forage sorghums, small grains, and peanuts are the main crops. Some acreage is in truck crops and orchards.

Maintaining and improving soil tilth, conserving moisture, and controlling soil blowing are the main management objectives. Use of a cropping system that includes high-residue crops and close spaced soil-improving crops is needed to help improve tilth, conserve moisture, and control soil blowing. Stripcropping and use of fertilizers and crop residue also help to control soil blowing.

CAPABILITY UNIT IIIe-5

This capability unit consists of deep to moderately deep, moderately permeable, gently sloping soils on uplands. The surface layer and lower layers are clay loam. The available water capacity is medium to high. The hazard of water erosion is moderate.

Forage sorghums and small grains are the main crops. Some acreage is in grain sorghum.

Controlling erosion and conserving moisture are the main management objectives. Use of a cropping system that includes high-residue crops and close spaced crops helps control erosion and conserve moisture. Terraces and contour farming are needed to help control water erosion. Grassed waterways and diversions are needed in places to control runoff.

CAPABILITY UNIT IIIe-6

The only soil in this capability unit is Purves clay, 1 to 3 percent slopes, a shallow, moderately slowly permeable, gently sloping soil on uplands. The surface layer and lower layers are clay, and they are over limestone bedrock. The available water capacity is low. The hazard of water erosion is moderate.

Forage sorghums and small grains are the main crops.

Controlling erosion and conserving moisture are the main management objectives. Use of a cropping system that includes high-residue crops and close spaced crops helps to control erosion and conserve moisture. Terraces and contour tillage are needed to help control water erosion. Grassed waterways and diversions are needed in places to help control runoff.

CAPABILITY UNIT IIIe-7

The only soil in this capability unit is Patilo complex, 1 to 5 percent slopes, a deep, moderately slowly permeable, gently sloping soil on uplands. The surface layer is fine sand, and the lower layers are sandy clay loam. The available water capacity is low. The hazard of water erosion is slight, and the hazard of soil blowing is severe.

Peanuts and truck crops are the main crops. Some acreage is in oats and forage sorghum.

Maintaining and improving soil tilth, conserving moisture and controlling soil blowing are the main management objectives. Use of a cropping system that includes high-residue crops and close spaced soil-improving crops helps to improve tilth, conserve moisture, and control soil blowing. Stripcropping and use of cover crops also help to control soil blowing.

CAPABILITY UNIT IIIe-8

The only soil in this capability unit is Lindy loam, 1 to 3 percent slopes, a moderately deep, slowly permeable, gently sloping soil on uplands. The surface layer is loam. The lower layers are clay and rest on limestone. The available water capacity is medium. The hazard of water erosion is moderate. This soil is crusty when dry.

Forage sorghums and small grains are the main crops.

Maintaining and improving soil tilth, conserving moisture, and controlling erosion are the main management objectives. Use of a cropping system that includes high-residue crops and close spaced crops helps to improve tilth, conserve moisture, and control erosion. Terraces and contour farming help to control erosion. Grassed waterways and diversions help to control runoff.

CAPABILITY UNIT IIIe-9

This capability unit consists of deep, slowly permeable, gently sloping soils on uplands. Some areas are eroded. The surface layer is fine sandy loam, and the lower layers are clay. The available water capacity is medium. The hazard of water erosion is severe. These soils are hard and crusty when dry.

Forage sorghums and small grains are the main crops.

Maintaining and improving soil tilth, conserving moisture, and controlling water erosion are the main management objectives. Use of a cropping system that includes high-residue crops and close spaced soil-improving crops helps improve tilth, conserve moisture, and control erosion. Terraces and contour farming are needed to help control erosion. Grassed waterways and diversions are needed in places to control runoff.

CAPABILITY UNIT IIIe-10

This capability unit consists of deep, moderately slowly permeable to slowly permeable, gently sloping, eroded soils on uplands. The surface layer is loamy fine sand, and the lower layers are sandy clay loam or clay. The available water capacity is medium. The hazard of water erosion is slight to moderate, and the hazard of soil blowing is severe.

Forage sorghums, small grains, and peanuts are the main crops. Some acreage is in truck crops.

Maintaining and improving soil tilth, conserving moisture, and controlling soil blowing are the main management objectives. Use of a cropping system that includes high-residue crops and close spaced soil-improving crops is needed to help improve tilth, conserve moisture, and control soil blowing. Stripcropping and use of fertilizers and crop residue also help control soil blowing.

CAPABILITY UNIT IIIw-1

The only soil in this capability unit is Hassee fine sandy loam, 0 to 1 percent slopes, a deep, very slowly permeable, nearly level soil on uplands. The surface layer is fine sandy loam, and the lower layers are loam, clay loam, or clay. The available water capacity is high. The hazard of water erosion is slight. This soil is hard and crusty when dry. Some areas receive extra water.

Forage sorghum and small grains are the main crops. Some acreage is in peanuts.

Maintaining and improving soil tilth and conserving moisture are the main management objectives. Use of a cropping system that includes high-residue crops and soil-improving crops helps to improve tilth and conserve moisture.

CAPABILITY UNIT IVe-1

This capability unit consists of deep, moderately permeable to moderately slowly permeable, sloping soils on uplands. Some areas are eroded. The surface layer is fine sandy loam, and the lower layers are sandy clay loam, sandy clay, or clay. The available water capacity is high. The hazard of water erosion is severe.

Forage sorghums, small grains, and peanuts are the main crops. Some areas are in truck crops and orchards.

Maintaining and improving soil tilth, conserving moisture, and controlling erosion are the main management objectives. Use of a cropping system that includes high-residue crops and close spaced soil-improving crops is needed to improve tilth, conserve moisture, and help control erosion. Contour farming and use of fertilizers and terraces are essential to help control erosion. Grassed waterways and diversions are needed in places to help control runoff.

CAPABILITY UNIT IVe-2

This capability unit consists of deep to moderately deep, moderately permeable, sloping soils on uplands. The surface layer is clay loam, and the lower layers are clay loam to silty clay loam. The available water capacity is medium to high. The hazard of water erosion is severe.

Forage sorghums and small grains are the main crops.

Maintaining and improving soil tilth, conserving moisture, and controlling erosion are the main management objectives. Use of a cropping system that includes high-residue crops and close spaced soil-improving crops helps improve tilth, conserve moisture, and control erosion. Contour farming and use of fertilizers and terraces also help control erosion. Grassed waterways and diversions are needed in places to control runoff.

CAPABILITY UNIT IVe-3

The only soil in this capability unit is Nimrod fine sand, 5 to 8 percent slopes, a deep, moderately slowly permeable, sloping soil on uplands. The surface layer is fine sand, and the lower layers are sandy clay or sandy

clay loam. The available water capacity is low. The hazard of water erosion is moderate. The hazard of soil blowing is severe.

Forage sorghums, small grains, and peanuts are the main crops. Some areas are in truck crops.

Maintaining and improving soil tilth, conserving moisture, and controlling soil blowing and water erosion are the main management objectives. Use of a cropping system that includes high-residue crops and close spaced soil-improving crops helps improve tilth, conserve moisture, and control soil blowing. Stripcropping and use of fertilizers and stubble mulch also help control soil blowing.

CAPABILITY UNIT IVe-4

The only soil in this capability unit is Purves clay, 3 to 5 percent slopes, a shallow, moderately slowly permeable, gently sloping soil on uplands. The surface layer and lower layers are clay, and they are over limestone bedrock. The available water capacity is low. The hazard of water erosion is severe.

Forage sorghum and small grains are the main crops.

Maintaining and improving soil tilth, conserving moisture, and controlling erosion are the main management objectives. Use of a cropping system that includes high-residue crops and close spaced soil-improving crops helps control erosion, conserve moisture, and improve tilth. Use of fertilizers, terracing and contour farming also helps control erosion. Grassed waterways and diversions are needed in places to control runoff.

CAPABILITY UNIT Vw-1

The only soil in this capability unit is Frio clay loam, frequently flooded, a deep, moderately slowly permeable, nearly level soil on bottom land. The surface layer is clay loam, and the lower layers are clay loam, clay, or silty clay. The available water capacity is high. The hazard of water erosion is slight, but areas are subject to frequent flooding.

The hazard of flooding makes this soil unsuitable for cultivation. Most areas are used as pasture or range.

CAPABILITY UNIT Vw-2

The only soils in this capability unit are Lincoln soils, frequently flooded. These are deep, rapidly permeable, nearly level to gently sloping soils on bottom land. The surface layer and lower layers are loamy fine sand and fine sand. The available water capacity is low. The hazard of soil blowing is severe. Areas are subject to frequent flooding.

The hazard of flooding makes the soils of this unit unsuitable for cultivation. Most areas are used as pasture or range. Some areas are used for wildlife and recreation.

CAPABILITY UNIT Vw-3

This capability unit consists of deep, moderately permeable to moderately rapidly permeable, nearly level soils on bottom land. The surface layer is fine sandy loam or very fine sandy loam, and the lower layers are fine sandy loam, loamy fine sand, or sandy clay loam. The available water capacity is medium to high. The hazard of water erosion is slight. The hazard of soil blowing is slight to moderate. These soils are subject to frequent flooding.

The hazard of flooding makes the soils of this unit unsuitable for cultivation. Most areas are used as pasture or range. Some areas are used for recreation.

CAPABILITY UNIT VIe-1

This capability unit consists of deep, moderately permeable and moderately slowly permeable, gently sloping to sloping, severely eroded soils on uplands. The surface layer is fine sandy loam, and the lower layers are sandy clay loam or clay. The available water capacity is high. The hazard of water erosion is severe.

These soils are not suitable for cultivation because they are severely eroded. Most areas are used for pasture or range (fig. 18).

CAPABILITY UNIT VIe-2

The only soil in this capability unit is Hardeman very fine sandy loam, 6 to 12 percent slopes, a deep, moderately rapidly permeable, sloping to strongly sloping soil on low-lying uplands. The surface layer and lower layers are very fine sandy loam. The available water capacity is medium. The hazard of water erosion is severe.

This soil is not suitable for cultivation because slopes are short and the hazard of erosion is severe. Most areas are in range.

CAPABILITY UNIT VIe-3

The only soil in this capability unit is Owens clay, 3 to 12 percent slopes, a shallow, very slowly permeable, gently sloping to strongly sloping soil on uplands. The surface layer is clay, and lower layers are clay over shaly clay. The available water capacity is low. The hazard of water erosion is severe.

This soil is not suitable for cultivation. Most areas are in range.

CAPABILITY UNIT VIe-4

The only soil in this capability unit is Truce fine sandy loam, 5 to 8 percent slopes, eroded, a deep, slowly permeable, sloping soil on uplands. The surface layer is fine sandy loam, and the lower layers are clay. The available water capacity is medium. The hazard of water erosion is severe. The soil is crusty and hard when dry.

This soil is not suitable for cultivation because of the hazard of erosion and the slope. It is mostly used for pasture or range.

CAPABILITY UNIT VIs-1

This unit consists of very shallow to shallow, moderately permeable to slowly permeable, nearly level to strongly sloping and undulating soils on uplands. The surface layer is clay loam, and the lower layers are loam, clay, and very gravelly clay loam over limestone or marl. The available water capacity is very low to low. The hazard of water erosion is moderate.

These soils are not suitable for cultivation because they contain gravel, cobbles, and stones and are too steep in places. Most areas are used as range.

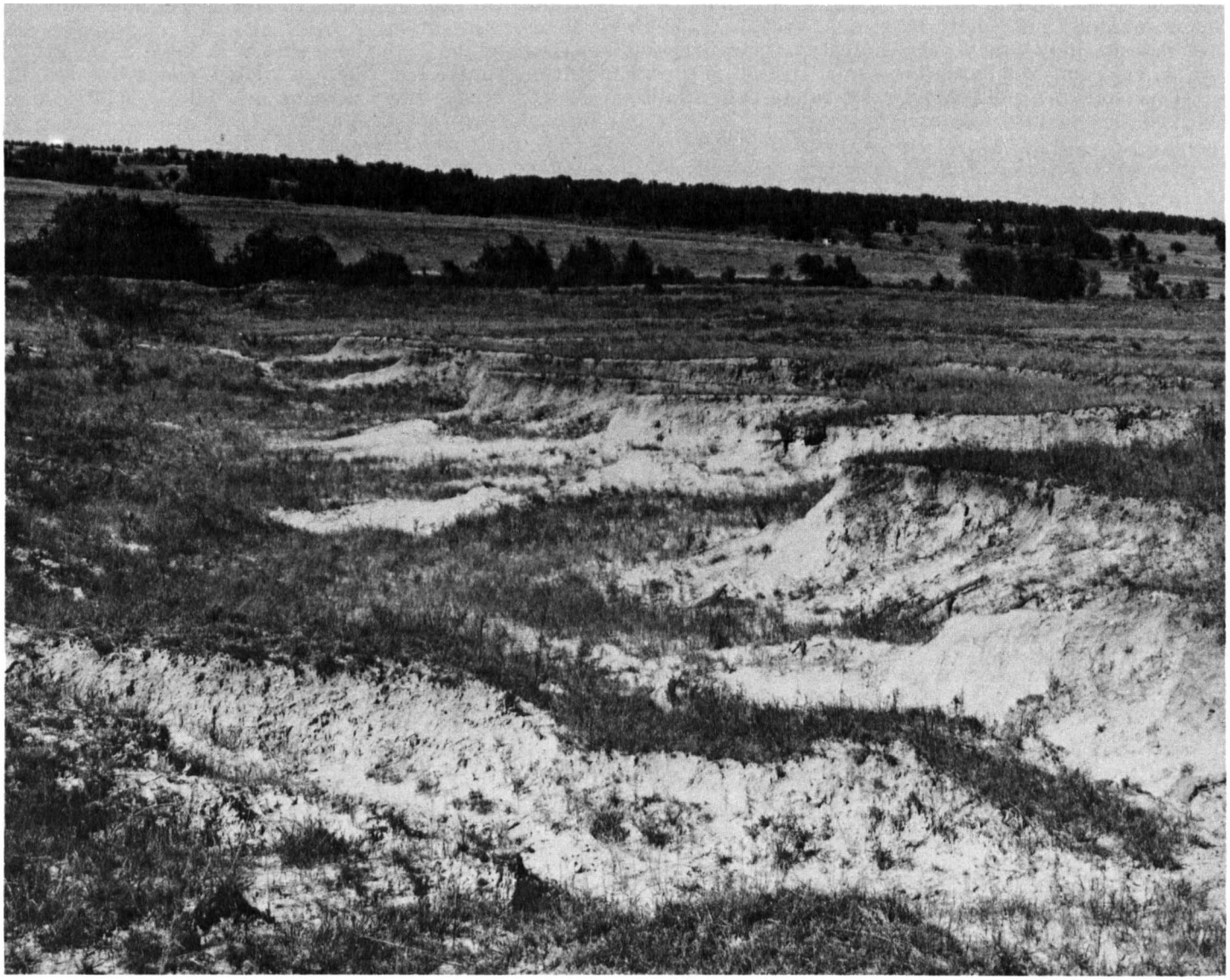

Figure 18.—**Natural vegetation on Windthorst soils, 1 to 8 percent slopes, severely eroded.**

CAPABILITY UNIT VIs–2

The only soils in this capability unit are Bonti and Truce soils, 1 to 8 percent slopes. These are moderately deep to deep, moderately slowly permeable to slowly permeable, gently sloping to sloping soils on uplands. The surface layer is cobbly and stony fine sand, and the lower layers are clay. The available water capacity is medium. The hazard of water erosion is moderate.

These soils are not suitable for cultivation. Most areas are in range.

CAPABILITY UNIT VIIe–1

This capability unit consists only of Duffau-Orthents complex, 3 to 8 percent slopes, severely eroded. The soil in this unit is deep, moderately permeable, gently sloping to sloping, severely eroded, and gullied. The surface layer is fine sandy loam or sandy clay loam, and the lower layers are sandy clay loam. The available water capacity is low to high. The hazard of water erosion is severe.

This unit is suitable only for range and wildlife.

CAPABILITY UNIT VIIs–1

This capability unit consists of very shallow to shallow, moderately slowly permeable, gently sloping to moderately steep soils on uplands. The surface layer is clay loam or gravelly clay loam, and the lower layers are clay loam, indurated limestone, or marl. The available water capacity is very low. The hazard of water erosion is moderate.

These soils are suitable only for native range or wildlife.

CAPABILITY UNIT VIIs–2

This capability unit consists of shallow to deep, very slowly permeable to slowly permeable, sloping to steep

soils on uplands. The surface layer is clay, fine sandy loam, or stony fine sandy loam, and the lower layers are clay or shaly clay. The available water capacity is low to medium. The hazard of water erosion is severe.

These soils are suitable only for range and wildlife.

Predicted Yields

Table 2 lists predicted yields of the principal crops grown in the county. The predictions are based on estimates made by farmers, soil scientists, and others who have knowledge of yields in the county and on information taken from research data. The predicted yields are average yields per acre that can be expected by good commercial farmers at the level of management which tends to produce the highest economic returns.

The yields are given for arable dryland soils. Not included in this table are soils that are used only for range or recreation.

Crops other than those shown in table 2 are grown in the county, but their predicted yields are not included because their acreage is small or reliable data on yields are not available.

The predicted yields can be expected if the following management practices are used:

1. Rainfall is effectively used and conserved.
2. Surface and/or subsurface drainage systems are installed.
3. Crop residue is managed to maintain soil tilth.
4. Minimum but timely tillage is used.
5. Insect, disease, and weed control measures are consistently used.
6. Fertilizer is applied according to soil tests and crop needs.
7. Adapted crop varieties are used at recommended seeding rates.

TABLE 2.—*Predicted average yields per acre of principal crops*

[Dashes indicate that the crop is not suited to the soil or is not generally grown on it]

Soil	Oats	Peanuts	Forage sorghums	Tame pasture
	Bu	*Lb*	*AUM*[1]	*AUM*[1]
Bastrop fine sandy loam, 0 to 1 percent slopes	40	1,250	6.0	7.0
Bastrop fine sandy loam, 1 to 3 percent slopes	40	1,200	6.0	6.0
Bastrop fine sandy loam, 2 to 5 percent slopes, eroded	30	800	4.0	5.0
Blanket clay loam, 1 to 3 percent slopes	60	---	5.5	6.5
Bolar clay loam, 1 to 3 percent slopes	50	---	5.0	5.5
Bolar clay loam, 3 to 5 percent slopes	35	---	5.0	5.0
Bolar clay loam, 5 to 8 percent slopes	30	---	5.0	5.0
Bonti fine sandy loam, 1 to 3 percent slopes	35	1,000	4.5	4.5
Bonti fine sandy loam, 3 to 5 percent slopes	35	900	4.0	4.5
Bonti fine sandy loam, 1 to 5 percent slopes, eroded	30	800	3.5	4.0
Bosque loam, occasionally flooded	60	---	6.5	7.0
Bunyan fine sandy loam, occasionally flooded	50	1,150	6.0	7.0
Chaney loamy fine sand, 1 to 5 percent slopes	30	1,200	5.5	6.0
Chaney loamy fine sand, 3 to 5 percent slopes, eroded	20	850	4.5	5.0
Denton clay, 1 to 3 percent slopes	60	---	6.0	6.5
Duffau and Weatherford soils, 1 to 5 percent slopes	35	1,200	5.0	6.0
Duffau and Weatherford soils, 2 to 5 percent slopes, eroded	30	800	4.0	5.0
Duffau and Weatherford soils, 5 to 8 percent slopes, eroded	25	800	4.0	4.5
Frio clay loam, occasionally flooded	60	---	6.5	6.5
Frio clay loam, frequently flooded	---	---	---	6.0
Hardeman very fine sandy loam, 0 to 2 percent slopes	40	---	6.0	7.0
Hassee fine sandy loam, 0 to 1 percent slopes	30	500	5.0	5.5
Heaton fine sand, 1 to 5 percent slopes	30	1,200	5.0	5.5
Krum clay, 0 to 1 percent slopes	70	---	7.0	7.5
Krum clay, 1 to 3 percent slopes	70	---	7.0	7.5
Lamar clay loam, 3 to 5 percent slopes	40	---	5.5	5.0
Lamar clay loam, 5 to 8 percent slopes	40	---	5.0	5.5
Lincoln soils, frequently flooded	---	---	---	4.5
Lindy loam, 1 to 3 percent slopes	45	---	5.0	5.0
May fine sandy loam, 1 to 3 percent slopes	45	1,200	5.5	6.0
Nimrod fine sand, 1 to 5 percent slopes	30	1,200	5.0	5.5
Nimrod fine sand, 5 to 8 percent slopes	25	1,000	4.5	5.0
Norwood silt loam	50	---	8.0	8.0
Patilo complex, 1 to 5 percent slopes	20	1,000	2.5	4.0
Purves clay, 1 to 3 percent slopes	30	---	4.5	3.0
Purves clay, 3 to 5 percent slopes	30	---	4.0	3.0
Reap clay, 1 to 3 percent slopes	30	---	4.0	3.0
Selden loamy fine sand, 1 to 5 percent slopes	30	1,200	5.5	6.0
Selden loamy fine sand, 1 to 5 percent slopes, eroded	20	800	5.0	5.0
Ships silty clay	70	---	7.0	8.0
Thurber clay loam, 1 to 3 percent slopes	30	---	4.0	3.5
Truce fine sandy loam, 1 to 3 percent slopes	35	900	4.0	4.5
Truce fine sandy loam, 3 to 5 percent slopes	20	---	2.5	4.0
Truce fine sandy loam, 2 to 5 percent slopes, eroded	15	---	2.0	3.0
Venus clay loam, 1 to 3 percent slopes	60	---	7.0	7.0

TABLE 2.—*Predicted average yields per acre of principal crops*—Continued

Soil	Oats	Peanuts	Forage sorghums	Tame pasture
	Bu	*Lb*	*AUM*[1]	*AUM*[1]
Venus clay loam, 3 to 5 percent slopes	45	---	6.5	6.0
Venus clay loam, 5 to 8 percent slopes	40	---	5.5	5.5
Windthorst loamy fine sand, 1 to 5 percent slopes	30	1,200	5.0	6.0
Windthorst fine sandy loam, 1 to 3 percent slopes	40	1,200	5.0	5.5
Windthorst fine sandy loam, 3 to 5 percent slopes	35	850	4.5	5.0
Windthorst fine sandy loam 1 to 5 percent slopes, eroded	30	800	4.0	4.5
Windthorst fine sandy loam, 5 to 8 percent slopes	25	800	4.0	4.5
Yahola and Bunyan soils, frequently flooded	---	---	---	7.0
Yomont very fine sandy loam	40	---	6.5	7.0
Yomont very fine sandy loam, frequently flooded	---	---	---	7.0

[1] Animal-unit-month, the number of months in a year that an acre will provide grazing for one animal unit (one cow, steer, or horse or seven sheep or goats) without injury to the pasture.

Pasture and Hayland

Well managed pasture and hayland are essential to the maintenance of a balanced forage program in the county.

Most important in pasture and hayland management is limiting grazing or cutting vegetation to an intensity which maintains adequate cover for soil protection and yet permits plants to retain sufficient leaf surface to effectively manufacture the nutrients needed for plant growth.

Other management practices, such as fertilization, weed control, and rotation grazing, are very important in maintaining and improving the vegetation. Fertilizers should be applied in rates recommended by soil tests and in quantities necessary for plant growth and desired forage production. Time of fertilizer applications varies for different kinds of grass. Weed control is much less of a problem on well managed and fertilized, properly used pastures than it is on improperly managed, overused pastures. An excellent ground cover of grass prevents invasion of undesirable plants and tends to shade and crowd out germinating plants. Rotation grazing permits more timely harvesting and allows plants to recover before the next grazing period.

A well managed pasture has one dominant species of perennial grass, adequate fencing and cross fencing for proper rotation, and freedom from weeds. Pasture systems that include several different grasses in separate pastures that have different growing seasons, provide quality forage year round. Forage production during the growing season fluctuates with weather conditions. Stocking rates should be adjusted and managed to maintain the dominant grass at a proper height.

The soils of Parker County have been placed into 14 pasture groups, according to their suitability for the production of forage. The soils in each group are enough alike to be suited to the same grasses, to have similar limitations and hazards, to require similar management, and to have similar productivity and other responses to management. Thus, the pasture group is a convenient grouping of soils for many statements about their management. These groups are identified by numerals and uppercase letters. An example is group 1C.

Groups are assigned locally, but are part of a statewide system. Not all of the groups in the statewide system are represented in Parker County; therefore, the numbers are not consecutive.

The pasture group of any soil can be found by referring to the "Guide to Mapping Units" at the back of the survey.

PASTURE GROUP 1A

This group consists only of Ships silty clay. This is a deep, clayey, nearly level soil on bottom land. It cracks and takes in water rapidly when dry, but expands and is very slowly permeable when wet. The available water capacity is high. Areas are occasionally flooded and seasonally wet.

Seedbeds are difficult to establish because the soil becomes puddled if it is grazed when wet. Fertilizer needs to be added for sustained forage production.

This soil is well suited to cool- and warm-season forage. The production potential is high for improved bermudagrass, johnsongrass, kleingrass, and hardinggrass.

PASTURE GROUP 1C

This group consists of deep, loamy, nearly level soils on bottom land. Permeability is moderately slow, and the available water capacity is high. Areas are occasionally to frequently flooded and subject to seasonal wetness.

Fertilizer needs to be added for sustained forage production.

These soils are suited to cool- and warm-season forage. The production potential is high for improved bermudagrass, johnsongrass, kleingrass, and hardinggrass.

PASTURE GROUP 2A

This group consists of deep, loamy, nearly level soils on bottom land. Permeability is moderate to moderately rapid, and the available water capacity is medium to high. Areas are occasionally to frequently flooded.

Fertilizer needs to be added for sustained forage production.

These soils are best suited to warm-season forage. The production potential is high for improved bermudagrass, johnsongrass, kleingrass, and indiangrass (fig. 19).

Figure 19.—Coastal bermudagrass on Bunyan fine sandy loam, occasionally flooded.

PASTURE GROUP 3A

This group consists only of Lincoln soils, frequently flooded. These are deep, sandy, nearly level to gently sloping soils on bottom land. Permeability is rapid, and the available water capacity is low. Areas are frequently flooded.

Seedings are difficult to establish because of the cutting action of blowing sand. Fertilizer needs to be added for sustained forage production, and applications should be split and applied at planned intervals throughout the growing season.

These soils are best suited to warm-season forage. The production potential is medium to high for improved bermudagrass.

PASTURE GROUP 7A

This group consists only of Reap clay, 1 to 3 percent slopes. It is a deep, clayey, gently sloping soil on uplands. This soil cracks and takes in water rapidly when dry, but expands and is very slowly permeable when wet. The available water capacity is high. Areas are seasonally wet.

Seedbeds are difficult to establish because the soil becomes puddled if it is grazed when wet. Fertilizer needs to be added for sustained forage production.

This soil is well suited to cool- and warm-season forage. The production potential is high for improved bermudagrass, johnsongrass, kleingrass, King Ranch bluestem, and hardinggrass.

PASTURE GROUP 7C

This group consists of deep to moderately deep, clayey to loamy, nearly level to gently sloping soils on uplands. Permeability is moderate to slow, and the available water capacity is medium to high.

Fertilizer needs to be added for sustained forage production.

These soils are well suited to cool- and warm-season forage. The production potential is high for improved bermudagrass, johnsongrass, kleingrass, hardinggrass, indiangrass, and switchgrass. It is medium for King Ranch bluestem.

PASTURE GROUP 7D

This group consists of deep to moderately deep,

loamy, sloping soils on uplands. Permeability is moderate, and the available water capacity is medium to high.

Fertilizer needs to be added for sustained forage production. Steep slopes make improved pastures difficult to establish.

These soils are well suited to cool- and warm-season forage. Slope and good drainage, however, make them better suited to cool-season plants. The production potential is medium for improved bermudagrass, johnsongrass, kleingrass, and King Ranch bluestem. It is high for hardinggrass.

PASTURE GROUP 7H

This group consists only of Thurber clay loam, 1 to 3 percent slopes. It is a deep, loamy, gently sloping soil on uplands. Permeability is very slow, and the available water capacity is high.

Soil compaction is a problem if this soil is grazed when wet. Seedbeds are difficult to prepare because the texture is clayey. Grass is difficult to establish because of surface crusting. Fertilizer needs to be added for sustained forage production.

This soil is well suited to cool- and warm-season forage. The production potential is high for improved bermudagrass, johnsongrass, kleingrass, and hardinggrass. It is medium for King Ranch bluestem.

PASTURE GROUP 8A

This group consists of deep to moderately deep, loamy, nearly level to sloping soils on uplands. Permeability is moderately slow to very slow, and the available water capacity is medium.

These soils are seasonally wet and seasonally droughty. Fertilizer needs to be added for sustained high forage production.

These soils are best suited to warm-season forage. Moisture conditions, however, are better for cool-season plants. The production potential is high for improved bermudagrass, kleingrass, and weeping lovegrass. It is moderate for King Ranch bluestem.

PASTURE GROUP 8B

This group consists of deep, loamy, gently sloping to sloping soils on uplands. Permeability is slow to moderately slow, and the available water capacity is medium to high.

These soils are eroded, and some critical areas need shaping before grass is planted. These soils are seasonally wet and seasonally droughty. Fertilizer needs to be added for sustained forage production.

These soils are well suited to cool-season grazing as a result of slope and drainage. The production potential is moderate for improved bermudagrass, kleingrass, weeping lovegrass, and King Ranch bluestem.

PASTURE GROUP 8C

This group consists of deep, loamy, nearly level to sloping soils on uplands. Permeability is moderate to moderately rapid, and the available water capacity is high.

Forage responds quickly to moisture from rains. The quick drying of the surface and some soil blowing are hazards to establishing grasses. Fertilizer needs to be added for sustained forage production.

These soils are well suited to cool- and warm-season forage. The production potential is high for improved bermudagrass, johnsongrass, kleingrass, hardinggrass, and weeping lovegrass.

PASTURE GROUP 9A

This group consists of deep, sandy, gently sloping to sloping soils on uplands. Permeability is moderate to slow, and the available water capacity is low to high.

Seedling grasses are difficult to establish because of the cutting action of blowing sand and the difficulty of obtaining a firm seedbed. Fertilizer needs to be added for sustained forage production, and applications should be split and applied at planned intervals throughout the growing season.

These soils are best suited to warm-season forage. The production potential is high for improved bermudagrass and weeping lovegrass (fig. 20).

PASTURE GROUP 9B

This group consists only of Patilo complex, 1 to 5 percent slopes. These are deep, sandy, gently sloping soils on uplands. Permeability is moderately slow, and the available water capacity is low.

Seedling grasses are difficult to establish because of the cutting action of blowing sand and the difficulty of obtaining a firm seedbed. Fertilizer needs to be added for sustained forage production, and applications should be split and applied at planned intervals throughout the growing season.

These soils are best suited to warm-season forage. They are well suited to grazing during wet periods. The production potential is medium for improved bermudagrass and weeping lovegrass.

PASTURE GROUP 13A

This group consists of shallow to very shallow, clayey to loamy and gravelly loamy, nearly level to gently sloping soils on uplands. Permeability is slow to moderately slow, and the available water capacity is low to very low.

Soil depth, stoniness, slope, or low available water capacity makes these soils generally unsuitable for pasture. Seedbeds are difficult to prepare and areas are better suited to native range. The number and amount of fertilizer applications should be in keeping with depth of the soil.

The production potential for these soils is low to medium for improved bermudagrass, kleingrass, and King Ranch bluestem.

Range [3]

Native range covers approximately 230,000 acres in Parker County, or about 40 percent of the total farmland. At the time of the survey there were approximately 100 ranch units, most of them operated as cow-calf enterprises. Many ranchers supplement their operations with winter stockers or carry-over calves.

[3] By DOUGLAS SELLARS, range conservationist, Soil Conservation Service.

Figure 20.—**Weeping lovegrass pasture on Selden loamy fine sand, 1 to 5 percent slopes.**

Most ranches include areas used for crops and pasture. They grow supplemental forage crops that are either grazed or stored as silage or hay. Improved pastures are in Coastal bermudagrass, kleingrass, and weeping lovegrass. Where water is available, pastures are irrigated to produce supplemental forage. The chief crops grown for supplemental forage are small grains, forage sorghum, and johnsongrass.

Grasslands throughout the county range from deep clay loam to very shallow clay loam over limestone bedrock and from sandy loam to sand.

A mixture of native short, mid, and tall grasses grows on the shallow and very shallow soils. Tall and mid grasses still grow on the deep clay loam, sandy loam, and sandy soils, but the vegetation is dominantly sand dropseed, three-awn, silver bluestem, and meadow dropseed.

Range sites and condition classes

Different kinds of soil vary in their capacity to produce grass and other plants for grazing. Soils that produce about the same kinds and amounts of forage, if the range is in similar condition, make up a range site.

Range sites differ in their ability to produce vegetation. The soils of any one range site produce about the same kind of climax vegetation. Climax vegetation is the stabilized plant community; it reproduces itself and does not change so long as the environment remains unchanged. Throughout the prairie and the plains, climax vegetation consists of the plants that were growing when the region was first settled. If cultivated crops are not grown, the most productive combination of forage plants on a range site is generally the climax vegetation.

Decreasers are plants in the climax vegetation that tend to decrease in relative amount under close grazing. They generally are the tallest and most productive perennial grasses and forbs and the most palatable to livestock.

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

Invaders are plants that cannot compete with plants in the climax plant community for moisture, nutrients, and light. Hence, invaders come in and grow along with

increasers after the climax vegetation has been reduced by grazing. Many are annual weeds, some are shrubs that have some grazing value, but others have little value for grazing.

Four range condition classes are used to indicate the degree of departure from the potential, or climax, vegetation caused by grazing or other uses. The classes show the present condition of the native vegetation on a range site in relation to the native vegetation that could grow there.

A range is in excellent condition if 76 to 100 percent of the vegetation is of the same kind as that in the climax stand. It is 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.

Range condition is judged according to standards that apply to the particular range site. It expresses the present kind and amount of vegetation in relation to the climax plant community for that site.

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

The main objective of good range management is to keep range in excellent or good condition. If this is done, water is conserved, yields are improved, and the soils are protected. The problem, however, is recognizing important changes in the kind of cover on a range site. Changes take place gradually and can be misinterpreted or overlooked. Growth encouraged by heavy rainfall may indicate that the range is in good condition, when actually the cover is weedy and the long-term trend is toward lower production. On the other hand, range that has been closely grazed for short periods under the supervision of a careful manager, may have a degraded appearance that temporarily conceals its quality and ability to recover.

Descriptions of range sites

In the following pages, the range sites of Parker County are described and the climax plants and principal invaders on the sites are named. Also given is an estimate of the potential annual yield of air-dry herbage for each site when it is in excellent condition. The range site in which a soil has been placed can be determined by referring to the "Guide to Mapping Units" at the back of this survey.

CLAY FLAT RANGE SITE

The very slowly permeable, deep, gently sloping soils of this site are on uplands. These soils have a surface layer and lower layers of clay. The available water capacity is high. The hazard of water erosion is moderate. The soils are crusty when dry.

The climax plant community is a mixture of mid and short grasses and forbs and scattered elm, hackberry, and lotebush. The approximate species composition, by weight, is 25 percent vine-mesquite; 15 percent each white tridens and Texas wintergrass; 10 percent buffalograss; and 35 percent Canada wildrye, side-oats grama, catclaw sensitivebrier, heath aster, Engelmann daisy, elm, hackberry, and lotebush.

If the site is in excellent condition, it produces 2,000 to 4,000 pounds of air-dry herbage per acre annually, depending on rainfall. About 90 percent is forage for cattle, sheep, or goats.

If the site is grazed too heavily, vine-mesquite, white tridens, Canada wildrye, and meadow dropseed decrease. Continued overgrazing results in an invasion of hairy tridens, Texas grama, lotebush, tasajillo, and upright prairie coneflower. Mesquite invades readily. In years of above-normal rainfall broomweed grows in fall, winter, and spring.

CLAY LOAM RANGE SITE

The slowly permeable to moderately permeable, nearly level to sloping, deep to moderately deep soils of this site are on uplands. These soils have a surface layer of clay or clay loam and lower layers of clay, silty clay loam, or clay loam. The available water capacity is medium to high. The hazard of water erosion is slight to severe.

The climax plant community is an open prairie of tall grass interspersed with some mid grasses. Woody species such as elm, pecan, and hackberry are along the small streams. The approximate species composition, by weight, is 20 percent little bluestem; 15 percent indiangrass; 10 percent big bluestem; 10 percent side-oats grama; 5 percent silver bluestem; 5 percent meadow dropseed; 5 percent Texas wintergrass; 5 percent Texas bluegrass; 5 percent Canada wildrye; 5 percent elm, pecan, hackberry, live oak, and other woody species; and 15 percent Engelmann daisy, bundleflowers, prairieflowers, maximilian sunflower, dotted gayfeather, compass plant, and other desirable forbs.

If the site is in excellent condition, it produces 3,000 to 6,500 pounds of air-dry herbage per acre annually, depending on rainfall. About 95 percent is forage for cattle, sheep, or goats.

If the site is grazed too heavily, indiangrass and big bluestem decrease. Little bluestem increases, but under continued heavy grazing it decreases and side-oats grama and other mid grasses increase. Continued overgrazing results in a cover of buffalograss, Texas wintergrass, ragweed, curlycup greenweed, and invaders such as mesquite, juniper, pricklypear, Texas grama, and hairy tridens.

CLAYPAN RANGE SITE

The very slowly permeable, nearly level to gently sloping, deep soils of this site are on uplands. These soils have a surface layer of fine sandy loam or clay loam and lower layers of loam, clay loam, or clay. The available water capacity is high. The hazard of water erosion is slight to moderate. The soils are crusty when dry.

The climax plant community is an open prairie of mid and short grasses and scattered condalia and ephedra. The approximate species composition, by weight, is 25 percent vine-mesquite; 10 percent side-oats grama; 10 percent Arizona cottontop; 10 percent buffalograss; 5 percent blue grama; 5 percent western wheatgrass; 5 percent Texas wintergrass; 5 percent tall dropseed; 5 percent sand dropseed; 5 percent perennial three-awn; 5 percent white tridens; 5 percent meadow dropseed; and 5 percent heath aster, Engel-

mann daisy, greenthread, catclay sensitivebrier, maximilian sunflower, western ragweed, and other forbs.

If the site is in excellent condition, it produces 2,500 to 3,500 pounds of air-dry herbage per acre annually, depending on rainfall. About 95 percent is used as forage for cattle, sheep, or goats.

If the site is grazed too heavily, silver bluestem, side-oats grama, and white tridens decrease, and buffalograss, curly mesquite, and Texas wintergrass increase. Continued overgrazing results in invasion of mesquite, condalia, tasajillo, pricklypear, ragweed, and annuals and a severe reduction in total annual production.

CLAYEY BOTTOM LAND RANGE SITE

The very slowly permeable, nearly level, deep soils of this site are on bottom land. These soils have a surface layer of silty clay and lower layers of clay or very fine sandy loam. The available water capacity is high. The hazard of water erosion is slight. Areas are occasionally flooded.

The climax plant community is a mixture of tall and mid grasses, forbs, and trees. The approximate species composition, by weight, is 25 percent vine-mesquite; 10 percent white tridens; 10 percent Canada wildrye; 15 percent Texas wintergrass; 10 percent Arizona cottontop; 10 percent little bluestem; 5 percent buffalograss; 5 percent indiangrass; 5 percent elm, live oak, hackberry, and other woody species; and 5 percent maximilian sunflower, Engelmann daisy, coreopsis, and greenthread.

If this site is in excellent condition, it produces 4,000 to 6,500 pounds of air-dry herbage per acre, depending on rainfall. About 90 percent is forage for cattle, sheep, or goats.

If the site is grazed too heavily, vine-mesquite, western wheatgrass, Canada wildrye, white tridens, Arizona cottontop, Engelmann daisy, and wild vetch decrease and buffalograss, Texas wintergrass, coreopsis, lotebush, pricklypear, and tasajillo increase. Under continued overgrazing, annual weeds, such as coreopsis and coneflower, and grasses, such as rescuegrass, make up a substantial part of the annual yield and total production is greatly reduced.

DEEP REDLAND RANGE SITE

The slowly permeable, gently sloping, moderately deep soils of this site are on uplands. These soils have a surface layer of loam and lower layers of clay underlain by indurated platy limestone. The available water capacity is medium. The hazard of water erosion is moderate.

The climax plant community is open grassland with scattered trees and motts. The overstory shades less than 10 percent of the site. It is chiefly live oak and post oak but may include Texas oak, Bigelow oak, blackjack oak, and several associated woody species. Tall and mid grasses are dominant. The approximate species composition, by weight, is 25 percent little bluestem; 15 percent indiangrass; 50 percent big bluestem, side-oats grama, tall dropseed, cane and silver bluestem, vine-mesquite, Texas cupgrass, Texas wintergrass, Canada wildrye, buffalograss, and curly mesquite; 5 percent live oak, post oak, and a few other woody species; and 5 percent forbs, such as maximilian sunflower, bush sunflower, Engelmann daisy, dotted gayfeather, sagewort, bundleflowers, western ragweed, and heath aster.

This site produces approximately 6,000 pounds of air-dry herbage per acre annually if growing conditions are favorable and 3,000 pounds or less annually if growing conditions are poor. About 90 percent is forage for cattle, sheep, or goats.

If the site is grazed too heavily, big bluestem, indiangrass, little bluestem, and the wildryes decrease and Texas wintergrass, side-oats grama, and buffalograss increase. Continued overgrazing results in a decrease of side-oats grama and other mid grass; an invasion of curly mesquite, Texas wintergrass, three-awn, buffalograss, and brush; and a reduction of annual production.

DEEP SAND RANGE SITE

The moderately slowly permeable, gently sloping, deep soils of this site are on uplands. These soils have a surface layer of fine sand and lower layers of sandy clay loam. The available water capacity is low. The hazard of water erosion is slight. The hazard of soil blowing is severe.

The climax plant community is an open stand or post oak and blackjack oak with an understory of tall and mid grasses and some interspersed brush species and forbs. The approximate species composition, by weight, is 10 percent sand lovegrass; 5 percent sand dropseed; 5 percent indiangrass and big bluestem; 5 percent purpletop tridens; 5 percent fringeleaf paspalum; 5 percent Scribner panicum; 10 percent annual grasses; 15 percent post oak; 10 percent blackjack oak; 5 percent bumelia; 5 percent greenbrier; 5 percent skunkbush sumac and pricklyash; and 15 percent trailing wild bean, lespedeza, erect dayflower, cenothera, bundleflower, and other forbs.

This site produces approximately 3,000 pounds of air-dry herbage per acre yearly if growing conditions are favorable and 1,000 pounds per acre if growing conditions are poor. Approximately 55 percent is forage for cattle, sheep, or goats.

If the site is grazed too heavily, sand lovegrass, indiangrass, big bluestem, and purpletop tridens decrease. Brush, especially oak, increases and completely dominates the site.

LOAMY BOTTOM LAND RANGE SITE

The moderately slowly permeable to moderately rapidly permeable, nearly level, deep soils of this site are on bottom land. These soils have a surface layer of loam, silt loam, clay loam, fine sandy loam, or very fine sandy loam and lower layers of clay, silty clay, clay loam, silty clay loam, silt loam, fine sandy loam, very fine sandy loam, or loamy fine sand. The hazard of water erosion is slight. Areas are subject to occasional or frequent flooding.

The climax plant community is a tall grass savanna that has a canopy of tall timber adjacent to the streams. This canopy shades 10 to 15 percent of the site and is chiefly pecan, elm, and live oak. The approximate species composition, by weight, is 25 percent big bluestem; 20 percent indiangrass; 15 percent little

bluestem; 25 percent side-oats grama, meadow dropseed, Canada wildrye, vine-mesquite, and tall dropseed; 10 percent pecan, elm, and live oak; and 5 percent Engelmann daisy, trailing wild bean, maximilian sunflower, heath aster, and Baldwin ironweed.

This site produces approximately 3,500 to 7,000 pounds of air-dry herbage per acre annually, depending on rainfall. Approximately 90 percent is forage for cattle, sheep, or goats.

If the site is grazed too heavily, big bluestem and indiangrass decrease. Little bluestem, side-oats grama, and tall dropseed at first increase and then decrease as other mid grasses increase. Continued overgrazing results in a dominant cover of buffalograss, meadow dropseed, Texas wintergrass, western ragweed, nightshades and other forbs, mesquite, sumac, greenbrier, and elbowbush.

REDLAND RANGE SITE

The slowly permeable, nearly level to gently sloping, shallow soils of this site are on uplands. These soils have a surface layer of clay loam and lower layers of clay over indurated limestone bedrock. The available water capacity is low. The hazard of water erosion is moderate.

The climax plant community is a savanna of tall and mid grass and oak trees. The approximate species composition, by weight, is 30 percent little bluestem; 15 percent indiangrass; 10 percent side-oats grama; 15 percent tall dropseed, cane bluestem, vine-mesquite, and Texas wintergrass; 5 percent big bluestem; 5 percent Texas cupgrass; 5 percent buffalograss, plains lovegrass and Canada wildrye; 10 percent live oak, post oak, Bigelow oak, Texas oak, elm, hackberry, redbush, gumelastic, elbowbush, and other woody species; and 5 percent bush sunflower, Engelmann daisy, dotted gayfeather, bundleflower, sensitivebrier, western ragweed, and other forbs.

If the site is in excellent condition, it produces approximately 5,000 pounds of air-dry herbage per acre annually if growing conditions are favorable and 2,500 pounds if growing conditions are poor. Approximately 90 percent is forage for cattle, sheep, or goats.

If the site is grazed too heavily, big bluestem, indiangrass, little bluestem, and Canada wildrye decrease. Continued overgrazing results in a dominant cover of Texas wintergrass, curly mesquite, and buffalograss; an increase of existing brush; and an invasion of mesquite. Bigelow oak becomes dominant on some sites.

SANDSTONE HILLS RANGE SITE

The slowly permeable, sloping to moderately steep, deep soils of this site are on uplands. These soils have a surface layer of stony fine sandy loam and lower layers of clay. The available water capacity is medium. The hazard of water erosion is severe.

The climax plant community is an open stand of mostly post oak trees and an understory of mid and tall grasses. Little bluestem is dominant. The approximate species composition, by weight, is 35 percent little bluestem; 10 percent indiangrass; 10 percent side-oats grama; 5 percent big bluestem; 5 percent switchgrass; 5 percent sand lovegrass; 5 percent Scribner panicum; 5 percent cane and silver bluestem; 10 percent post oak and blackjack oak; 5 percent Texas ash, greenbrier, cedar elm, skunkbush sumac, elbowbush, and bumelia; and 5 percent Engelmann daisy, western ragweed, bundleflower, and prairie-clover.

If the site is in excellent condition, it produces 2,000 to 3,500 pounds of air-dry herbage per acre annually, depending on rainfall. About 80 percent is forage for cattle, sheep, or goats.

If the site is grazed too heavily, big bluestem, indiangrass, and sand lovegrass decrease. Little bluestem and mid grasses at first increase, but then decrease under continued overgrazing; oak, skunkbush, greenbrier, three-awn, red lovegrass, sand dropseed, ragweed, and silverleaf nightshade dominate the site, and mesquite also invades in places.

SANDY BOTTOM LAND RANGE SITE

The rapidly permeable, nearly level to gently sloping, deep soils of this site are on bottom land. These soils have a surface layer of loamy fine sand and lower layers of fine sand. The available water capacity is low. The hazard of water erosion is slight. The hazard of soil blowing is severe. Areas are frequently flooded.

The climax plant community is a tall grass savanna, 10 to 20 percent of which is shaded by a canopy of elm, cottonwood, and willow. Approximate species composition, by weight, is 20 percent switchgrass; 15 percent indiangrass; 10 percent little bluestem; 35 percent eastern gramagrass, sand bluestem, purpletop tridens, Canada wildrye, and side-oats grama; 15 percent cottonwood, elm, willow, greenbrier, and pecan; and 5 percent maximilian sunflower, clammyweed, western ragweed, western indigo, and trailing wild bean.

If the site is in excellent condition, it produces 2,000 to 3,000 pounds of air-dry herbage per acre annually, depending on rainfall. About 90 percent is forage for cattle, sheep, or goats.

If the site is grazed too heavily, eastern gramagrass, big bluestem, indiangrass, and little bluestem decrease. When the site is in poor condition, sand dropseed, hooded windmillgrass, silver bluestem, western ragweed, bullnettle, greenbrier, oak, and chinaberry are dominant.

SANDY RANGE SITE

The moderately permeable to slowly permeable, gently sloping to sloping, deep soils of this site are on uplands. These soils have a surface layer of loamy fine sand or fine sand and lower layers of clay, sandy clay, or sandy clay loam. The available water capacity is low to high. The hazard of water erosion is slight to moderate. The hazard of soil blowing is severe.

The climax plant community is a mixture of tall and mid grasses and an abundant variety of forbs on a post oak and blackjack oak savanna. Post oak is the dominant woody species. Approximate species composition, by weight, is 25 percent little bluestem; 10 percent big bluestem; 10 percent indiangrass; 5 percent sand lovegrass; 5 percent purpletop tridens; 5 percent tall dropseed; 5 percent silver bluestem; 5 percent hairy grama; 5 percent Scribner panicum; 15 percent post oak and blackjack oak; 5 percent greenbrier,

bumelia, poison oak, pricklyash, and hackberry; and 5 percent trailing wild bean, lespedeza, erect dayflower, and dalea.

If the site is in excellent condition, it produces 2,500 to 4,500 pounds of air-dry herbage per acre annually, depending on rainfall. About 80 percent is forage for cattle, sheep, or goats.

If the site is grazed too heavily, the tall grasses decrease. When the site is in poor condition, silver bluestem, western ragweed, camphorweed, red lovegrass, sand dropseed, and hooded windmillgrass dominate. Blackjack oak and post oak increase to such density that many grass species are shaded out.

SANDY LOAM RANGE SITE

The moderately rapidly permeable to moderately slowly permeable, nearly level to strongly sloping, moderately deep to deep soils of this site are on uplands. These soils have a surface layer of fine sandy loam or very fine sandy loam and lower layers of sandy clay loam, clay loam, sandy clay, or very fine sandy loam. The available water capacity is medium to high. The hazard of water erosion is slight to severe. The hazard of soil blowing is slight to moderate.

The climax plant community is a post oak, blackjack oak savanna that has an understory of mid and tall grasses. Little bluestem, indiangrass, big bluestem, and side-oats grama are dominant. Approximate species composition, by weight, is 30 percent little bluestem; 10 percent big bluestem; 10 percent indiangrass; 10 percent side-oats grama; 5 percent silver bluestem; 5 percent Scribner panicum; 5 percent Texas wintergrass; 5 percent Arizona cottontop; 10 percent post oak, blackjack oak, elm, hackberry, skunkbush sumac, and pricklyash; and 10 percent Engelmann daisy, bundleflower, prairie-clover, western ragweed, and dotted gayfeather.

If the site is in excellent condition, it produces 3,000 to 6,000 pounds of air-dry herbage per acre annually, depending on rainfall. About 95 percent is forage for cattle, sheep, or goats.

If the site is too heavily grazed, tall grasses decrease. Continued overgrazing results in decrease of side-oats grama, Arizona cottontop, and other mid grasses. When the site is in poor condition, buffalograss, hairy grama, hooded windmillgrass, and western ragweed dominate, and mesquite readily invades.

SHALLOW RANGE SITE

The moderately permeable to moderately slowly permeable, gently sloping to sloping and undulating, very shallow to shallow soils of this site are on uplands. These soils have a surface layer of clay loam or clay and lower layers of clay or very gravelly clay loam over limestone bedrock. The available water capacity is very low to low. The hazard of water erosion is slight to moderate to severe.

The climax plant community is an open prairie of tall and mid grass that has scattered live oak and hackberry trees. Approximate species composition, by weight, is 30 percent little bluestem; 15 percent indiangrass; 10 percent big bluestem; 10 percent side-oats grama; 5 percent switchgrass; 5 percent tall grama; 5 percent Texas wintergrass; 5 percent hairy dropseed; 5 percent silver bluestem; 5 percent live oak, elm, elbowbush, and bumelia; and 5 percent dotted gayfeather, Engelmann daisy, western ragweed, and prairie-clover.

If the site is in excellent condition, it produces 2,000 to 3,000 pounds of air-dry herbage per acre annually, depending on rainfall. About 95 percent is forage for cattle, sheep, or goats.

If the site is too heavily grazed, tall grasses decrease. When the site is in poor condition, short grasses, graygold aster, western ragweed, and queensdelight are dominant.

SHALLOW CLAY RANGE SITE

The very slowly permeable to slowly permeable, gently sloping to steep, shallow to deep soils of this site are on uplands. These soils have a surface layer of clay or fine sandy loam and lower layers of clay. The available water capacity is medium to low. The hazard of water erosion is severe.

The climax plant community is short and mid grasses and scattered hackberry trees and such low growing shrubs as ephedra, wolfberry, dalea, catclaw, and agrito. Approximate species composition, by weight, is 30 percent side-oats grama; 15 percent cane and silver bluestem; 10 percent buffalograss; 10 percent vine-mesquite; 5 percent curly mesquite; 5 percent Texas wintergrass; 5 percent Arizona cottontop; 5 percent rough tridens; 5 percent meadow dropseed and hairy grama; 5 percent ephedra, hackberry, wolfberry, dalea, catclaw, and agrito; and 5 percent western ragweed, Louisiana sagewort, bundleflower, and Engelmann daisy.

If the site is in excellent condition, it produces 1,000 to 2,500 pounds of air-dry herbage per acre annually, depending on rainfall. About 95 percent is forage for cattle, sheep, or goats.

If the site is too heavily grazed, mid grasses decrease and buffalograss and curly mesquite are dominant. Continued overgrazing reduces the vigor of these plants; the resulting cover of vegetation is inadequate, and extensive erosion occurs. When the site is in poor condition, pricklypear, mesquite, and condalia readily invade.

STEEP ADOBE RANGE SITE

The moderately slowly permeable, gently sloping to moderately steep, shallow to very shallow soils of this site are on uplands. These soils have a surface layer of clay loam or gravelly clay loam and lower layers of loam, clay loam, gravelly clay loam, or limestone and marl. The available water capacity is very low. The hazard of erosion is moderate.

The climax plant community is a mixture of tall and mid grass, scattered motts, and groves of live oak and Texas oak. Approximate species composition, by weight, is 30 percent little bluestem; 10 percent indiangrass; 10 percent side-oats grama; 10 percent tall grama; 5 percent hairy dropseed; 5 percent silver bluestem; 5 percent rough tridens; 5 percent hairy grama; 15 percent Texas oak, live oak, juniper, flameleaf sumac, and skunkbush sumac; and 5 percent wild

alfalfa, bigtop dalea, white milkwort, prairie-clover, and dotted gayfeather.

If the site is in excellent condition, it produces 1,000 to 3,000 pounds of air-dry herbage per acre annually, depending on rainfall. About 85 percent is forage for cattle, sheep, or goats.

If the site is too heavily grazed, big and little bluestem, indiangrass, and side-oats grama decrease. When the site is in poor condition, Texas grama, perennial three-awn, queensdelight, hairy tridens, and red grama are dominant. Juniper and Texas oak readily increase and form a canopy of as much as 40 to 60 percent in places.

TIGHT SANDY LOAM RANGE SITE

The slowly permeable, gently sloping to sloping, deep soils of this site are on uplands. These soils have a surface layer of fine sandy loam and lower layers of clay. The available water capacity is medium. The hazard of water erosion is moderate to severe. These soils are crusty when dry.

The climax plant community is a mid grass and post oak savanna. Approximate species composition, by weight, is 30 percent side-oats grama; 15 percent Arizona cottontop; 15 percent vine-mesquite; 5 percent blue grama; 5 percent silver bluestem; 5 percent buffalograss; 5 percent Texas wintergrass; 5 percent perennial three-awn; 5 percent little bluestem; 5 percent post oak, pricklyash, skunkbush sumac, catclaw acacia, greenbrier, and bumelia; and 5 percent western ragweed, Engelmann daisy, heath aster, verbena, and sagewort.

If the site is in excellent condition, it produces 2,000 to 4,000 pounds of air-dry herbage per acre annually, depending on rainfall. About 95 percent is forage for cattle, sheep, or goats.

If the site is too heavily grazed, mid grasses decrease and buffalograss, hooded windmillgrass, and Texas wintergrass are dominant. Continued heavy grazing results in a cover of buffalograss, hairy tridens, curly mesquite, Texas grama, western ragweed, and annual broomweed. When the site is in poor condition, mesquite readily invades.

VERY SHALLOW RANGE SITE

The moderately slowly permeable, gently sloping, very shallow soils of this site are on uplands. These soils have a surface layer of gravelly clay loam over indurated limestone. The available water capacity is very low. The hazard of erosion is moderate.

The climax plant community is a mixed prairie of mid grasses and scattered tall grasses. Approximate species composition, by weight, is 20 percent little bluestem; 15 percent side-oats grama, 10 percent indiangrass; 10 percent slim tridens; 10 percent tall grama; 10 percent tall dropseed; 5 percent perennial three-awn; 5 percent buffalograss; 5 percent hairy grama; and 10 percent dotted gayfeather, Engelmann daisy, prairie-clover, graygold aster, and Texas false sage.

If this site is in excellent condition, it produces 800 to 1,500 pounds of air-dry herbage per acre annually, depending on rainfall. About 95 percent is forage for cattle, sheep, or goats.

If the site is too heavily grazed, tall grasses decrease. When the site is in poor condition, side-oats grama decreases and perennial three-awn, red grama, hairy tridens, buffalograss, broomweed, and graygold aster are dominant.

Wildlife [4]

Soils directly influence the kind and amount of vegetation and the amount of water available, and in this way indirectly influence the kinds of wildlife that can live in an area. Soil properties that affect the growth of wildlife habitat are: (1) thickness of soil useful to crops, (2) surface texture, (3) available water capacity to a depth of 40 inches, (4) wetness, (5) surface stoniness or rockiness, (6) flood hazard, (7) slope, and (8) permeability of the soil to air and water.

Elements of wildlife habitat.—Each soil is rated in table 3 according to its suitability for producing various kinds of plants and other elements that make up wildlife habitat. The ratings take into account mainly the characteristics of the soils and closely related natural factors of the environment. They do not take into account climate, present use of soils, or present distribution of wildlife and people. For this reason, selection of a site for development of wildlife habitat requires inspection at the site.

A rating of *good* means wildlife habitat is easily created, improved, and maintained. Few or no limitations affect management, and satisfactory results are expected when the soil is used for the prescribed purpose.

A rating of *fair* means wildlife habitat can be created, improved, or maintained in most places. Moderate intensity of management and fairly frequent attention may be required for satisfactory results, however.

A rating of *poor* means limitations for the designated use are severe. Habitats can be created, improved, or maintained in most places, but management is difficult and requires intensive effort.

A rating of *very poor* means the limitations to growth of wildlife habitat are very severe and that unsatisfactory results are to be expected. Wildlife habitat is either impossible or impractical to create, improve, or maintain on soils in this category.

The significance of each of the elements of wildlife habitat and kinds of wildlife is given in the following paragraphs.

Grain and seed crops are annual grain-producing plants, such as corn, sorghum, millet, and soybeans.

Domestic grasses and legumes are established by planting. They provide food and cover for wildlife. Grasses include bahiagrass, ryegrass, and panicgrass; legumes include annual lespedeza, shrub lespedeza, and clovers.

Wild herbaceous plants are native or introduced perennial grasses, forbs, and weeds that provide food and cover for upland wildlife. Beggarweed, perennial lespedeza, wild bean, pokeweed, and cheatgrass are

[4] This section prepared with help of LYNN POST, biologist, Soil Conservation Service.

TABLE 3.—*Suitability of soils for wildlife habitat elements and kinds of wildlife*

Soil series and map symbols	Elements of wildlife habitat						Kind of wildlife		
	Grain and seed crops	Domestic grasses and legumes	Wild herbaceous plants	Shrubs	Wetland plants	Shallow water developments	Openland	Rangeland	Wetland
Aledo: ALE	Poor	Poor	Poor	Fair	Very poor.	Very poor.	Poor	Poor	Very poor.
Bastrop:									
BaA, BaB	Good	Fair	Good	Good	Poor	Very poor.	Good	Good	Very poor.
BaC2	Fair	Fair	Good	Good	Poor	Very poor.	Fair	Good	Very poor.
Blanket: BbB	Good	Good	Fair	Good	Poor	Very poor.	Good	Fair	Very poor.
Bolar:									
BcB	Good	Good	Fair	Fair	Poor	Very poor.	Good	Fair	Very poor.
BcC, BcD	Fair	Good	Fair	Fair	Poor	Very poor.	Fair	Fair	Very poor.
Bonti:									
BfB	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
BfC, BfC2	Fair	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
BnD	Poor	Fair	Good	Good	Poor	Very poor.	Fair	Good	Very poor.
Bosque: Bo	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
Brackett: BrE, BsE, BsG	Very poor.	Very poor.	Fair	Fair	Very poor.	Very poor.	Very poor.	Fair	Very poor.
Bunyan: Bu	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
Chaney: ChC, ChC2	Fair	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
Denton: DeB	Good	Good	Fair	Fair	Poor	Very poor.	Good	Fair	Very poor.
Duffau:									
DhD, DmC, DwC2, DwD2	Fair	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
DgD3, DyD3	Poor	Fair	Good	Good	Poor	Very poor.	Fair	Good	Very poor.
Frio:									
Fc	Good	Good	Fair	Good	Poor	Very poor.	Good	Fair	Very poor.
Ff	Poor	Fair	Fair	Good	Poor	Very poor.	Fair	Fair	Very poor.
Hardeman: HaB, HaE	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
Hassee: HeA	Fair	Fair	Good	Fair	Fair	Fair	Fair	Fair	Fair.
Heaton: HfC	Fair	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
Hensley: HnB	Poor	Poor	Fair	Fair	Very poor.	Very poor.	Poor	Fair	Very poor.
Krum: KcA, KcB	Fair	Fair	Fair	Fair	Poor	Very poor.	Fair	Fair	Very poor.
Lamar: LaC, LaD	Fair	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
Lincoln: Lf	Poor	Fair	Fair	Fair	Very poor.	Very poor.	Fair	Fair	Very poor.
Lindy: LnB	Fair	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
Maloterre: MaC	Very poor.	Very poor.	Poor	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.
May: MfB	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
Nimrod: NdC, NdD	Fair	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
Norwood: Nr	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
Owens:									
OcE	Poor	Fair	Fair	Poor	Very poor.	Very poor.	Fair	Poor	Very poor.
OtG	Very poor.	Very poor.	Fair	Poor	Very poor.	Very poor.	Poor	Poor	Very poor.

TABLE 3.—*Suitability of soils for wildlife habitat elements and kinds of wildlife*—Continued

Soil series and map symbols	Elements of wildlife habitat						Kind of wildlife		
	Grain and seed crops	Domestic grasses and legumes	Wild herbaceous plants	Shrubs	Wetland plants	Shallow water developments	Openland	Rangeland	Wetland
Patilo: PaC	Fair	Good	Fair	Fair	Poor	Very poor.	Fair	Fair	Very poor.
Purves: PcB, PcC, PuC	Fair	Good	Poor	Fair	Poor	Very poor.	Fair	Poor	Very poor.
Reap: ReB	Fair	Good	Poor	Good	Poor	Very poor.	Fair	Fair	Very poor.
Selden: SdC, SdC2, SuC	Fair	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
Ships: Sw	Fair	Fair	Fair	Good	Poor	Poor	Fair	Fair	Poor.
Thurber: ThB	Fair	Good	Fair	Fair	Poor	Poor	Fair	Fair	Poor.
Truce:									
TrB	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
TrC, TrC2	Fair	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
TrD2	Poor	Fair	Good	Good	Poor	Very poor.	Fair	Good	Very poor.
TuF	Very poor.	Very poor.	Good	Good	Very poor.	Very poor.	Poor	Good	Very poor.
Venus:									
VeB	Good	Good	Good	Fair	Poor	Very poor.	Good	Fair	Very poor.
VeC, VeD, VuD	Fair	Good	Good	Fair	Poor	Very poor.	Good	Fair	Very poor.
Weatherford:									
Weatherford part of DmC, DwC2 and DwD2	Fair	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
Weatherford part of unit DyD3	Poor	Fair	Good	Good	Poor	Very poor.	Fair	Good	Very poor.
Windthorst:									
WnC, WoC, WoD, WuD	Fair	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
WoB	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
WoC2, WvD3	Poor	Fair	Good	Good	Poor	Very poor.	Fair	Good	Very poor.
Yahola: Yb	Poor	Fair	Fair	Fair	Very poor.		Fair	Fair	Very poor.
Yomont:									
Ym	Very poor.	Poor	Fair	Fair	Very poor.	Very poor.	Poor	Fair	Very poor.
Yo	Good	Good	Good	Fair	Very poor.	Very poor.	Good	Fair	Very poor.

typical examples. Typical range plants are bluestem, grama, perennial forbs, and legumes.

Shrubs produce wildlife food in the form of fruits, nuts, buds, catkins, or browse. Such plants commonly grow in their natural environment, but they may be planted and developed through wildlife management programs. Typical species are oak, dogwood, and silverberry.

Wetland plants are annual and perennial herbaceous plants that grow wild on moist and wet sites. They furnish food and cover mostly for wetland wildlife. Typical examples are smartweed, wild millet, spikerush, rushes, sedges, burreed, tearthumb, and aneilema. Submerged and floating aquatics are not included in this category.

Shallow water developments are impoundments or excavations for controlling water, generally not more than 5 feet deep, to create habitat for waterfowl. Some are designed to be drained, planted, and then flooded; others are permanent impoundments that grow submersed aquatics.

Kinds of Wildlife.—Table 3 rates soils according to their suitability as habitat for the three kinds of wildlife in the county—openland, rangeland, and wetland wildlife. These ratings are related to ratings made for the elements of habitat. For example, soils rated very poor for shallow water developments are rated very poor for wetland wildlife.

Openland wildlife are birds and mammals that normally live in meadows, pastures, and open areas where grasses, herbs, and shrubby plants grow. Quail, doves, meadowlarks, field sparrows, cottontail rabbits,

and foxes are typical examples of openland wildlife.

Rangeland wildlife are birds and mammals that normally live in rangeland areas of grass, low-growing trees, and shrubs. Meadow lark, quail, wild turkeys, coyote, deer, and raccoons are typical examples of rangeland wildlife.

Wetland wildlife are birds and mammals that normally live in wet areas, marshes, and swamps. Ducks, geese, rails, shore birds, herons, minks, and muskrats are typical examples of wetland wildlife.

Recreation

Knowledge of soils is necessary in planning, developing, and maintaining areas used for recreation. In table 4 the soils of Parker County are rated according to limitations that affect their suitability for camp areas, playgrounds, picnic areas, and paths and trails.

In table 4 the soils are rated as having slight, moderate, or severe limitations for the specified uses. For all of these ratings, it is assumed that a good cover of vegetation can be established and maintained. A limitation of *slight* means that soil properties are generally favorable and limitations are so minor that they easily can be overcome. A *moderate* limitation can be overcome or modified by planning, by design, or by special maintenance. A *severe* limitation means that costly soil reclamation, special design, intense maintenance, or a combination of these, is required.

Camp areas are used intensively for tents and small camp trailers and the accompanying activities of outdoor living. Little preparation of the site is required, other than shaping and leveling for tent and parking areas. Camp areas are subject to heavy foot traffic and limited vehicular traffic. The best soils have mild slopes, good drainage, a surface free of rocks and coarse fragments, freedom from flooding during periods of heavy use, and a surface that is firm after rains but not dusty when dry.

Picnic areas are attractive natural or landscaped tracts used chiefly for preparing meals and eating outdoors. These areas are subject to heavy foot traffic. Most of the vehicular traffic, however, is confined to access roads. The best soils are firm when wet but not dusty when dry; are free from flooding during the season of use; do not have slopes or stoniness that greatly increases cost of leveling sites or of building access roads.

Playgrounds are areas used intensively for baseball, football, badminton, and similar organized games. Soils suitable for this use need to withstand intensive foot traffic. The best soils have a nearly level surface free of coarse fragments and rock outcrops; good drainage; freedom from flooding during periods of heavy use; and a surface that is firm after rains but not dusty when dry. If grading and leveling are required, depth to rock is important.

Paths and trails are used for local and cross-country travel by foot or horseback. Design and layout should require little or no cutting and filling. The best soils are at least moderately well drained, are firm when wet but not dusty when dry, are flooded not more than once during the season of use, have slopes of less than 15 percent, and have few or no rocks or stones on the surface.

Engineering [5]

This section is useful to those who need information about soils used as structural material or as foundation upon which structures are built. Among those who can benefit from this section are planning commissions, town and city managers, land developers, engineers, contractors, and farmers.

Among properties of soils highly important in engineering are permeability, strength, compaction characteristics, soil drainage condition, shrink-swell potential, grain size, plasticity, and soil reaction. Also important are depth to the water table, depth to bedrock, and soil shape. These properties, in various degrees and combinations, affect construction and maintenance of roads, airports, pipelines, foundations for small buildings, irrigation systems, ponds and small dams, and systems for disposal of sewage and refuse.

Information in this section of the soil survey can be helpful to those who—

1. Select potential residential, industrial, commercial, and recreational areas.
2. Evaluate alternate routes for roads, highways, pipelines, and underground cables.
3. Seek sources of gravel, sand, or clay.
4. Plan farm drainage systems, irrigation systems, ponds, terraces, and other structures for controlling water and conserving soil.
5. Correlate performance of structures already built with properties of the kinds of soil on which they are built, for the purpose of predicting performance of structures on the same or similar kinds of soil in other locations.
6. Predict the trafficability of soils for cross-country movement of vehicles and construction equipment.
7. Develop preliminary estimates pertinent to construction in a particular area.

Most of the information in this section is presented in tables 5, 6, and 7, which show, respectively, several estimated soil properties significant to engineering; interpretations for various engineering uses; and results of engineering laboratory tests on soil samples.

[5] LERON E. SATTERWHITE, civil engineer, Soil Conservation Service, assisted in preparation of this section.

TABLE 4.—*Degree and kind of limitation affecting recreational development*

[An asterisk in the first column indicates that at least one mapping unit is made up of two or more kinds of soil. The soils in such mapping units may have different properties and limitations, and for this reason it is necessary to follow the instructions in the first column of this table carefully. Some terms in this table are explained in the glossary where they are identified by an asterisk]

Soil series and map symbols	Camp areas	Picnic areas	Playgrounds	Paths and trails
Aledo: ALE	Moderate: too clayey	Moderate: too clayey	Severe: depth to rock.	Moderate: too clayey.
Bastrop:				
BaA, BaB	Slight	Slight	Slight	Slight.
BaC2	Slight	Slight	Moderate: slope	Slight.
Blanket: BbB	Moderate: percs slowly; too clayey.	Moderate: too clayey	Moderate: percs slowly; too clayey.	Moderate: too clayey.
Bolar:				
BcB, BcC	Moderate: too clayey	Moderate: too clayey	Moderate: depth to rock.	Moderate: too clayey.
BcD	Moderate: too clayey	Moderate: too clayey	Severe: slope	Moderate: too clayey.
*Bonti:				
BfB, BfC, BfC2	Moderate: percs slowly.	Slight	Moderate: depth to rock; slope.	Slight.
BnD	Severe: large stones	Severe: large stones	Severe: large stones	Severe: large stones.
For Truce part of BnD, see Truce series.				
Bosque: Bo	Severe: floods	Moderate: floods	Severe: floods	Slight.
*Brackett:				
BrE, BsE	Moderate: percs slowly; slope.	Moderate: slope	Severe: depth to rock; slope.	Moderate: too clayey.
For Maloterre part of BsE, see Maloterre series. No interpretations for Urban land part of BrE.				
BsG	Severe: slope	Severe: slope	Severe: depth to rock.	Moderate: slope; too clayey.
For the Maloterre part of BsG, see Maloterre series.				
Bunyan: Bu	Severe: floods	Moderate: floods	Moderate: floods	Slight.
Chaney: ChC, ChC2	Moderate: percs slowly.	Moderate: too sandy	Moderate: slope; too sandy.	Moderate: too sandy.
Denton: DeB	Severe: too clayey	Severe: too clayey	Severe: too clayey	Severe: too clayey.
*Duffau:				
DgD3, DwC2, DwD2, DyD3	Slight	Slight	Moderate: slope	Slight.
For Weatherford part of DwC2, DwD2, DyD3, and DmC, see Weatherford series. Orthents part of DyD3 too variable to rate.				
DhD, DmC	Moderate: too sandy	Moderate: too sandy	Severe: slope; too sandy.	Moderate: too sandy.
Frio:				
Fc	Severe: floods	Moderate: floods	Moderate: floods	Moderate: too clayey.
Ff	Severe: floods	Severe: floods	Severe: floods	Moderate: too clayey.
Hardeman:				
HaB	Slight	Slight	Slight	Slight.
HaE	Moderate: slope	Moderate: slope	Severe: slope	Slight.
Hassee: HeA	Severe: percs slowly; wet.	Moderate: wet	Severe: percs slowly; wet.	Moderate: wet.
Heaton: HfC	Moderate: too sandy	Moderate: too sandy	Severe: dusty; too sandy.	Severe: too sandy.
Hensley: HnB	Severe: large stones	Severe: large stones	Severe: large stones	Severe: large stones.
Krum: KcA, KcB	Severe: too clayey	Severe: too clayey	Severe: too clayey	Severe: too clayey.
Lamar: LaC, LaD	Moderate: too clayey.	Moderate: too clayey	Moderate: too clayey	Moderate: too clayey.
Lincoln: Lf	Severe: floods	Severe: floods	Severe: floods	Severe: floods.
Lindy: LnB	Moderate: percs slowly.	Slight	Moderate: depth to rock; percs slowly.	Slight.

TABLE 4.—*Degree and kind of limitation affecting recreational development*—Continued

Soil series and map symbols	Camp areas	Picnic areas	Playgrounds	Paths and trails
Maloterre: MaC	Moderate: small stones; too clayey.	Moderate: small stones; too clayey.	Severe: depth to rock.	Moderate: small stones; too clayey.
May: MfB	Slight	Slight	Moderate: slope	Slight.
Nimrod: NdC, NdD	Severe: dusty; too sandy.	Severe: dusty; too sandy.	Severe: dusty; too sandy.	Severe: too sandy.
Norwood: Nr	Severe: floods	Moderate: floods	Moderate: floods	Slight.
Orthents: Mapped only with Duffau series. Too variable to rate.				
*Owens: OcE, OtG For Truce part of OtG, see Truce series.	Severe: percs slowly; slope; too clayey.	Severe: slope; too clayey.	Severe: percs slowly; slope; too clayey.	Severe: too clayey.
Patilo: PaC	Severe: too sandy	Severe: too sandy	Severe: too sandy	Severe: too sandy.
*Purves: PcB, PcC, PuC Urban land part of PuC is too variable to rate.	Severe: too clayey	Severe: too clayey	Severe: depth to rock; too clayey.	Severe: too clayey.
Reap: ReB	Severe: percs slowly; too clayey.	Severe: too clayey	Severe: percs slowly; too clayey.	Severe: too clayey.
*Selden: SdC, SdC2, SuC Urban land part of SuC is too variable to rate.	Moderate: too sandy	Moderate: too sandy	Severe: dusty	Moderate: too sandy.
Ships: Sw	Severe: percs slowly; too clayey.	Severe: too clayey	Severe: percs slowly; too clayey.	Severe: too clayey.
Thurber: ThB	Severe: percs slowly.	Moderate: too clayey	Severe: percs slowly.	Moderate: too clayey.
Truce:				
TrB, TrC, TrC2	Moderate: percs slowly.	Slight	Moderate: percs slowly.	Slight.
TrD2	Moderate: percs slowly.	Slight	Severe: slope	Slight.
TuF	Severe: large stones; slope.	Severe: large stones; slope.	Severe: large stones; slope.	Severe: large stones; slope.
Urban land: Mapped only with Brackett, Duffau, Purves, Selden, Venus, and Windthorst series. Too variable to rate.				
Weatherford: Mapped only with Duffau soils.				
Weatherford part of DmC	Moderate: too sandy	Moderate: too sandy	Severe: dusty	Moderate: too sandy.
Weatherford part of DwC2	Slight	Slight	Moderate	Slight.
Weatherford part of DwD2 and DyD3	Slight	Slight	Severe: slope	Slight.
Windthorst:				
WnC	Moderate: percs slowly.	Moderate: too sandy	Moderate: slope; too sandy.	Moderate: too sandy.
WoB, WoC, WoC2	Moderate: percs slowly.	Slight	Moderate: percs slowly.	Slight.
WoD, WuD, WvD3 Urban land part of WuD is too variable to rate.	Moderate: percs slowly.	Slight	Severe: slope	Slight.
*Yahola: Yb For Bunyan part of Yb, see Bunyan series.	Severe: floods	Moderate: floods	Severe: floods	Slight.
Yomont:				
Ym	Severe: floods	Severe: floods	Severe: floods	Moderate: floods.
Yo	Severe: floods	Moderate: floods	Moderate: floods	Slight.

This information, along with the soil map and other parts of this publication, can be used to make interpretations in addition to those given in tables 5 and 6, and it also can be used to make other useful maps.

This information, however, does not eliminate need for further investigations at sites selected for engineering works, especially works that involve heavy loads or that require excavations to depths greater than those shown in the tables, generally depths greater than 6 feet. Also, inspection of sites, especially the small ones, is needed because many mapped areas of a given mapping unit may contain small areas of other kinds of soil that have strongly contrasting properties and different suitabilities or limitations for soil engineering.

Some of the terms used in this soil survey have special meaning in soil science that is not familiar to some engineers. The Glossary defines many of these terms commonly used in soil science.

Engineering classification systems

The two systems most commonly used in classifying samples of soils for engineering are the Unified Soil Classification System [6] used by the SCS engineers, Department of Defense, and others, and the AASHTO system adopted by the American Association of State Highway [and Transportation] Officials.[7]

In the Unified system soils are classified according to particle size distribution, plasticity, liquid limit, and organic matter. Soils are grouped in 15 classes. There are eight classes of coarse-grained soils, identified as GW, GP, GM, GC, SW, SP, SM, and SC; six classes of fine-grained soils, identified as ML, CL, OL, MH, CH, and OH; and one class of highly organic soils, identified as Pt. Soils on the borderline between two classes are designated by symbols for both classes; for example, CL–ML.

The AASHTO system is used to classify soils according to those properties that affect use in highway construction and maintenance. In this system, a soil is placed in one of seven basic groups ranging from A–1 through A–7 on the basis of grain-size distribution, liquid limit, and plasticity index. In group A–1 are gravelly soils of high bearing strength, or the best soils for subgrade (foundation). At the other extreme, in group A–7, are clay soils that have low strength when wet and that are the poorest soils for subgrade. Where laboratory data are available to justify a further breakdown, the A–1, A–2, and A–7 groups are divided as follows: A–1–a, A–1–b, A–2–4, A–2–5, A–2–6, A–2–7, A–7–5, and A–7–6. As additional refinement, the engineering value of a soil material can be indicated by a group index number. Group indexes range from 0 for the best material to 20 or more for the poorest. The AASHTO classification for tested soils, with group index numbers in parentheses, is shown in table 7; the estimated classification, without group index numbers, is given in table 5 for all soils mapped in the survey area.

USDA texture is determined by the relative proportions of sand, silt, and clay in soil material that is less than 2.0 millimeters in diameter. "Sand," "silt," "clay," and some of the other terms used in the USDA textural classification are defined in the Glossary.

Estimated properties significant to engineering

Several estimated soil properties significant in engineering are given in table 5. These estimates are made for typical soil profiles, by layers sufficiently different to have different significance for soil engineering. The estimates are based on field observations made in the course of mapping, on test data for these and similar soils, and on experience with the same kinds of soil in other counties. Following are explanations of some of the columns in table 5.

Hydrologic soil groups give the runoff potential from rainfall. In the four major groupings the soils are classified on the basis of intake of water at the end of long-duration storms occurring after the soils have had prior wetting and opportunity for swelling, and without considering the protective effects of vegetation.

The major soil groups are:

A. (Low runoff potential). Soils having high infiltration rates even when thoroughly wetted. These consist chiefly of deep, well drained to excessively drained sands or gravels. These soils have a high rate of water transmission; water readily passes through them.

B. Soils having moderate infiltration rates when thoroughly wetted. These consist chiefly of moderately deep to deep, moderately well drained to well drained soils with moderately fine to moderately coarse textures. These soils have a moderate rate of water transmission.

C. Soils having slow infiltration rates when thoroughly wetted. These consist chiefly of soils with a layer that impedes downward movement of water or soils with moderately fine texture to fine texture. These soils have a slow rate of water transmission.

D. (High runoff potential). Soils having very slow infiltration rates when thoroughly wetted. These consist chiefly of clay soils with a high swelling potential, soils with a permanent high water table, soils with a claypan or clay layer at or near the surface, and shallow soils over nearly impervious material. These soils have a very slow rate of water transmission.

Depth to bedrock is distance from the surface of the soil to the upper surface of the rock layer.

Soil texture is described in table 5 in the standard terms used by the Department of Agriculture. These terms take into account relative percentages of sand, silt, and clay in soil material that is less than 2 millimeters in diameter. "Loam," for example, is soil material that contains 7 to 27 percent clay, 28 to 50 percent silt, and less than 52 percent sand. If the soil contains gravel or other particles coarser than sand, an appropriate modifier is added, as for example, "gravelly loamy sand." "Sand," "silt," "clay," and

[6] American Society for Testing Materials. 1974. Standard method for classification of soils for engineering purposes. ASTM Stand. D2487. *In* 1974 Annual Book of ASTM Standards, Part 19.

[7] American Association of State Highway [and Transportations] Officials, 1970. Standard specifications for highway materials and methods of sampling and testing, Ed. 10, 2 vol., illus.

TABLE 5.—*Estimated soil properties*

[An asterisk in the first column indicates that at least one mapping unit in this series is made up of two or more kinds of soil that other series that appear in the first column. The

Soil series and map symbols	Hydrologic soil group	Depth to bedrock	Depth from surface	USDA texture	Classification		Coarse fraction greater than 3 inches
					Unified	AASHTO	
		Inches	*Inches*				*Percent*
Aledo: ALE	C	8–20	0–4	Clay loam	CL, GC	A–6, A–4	5–20
			4–16	Very gravelly clay loam	GC or SC	A–2–6, A–2–4	5–30
			16	Fractured indurated limestone.			
Bastrop: BaA, BaB, BaC2	B	>60	0–12	Fine sandy loam	SM, ML, SM–SC or CL–ML	A–4	---
			12–75	Sandy clay loam	SC or CL	A–6	---
Blanket: BbB	C	>60	0–22	Clay loam	CL	A–6	---
			22–50	Clay	CL or CH	A–7–6	---
			50–62	Clay loam	CL	A–6, A–7–6	---
Bolar: BcB, BcC, BcD	C	20–40	0–30	Clay loam	CL	A–6, A–7–6	0–15
			30	Indurated limestone bedrock.			
*Bonti: BfB, BfC, BfC2	C	20–40	0–10	Fine sandy loam	ML, SM, SM–SC, SC, CL–ML, CL	A–4	0–2
			10–32	Clay	CL	A–6, A–7–6	0–2
			32–34	Strongly cemented sandstone.			
BnD For Truce part of BnD, see TuF in Truce series.	C	20–40	0–10	Stony fine sandy loam	SM, SC, CL, SM–SC, CL–ML, ML	A–4, A–2–4	8–25
			10–35	Clay	CL	A–6, A–7–6	0–20
			35–36	Strongly cemented sandstone.			
Bosque: Bo	B	>60	0–25	Loam	CL, CL–ML	A–4, A–6	---
			25–55	Clay loam	CL	A–6, A–4	---
			55–60	Sandy clay loam	CL	A–6, A–7–6	---
*Brackett: BrE, BsE, BsG For Maloterre part of BsE and BsG, see Maloterre series. No estimates for Urban land part of BrE.	C	10–20	0–4	Clay loam	SC or CL	A–6	0–20
			4–14	Loam	SC or CL	A–6	0–20
			14–30	Interbedded weakly and strongly cemented limestone and pale-yellow clay loam.			
Bunyan: Bu	B	>60	0–10	Fine sandy loam	SC, CL	A–4, A–6	---
			10–60	Sandy clay loam	CL, SC	A–4, A–6	---
Chaney: ChC, ChC2	C	>60	0–16	Loamy fine sand	SM or SP–SM	A–2–4	0–5
			16–60	Sandy clay	CL or CH	A–7–6	0–5
Denton: DeB	D	22–40	0–35	Clay	CH	A–7–6	0–10
			35–36	Indurated limestone bedrock.			

significant to engineering

may have different properties and limitations. For this reason it is necessary to follow carefully the instructions for referring to symbol > means more than; < means less than]

Percentage less than 3 inches in diameter passing sieve—				Liquid limit	Plasticity index	Permeability	Available water capacity	Reaction	Shrink-swell potential	Risk of corrosion	
No. 4 (4.7 mm)	No. 10 (2.0 mm)	No. 40 (0.42 mm)	No. 200 0.074 mm)							Uncoated steel	Concrete
				Percent		*Inches per hour*	*Inches per inch of soil*	*pH*			
65–95	60–90	55–90	40–70	30–40	10–20	0.6–2.0	0.07–0.18	7.9–8.4	Moderate	Moderate	Low.
35–55	30–50	25–50	15–35	30–40	10–20	0.6–2.0	0.05–0.12	7.9–8.4	Low	Moderate	Low.
98–100	98–100	90–100	45–55	18–25	2–7	2.0–6.0	0.14–0.17	5.6–7.3	Low	Low	Low.
98–100	98–100	90–100	40–60	26–35	11–22	0.6–2.0	0.15–0.19	6.1–7.3	Low	Moderate	Low.
98–100	95–100	90–100	70–80	28–40	12–25	0.6–2.0	0.15–0.20	6.6–7.8	Moderate	High	Low.
95–100	95–100	85–95	75–85	41–55	20–35	0.2–0.6	0.12–0.18	6.6–8.4	Moderate.		
85–100	80–100	70–90	51–80	30–45	20–30	0.6–2.0	0.12–0.18	7.4–8.4	Moderate.		
75–95	75–95	70–90	51–70	30–42	15–25	0.6–2.0	0.11–0.20	7.9–8.4	Moderate	High	Low.
90–100	90–100	70–100	36–65	18–30	2–10	0.6–2.0	0.11–0.15	5.6–7.3	Low	Low	Moderate.
80–100	80–100	80–100	51–70	30–45	18–25	0.2–0.60	0.15–0.20	5.1–6.0	Moderate	High	Moderate.
75–90	75–90	55–90	30–55	18–35	2–10	0.6–2.0	0.08–0.12	5.6–7.3	Low	Low	Moderate.
80–100	80–100	80–100	51–70	30–45	18–25	0.2–0.60	0.15–0.20	5.1–6.0	Moderate	High	Moderate.
100	95–100	80–100	60–80	24–40	7–22	0.6–2.0	0.15–0.17	7.9–8.4	Low	High	Low.
100	95–100	95–100	60–80	30–40	10–25	0.6–2.0	0.15–0.18	7.9–8.4	Low	High	Low.
98–100	95–100	80–100	60–80	26–45	11–25	0.6–2.0	0.11–0.18	7.9–8.4	Low	High	Moderate.
80–100	80–100	55–75	45–85	30–40	11–20	0.2–0.6	0.1–0.15	7.9–8.4	Low	High	Low.
80–100	80–100	55–75	45–85	30–40	11–20	0.2–0.6	0.1–0.15	7.9–8.4	Low	High	Low.
100	95–100	70–90	40–65	25–35	8–16	2.0–6.0	0.11–0.15	6.1–7.3	Low	Low	Low.
100	95–100	80–90	40–75	25–40	10–25	0.6–2.0	0.15–0.19	5.6–8.4	Low	Moderate	Low.
90–100	90–100	60–95	10–30	<25	'NP–3	2.0–6.0	0.05–0.10	5.6–7.3	Very low	Low	Low.
90–100	90–100	90–100	51–85	42–60	25–42	0.06–0.2	0.15–0.18	5.6–7.3	Moderate	High	Moderate.
80–100	80–100	80–100	75–95	51–70	30–45	0.06–0.2	0.15–0.20	7.9–8.4	High	High	Low.

TABLE 5.—*Estimated soil properties*

Soil series and map symbols	Hydrologic soil group	Depth to bedrock	Depth from surface	USDA texture	Classification		Coarse fraction greater than 3 inches
					Unified	AASHTO	
		Inches	*Inches*				*Percent*
*Duffau:							
DhD, DmC	B	>60	0–9	Loamy fine sand	SM	A–4, A–2–4	---
			9–75	Sandy clay loam	SC or CL	A–6	---
			75–95	Weakly cemented sandstone and fine sandy loam.	SM, SC, SM–SC, CL, ML, CL–ML	A–4, A–6	---
DgD3, DwC2, DwD2, DyD3	B	>60	0–6	Fine sandy loam	SM, ML or SM–SC, CL–ML	A–4, A–2–4	---
			6–60	Sandy clay loam	SC or CL	A–6	---
Frio: Fc, Ff	B	>60	0–18	Clay loam	CL	A–6, A–7–6	---
			18–60	Silty clay, silty clay loam	CL	A–6, A–7–6	---
Hardeman: HaB, HaE	B	>60	0–60	Very fine sandy loam, fine sandy loam.	ML, CL–ML	A–4	---
Hassee: HeA	D	>60	0–15	Fine sandy loam, loam	CL	A–4, A–6	---
			15–64	Clay, clay loam	CH, CL	A–7–6	---
Heaton: HfC	A	>60	0–30	Fine sand	SM	A–2–4	0–3
			30–90	Sandy clay loam	SC	A–2–4, A–2–6, A–4, A–6	---
Hensley: HnB	D	10–20	0–6	Clay loam	CL, SC	A–6	0–25
			6–14	Clay	CL or CH	A–6, A–7–6	0–10
			14–15	Indurated limestone bedrock.			
Krum: KcA, KcB	C	>60	0–60	Clay	CH	A–7–6	---
Lamar: LaC, LaD	B	>60	0–60	Clay loam, silty clay loam	CL, CL–ML	A–6, A–4	---
Lincoln: Lf	A	>60	0–7	Loamy fine sand	SM, SM–SP, SM–SC	A–2–4, A–3, A–4	---
			7–60	Fine sand	SM, SM–SP, SP	A–2–4, A–3	---
Lindy: LnB	C	20–40	0–10	Loam	CL	A–4, A–6	0–5
			10–25	Clay	CL or CH	A–6, A–7–6	0–5
			25–30	Indurated platy limestone.			
Maloterre: MaC	D	3–10	0–7	Gravelly clay loam	CL	A–6	5–10
			7–10	Indurated limestone containing many fossil shells.			
May: MfB	B	>60	0–12	Fine sandy loam	ML, CL–ML, SM SM–SC	A–4	---
			12–40	Sandy clay loam	SC or CL	A–6	---
			40–60	Clay loam	CL	A–6 or A–4	---
Nimrod: NdC, NdD	C	>60	0–28	Fine sand	SM or SP–SM	A–2–4	---
			28–45	Sandy clay loam	SC	A–6, A–2–6	---
			45–65	Sandy clay	SC or CL	A–6, A–2–6	---

significant to engineering—Continued

Percentage less than 3 inches in diameter passing sieve—				Liquid limit	Plasticity index	Permeability	Available water capacity	Reaction	Shrink-swell potential	Risk of corrosion	
No. 4 (4.7 mm)	No. 10 (2.0 mm)	No. 40 (0.42 mm)	No. 200 0.074 mm)							Uncoated steel	Concrete
				Percent		*Inches per hour*	*Inches per inch of soil*	*pH*			
95–100	95–100	80–98	15–40	<21	NP–3	2.0–6.0	0.07–0.11	6.1–7.8	Very low	Moderate	Low.
95–100	95–100	85–100	40–60	30–40	15–24	0.6–2.0	0.15–0.19	6.1–7.8	Low	Moderate	Low.
95–100	95–100	80–100	40–65	20–35	2–18	2.0–6.0	0.07–0.11	6.1–7.8	Low	Low	Low.
98–100	95–100	75–90	30–60	<25	NP–7	2.0–6.0	0.11–0.15	6.1–7.8	Low	Moderate	Low.
95–100	95–100	85–100	40–60	30–40	15–24	0.6–2.0	0.15–0.19	6.1–7.8	Low	Moderate	Low.
95–100	95–100	75–100	70–95	35–49	20–30	0.2–0.6	0.15–0.20	7.9–8.4	Moderate	High	Low.
95–100	90–100	75–100	70–90	35–49	20–30	0.2–0.6	0.15–0.20	7.9–8.4	Moderate	High	Low.
100	98–100	98–100	51–75	<30	NP–7	2.0–6.0	0.10–0.15	7.4–8.4	Very low	Low	Low.
99–100	99–100	80–95	51–75	20–35	8–16	0.6–2.0	0.11–0.20	6.1–7.3	Low	High	Low.
99–100	99–100	90–100	75–85	45–55	30–40	<0.06	0.12–0.20	6.1–8.4	High	High	Low.
95–100	95–100	75–90	15–30	<25	NP–3	2.0–6.0	0.05–0.09	6.1–7.3	Very low	Low	Low.
98–100	95–100	75–90	25–45	20–35	8–15	0.6–2.0	0.14–0.16	6.1–7.3	Low	Moderate	Low.
65–95	60–95	55–95	36–80	20–40	11–20	0.2–0.6	0.10–0.18	6.1–7.8	Low	High	Low.
80–100	75–100	70–100	60–95	38–55	18–30	0.06–0.2	0.08–0.20	6.6–8.4	Moderate	High	Low.
95–100	95–100	95–100	85–95	51–65	25–45	0.2–0.6	0.15–0.20	7.9–8.4	High	High	Low.
95–100	95–100	85–100	60–80	20–40	5–18	0.6–2.0	0.12–0.15	7.9–8.4	Moderate	Moderate	Low.
98–100	98–100	98–100	8–45	<25	NP–5	6.0–20.0	0.05–0.10	7.9–8.4	Low	Low	Low.
98–100	95–100	95–100	3–30	<25	NP–3	6.0–20.0	0.05–0.08	7.9–8.4	Low	Low	Low.
75–100	70–100	70–100	60–85	20–40	10–20	0.6–2.0	0.12–0.20	6.1–7.8	Low	High	Low.
80–100	75–100	75–100	65–90	38–55	20–30	0.06–0.2	0.10–0.20	6.1–7.8	Moderate	High	Low.
75–95	65–95	60–90	51–80	30–40	11–20	0.2–0.6	0.13–0.16	7.9–8.4	Low	High	Low.
98–100	95–100	90–95	40–55	<25	NP–7	2.0–6.0	0.11–0.15	6.1–7.3	Low	Low	Low.
98–100	95–100	85–100	40–60	30–40	15–25	0.6–2.0	0.15–0.19	6.6–7.8	Moderate	Moderate	Low.
98–100	98–100	80–95	40–75	20–40	10–20	0.6–2.0	0.15–0.20	6.6–7.8	Moderate	High	Low.
98–100	98–100	90–100	10–20	<25	NP–3	6.0–20.0	0.05–0.09	6.1–7.3	Very low	Low	Low.
95–100	95–100	90–100	25–45	20–35	11–20	0.2–0.60	0.14–0.17	5.1–6.0	Low	High	Moderate.
95–100	95–100	90–100	15–55	25–30	11–16	0.2–0.60	0.15–0.17	5.1–6.0	Low	High	Moderate.

TABLE 5.—*Estimated soil properties*

Soil series and map symbols	Hydrologic soil group	Depth to bedrock	Depth from surface	USDA texture	Classification		Coarse fraction greater than 3 inches
					Unified	AASHTO	
		Inches	*Inches*				*Percent*
Norwood: Nr	B	>60	0–6	Silt loam	CL, CL–ML	A–6, A–4	---
			6–60	Silt loam	CL	A–6, A–7–6	---
Orthents. Mapped only with Duffau series. Too variable to rate.							
*Owens: OcE, OtG	D	15–20	0–18	Clay	CL or CH	A–7–6	0–20
			18–40	Shaly clay	CL or CH	A–6, A–7–6	0–5
For Truce part of OtG, see TrB in Truce series.							
Patilo: PaC	C	>60	0–48	Fine sand	SM	A–2–4	---
			48–70	Sandy clay loam	SC	A–6 or A–2–6	---
Purves: PcB, PcC, PuC	D	12–20	0–15	Clay	CH	A–7–6	0–20
			15–16	Limestone bedrock.			
No estimates for Urban land part of PcC.							
Reap: ReB	D	>60	0–55	Clay	CH	A–7–6	---
			55–64	Shaly clay.			
Selden: SdC, SdC2, SuC	C	>60	0–18	Loamy fine sand	SM, SM–SC, SP–SM	A–2–4	---
			18–65	Sandy clay loam	SC	A–2–6, A–6	---
No estimates for Urban land part of SuC.							
Ships: Sw	D	>60	0–52	Silty clay, clay	CH	A–7–6	---
			52–60	Very fine sandy loam	CL–ML, CL, SM–SC, SM, SC ML	A–4	---
Thurber: ThB	D	>60	0–8	Clay loam	CL	A–4, A–6	---
			8–37	Clay	CL or CH	A–7–6	---
			37–64	Clay loam	CL	A–6, A–7–6	---
Truce:							
TrB, TrC, TrC2, TrD2	C	>60	0–8	Fine sandy loam	SM–SC, SC, CL, CL–ML	A–4	0–10
			8–48	Clay	CL	A–4, A–6	---
			48–60	Shaly clay.			
TuF	C	>60	0–10	Stony fine sandy loam	GM–GC, SC, CL–ML, CL, GC, SM–SC	A–4	5–20
			10–48	Clay	CL	A–6, A–7–6	0–10
			48–60	Shaly clay.			
Urban land: Mapped only with Brackett, Duffau, Purves, Seldon, Venus and Windthorst series. Too variable to rate.							
Venus: VeB, VeC, VeD, VuD	B	>60	0–16	Clay loam	CL, CL–ML	A–6 or A–4	---
			16–62	Clay loam	CL, CL–ML	A–6 or A–4	---
No estimates for the Urban land part of VuD.							

significant to engineering—Continued

Percentage less than 3 inches in diameter passing sieve—				Liquid limit	Plasticity index	Permeability	Available water capacity	Reaction	Shrink-swell potential	Risk of corrosion	
No. 4 (4.7 mm)	No. 10 (2.0 mm)	No. 40 (0.42 mm)	No. 200 0.074 mm)							Uncoated steel	Concrete
				Percent		*Inches per hour*	*Inches per inch of soil*	*pH*			
100	100	95–100	70–90	20–35	7–15	0.60–2.0	0.17–0.21	7.9–8.4	Low	High	Low.
100	100	90–100	85–95	20–45	11–25	0.60–2.0	0.15–0.20	7.9–8.4	Low	High	Low.
90–100	80–100	70–100	70–95	45–60	22–30	<0.06	0.13–0.17	7.9–8.4	High	High	Low.
95–100	85–100	80–90	55–80	40–55	25–35	<0.06	0.03–0.08	7.9–8.4	High	High	Low.
100	95–100	90–100	8–20	<25	NP–3	6.0–20.0	0.05–0.08	5.6–7.3	Very low	Low	Low.
90–100	90–100	90–100	25–45	20–35	11–20	0.2–0.6	0.14–0.18	5.1–6.5	Low	Low	Moderate.
75–100	75–100	70–95	70–90	51–65	30–40	0.2–0.6	0.12–0.18	7.9–8.4	High	High	Low.
98–100	98–100	95–100	75–90	51–70	35–45	<0.06	0.15–0.17	7.9–8.4	Very high	High	Low.
98–100	98–100	90–100	10–20	20–25	2–6	2.0–6.0	0.05–0.09	6.1–7.3	Low	Low	Moderate.
95–100	95–100	90–100	25–49	25–40	15–25	0.2–0.6	0.14–0.17	5.6–6.5	Low	High	Moderate.
100	100	100	85–99	51–65	35–45	<0.06	0.14–0.19	7.9–8.4	Very high	Very high	Low.
95–100	90–100	85–95	40–65	<30	NP–10	2.0–6.0	0.10–0.20	7.9–8.4	Low	Very high	Low.
95–100	95–100	90–100	60–90	25–35	8–20	0.2–0.6	0.15–0.20	6.1–7.8	Moderate	High	Low.
95–100	95–100	90–100	70–95	41–60	25–40	<0.06	0.12–0.18	6.6–8.4	High	High	Low.
95–100	85–100	75–100	51–85	35–49	20–35	<0.06	0.12–0.18	7.9–8.4	High	High	Low.
75–100	75–100	70–100	40–75	18–30	5–10	0.6–2.0	0.11–0.15	6.1–7.3	Low	Low	Low.
80–100	80–100	80–100	51–80	30–45	20–30	0.06–0.2	0.12–0.18	6.1–8.4	Moderate	High	Low.
70–90	70–85	65–85	36–60	18–30	5–10	0.6–2.0	0.08–0.12	6.1–7.3	Low	Low	Low.
80–100	80–100	80–100	51–80	30–45	20–30	0.06–0.2	0.12–0.18	6.1–8.4	Moderate	High	Low.
100	98–100	85–100	51–80	20–40	5–18	0.6–2.0	0.18–0.20	7.9–8.4	Low	High	Low.
95–100	95–100	85–100	51–80	20–40	5–18	0.6–2.0	0.15–0.20	7.9–8.4	Low	High	Low.

TABLE 5.—*Estimated soil properties*

Soil series and map symbols	Hydrologic soil group	Depth to bedrock	Depth from surface	USDA texture	Classification		Coarse fraction greater than 3 inches
					Unified	AASHTO	
		Inches	*Inches*				*Percent*
Weatherford:							
Mapped only with Duffau soils.							
Weatherford part of DwC2, DwD2, DyD3.	B	>60	0–10	Fine sandy loam	SM, ML, CL–ML, SM–SC	A–4	---
			10–45	Sandy clay loam	SC or CL	A–6	---
			45–65	Weakly cemented packsand			
Weatherford part of DmC.	B	>60	0–10	Loamy fine sand	SM	A–2–4	---
			10–46	Sandy clay loam	SC or CL	A–6	---
			46–65	Weakly cemented packsand			
Windthorst:							
WoB, WoC, WoC2, WoD, WuD, WvD3.	C	>60	0–10	Fine sandy loam	CL–ML, SM–SC, SM, ML	A–4	---
No estimates for Urban land part of WuD.			10–60	Clay, sandy clay; sandy clay loam.	CL or CH	A–6 or A–7–6	---
WnC	C	>60	0–15	Loamy fine sand	SM or SM–SC	A–2–4	---
			15–60	Clay	CL or CH	A–6 or A–7–6	---
*Yahola: Yb	B	>60	0–60	Fine sandy loam; loamy fine sand; sandy clay loam.	SM, SM–SC	A–4, A–2–4	---
For Bunyan part of Yb, see Bunyan series.							
Yomont: Yo, Ym	B	>60	0–80	Very fine sandy loam	ML, CL–ML	A–4	---

[1] NP is nonplastic.

TABLE 6.—*Engineering*

[An asterisk in the first column indicates that at least one mapping unit in this series is made up of two or more kinds of soil ring to other series that appear in the first column. Some terms in this table

Soil series and map symbols	Degree and kind of limitations for—				
	Septic tank absorption fields	Sewage lagoons	Shallow excavations	Dwellings without basements	Sanitary landfill
Aledo: ALE	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.
Bastrop: BaA, BaB, BaC2	Moderate: percs slowly.	Moderate: seepage.	Slight	Slight	Slight
Blanket: BbB	Severe: percs slowly.	Slight	Severe: too clayey.	Moderate: shrink swell.	Severe: too clayey.
Bolar:					
BcB, BcC	Severe: depth to rock.	Severe: depth to rock.	Moderate: depth to rock.	Moderate: depth to rock; low strength, shrink swell.	Moderate: depth to rock.
BcD	Severe: depth to rock.	Severe: depth to rock.	Moderate: depth to rock.	Moderate: depth to rock; shrink swell.	Moderate: depth to rock.
*Bonti:					
BfB, BfC, BfC2	Severe: depth to rock; percs slowly.	Severe: depth to rock.	Severe: depth to rock.	Moderate: depth to rock; shrink swell.	Severe: depth to rock.
BnD	Severe: depth to rock; percs slowly.	Severe: depth to rock.	Severe: depth to rock.	Moderate: depth to rock; shrink swell.	Severe: depth to rock.
For Truce part of BnD, see TuF in Truce series.					
Bosque: Bo	Severe: floods	Severe: floods	Severe: floods	Severe: floods	Severe: floods
*Brackett:					

significant to engineering—Continued

Percentage less than 3 inches in diameter passing sieve—				Liquid limit	Plasticity index	Permeability	Available water capacity	Reaction	Shrink-swell potential	Risk of corrosion	
No. 4 (4.7 mm)	No. 10 (2.0 mm)	No. 40 (0.42 mm)	No. 200 0.074 mm)							Uncoated steel	Concrete
				Percent		*Inches per hour*	*Inches per inch of soil*	*pH*			
98–100	95–100	75–90	45–55	<25	NP–7	2.0–6.0	0.11–0.15	6.1–7.3	Low	Moderate	Low.
98–100	95–100	90–100	40–60	30–40	15–24	0.6–2.0	0.15–0.19	5.6–6.5	Low	Moderate	Low.
95–100	95–100	75–98	15–30	<21	NP–3	2.0–6.0	0.07–0.11	6.1–7.3	Very low	Moderate	Low.
98–100	95–100	90–100	40–60	30–40	15–24	0.6–2.0	0.15–0.19	5.6–6.5	Low	Moderate	Low.
98–100	95–100	95–100	36–75	<28	NP–7	0.6–2.0	0.12–0.17	6.1–7.3	Low	High	Low.
99–100	99–100	88–100	51–85	35–55	20–35	0.2–0.6	0.15–0.20	5.6–8.4	High	High	Low.
95–100	95–100	90–95	15–30	<21	NP–4	2.0–6.0	0.07–0.11	6.1–7.3	Very low	High	Low.
99–100	99–100	88–100	51–85	35–55	20–35	0.2–0.6	0.15–0.20	5.6–8.4	High	High	Low.
---	100	85–98	20–49	<26	NP–6	2.0–6.0	0.10–0.15	7.9–8.4	Low	Low	Low.
100	98–100	95–100	55–85	<30	NP–5	2.0–6.0	0.16–0.20	7.9–8.4	Very low	Moderate	Low.

interpretations of soils

that may have different properties and limitations. For this reason it is necessary to follow carefully the instructions for refer- are explained in the glossary, where they are identified by an asterisk]

Degree and kind of limitations for—Continued			Suitability as source of—		Soil features affecting terraces and diversions
Local roads and streets	Pond reservoir areas	Embankments	Road fill	Topsoil	
Severe: depth to rock.	Severe: depth to rock.	Severe: thin layer.	Poor: thin layer	Poor: small stones; thin layer.	Depth to rock.
Moderate: low strength.	Moderate: seepage.	Moderate: piping.	Fair: low strength.	Fair: thin layer	Favorable.
Severe: low strength.	Moderate: seepage.	Moderate: compressible; piping.	Poor: low strength.	Fair: too clayey	Favorable.
Severe: low strength.	Severe: depth to rock; seepage.	Moderate: thin layer.	Poor: low strength; thin layer.	Fair: excess lime	Favorable.
Severe: low strength.	Severe: depth to rock; seepage.	Moderate: thin layer.	Poor: low strength; thin layer.	Fair: excess lime	Slope.
Severe: low strength.	Severe: depth to rock.	Moderate: thin layer.	Poor: low strength; thin layer.	Fair: thin layer	Favorable.
Severe: low strength.	Severe: depth to rock.	Severe: large stones.	Poor: low strength; thin layer.	Poor: large stones.	Large stones.
Severe: floods	Moderate: seepage.	Moderate: compressible.	Fair: low strength.	Good	Not needed.

TABLE 6.—*Engineering*

Soil series and map symbols	Degree and kind of limitations for—				
	Septic tank absorption fields	Sewage lagoons	Shallow excavations	Dwellings without basements	Sanitary landfill
BrE, BsE No interpretations for the Urban land part of BrE. For Maloterre part of BsE, see Maloterre series.	Severe: depth to rock; percs slowly.	Severe: depth to rock; slope.	Moderate: depth to rock.	Moderate: depth to rock.	Severe: depth to rock.
BsG For Maloterre part of BsG, see Maloterre series.	Severe: depth to rock; percs slowly.	Severe: depth to rock; slope.	Severe: slope	Severe: slope	Severe: depth to rock.
Bunyan: Bu	Severe: floods	Severe: floods	Severe: floods	Severe: floods	Severe: floods
Chaney: ChC, ChC2	Severe: percs slowly.	Moderate: slope.	Moderate: too clayey.	Moderate: shrink swell.	Moderate: too clayey.
Denton: DeB	Severe: depth to rock; percs slowly.	Severe: depth to rock.	Severe: too clayey.	Severe: low strength; shrink swell.	Severe: depth to rock; too clayey.
*Duffau:					
DgD3, DwD2, DyD3 For Weatherford part of DwD2 and DyD3, see Weatherford series. No interpretations for Orthents part of DgD3.	Moderate: percs slowly.	Moderate: seepage.	Slight	Slight	Slight
DhD No interpretations for Urban land part of DhD.	Moderate: percs slowly.	Moderate: seepage.	Slight	Slight	Slight
DmC For Weatherford part of DmC, see Weatherford series.	Moderate: percs slowly.	Moderate: seepage.	Slight	Slight	Slight
DwC2 For Weatherford part of DwC2, see Weatherford series.	Moderate: percs slowly.	Moderate: seepage.	Slight	Slight	Slight
Frio: Fc, Ff	Severe: floods; percs slowly.	Severe: floods	Severe: floods	Severe: floods	Severe: floods
Hardeman:					
HaB	Slight	Severe: seepage.	Slight	Slight	Slight
HaE	Moderate: slope.	Severe: seepage; slope.	Moderate: slope.	Moderate: slope.	Slight
Hassee: HeA	Severe: percs slowly.	Slight	Severe: too clayey; wet.	Severe: shrink swell; wet.	Severe: too clayey.
Heaton: HfC	Slight	Moderate: seepage.	Severe: unstable cutbanks.	Slight	Slight
Hensley: HnB	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.
Krum: KcA, KcB	Severe: percs slowly.	Slight	Severe: unstable cutbanks; too clayey.	Severe: low strength; shrink swell.	Severe: too clayey.
Lamar: LaC, LaD	Moderate: percs slowly.	Moderate: seepage; slope.	Moderate: too clayey.	Moderate: shrink swell.	Moderate: too clayey.
Lincoln: Lf	Severe: floods	Severe: floods; seepage.	Severe: floods	Severe: floods	Severe: floods; seepage.
Lindy: LnB	Severe: depth to rock; percs slowly.	Severe: depth to rock.	Severe: depth to rock.	Moderate: depth to rock; shrink swell.	Severe: depth to rock.
Maloterre: MaC	Severe: depth rock.	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.
May: MfB	Slight	Moderate: seepage.	Slight	Moderate: shrink swell.	Slight
Nimrod: NdC, NdD	Severe: percs slowly.	Severe: seepage.	Severe: unstable cutbanks.	Moderate: wet	Moderate: wet
Norwood: Nr	Severe: floods	Severe: floods	Severe: floods	Severe: floods	Severe: floods
Orthents: Mapped only in com-					

interpretations of soils—Continued

Degree and kind of limitations for—Continued			Suitability as source of—		Soil features affecting terraces and diversions
Local roads and streets	Pond reservoir areas	Embankments	Road fill	Topsoil	
Moderate: depth to rock.	Severe: seepage.	Moderate: thin layer.	Poor: thin layer	Poor: excess lime	Depth to rock; rooting depth.
Severe: slope	Severe: seepage.	Moderate: thin layer.	Poor: thin layer	Poor: excess lime	Depth to rock; rooting depth.
Severe: floods	Moderate: seepage.	Moderate: piping.	Fair: low strength.	Fair: thin layer	Not needed.
Severe: low strength.	Slight	Moderate: erodes easily, piping.	Poor: low strength.	Poor: too sandy	Erodes easily; piping.
Severe: low strength; shrink swell.	Severe: depth to rock.	Moderate: compressible; shrink swell.	Poor: low strength; shrink swell.	Poor: too clayey	Favorable.
Moderate: low strength.	Moderate: seepage.	Moderate: piping.	Fair: low strength.	Fair: thin layer	Erodes easily.
Moderate: low strength.	Moderate: seepage.	Moderate: piping.	Fair: low strength.	Poor: too sandy	Too sandy.
Moderate: low strength.	Moderate: seepage.	Moderate: piping.	Fair: low strength.	Poor: too sandy	Too sandy.
Moderate: low strength.	Moderate: seepage.	Moderate: piping.	Fair: low strength.	Fair: thin layer	Erodes easily.
Severe: floods	Moderate: seepage.	Moderate: compressible.	Poor: low strength.	Fair: too clayey	Not needed.
Slight	Severe: seepage.	Moderate: piping.	Fair: low strength.	Good	Erodes easily.
Moderate: slope.	Severe: seepage.	Moderate: piping.	Fair: low strength.	Good	Erodes easily; slope.
Severe: shrink swell.	Slight	Moderate: unstable fill.	Poor: shrink swell.	Fair: thin layer	Percs slowly.
Slight	Moderate: seepage.	Moderate: erodes easily.	Good	Poor: too sandy	Erodes easily; piping.
Severe: depth to rock.	Severe: depth to rock.	Severe: thin layer.	Poor: thin layer	Poor: thin layer	Depth to rock.
Severe: low strength; shrink swell.	Moderate: seepage.	Moderate: low strength.	Poor: low strength; shrink swell.	Poor: too clayey	Erodes easily; percs slowly.
Moderate: shrink swell.	Moderate: seepage.	Moderate: piping.	Fair: shrink swell.	Fair: too clayey	Erodes easily; slope.
Severe: floods	Severe: seepage.	Moderate: piping; unstable fill.	Good	Poor: too sandy	Not needed.
Severe: low strength.	Severe: depth to rock.	Moderate: unstable fill.	Poor: low strength.	Fair: thin layer	Depth to rock.
Severe: depth to rock.	Severe: depth to rock.	Severe: thin layer.	Poor: thin layer	Poor: small stones; thin layer.	Depth to rock.
Moderate: low strength.	Moderate: seepage.	Moderate: erodes easily.	Fair: low strength.	Fair: thin layer	Favorable.
Slight	Moderate: seepage.	Moderate: erodes easily; piping.	Good	Poor: too sandy	Erodes easily; piping.
Severe: floods	Moderate: seepage.	Moderate: erodes easily; piping.	Fair: low strength	Good	Not needed.

TABLE 6.—*Engineering*

Soil series and map symbols	Degree and kind of limitations for—				
	Septic tank absorption fields	Sewage lagoons	Shallow excavations	Dwellings without basements	Sanitary landfill
plex with Duffau series. Too variable to rate.					
*Owens: OcE, OtG — For Truce part of OtG, see TrC in Truce series.	Severe: percs slowly; slope.	Severe: slope	Severe: slope; too clayey.	Severe: shrink swell; slope.	Severe: slope; too clayey.
Patilo: PaC	Severe: percs slowly.	Severe: seepage.	Severe: cutbanks cave.	Slight	Moderate: too sandy; wet.
Purves: PcB, PcC, PuC — No interpretations for Urban land part of PuC.	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock; shrink swell.	Severe: depth to rock.
Reap: ReB	Severe: percs slowly.	Slight	Severe: too clayey.	Severe: shrink swell.	Severe: too clayey.
*Selden: SdC, SdC2, SuC — No interpretations for Urban land part of SuC.	Severe: percs slowly.	Moderate: slope.	Moderate: wet	Slight	Slight
Ships: Sw	Severe: floods; percs slowly.	Severe: floods	Severe: floods; too clayey.	Severe: floods; shrink swell.	Severe: floods; too clayey.
Thurber: ThB	Severe: percs slowly.	Slight	Severe: too clayey.	Severe: shrink swell.	Severe: too clayey.
Truce:					
TrB	Severe: percs slowly.	Slight	Severe: too clayey.	Moderate: shrink swell.	Severe: too clayey.
TrC, TrC2, TrD2	Severe: percs slowly.	Moderate: slope.	Severe: too clayey.	Moderate: shrink swell.	Severe: too clayey.
TuF	Severe: percs slowly; slope.	Severe: large stones; slope.	Severe: large stones; too clayey.	Severe: slope	Severe: large stones; too clayey.
Urban land: Mapped only with Brackett, Duffau, Purves, Selden, Venus, and Windthorst series. Too variable to rate.					
Venus:					
VeB, VeC	Slight	Moderate: seepage.	Slight	Slight	Slight
VeD, VuD — No interpretations for Urban land part of VuD.	Slight	Moderate: seepage.	Slight	Slight	Slight
Weatherford: Mapped only with Duffau series.					
Weatherford part of DmC	Moderate: percs slowly.	Moderate: seepage.	Slight	Slight	Slight
Weatherford part of DwC2	Moderate: percs slowly.	Moderate: seepage.	Slight	Slight	Slight
Weatherford part of DwD2 and DyD3	Moderate: percs slowly.	Moderate: seepage.	Slight	Slight	Slight
Windthorst:					
WnC	Severe: percs slowly.	Moderate: slope.	Moderate: too clayey.	Severe: shrink swell.	Severe: too clayey.
WoB, WoC, WoC2, WoD, WuD, WvD3 — No interpretations for Urban land part of WuD.	Severe: percs slowly.	Moderate: slope.	Moderate: too clayey.	Severe: shrink swell.	Moderate: too clayey.
*Yahola: Yb	Severe: floods	Severe: floods; seepage.	Severe: floods	Severe: floods	Severe: floods

interpretations of soils—Continued

Degree and kind of limitations for—Continued			Suitability as source of—		
Local roads and streets	Pond reservoir areas	Embankments	Road fill	Topsoil	Soil features affecting terraces and diversions
Severe: shrink swell; slope.	Slight	Moderate: compressible.	Poor: shrink swell.	Poor: too clayey	Rooting depth; slope.
Slight	Severe: seepage.	Moderate: piping; seepage.	Good	Poor: too sandy	Erodes easily; piping.
Severe: depth to rock; shrink swell.	Severe: depth to rock.	Severe: thin layer.	Poor: depth to rock; shrink swell.	Poor: too clayey	Depth to rock.
Severe: low strength; shrink swell.	Slight	Moderate: shrink swell; unstable fill.	Poor: low strength; shrink swell.	Poor: too clayey	Percs slowly.
Slight	Moderate: seepage.	Moderate: piping.	Good	Poor: too sandy	Too sandy.
Severe: shrink swell.	Slight	Moderate: shrink swell; unstable fill.	Poor: shrink swell.	Poor: too clayey	Not needed.
Severe: low strength; shrink swell.	Slight	Moderate: compressible.	Poor: low strength; shrink swell.	Poor: thin layer	Percs slowly.
Severe: low strength.	Slight	Moderate: low strength.	Poor: low strength.	Fair: thin layer	Favorable.
Severe: low strength.	Slight	Moderate: low strength.	Poor: low strength.	Fair: thin layer	Slope.
Severe: low strength; slope.	Slight	Severe: large stones.	Poor: low strength.	Poor: large stones.	Large stones; slope.
Moderate: low strength.	Severe: seepage.	Moderate: piping.	Fair: low strength.	Fair: too clayey	Favorable.
Moderate: low strength.	Severe: seepage.	Moderate: piping.	Fair: low strength.	Fair: too clayey	Slope.
Moderate: low strength.	Moderate: seepage.	Moderate: piping.	Fair: low strength.	Poor: too sandy	Too sandy.
Moderate: low strength.	Moderate: seepage.	Moderate: piping.	Fair: low strength.	Fair: thin layer	Erodes easily.
Moderate: low strength.	Moderate: slope.	Moderate: piping.	Fair: low strength.	Fair: thin layer	Erodes easily.
Severe: shrink swell.	Moderate: seepage.	Moderate: compressible.	Poor: shrink swell.	Poor: too sandy	Too sandy.
Severe: shrink swell.	Moderate: seepage.	Moderate: compressible.	Poor: shrink swell.	Fair: thin layer	Erodes easily.
Severe: floods	Severe: seepage.	Moderate: piping.	Fair: low strength.	Good	Not needed.

TABLE 6.—*Engineering*

Soil series and map symbols	Degree and kind of limitations for—				
	Septic tank absorption fields	Sewage lagoons	Shallow excavations	Dwellings without basements	Sanitary landfill
For Bunyan part of Yb, see Bunyan series.					
Yomont:					
Ym	Severe: floods	Severe: floods	Severe: floods	Severe: floods	Severe: floods
Yo	Severe: floods	Severe: floods; seepage.	Severe: floods	Severe: floods	Severe: floods

TABLE 7.—

[Tests performed by Texas Highway Department, Materials

Soil name and location	Parent material	Report No.	Depth	Shrinkage		
				Limit	Linear	Ratio
			Inches	*Percent*	*Percent*	
Aledo clay loam, in an area of Aledo association, undulating: 4 miles southeast of Weatherford, from the junction of Farm Road 51 and State Highway 171 south of Weatherford, go 0.65 mile southeast on State Highway 171, 0.3 mile east on county road; 500 feet south of road to a native range pasture. (Modal)	Limestone bedrock.	71–338–R 71–339–R	0–4 4–16	22 21	7.1 7.4	1.65 1.69
Bastrop fine sandy loam, 0 to 1 percent slopes: about 12 miles southwest of Weatherford; from Brazos River bridge on Farm Road 1543 at Dennis, go east on paved county road 1.5 miles, 0.5 mile south on dirt road, 150 feet east of road to cultivated field. (Modal)	Old alluvial loamy or sandy material.	70–356–R 70–357–R	0–8 17–28	16 17	2.0 5.1	1.81 1.85
Bonti fine sandy loam, 1 to 3 percent slopes: about 13 miles west of Weatherford to overpass intersection of I–20 and Farm Road 113; 0.4 mile west on the south service road to wooded area on west side of cultivated field; then 100 feet south into wooded native pasture. (Modal)	Strongly cemented sandstone interbedded with shale.	70–364–R 70–365–R	2–10 10–18	17 12	1.4 12.3	1.81 1.99
Bosque loam, occasionally flooded: 10 miles southwest of Weatherford and northeast of Dennis; from Brazos River bridge at Dennis go north and east on Farm Road 1543 for 2 miles, east on county road for 0.2 mile; 200 feet north of road. (Modal)	Loamy calcareous alluvium.	70–358–R 70–359–R 70–360–R	0–10 25–55 55–60	17 16 15	3.7 7.7 6.7	1.79 1.88 1.90
Denton clay, 1 to 3 percent slopes: 4.5 miles northwest of Weatherford via Farm Road 920; 300 feet west of road to cultivated field. (Modal)	Limestone bedrock.	71–355–R	6–16	16	17.7	1.88
Duffau loamy fine sand in an area of Duffau and Weatherford soils, 1 to 5 percent slopes: 1.7 miles west of junction on Farm Road 920 and Farm Road 1307 at Poolville; 100 feet south of road to a cultivated field. (Modal)	Weakly cemented sandstone and fine sandy loam.	71–343–R 71–344–R 71–345–R	0–9 9–40 75–95	17 16 21	0.9 8.1 0.8	1.78 1.83 1.71
Hardeman very fine sandy loam, 0 to 2 percent slopes: 0.65 mile east of junction of a county road and Farm Road 1543 just south of the Brazos River bridge at Dennis; 250 feet north of road to pasture. (Modal)	Calcareous loamy alluvium.	70–366–R 70–367–R	2–10 10–50	21 17	2.7 2.2	1.66 1.80
Lincoln loamy fine sand in an area of Lincoln soils, frequently flooded: approximately 16 miles southwest of Weatherford; from the south end of the Brazos River bridge on Farm Road 1543 at Dennis go east on county road 0.63 mile; 0.44 mile north of road to wooded pasture. (Modal)	Alluvial sands.	70–354–R 70–355–R	0–7 7–60	19 20	1.8 0.6	1.70 1.69

interpretations of soils—Continued

Degree and kind of limitations for—Continued			Suitability as source of—		Soil features affecting terraces and diversions
Local roads and streets	Pond reservoir areas	Embankments	Road fill	Topsoil	
Severe: floods	Severe: seepage.	Moderate: piping.	Fair: low strength.	Good	Not needed.
Moderate: floods.	Severe: seepage.	Moderate: piping.	Fair: low strength.	Good	Not needed.

Soil test data

and Testing Division, Camp Hubbard, Austin, Texas]

Mechanical analysis [1]											Liquid limit	Plasticity index	Classification [2]	
Percentage passing sieve									Percentage smaller than—					
1¼ inch	⅞ inch	⅝ inch	⅜ inch	No. 4 (4.7 mm)	No. 10 (2.0 mm)	No. 40 (0.42 mm)	No. 200 (0.074 mm)	0.05 mm	0.005 mm	0.002 mm			AASHTO	Unified
											Percent			
100	99	96	93	90	88	77	59	---	---	---	36	12	A-6(6)	ML or CL
[3]80	63	56	47	39	34	29	22	---	---	---	36	14	A-2-6(0)	GC
---	---	---	100	99	98	95	53	42	11	9	19	4	A-4(4)	CL-ML
---	---	---	100	99	98	96	59	47	21	19	26	12	A-6(6)	CL
---	---	---	100	99	99	94	44	---	---	---	19	3	A-4(2)	SM
---	---	---	100	98	97	91	61	---	---	---	36	21	A-6(9)	CL
---	---	---	---	---	---	100	68	51	14	11	24	7	A-4(7)	CL-ML
---	---	---	---	---	100	99	75	58	23	21	30	16	A-6(10)	CL
---	---	---	100	99	97	95	62	50	22	18	27	14	A-6(7)	CL
---	---	---	---	---	---	100	94	83	45	35	58	30	A-7-6(20)	CH
---	---	---	---	---	100	98	38	28	12	10	18	2	A-4(1)	SM
---	---	---	---	---	100	99	59	47	28	26	32	17	A-6(8)	CL
---	---	---	---	---	---	100	45	30	11	10	22	2	A-4(2)	SM
---	---	---	---	---	---	100	71	50	10	8	26	4	A-4(7)	CL-ML
---	---	---	---	---	100	99	54	40	11	10	20	3	A-4(4)	ML
---	---	---	---	---	---	100	44	28	7	6	22	3	A-4(2)	SM
---	---	---	---	---	100	98	3	2	2	1	25	3	A-3(0)	SP

TABLE 7.—*Soil test*

Soil name and location	Parent material	Report No.	Depth	Shrinkage		
				Limit	Linear	Ratio
			Inches	*Percent*	*Percent*	
Nimrod fine sand, 1 to 5 percent slopes: from junction of Farm Road 920 and Farm Road 3107 at Poolville, go west 0.5 mile, south and west on county road 2.5 miles; 50 feet south of road. (Modal)	Basal sands and sandy clay loams.	71–346–R 71–347–R	8–28 28–45	17 15	0 5.3	1.80 1.86
Norwood silt loam: 13 miles south of Weatherford; from courthouse in Weatherford go south on State Highway 171, south on Farm Road 1884 for 9 miles, south and west on Horseshoe Bend Road 4.2 miles; east of road 350 feet from fence. (Modal)	Calcareous loamy alluvium.	71–353–R 71–354–R	0–6 6–60	20 19	3.5 7.2	1.71 1.80
Thurber clay loam, 1 to 3 percent slopes: approximately 15 miles southwest of Weatherford; from Brock go west on county road 3 miles; 150 feet south of road to field. (Modal)	Calcareous clay and clay loam.	70–368–R 70–369–R 70–370–R	0–8 8–18 37–50	15 12 13	5.7 15.0 11.9	1.86 1.99 1.98
Truce fine sandy loam, 1 to 3 percent slopes: from railroad crossing on Farm Road 113 in Millsap go south 2.2 miles, west and south on county road 1.2 miles; west of road 100 feet from fence. (Modal)	Shaly clay.	71–348–R 71–349–R 71–350–R	0–8 8–24 48–60	16 14 20	3.3 12.1 13.7	1.84 1.93 1.84
Venus clay loam, 3 to 5 percent slopes: 4.5 miles southwest of Weatherford; from junction of U.S. Highway 180 and 80 in Weatherford, go southwest 4.5 miles on U.S. Highway 80; 100 feet north of fence along Interstate-20 access road. (Modal)	Limy earths.	70–361–R 70–362–R 70–363–R	0–9 16–50 50–62	14 16 16	8.2 8.5 8.7	1.89 1.85 1.86
Windthorst fine sandy loam, 1 to 3 percent slopes: 5.2 miles southwest of courthouse in Weatherford via U.S. Highway 80, 800 feet west of the junction of Dennis Road and U.S. Highway 80, 150 feet north of fence. (Modal)	Clay and fine sandy loam.	71–340–R 71–341–R	0–4 10–18	21 18	2.7 11.6	1.67 1.83
Yomont very fine sandy loam: from junction of Farm Road 1884 and county road at Tin Top, go south and southwest 1.65 miles; 700 feet west and 500 feet north of corner in road. (Modal)	Calcareous loamy alluvium.	71–351–R 71–352–R	0–8 8–60	22 24	1.8 1.6	1.61 1.55

[1] According to the AASHTO Designation T88–57, "Mechanical Analysis of Soils," in "Standard Specifications for Highway Materials and Methods of Sampling and Testing," pt. 2, Ed. 8 (1961), published by American Association of State Highway [and Transportation] Officials. Results by this procedure frequently may differ somewhat from results that would have been obtained by the soil survey procedure of the Soil Conservation Service (SCS). In the AASHTO procedure, the fine material is analyzed by the hydrometer method and the various grain-size fractions are calculated on the basis of all the material, including that

some of the other terms used in USDA textural classification are defined in the Glossary.

Liquid limit and plasticity index indicate the effect of water on the strength and consistence of soil material. As the moisture content of a clayey soil is increased from a dry state, the material changes from a semisolid to a plastic state. If the moisture content is further increased, the material changes from a plastic to a liquid state. The plastic limit is the moisture content at which the soil material changes from the semisolid to plastic state; and the liquid limit, from a plastic to a liquid state. The plasticity index is the numerical difference between the liquid limit and the plastic limit. It indicates the range of moisture content within which a soil material is plastic. Liquid limit and plasticity index are estimated in table 5, but in table 7 the data on liquid limit and plasticity index are based on tests of soil samples.

Permeability is that quality of a soil that enables it to transmit water or air. It is estimated on the basis of those soil characteristics observed in the field, particularly structure and texture. The estimates in table 5 do not take into account lateral seepage or such transient soil features as plowpans and surface crusts.

Available water capacity is the ability of soils to hold water for use by most plants. It is commonly defined as the difference between the amount of water in the soil at field capacity and the amount at the wilting point of most crop plants.

Reaction is the degree of acidity or alkalinity of a

data—Continued

Mechanical analysis [1]											Liquid limit	Plasticity index	Classification [2]	
Percentage passing sieve								Percentage smaller than—						
1¼ inch	⅞ inch	⅝ inch	⅜ inch	No. 4 (4.7 mm)	No. 10 (2.0 mm)	No. 40 (0.42 mm)	No. 200 (0.074 mm)	0.05 mm	0.005 mm	0.002 mm			AASHTO	Unified
											Percent			
---	---	---	---	---	100	97	18	12	4	3	19	3	A–2–4(0)	SM
---	---	---	---	---	100	99	40	34	24	22	25	12	A–6(2)	SC
---	---	---	---	---	100	99	87	71	15	11	26	7	A–4(8)	CL–ML
---	---	---	---	---	---	100	94	85	28	22	32	15	A–6(10)	CL
---	---	---	---	100	99	97	71	60	20	15	26	10	A–4(7)	CL
---	---	---	100	99	99	96	77	70	40	36	44	27	A–7–6(16)	CL
---	---	---	100	99	95	87	71	65	45	30	36	22	A–6(12)	CL
---	---	---	---	---	100	99	54	44	18	15	22	6	A–4(4)	CL–ML
100	99	99	99	98	97	96	71	65	45	39	38	21	A–6(11)	CL
---	---	---	100	99	98	95	92	91	62	44	50	29	A–7–6(18)	CL or CH
---	---	---	---	---	100	99	77	65	21	18	30	13	A–6(9)	CL
---	---	---	---	---	100	98	77	63	28	25	33	17	A–6(11)	CL
---	---	---	100	99	96	92	73	60	27	23	33	18	A–6(11)	CL
---	---	---	---	---	---	100	72	55	13	8	27	6	A–4(7)	CL–ML
---	---	---	---	---	---	100	85	70	39	36	43	25	A–7–6(15)	CL
---	---	---	---	---	---	100	83	56	8	6	26	4	A–4(8)	CL–ML
---	---	---	---	---	---	100	74	43	5	4	26	4	A–4(8)	CL–ML

coarser than 2 millimeters in diameter. In the SCS soil survey procedure, the fine material is analyzed by the pipette method and the material coarser than 2 millimeters in diameter is excluded from calculations of grain-size fractions. The mechanical analyses used in this table are not suitable for use in naming textural classes for soil.

[2] Unified and AASHTO classification made by Soil Conservation Service personnel.

[3] 100 percent passed the 2-inch sieve and 94 percent the 1¾-inch sieve.

soil, expressed in pH values. The pH value and terms used to describe soil reaction are explained in the Glossary.

Shrink-swell potential is the relative change in volume to be expected of soil material with changes in moisture content, that is, the extent to which the soil shrinks as it dries out or swells when it gets wet. Extent of shrinking and swelling is influenced by the amount and kind of clay in the soil. Shrinking and swelling of soils causes much damage to building foundations, roads, and other structures. A *high* shrink-swell potential indicates a hazard to maintenance of structures built in, or, or with material having this rating.

Risk of corrosion, as used in table 5, pertains to potential soil-induced chemical action that dissolves or weakens uncoated steel or concrete. Rate of corrosion of uncoated steel is related to soil properties, such as drainage, texture, total acidity, and electrical conductivity of the soil material. Risk of corrosion for concrete is influenced mainly by the content of sodium or magnesium sulfate, but also by soil texture and acidity. Installations of uncoated steel that intersect soil boundaries or soil horizons are more susceptible to corrosion than installations entirely in one kind of soil or in one soil horizon. A corrosivity rating of *low* means that there is a low probability of soil-induced corrosion damage. A rating of *high* means that there is a high probability of damage, so that protective measures for steel and more resistant concrete should be used to avoid or minimize damage.

Engineering interpretations

The interpretations in table 6 are based on the engineering properties of soils shown in table 5, on test data for soils in this survey area and others nearby or adjoining, and on the experience of engineers and soil scientists with the soils of Parker County. In table 6, ratings are used to summarize limitation or suitability of the soils for all listed purposes other than for terraces and diversions. For these particular uses, table 6 lists these soil features not to be overlooked in planning, installation, and maintenance.

Soil limitations are indicated by the ratings slight, moderate, and severe. *Slight* means soil properties generally favorable for the rated use, or in other words, limitations that are minor and easily overcome. *Moderate* means that some soil properties are unfavorable but can be overcome or modified by special planning and design. *Severe* means soil properties so unfavorable and so difficult to correct or overcome as to require major soil reclamation, special designs, or intensive maintenance.

Soil suitability is rated by the terms *good, fair,* and *poor,* which have, respectively, meanings approximately parallel to the terms slight, moderate, and severe.

Following are explanations of some of the columns in table 6.

Septic tank absorption fields are subsurface systems of tile or perforated pipe that distribute effluent from a septic tank into natural soil. The soil material from a depth of 18 inches to 6 feet is evaluated. The soil properties considered are those that affect both absorption of effluent and construction and operation of the system. Properties that affect absorption are permeability, depth to water table or rock, and susceptibility to flooding. Slope is a soil property that affects difficulty of layout and construction and also the risk of soil erosion, lateral seepage, and downslope flow of effluent. Large rocks or boulders increase construction costs.

Sewage lagoons are shallow ponds constructed to hold sewage within a depth of 2 to 5 feet long enough for bacteria to decompose the solids. A lagoon has a nearly level floor, and sides, or embankments, of compacted soil material. The assumption is made that the embankment is compacted to medium density and the pond is protected from flooding. Properties are considered that affect the pond floor and the embankment. These that affect the pond floor are permeability, organic matter, and slope, and if the floor needs to be leveled, depth to bedrock becomes important. The soil properties that affect the embankment are the engineering properties of the embankment material as interpreted from the Unified Soil Classification and the amount of stones, if any, that influence the ease of excavation and compaction of the embankment material.

Shallow excavations are those that require digging or trenching to a depth of less than 6 feet, as for example, excavations for pipelines, sewer lines, phone and power transmission lines, basements, open ditches, and cemeteries. Desirable soil properties are good workability, moderate resistance to sloughing, gentle slopes, absence of rock outcrops or big stones, and freedom from flooding or a high water table.

Dwellings without basements, as rated in table 6, are not more than three stories high and are supported by foundation footings placed in undisturbed soil. The features that affect the rating of a soil for dwellings are those that relate to capacity to support load and resist settlement under load, and those that relate to ease of excavation. Soil properties that affect capacity to support load are wetness, susceptibility to flooding, density, plasticity, texture, and shrink-swell potential. Those that affect excavation are wetness, slope, depth to bedrock, and content of stones and rocks.

Sanitary landfill is a method of disposing of refuse in dug trenches. The waste is spread in thin layers, compacted, and covered with soil throughout the disposal period. Landfill areas are subject to heavy vehicular traffic. Some soil properties that affect suitability for landfill are ease of excavation, hazard of polluting ground water, and trafficability. The best soils have moderately slow permeability, withstand heavy traffic, and are friable and easy to excavate. Unless otherwise stated the ratings in table 6 apply only to a depth of about 6 feet, and therefore limitation ratings of *slight* or *moderate* may not be valid if trenches are to be much deeper than that. For some soils, reliable predictions can be made to a depth of 10 or 15 feet, but regardless of that, every site should be investigated before it is selected.

Local roads and streets, as rated in table 6, have an all-weather surface expected to carry automobile traffic all year. They have a subgrade of underlying soil material; a base consisting of gravel, crushed rock, or soil material stabilized with lime or cement; and a flexible or rigid surface, commonly asphalt or concrete. These roads are graded to shed water and have ordinary provisions for drainage. They are built mainly from soil at hand, and most cuts and fills are less than 6 feet deep.

Soil properties that most affect design and construction of roads and streets are the load-supporting capacity and stability of the subgrade and the workability and quantity of cut and fill material available. The AASHTO and Unified classifications of the soil material, and also the shrink-swell potential, indicate traffic-supporting capacity. Wetness and flooding affect stability of the material. Slope, depth to hard rock, content of stones and rocks, and wetness affect ease of excavation and amount of cut and fill needed to reach an even grade.

Pond reservoir areas hold water behind a dam or embankment. Soils suitable for pond reservoir areas have low seepage, which is related to their permeability and depth to fractured or permeable bedrock or other permeable material.

Embankments, dikes, and levees require soil material resistant to seepage and piping and of favorable stability, shrink-swell potential, shear strength, and compactibility. Presence of stones or organic material in a soil are among factors that are unfavorable.

Road fill is soil material used in embankments for roads. The suitability ratings reflect (1) the predicted performance of soil after it has been placed in an embankment that has been properly compacted and

provided with adequate drainage and (2) the relative ease of excavating the material at borrow areas.

The soils were not rated as a source of sand and gravel because most of the soils of Parker County are unsuitable sources. Only Heaton fine sand, 1 to 5 percent slopes, Lincoln soils, frequently flooded, and Patilo complex, 1 to 5 percent slopes, are fair sources of sand; and the Nimrod soils are poor sources of sand.

Topsoil is used for topdressing an area where vegetation is to be established and maintained. Suitability is affected mainly by ease of working and spreading the soil material, as in preparing a seedbed; by natural fertility of the material, or the response of plants when fertilizer is applied; and by absence of substances toxic to plants. Texture of the soil material and its content of stone fragments are characteristics that affect suitability, but also considered in the ratings is damage that will result at the area from which topsoil is taken.

Terraces and diversions are embankments, or ridges, constructed across the slope to intercept runoff so that it soaks into the soil or flows slowly to a prepared outlet. Features that affect suitability of a soil for terraces are uniformity and steepness of slope; depth to bedrock or other unfavorable material; presence of stones; permeability; and resistance to water erosion, soil slipping, and soil blowing. A soil suitable for these structures provides outlets for runoff and is not difficult to vegetate.

Soil test data

Table 7 contains engineering test data for some of the major soil series in Parker County. These tests were made to help evaluate the soils for engineering purposes. The engineering classifications given are based on data obtained by mechanical analyses and by tests to determine liquid limits and plastic limits. The mechanical analyses were made by combined sieve and hydrometer methods.

Tests to determine liquid limit and plastic limit measure the effect of water on the consistence of soil material, as has been explained for table 5.

Shrinkage limit is the percentage of moisture at which shrinkage of the soil material stops.

Shrinkage ratio is the relation of change in volume of the soil material to the water content of the soil material when at the shrinkage limit. The change in volume is expressed as a percentage of the air-dry volume of the soil material, and the water content is expressed as a percentage of the weight of the soil material when ovendry.

Linear shrinkage is the decrease in one dimension, expressed as a percentage of the original dimension, of the soil mass when the moisture content is reduced from the given value to the shrinkage limit.

Formation and Classification of Soils

This section lists the factors of soil formation and briefly describes important processes in development of soil horizons. In addition, the current system of soil classification is described [8] and each soil series represented in the county is placed in major categories of the system.

Soil is a natural, three-dimensional body on the earth's surface that supports plants and that has properties resulting from the integrated effect of climate and living organisms acting on earthy parent material, as conditioned by relief over periods of time. Areas of a particular soil range from a few yards to several hundred acres in size.

Factors of Soil Formation

Soil is formed by the action of soil-forming processes on materials deposited or accumulated by geologic forces. The characteristics of the soil at any given point are determined by climate; living organisms in and on the soil; the physical and mineralogical composition of the parent material; the relief, or lay of the land; and the length of time that the forces of soil formation have acted on the parent material.

The five factors of soil formation are so closely interrelated in their effects on the soil that few generalizations can be made regarding the effect of any one factor unless conditions are specified for the other four. Many of the processes of soil formation are unknown.

Climate

The climate of Parker County is subtropical; winters are dry, and summers are hot and humid. The area is characterized by rapid changes in temperature, which ranges to marked extremes and shows wide daily and annual variations. The climate is uniform throughout the county, and differences among the soils generally are not a result of climate.

Living organisms

Plants, animals, insects, bacteria, and fungi are important in the formation of soils. They add to the supply of organic matter and nitrogen in the soil, cause gains and losses in plant nutrients, and change the structure and porosity of the soils.

In Parker County the type of vegetation, mainly grasses or oak trees, has affected soil formation more than living organisms. In general, soils that formed under grasses have a higher organic-matter content than soils that formed under trees. Grasses contribute to the accumulation of organic matter and thus to the darkening of the soils. For example, Bolar and Denton soils formed under grass and have a high organic-matter content. On the other hand, Duffau, Nimrod, and Patilo soils formed under oak trees and have a low organic-matter content.

Parent material

Parent material is the unconsolidated mass in which a soil forms. It determines the limits of the chemical and mineral composition of the soil.

Geologic formations that are exposed in Parker County range from Recent to Pennsylvanian in age.

[8] United States Department of Agriculture. 1960. Soil classification. A comprehensive system, 7th approximation. 265 pp., illus. [Supplements issued March 1967 and September 1968]

The older stratigraphic units are exposed near the western limits of the county. Younger bedrock units are exposed in sequence in a generally eastward direction.

Pennsylvanian age rocks in the county are mainly interbedded limestone, sandstone, and shale of the Strawn Group. These strata are exposed along the western margin of the county. Hensley and Lindy soils were derived from limestone. Bonti soil is an example of soil formed in material weathered from sandstone. Owens and Truce soils formed in material weathered from shale.

Cretaceous rocks consist mainly of interbedded sandstone, limestone, marl, and clay of the Trinity, Fredericksburg, and Washita Groups. Formations of these groups are to the east of the Pennsylvanian age rocks and underlie most of the county. Duffau, Weatherford, and Windthorst soils are examples of soils derived from sandstone and clay. Aledo, Bolar, and Denton soils were derived from limestone and marl.

The Hassee and Thurber soils are examples of soils weathered from terrace deposits of Pleistocene age. These soils are in small areas in the western part of the county.

Alluvium is of Recent age and consists of gravel, sand, silt, and clay deposited along the Brazos River and many of the smaller stream valleys in the county. Bunyan, Lincoln, and Yahola soils are typical soils formed in alluvium.

Relief

Relief, or topography, affects soil formation by its influence on drainage, erosion, plant cover, and soil temperature. The soils of Parker County are nearly level to steep.

On the steeper slopes where runoff is rapid the soil material is likely to be removed by erosion almost as fast as horizons develop. Owens soils, for example, formed in more sloping areas than Thurber soils. Because of erosion, they are thinner and their profile is not so well developed.

Bastrop and May soils formed in nearly level to gently sloping areas. Much of the rain that falls does not run off these soils, but is absorbed. The rainfall causes leaching and affects other soil-forming processes that aid in the formation of distinct soil horizons.

Time

A long time is required for the formation of distinct horizons. The length of time that parent materials have been in place is commonly reflected in the degree of development of the soil profile.

The soils of Parker County range from young to old. The young soils have very little horizon development, and the old soils have well-expressed soil horizons. Lincoln, Yahola, and Yomont soils are examples of young soils that have little horizon development. Duffau and Windthorst soils are examples of older soils that have well-developed soil horizons. They have distinct A and B horizons that show marked differentiation from the original parent material.

Formation of Horizons

The formation of soil horizons is the result of several processes. Among these are (1) accumulation of organic matter, (2) leaching of carbonates and bases, (3) reduction and transfer of iron, and (4) translocation of silicate clay minerals. In most soils more than one of these processes has been active in the development of soil horizons.

The soils of Parker County range from low to high in organic-matter content. The accumulation of organic matter in the upper part of the soil profile is important in the formation of the A1 horizon. Accumulation of organic matter causes dark surface horizons. Surface horizons that are dark colored, have at least 1 percent organic matter, and are at least 10 inches thick are called mollic epipedons. Denton and Venus soils have dark surface layers resulting from accumulation of organic matter.

Leaching of carbonates has occurred in many of the soils of Parker County. The leaching of carbonates and bases in soils generally precedes translocation of silicate clay minerals. Much leaching has occurred in Hassee and Thurber soils. Krum and Venus soils have surface horizons high in carbonates.

Reduction and transfer of iron, a process called gleying, is evident in the poorly drained soils of Parker County. Gray in the subsurface horizon shows reduction and loss of iron. Hassee soils have gray lower layers that indicate reduction and loss of iron. Yellowish-brown, strong-brown, and reddish-brown mottles and concretions in some horizons indicate segregation of iron. Chaney, Selden, and Nimrod soils have yellowish-brown, strong-brown, or reddish-brown mottles or concretions.

The translocation of clay minerals has also contributed to horizon development in many soils of Parker County. The B horizon generally has accumulations of clay (clay films) in pores and on the surfaces of peds. These soils were probably leached of carbonates and bases before the translocation of silicate clays took place. The horizons with accumulations of translocated clay are called argillic horizons. Bastrop, Bonti, and Windthorst soils are examples of soils with argillic horizons.

Classification of Soils

Soils are classified so that we can more easily remember their significant characteristics. Classification enables us to assemble knowledge about the soils, to see their relationship to one another and to the whole environment, and to develop principles that help us to understand their behavior and their response to manipulation. First through classification, and then through use of soil maps, we can apply our knowledge of soils to specific fields and other tracts of land.

The narrow categories of classification, such as those

TABLE 8.—*Soils series classified by higher categories*

Series	Family	Subgroup	Order
Aledo	Loamy-skeletal, carbonatic, thermic	Lithic Haplustolls	Mollisols.
Bastrop	Fine-loamy, mixed, thermic	Udic Paleustalfs	Alfisols.
Blanket	Fine, mixed, thermic	Pachic Argiustolls	Mollisols.
Bolar	Fine-loamy, carbonatic, thermic	Typic Calciustolls	Mollisols.
Bonti	Fine, mixed, thermic	Ultic Paleustalfs	Alfisols.
Bosque	Fine-loamy, mixed, thermic	Cumulic Haplustolls	Mollisols.
Brackett	Loamy, carbonatic, thermic, shallow	Typic Ustochrepts	Inceptisols.
Bunyan	Fine-loamy, mixed nonacid thermic	Typic Udifluvents	Entisols.
Chaney	Fine, mixed, thermic	Aquic Paleustalfs	Alfisols.
Denton	Fine, montmorillonitic, thermic	Vertic Calciustolls	Mollisols.
Duffau	Fine-loamy, siliceous. thermic	Udic Paleustalfs	Alfisols.
Frio	Fine, mixed thermic	Cumulic Haplustolls	Mollisols.
Hardeman	Coarse-loamy, mixed, thermic	Typic Ustochrepts	Inceptisols.
Hassee	Fine, montmorillonitic, thermic	Mollic Albaqualfs	Alfisols.
Heaton	Loamy, siliceous, thermic	Arenic Paleustalfs	Alfisols.
Hensley	Clayey, mixed thermic	Lithic Rhodustalfs	Alfisols.
Krum	Fine, montmorillonitic, thermic	Vertic Haplustolls	Mollisols.
Lamar	Fine-silty, mixed, thermic	Typic Ustochrepts	Inceptisols.
Lincoln	Sandy, mixed, thermic	Typic Ustifluvents	Entisols.
Lindy	Fine, mixed, thermic	Udic Haplustalfs	Alfisols.
Maloterre	Loamy, carbonatic, thermic	Lithic Ustorthents	Entisols.
May	Fine-loamy, mixed, thermic	Udic Haplustalfs	Alfisols.
Nimrod	Loamy, siliceous, thermic	Aquic Arenic Paleustalfs	Alfisols.
Norwood	Fine-silty, mixed (calcareous), thermic	Typic Udifluvents	Entisols.
Owens	Clayey, mixed, thermic, shallow	Typic Ustochrepts	Inceptisols.
Patilo	Loamy, siliceous, thermic	Grossarenic Paleustalfs	Alfisols.
Purves	Clayey, montmorillonitic, thermic	Lithic Calciustolls	Mollisols.
Reap	Fine, montmorillonitic, thermic	Entic Chromusterts	Vertisols.
Selden	Fine-loamy, siliceous, thermic	Aquic Paleustalfs	Alfisols.
Ships	Very fine, mixed, thermic	Udertic Haplustolls	Mollisols.
Thurber	Fine, montmorillonitic, thermic	Typic Haplustalfs	Alfisols.
Truce	Fine, mixed, thermic	Udic Paleustalfs	Alfisols.
Venus	Fine-loamy, mixed, thermic	Typic Calciustolls	Mollisols.
Weatherford	Fine-loamy, siliceous, thermic	Ultic Haplustalfs	Alfisols.
Windthorst	Fine, mixed, thermic	Udic Paleustalfs	Alfisols.
Yahola	Coarse-loamy, mixed (calcareous), thermic	Typic Ustifluvents	Entisols.
Yomont	Coarse-silty, mixed (calcareous), thermic	Typic Ustifluvents	Entisols.

used in detailed soil surveys, allow us to organize and apply knowledge about soils in managing farms, fields, and woodlands; in developing rural areas; in engineering work; and in many other ways. Soils are placed in broad classes to facilitate study and comparison of large areas, such as countries and continents.

The system of soil classification currently used was adopted by the National Cooperative Soil Survey in 1965. Because this system is under continual study, readers interested in developments of the current system should search the latest literature available.

The current system of classification has six categories. Beginning with the broadest, these categories are order, suborder, great group, subgroup, family, and series. In this system the criteria used as a basis for classification are soil properties that are observable and measurable. The properties are chosen, however, so that the soils of similar genesis, or mode of origin, are grouped. In table 8, the soil series of Parker County are placed in five categories of the current system. Classes of the current system are briefly defined in the following paragraphs.

ORDER. Ten soil orders are recognized. The properties used to differentiate among soil orders are those that tend to give broad climatic groupings of soils. The two exceptions to this are the Entisols and Histosols, which occur in many different climates. Each order is named with a word of three or four syllables ending in *sol* (Ent-i-sol).

The five orders to which the soils of Parker County belong are Alfisols, Entisols, Inceptisols, Mollisols, and Vertisols. Alfisols have a light-colored surface layer low in organic matter, a clay-enriched B horizon, an accumulation of aluminum and iron, and a base saturation of more than 35 percent. Entisols have little or no evidence of development of pedogenic horizons. Inceptisols have a light-colored surface layer low in organic matter, but lack a clay-enriched B horizon. Mollisols have a dark-colored surface layer high in organic matter and have a base saturation of more than 50 percent. Vertisols are clayey soils that have deep, wide cracks during part of most years.

SUBORDER. Each order is subdivided into suborders that are based primarily on those soil characteristics that seem to produce classes with the greatest genetic similarity. The suborders narrow the broad climatic range permitted in the orders. The soil properties used to separate suborders are mainly those that reflect either the presence or absence of waterlogging, or soil differences resulting from the climate or vegetation. The names of suborders have two syllables. The last syllable indicates the order. An example is *Aquent*

(*Aqu,* meaning water or wet, and *ent,* from Entisol).

GREAT GROUP. Soil suborders are separated into great groups on the basis of uniformity in the kinds and sequence of major soil horizons and features. The horizons used to make separations are those in which clay, iron, or humus have accumulated; those that have pans that interfere with growth of roots, movement of water, or both; and thick, dark-colored surface horizons. The features used are the self-mulching properties of clay, soil temperature, major differences in chemical composition (mainly calcium, magnesium, sodium, and potassium), dark-red and dark-brown colors associated with basic rocks, and the like. The names of great groups have three or four syllables and are made by adding a prefix to the name of the suborder. An example is Haplaquent (*Hapl,* meaning simple horizons, *aqu* for wetness or water, and *ent,* from Entisols).

SUBGROUP. Great groups are subdivided into subgroups, one representing the central (typic) segment of the group, and others called intergrades that have properties of the group and also one or more properties of another great group, suborder, or order. Subgroups may also be made in those instances where soil properties intergrade outside of the range of any other great group, suborder, or order. The names of subgroups are derived by placing one or more adjectives before the name of the great group. An example is Typic Haplaquents (a typical Haplaquent).

FAMILY. Soil families are separated within a subgroup primarily on the basis of properties important to the growth of plants or on the behavior of soils when used for engineering. Among the properties considered are texture, mineralogy, reaction, soil temperature, permeability, thickness of horizons, and consistence. A family name consists of a series of adjectives preceding the subgroup name. The adjectives are the class names for texture, mineralogy, and so on, that are used as family differentiae. An example is the coarse-loamy, siliceous, acid, thermic family of Typic Haplaquents.

Environmental Features That Affect Soil Use

This section describes some features of the environment that affect soil use in Parker County. Climate, flood prevention, soil use patterns and trends, as well as transportation and markets are considered.

Climate [9]

The climate of Parker County is subtropical. Winters are dry, and summers are hot and humid. Tropical maritime air masses control the weather during the spring, summer, and fall. Large variations in temperature sometimes accompany polar air masses in winter. The prevailing winds are southerly throughout the year, even in winter. Precipitation averages 32.05 inches annually.

In winter surges of cold polar Canadian air are frequent, and cold fronts are often accompanied by strong northerly winds and sudden drops in temperature. Very cold weather rarely occurs before the end of December. Freezing temperatures occur on approximately one-half of the nights in December. Even in January and February the periods of cold are short, and fair, mild weather often occurs. Precipitation is lowest during the winter when it is associated with frontal activity. It may fall as rain, freezing rain, sleet, or snow. Snow falls once or twice a month during January and February, but the average accumulation

[9] Prepared by ROBERT B. ORTON, Texas State climatologist, National Weather Service, U.S. Dept. of Commerce.

TABLE 9.—

[Data recorded at Weatherford, Texas, elevation 1,040 ft., for period

Month	Temperature °F				Precipitation				
						Probability, in percent, of receiving			
	Mean daily maximum	Mean monthly maximum	Mean daily minimum	Mean monthly minimum	Mean total	0 or trace	0.50 inch or more	1.00 inch or more	2.00 inches or more
					In				
January	53.9	76.0	31.6	13.2	1.89	<1	83	70	40
February	58.3	80.4	35.6	18.9	2.35	<1	90	73	45
March	66.3	85.4	40.9	23.1	1.97	<1	90	73	42
April	75.5	90.6	51.7	35.0	4.12	<1	97	89	70
May	82.3	94.8	60.3	45.8	5.07	<1	>99	99	90
June	90.8	99.2	68.3	57.8	3.10	1	89	75	56
July	96.0	103.2	71.7	64.0	2.06	<1	80	65	37
August	96.8	105.2	71.1	61.4	1.88	4	72	56	30
September	91.7	100.4	63.8	49.5	2.92	3	82	70	50
October	78.7	91.8	53.4	37.1	2.88	2	85	85	54
November	65.2	82.2	41.2	25.1	1.99	5	80	64	38
December	56.6	76.1	34.8	18.4	1.82	2	84	72	38
Year	76.0		52.0		32.05				

[1] Less than one-half.
[2] T=Trace, an amount too small to measure.

is less than an inch. Rare, exceptionally heavy snows, such as 15 inches that fell in January 1948, distort the data. The arithmetic mean gives a poor estimate of expected snowfall. Snow usually melts as it falls, only briefly interrupting outdoor activities.

Spring is a very pleasant season in Parker County. March has short warm spells and short cool spells; sometimes temperature changes are rather pronounced. Cloudy weather and light steady rains decrease and showery precipitation increases. Showers and thundershowers are frequent during the late afternoon or night in April and May. March and April are the windiest months of the year.

Summer is hot in the county. Refrigeration type air-conditioning is recommended for maximum comfort indoors and for automobile travel. June may have some very hot days, but thunderstorms break the spells of hot weather. There is little variety in daily weather patterns during July and August. August is one of the driest months of the year.

Fall is a most delightful season. Days are mild, and nights are cool. Winds are light, and fair weather persists. Rainfall increases during September and October, and weak tropical weather systems move in from the Gulf of Mexico or, occasionally, from the Pacific. The weather has greater variety than in summer, but continues mild. Thundershower activity, not as frequent as in spring, drops off sharply after October.

The wettest year on record at Weatherford since 1891 was 1957, when a total of 55.88 inches of rain fell; the driest year was 1954, when only 16.66 inches fell. The highest temperature ever recorded is 113° F, August 11, 1936; the lowest, −11° F, February 12, 1899. The mean annual relative humidity is 79 percent for 6:00 a.m., 53 percent for noon, and 48 percent for 6:00 p.m., Central Standard Time. The seasonal variation in relative humidity is small. The county receives about 60 percent of the total possible sunshine in winter and 80 percent in summer. The mean annual lake evaporation is about 60 inches.

At Weatherford the mean length of the warm season (freeze-free period) is 225 days. The mean dates of the last occurrence of 32° F or lower temperatures in spring and the first occurrence in fall are March 29 and November 9 respectively.

Table 9 gives a summary of climatological data for Parker County.

Flood Prevention

Flood prevention work in Parker County was authorized by Public Law 534, which the Congress passed in 1944. This bill authorizes local landowners, the Soil Conservation Service, the Soil and Water Conservation Service, the Soil and Water Conservation Districts, and the County Commissioners to work together for flood prevention. This work is coordinated with the plan of the Army Corps of Engineers for flood control in the Trinity River Watershed. Some structures are planned and built in the Brazos River Watershed under Public Law 566 projects which are similar to those under Public Law 534.

The purpose of these programs is the prevention of floods by building floodwater retarding structures. These structures impound the runoff from heavy rains and release the water slowly enough to prevent the stream channels below from becoming flooded. They are constructed on upper parts of main streams and on laterals feeding main streams.

There are 33 floodwater retarding structures and one erosion control structure in Parker County on the Clear Fork of the Trinity River. Several structures are planned for watersheds that drain into the Brazos River.

The prevention of flood damage is the chief purpose of a floodwater retarding structure, but many of the lakes thus created are also used for recreation, irrigation, and livestock water.

Climatological summary

1938 to 1967. The symbol > means greater than, < less than]

Precipitation—Continued									
selected amounts during month				Mean number of days that have—			Snow, sleet		
3.00 inches or more	4.00 inches or more	5.00 inches or more	6.00 inches or more	0.10 inch or more	0.50 inch or more	1.00 inch or more	Mean total	Maximum monthly	Greatest depth of accumulation
							In	*In*	*In*
22	12	6	2	3	1	1	1.7	15.0	9
30	16	10	5	3	1	(1)	.4	3.0	1
25	14	6	4	4	1	(1)	.2	5.0	2T
50	33	22	12	7	3	2	0	0	0
72	60	40	31	6	3	1	0	0	0
40	28	19	15	4	2	1	0	0	0
20	10	5	3	4	2	(1)	0	0	0
18	10	5	4	3	1	1	0	0	0
34	24	15	9	4	2	1	0	0	0
34	24	16	11	4	2	(1)	T	T	0
20	10	5	4	4	1	1	.3	.8	0
20	10	6	4	4	1	(1)	1.5	5.0	0
				50	20	8	4.1	15.0	9

Soil Use Patterns and Trends

The soils of Parker County are used chiefly for farming. Some areas, however, are used for urban development and some are Federal land. Farmlands are used mainly for crops, pasture, and range. In recent years the percentage of land used for crops and range has been decreasing and improved grasses have been established. This trend is partly a result of the changing ownership pattern. Urban residents are buying small acreages and establishing improved pastures. The trend is expected to continue.

More and more acreage will be used for urban development as rural areas become more densely populated.

Transportation and Markets

Parker County is served by a railroad that runs through Weatherford, Aledo, Bennett, and Millsap and a spur line from Weatherford through Garner to Mineral Wells and Fort Wolters. The county is served by many State and Federal highways, which provide for rapid movement of goods to nearby metropolitan areas.

There is a farmers market for locally produced fruits and vegetables. Livestock can be marketed locally as well as in nearby market centers. With the good transportation facilities, products can easily be shipped to points out of the county.

Glossary

[Asterisks indicate terms used in tables 4 and 6]

Alluvium. Soil material, such as sand, silt, or clay, that has been deposited on land by streams.

Association, soil. A group of soils geographically associated in a characteristic repeating pattern.

Available water capacity (also termed 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 capacity and the amount at wilting point. It is commonly expressed as inches of water per inch of soil.

Base saturation. The degree to which material that has base-exchange properties is saturated with exchangeable cations other than hydrogen, expressed as a percentage of the cation-exchange capacity.

Calcareous soil. A soil containing enough calcium carbonate (often with magnesium carbonate) to effervesce (fizz) visibly when treated with cold, dilute hydrochloric acid.

Caliche. A more or less cemented deposit of calcium carbonate in many soils of warm-temperature areas, as in the Southwestern States. The material may consist of soft, thin layers in the soil or of hard, thick beds just beneath the solum, or it may be exposed at the surface by erosion.

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 clay on the surface of a soil aggregate. Synonyms: clay coat, clay skin.

Claypan. A compact, slowly permeable soil horizon that contains more clay than the horizon above and below it. A claypan is commonly hard when dry and plastic or stiff when wet.

Climax vegetation. The stabilized plant community on a particular site; it reproduces itself and does not change so long as the environment does not change.

Colluvium. Soil material, rock fragments, or both, moved by creep, slide, or local wash and deposited at the base of steep slopes.

Complex, soil. A mapping unit consisting of different kinds of soils that occur in such small individual areas or in such an intricate pattern that they cannot be shown separately on a publishable soil map.

***Compressible.** Excessive decrease in volume of soft soil under load.

Concretions. Grains, pellets, or nodules of various sizes, shapes, and colors consisting of concentrations of compounds, or of soil grains cemented together. The composition of some concretions is unlike that of the surrounding soil. Calcium carbonate and iron oxide are examples of material commonly found in concretions.

Consistence, soil. The feel of the soil and the ease with which a lump can be crushed by the fingers. Terms commonly used to describe consistence are—

Loose.—Noncoherent when dry or moist; does not hold together in a mass.

Friable.—When moist, crushes easily under gentle pressure between thumb and forefinger and can be pressed together into a lump.

Firm.—When moist, crushes under moderate pressure between thumb and forefinger, but resistance is distinctly noticeable.

Plastic.—When wet, readily deformed by moderate pressure but can be pressed into a lump; will form a "wire" when rolled between thumb and forefinger.

Sticky.—When wet, adheres to other material, and tends to stretch somewhat and pull apart, rather than to pull free from other material.

Hard.—When dry, moderately resistant to pressure; can be broken with difficulty between thumb and forefinger.

Soft.—When dry, breaks into powder or individual grains under very slight pressure.

Cemented.—Hard and brittle; little affected by moistening.

Drainage class (natural). Refers to the conditions of frequency and duration of periods of saturation or partial saturation that existed during the development of the soil, as opposed to altered drainage, which is commonly the result of artificial drainage or irrigation but may be caused by the sudden deepening of channels or the blocking of drainage outlets. Seven different classes of natural soil drainage are recognized.

Excessively drained soils are commonly very porous and rapidly permeable and have a low available water capacity.

Somewhat excessively drained soils are also very permeable and are free from mottling throughout their profile.

Well-drained soils are nearly free from mottling and are commonly of intermediate texture.

Moderately well drained soils commonly have a slowly permeable layer in or immediately beneath the solum. They have uniform color in the A and upper B horizons and mottling in the lower B and the C horizons.

Somewhat poorly drained soils are wet for significant periods but not all the time, and some soils commonly have mottling at a depth below 6 to 16 inches.

Poorly drained soils are wet for long periods and are light gray and generally mottled from the surface downward, although mottling may be absent or nearly so in some soils.

Very poorly drained soils are wet nearly all the time. They have a dark-gray or black surface layer and are gray or light gray, with or without mottling, in the deeper parts of the profile.

Decreaser. Any of the climax range plants most heavily grazed. Because they are the most palatable, they are first to be destroyed by overgrazing.

Deferred grazing. The practice of delaying grazing until range plants have reached a definite stage of growth, in order to increase the vigor of the forage and to allow the desirable plants to produce seed. Contrasts with continuous grazing and rotation grazing.

***Depth to rock.** Bedrock is so near surface that it affects specified use of soil.

Diversion, or diversion terrace. A ridge of earth, generally a terrace, that is built to divert runoff from its natural course and, thus, to protect areas downslope from the effects of such runoff.

Erosion. The wearing away of the land surface by wind (sandblast), running water, and other geological agents.

***Excess lime.** Excess carbonates. Excessive carbonates, or lime, restrict the growth of some plants.

Fertility, soil. The quality of a soil that enables it to provide compounds, in adequate amounts and in proper balance, for the growth of specified plants, when other growth factors such as light, moisture, temperature, and the physical condition of the soil are favorable.

Flood plain. Nearly level land, consisting of stream sediments, that borders a stream and is subject to flooding unless protected artificially.

Genesis, soil. The manner in which a soil originates. Refers especially to the processes initiated by climate and organisms that are responsible for the development of the solum, or true soil, from the unconsolidated parent material, as conditioned by relief and age of landform.

Gilgai. Typically, the microrelief of Vertisols—clayey soils that have a high coefficient of expansion and contraction with changes in moisture; usually a succession of microbasins and microknolls, in nearly level areas, or of microvalleys and microridges that run with the slope.

Gully. A miniature valley with steep sides cut by running water and through which water ordinarily runs only after rains. The distinction between gully and rill is one of depth. A gully generally is an obstacle to farm machinery and is too deep to be obliterated by normal tillage; a rill is of lesser depth and can be smoothed over by ordinary tillage. V-shaped gullies result if the material is more difficult to erode with depth; whereas U-shaped gullies result if the lower material is more easily eroded than that above it.

Hardpan. A hardened or cemented soil horizon, or layer. The soil material may be sandy or clayey, and it may be cemented by iron oxide, silica, calcium carbonate, or other substance.

Horizon, soil. A layer of soil, approximately parallel to the surface, that has distinct characteristics produced by soil-forming processes. These are the major horizons:

A horizon.—The mineral horizon at the surface or just below an O horizon. This horizon is the one in which living organisms are most active and therefore is marked by the accumulation of humus. The horizon may have lost one or more of soluble salts, clay, and sesquioxides (iron and aluminum oxides).

B horizon.—The mineral horizon below an A horizon. The B horizon is in part a layer of change from the overlying A to the underlying C horizon. The B horizon also has distinctive characteristics caused (1) by accumulation of clay, sesquioxides, humus, or some combination of these; (2) by prismatic or blocky structure; (3) by redder or stronger colors than the A horizon; or (4) by some combination of these. Combined A and B horizons are usually called the solum, or true soil. If a soil lacks a B horizon, the A horizon alone is the solum.

C horizon.—The weathered rock material immediately beneath the solum. In most soils this material is presumed to be like that from which the overlying horizons were formed. If the material is known to be different from that in the solum, a Roman numeral precedes the letter C.

R layer.—Consolidated rock beneath the soil. The rock usually underlies a C horizon but may be immediately beneath an A or B horizon.

Increasers. Species in the climax vegetation that increase in relative amount as the more desirable plants are reduced by close grazing; increasers commonly are shorter than decreasers, and some are less palatable to livestock.

Invaders. On range, plants that come in and grow after the climax vegetation has been reduced by grazing. Generally, invader plants are those that follow disturbance of the surface. (Most weeds are "invaders").

Irrigation. Application of water to soils to assist in production of crops. Some methods of irrigation are—

Border.—Water is applied at the upper end of a strip in which the lateral flow of water is controlled by small earth ridges called border dikes, or borders.

Furrow.—Water is applied in small ditches made by cultivation implements used for tree and row crops.

Sprinkler.—Water is sprayed over the soil surface through pipes or nozzles from a pressure system.

***Large stones.** Rock fragments 10 inches (25 centimeters) or more across. Large stones adversely affect the specified use.

Liquid limit. The moisture content at which the soil passes from a plastic to a liquid state. In engineering, a high liquid indicates that the soil has a high content of clay and a low capacity for supporting loads.

***Low strength.** Inadequate strength for supporting loads.

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 their thickness and arrangement in the soil profile.

Mottling, soil. Irregularly marked with spots of different colors that vary in number and size. Mottling in soils usually indicates poor aeration and lack of drainage. Descriptive terms are as follows: abundance—*few*, *common*, and *many*; size—*fine*, *medium*, and *coarse*; and contrast—*faint*, *distinct*, and *prominent*. The size measurements are these: *fine*, less than 5 millimeters (about 0.2 inch) in diameter along the greatest dimension; *medium*, ranging from 5 millimeters to 15 millimeters (about 0.2 to 0.6 inch) in diameter along the greatest dimension; and *coarse*, more than 15 millimeters (about 0.6 inch) in diameter along the greatest dimension.

Munsell notation. A system for designating color by degrees of the three simple variables—hue, value, and chroma. For example, a notation of 10YR 6/4 is a color with a hue of 10YR, a value of 6, and a chroma of 4.

Parent material. Disintegrated and partly weathered rock from which soil has formed.

Ped. An individual natural soil aggregate, such as a crumb, a prism, or a block, in contrast to a clod.

***Percs slowly.** The slow movement of water through the soil adversely affecting the specified use.

Permeability. The quality that enables the soil to transmit water or air. Terms used to describe permeability are as follows: *very slow*, *slow*, *moderately slow*, *moderate*, *moderately rapid*, *rapid*, and *very rapid*.

pH value. A numerical means for designating acidity and alkalinity in soils. A pH value of 7.0 indicates precise neutrality; a higher value, alkalinity; and a lower value, acidity.

***Piping.** Formation by moving water of subsurface tunnels or pipeline cavities.

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 a semisolid to a plastic state.

Plowpan. A compacted layer formed in the soil immediately below the plowed layer.

Poorly graded. A soil material consisting mainly of particles of nearly the same size. Because there is little difference in size of the particles in poorly graded soil material, density can be increased only slightly by compaction.

Profile, soil. A vertical section of the soil through all its horizons and extending into the parent material.

Range condition. The state of health or productivity of both soil and forage in a given range, in terms of what productivity could or should be under normal climate and the best practical management. Condition classes generally recognized are—*excellent*, *good*, *fair*, and *poor*. The classification is based on the percentage of original, or climax, vegetation on the site, as compared to what ought to grow on it if management were good.

Reaction, soil. The degree of acidity or alkalinity of a soil, expressed in pH values. A soil that tests to pH 7.0 is precisely neutral in reaction because it is neither acid nor alkaline. An acid, or "sour," soil is one that gives an acid reaction; an alkaline soil is one that is alkaline in reaction. In words, the degrees of acidity or alkalinity are expressed thus:

	pH		*pH*
Extremely acid	Below 4.5	Neutral	6.6 to 7.3
Very strongly acid	4.5 to 5.0	Mildly alkaline	7.4 to 7.8
Strongly acid	5.1 to 5.5	Moderately alkaline	7.9 to 8.4
Medium acid	5.6 to 6.0	Strongly alkaline	8.5 to 9.0
Slightly acid	6.1 to 6.5	Very strongly alkaline	9.1 and higher.

Relief. The elevations or inequalities of a land surface, considered collectively.

Rill. A steep-sided channel resulting from accelerated erosion. A rill normally is a few inches in depth and width and is not large enough to be an obstacle to farm machinery.

***Rooting depth.** Shallow root zone. The soil is shallow over a layer that greatly restricts roots.

Sand. Individual rock or mineral fragments in a soil that range in diameter from 0.05 to 2.0 millimeters. Most sand grains consist of quartz, but they may be of any mineral composition. The textural class name of any soil that contains 85 percent or more sand and not more than 10 percent clay.

***Seepage.** The rapid 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. If two sequa are present in a single soil profile, it is said to have a bisequum.

Series, soil. A group of soils developed from a particular type of parent material and having genetic horizons that, except for texture of the surface layer, are similar in differentiating characteristics and in arrangement in the profile.

***Shrink-swell.** The shrinking of soil when dry and the swelling when wet. It can damage roads, dams, building foundations, and other structures as well as plant roots.

Silica. Silica is a combination of silicon and oxygen. The mineral form is called quartz.

Silica-sesquioxide ratio. The ratio of the number of molecules of silica to the number of molecules of alumina plus iron oxide in a soil or the clay fraction of a soil. The more highly weathered materials in warm-temperate, humid regions, and especially those in the tropics, generally have low ratios. The clays in soils with low ratios normally are less active, physically and chemically, than those with high ratios.

Silt. Individual mineral particles in a soil that range in diameter from the upper limit of clay (0.002 millimeter) to the lower limit of very fine sand (0.05 millimeter). Soil of the silt textural class is 80 percent or more silt and less than 12 percent clay.

Slickensides. Polished and grooved surfaces produced by one mass sliding past another. In soils, slickensides may occur at the bases of slip surfaces on relatively steep slopes and in swelling clays, where there is marked change in moisture content.

Soil separates. Mineral particles less than 2 millimeters in equivalent diameter and ranging between specified size limits. The names and sizes of separates recognized in the United States are as follows: *Very coarse sand* (2.0 to 1.0 millimeter); *coarse sand* (1.0 to 0.5 millimeter); *medium sand* (0.5 to 0.25 millimeter); *fine sand* (0.25 to 0.10 millimeter); *very fine sand* (0.10 to 0.05 millimeter); *silt* (0.05 to 0.002 millimeter); and *clay* (less than 0.002 millimeter). The separates recognized by the International Society of Soil Science are as follows: I (2.0 to 0.2 millimeter); II (0.2 to 0.02 millimeter); III (0.02 to 0.002 millimeter); IV (less than 0.002 millimeter).

Solum. The upper part of a soil profile, above the parent material, in which the processes of soil formation are active. The solum in mature soil includes the A and B horizons. Generally, the characteristics of the material in these horizons are unlike those of the underlying material. The living roots and other plant and animal life characteristic of the soil are largely confined to the solum.

Stone line. A concentration of coarse rock fragments in soils that generally represents an old weathering surface. In a cross section, the line may be one stone or more thick. The line generally overlies material that weathered in place, and it is ordinarily overlain by sediment of variable thickness.

Structure, soil. The arrangement of primary soil particles into compound particles or clusters that are separated from adjoining aggregates and have properties unlike those of an equal mass of unaggregated primary soil particles. 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 together without any regular cleavage, as in many claypans and hardpans).

Substratum. Technically, the part of the soil below the solum.

Surface soil. The soil ordinarily moved in tillage, or its equivalent in uncultivated soil, about 5 to 8 inches in thickness. The plowed layer.

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 it may soak into the soil or flow slowly to a prepared outlet without harm. Terraces in fields are generally built so they can be farmed. Terraces intended mainly for drainage have a deep channel that is maintained in permanent sod.

Terrace (geological), An old alluvial plain, ordinarily flat or undulating, bordering a river, lake, or the sea. Stream terraces are frequently called second bottoms, as contrasted to flood plains, and are seldom subject to overflow. Marine terraces were deposited by the sea and are generally wide.

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.** Otherwise suitable soil material too thin for the specified use.

Tilth, soil. The condition of the soil in relation to the growth of plants, especially soil structure. Good tilth refers to the friable state and is associated with high noncapillary porosity and stable, granular structure. A soil in poor tilth is nonfriable, hard, nonaggregated, and difficult to till.

Topsoil. A presumed fertile soil or soil material, or one that responds to fertilization, ordinarily rich in organic matter, used to topdress roadbanks, lawns, and gardens.

Trace elements. The chemical elements found in soils in extremely small amounts, yet which are essential to plant growth. Some of the trace elements are zinc, cobalt, manganese, copper, and iron.

***Unstable fill.** Risk of caving or sloughing in banks of fill material.

Water table. The highest part of the soil or underlying rock material that is wholly saturated with water. In some places an upper, or perched, water table may be separated from a lower one by a dry zone.

Well-graded soil. A soil or soil material consisting of particles that are well distributed over a wide range in size or diameter. Such a 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 oven-dry basis, at which plants (specifically sunflower) wilt so much that they do not recover when placed in a dark, humid atmosphere.

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GUIDE TO MAPPING UNITS

Map symbol	Mapping unit	Page	Capability unit Symbol	Page	Range site Name	Page	Pasture group
ALE	Aledo association, undulating	10	VIs-1	48	Shallow	58	(1/)
BaA	Bastrop fine sandy loam, 0 to 1 percent slopes	10	I-2	44	Sandy Loam	58	8C
BaB	Bastrop fine sandy loam, 1 to 3 percent slopes	10	IIe-3	45	Sandy Loam	58	8C
BaC2	Bastrop fine sandy loam, 2 to 5 percent slopes, eroded	11	IIIe-1	46	Sandy Loam	58	8C
BbB	Blanket clay loam, 1 to 3 percent slopes	12	IIe-1	44	Clay Loam	55	7C
BcB	Bolar clay loam, 1 to 3 percent slopes	12	IIe-1	44	Clay Loam	55	7C
BcC	Bolar clay loam, 3 to 5 percent slopes	13	IIIe-5	46	Clay Loam	55	7C
BcD	Bolar clay loam, 5 to 8 percent slopes	13	IVe-2	47	Clay Loam	55	7D
BfB	Bonti fine sandy loam, 1 to 3 percent slopes	13	IIe-2	45	Sandy Loam	58	8A
BfC	Bonti fine sandy loam, 3 to 5 percent slopes	14	IIIe-2	46	Sandy Loam	58	8A
BfC2	Bonti fine sandy loam, 1 to 5 percent slopes, eroded	14	IIIe-2	46	Sandy Loam	58	8A
BnD	Bonti and Truce soils, 1 to 8 percent slopes	14	VIs-2	49	----------	--	8A
	Bonti	--	-------	--	Sandy Loam	58	--
	Truce	--	-------	--	Tight Sandy Loam	59	--
Bo	Bosque loam, occasionally flooded	15	IIw-1	45	Loamy Bottom Land	56	2A
BrE	Brackett-Urban land complex, 3 to 12 percent slopes	16	(2/)	--	(3/)	--	(1/)
BsE	Brackett and Maloterre soils, 3 to 12 percent slopes	16	VIs-1	48	Steep Adobe	58	(1/)
BsG	Brackett and Maloterre soils, 12 to 30 percent slopes	16	VIIs-1	49	Steep Adobe	58	(1/)
Bu	Bunyan fine sandy loam, occasionally flooded	17	IIw-1	45	Loamy Bottom Land	56	2A
ChC	Chaney loamy fine sand, 1 to 5 percent slopes	18	IIIe-4	46	Sandy	57	9A
ChC2	Chaney loamy fine sand, 3 to 5 percent slopes, eroded	18	IIIe-10	47	Sandy	57	9A
DeB	Denton clay, 1 to 3 percent slopes	19	IIe-1	44	Clay Loam	55	7C
DgD3	Duffau-Orthents complex, 3 to 8 percent slopes, severely eroded	19	VIIe-1	49	Sandy Loam	58	(1/)
DhD	Duffau-Urban land complex, 3 to 8 percent slopes	20	(2/)	--	(3/)	--	(1/)
DmC	Duffau and Weatherford soils, 1 to 5 percent slopes	20	IIIe-4	46	Sandy	57	9A
DwC2	Duffau and Weatherford soils, 2 to 5 percent slopes, eroded	21	IIIe-1	46	Sandy Loam	58	8C
DwD2	Duffau and Weatherford soils, 5 to 8 percent slopes, eroded	22	IVe-1	47	Sandy Loam	58	8C
DyD3	Duffau and Weatherford soils, 2 to 8 percent slopes, severely eroded	22	VIe-1	48	Sandy Loam	58	(1/)
Fc	Frio clay loam, occasionally flooded	23	IIw-2	45	Loamy Bottom Land	56	1C
Ff	Frio clay loam, frequently flooded	23	Vw-1	48	Loamy Bottom Land	56	1C
HaB	Hardeman very fine sandy loam, 0 to 2 percent slopes	23	IIe-4	45	Sandy Loam	58	8C
HaE	Hardeman very fine sandy loam, 6 to 12 percent slopes	23	VIe-2	48	Sandy Loam	58	(1/)
HeA	Hassee fine sandy loam, 0 to 1 percent slopes	25	IIIw-1	47	Claypan	55	8A
HfC	Heaton fine sand, 1 to 5 percent slopes	26	IIIe-4	46	Sandy	57	9A
HnB	Hensley complex, 0 to 3 percent slopes	26	VIs-1	48	Redland	57	13A
KcA	Krum clay, 0 to 1 percent slopes	27	IIs-1	45	Clay Loam	55	7C
KcB	Krum clay, 1 to 3 percent slopes	27	IIe-1	44	Clay Loam	55	7C
LaC	Lamar clay loam, 3 to 5 percent slopes	27	IIIe-5	46	Clay Loam	55	7C
LaD	Lamar clay loam, 5 to 8 percent slopes	27	IVe-2	47	Clay Loam	55	7D
Lf	Lincoln soils, frequently flooded	28	Vw-2	48	Sandy Bottom Land	57	3A
LnB	Lindy loam, 1 to 3 percent slopes	28	IIIe-8	47	Deep Redland	56	7C
MaC	Maloterre soils, 2 to 5 percent slopes	29	VIIs-1	49	Very Shallow	59	13A
MfB	May fine sandy loam, 1 to 3 percent slopes	29	IIe-3	45	Sandy Loam	58	8C
NdC	Nimrod fine sand, 1 to 5 percent slopes	30	IIIe-4	46	Sandy	57	9A

GUIDE TO MAPPING UNITS--Continued

Map symbol	Mapping unit	Page	Capability unit		Range site		Pasture group
			Symbol	Page	Name	Page	
NdD	Nimrod fine sand, 5 to 8 percent slopes	30	IVe-3	47	Sandy	57	9A
Nr	Norwood silt loam	30	I-1	44	Loamy Bottom Land	56	2A
OcE	Owens clay, 3 to 12 percent slopes	31	VIe-3	48	Shallow Clay	58	(1/)
OtG	Owens-Truce complex, 5 to 30 percent slopes	31	VIIs-2	49	Shallow Clay	58	(1/)
PaC	Patilo complex, 1 to 5 percent slopes	32	IIIe-7	46	Deep Sand	56	9B
PcB	Purves clay, 1 to 3 percent slopes	33	IIIe-6	46	Shallow	58	13A
PcC	Purves clay, 3 to 5 percent slopes	33	IVe-4	48	Shallow	58	13A
PuC	Purves-Urban land complex, 1 to 5 percent slopes	33	(2/)	--	(3/)	--	(1/)
ReB	Reap clay, 1 to 3 percent slopes	34	IIIe-3	46	Clay Flat	55	7A
SdC	Selden loamy fine sand, 1 to 5 percent slopes	34	IIIe-4	46	Sandy	57	9A
SdC2	Selden loamy fine sand, 1 to 5 percent slopes, eroded	34	IIIe-10	47	Sandy	57	9A
SuC	Selden-Urban land complex, 1 to 5 percent slopes	34	(2/)	--	(3/)	--	(1/)
Sw	Ships silty clay	35	IIs-2	45	Clayey Bottom Land	56	1A
ThB	Thurber clay loam, 1 to 3 percent slopes	36	IIIe-3	46	Claypan	55	7H
TrB	Truce fine sandy loam, 1 to 3 percent slopes	36	IIe-2	45	Tight Sandy Loam	59	8A
TrC	Truce fine sandy loam, 3 to 5 percent slopes	36	IIIe-9	47	Tight Sandy Loam	59	8A
TrC2	Truce fine sandy loam, 2 to 5 percent slopes, eroded	36	IIIe-9	47	Tight Sandy Loam	59	8A
TrD2	Truce fine sandy loam, 5 to 8 percent slopes, eroded	37	VIe-4	48	Tight Sandy Loam	59	8B
TuF	Truce stony soils, 5 to 20 percent slopes	37	VIIs-2	49	Sandstone Hills	57	(1/)
VeB	Venus clay loam, 1 to 3 percent slopes	38	IIe-1	44	Clay Loam	55	7C
VeC	Venus clay loam, 3 to 5 percent slopes	38	IIIe-5	46	Clay Loam	55	7C
VeD	Venus clay loam, 5 to 8 percent slopes	38	IVe-2	47	Clay Loam	55	7D
VuD	Venus-Urban land complex, 3 to 8 percent slopes	38	(2/)	--	(3/)	--	(1/)
WnC	Windthorst loamy fine sand, 1 to 5 percent slopes	40	IIIe-4	46	Sandy	57	9A
WoB	Windthorst fine sandy loam, 1 to 3 percent slopes	40	IIe-2	45	Sandy Loam	58	8A
WoC	Windthorst fine sandy loam, 3 to 5 percent slopes	40	IIIe-2	46	Sandy Loam	58	8A
WoC2	Windthorst fine sandy loam, 1 to 5 percent slopes, eroded	41	IIIe-2	46	Sandy Loam	58	8A
WoD	Windthorst fine sandy loam, 5 to 8 percent slopes	41	IVe-1	47	Sandy Loam	58	8B
WuD	Windthorst-Urban land complex, 2 to 8 percent slopes	41	(2/)	--	(3/)	--	(1/)
WvD3	Windthorst soils, 1 to 8 percent slopes, severely eroded	41	VIe-1	48	Sandy Loam	58	8B
Yb	Yahola and Bunyan soils, frequently flooded	42	Vw-3	48	Loamy Bottom Land	56	2A
Ym	Yomont very fine sandy loam, frequently flooded	43	Vw-3	48	Loamy Bottom Land	56	2A
Yo	Yomont very fine sandy loam	42	IIe-4	45	Loamy Bottom Land	56	2A

1/ Generally not used as pasture.

2/ Generally not used for crops.

3/ Generally not used as range.

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