SOIL SURVEY

Coke County Texas

UNITED STATES DEPARTMENT OF AGRICULTURE
Soil Conservation Service
In cooperation with
TEXAS AGRICULTURAL EXPERIMENT STATION
Issued October 1974

Major fieldwork for this soil survey was done in the period 1962–1967. Soil names and descriptions were approved in 1968. Unless otherwise indicated, statements in this publication refer to conditions in the county in 1968. 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 North Concho River and the Coke County Soil and Water Conservation Districts.

Either enlarged or reduced copies of the soil map in this publication can be made by commercial photographers, or they can be purchased on individual order from the Cartographic Division, Soil Conservation Service, USDA, Washington, D.C. 20250.

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 Coke 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 and range site classification of each. It also shows the page where each soil is described and the page on which the range site is described.

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 ranchers and those who work with them can learn about use and management of the soils from the section, "Descriptions of the Soils."

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

Ranchers and others can find, under "Range Management," 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 find data useful in the selection of sites for nonindustrial buildings and for recreation areas in the engineering tables.

Engineers and builders can find, under "Engineering Uses of the Soils," tables that contain test data, estimates of soil properties, and interpretations of soil properties as they 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 the Soils."

Newcomers to the 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 additional information about the county given at the beginning and end of the publication.

U.S. GOVERNMENT PRINTING OFFICE: 1974

For sale by the Superintendent of Documents, U.S. Government Printing Office
Washington, D.C. 20402

Contents

	Page
How this survey was made	1
General soil map	2
1. Kimbrough-Olton-Mereta association	2
2. Tarrant association	3
3. Olton-Miles association	3
4. Cobb-Cosh association	3
5. Miles-Colorado association	3
6. Tivoli-Brownfield association	3
Descriptions of the soils	3
Badland	4
Berda series	4
Bronte series	5
Brownfield series	7
Clairemont series	7
Cobb series	8
Colorado series	9
Cosh series	9
Cottonwood series	10
Frio series	10
Kimbrough series	11
Latom series	11
Lipan series	11
Mereta series	12
Miles series	13
Nuvalde series	14
Olton series	15
Potter series	15
Spade series	16
Stony steep land	16
Tarrant series	17
Descriptions of the soils—Continued	
Tivoli series	17
Vernon series	18
Weymouth series	18
Yahola series	19
Use and management of the soils	19
Management of cultivated soils	19
Yield predictions	19
Capability grouping	20
Range management	22
Range sites and condition classes	22
Descriptions of range sites	23
Wildlife	29
Engineering uses of the soils	31
Engineering classification systems	31
Engineering test data	42
Estimated engineering properties	42
Interpretations of engineering properties	43
Formation and classification of the soils	44
Factors of soil formation	44
Parent material	44
Climate	45
Living organisms	45
Topography	45
Time	45
Classification of the soils	45
Climate	46
Settlement and population	47
Glossary	47
Guide to mapping units Following	49

Issued October 1974

SOIL SURVEY OF COKE COUNTY, TEXAS

BY LLOYD J. BARNHILL, SOIL CONSERVATION SERVICE [1]

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

COKE COUNTY is in the west-central part of Texas (fig. 1), in the land resource area of the Rolling Red Plains and Edwards Plateau. It has an area of 585,600 acres. It is rectangular in shape and is about 34 miles wide and 30 miles long.

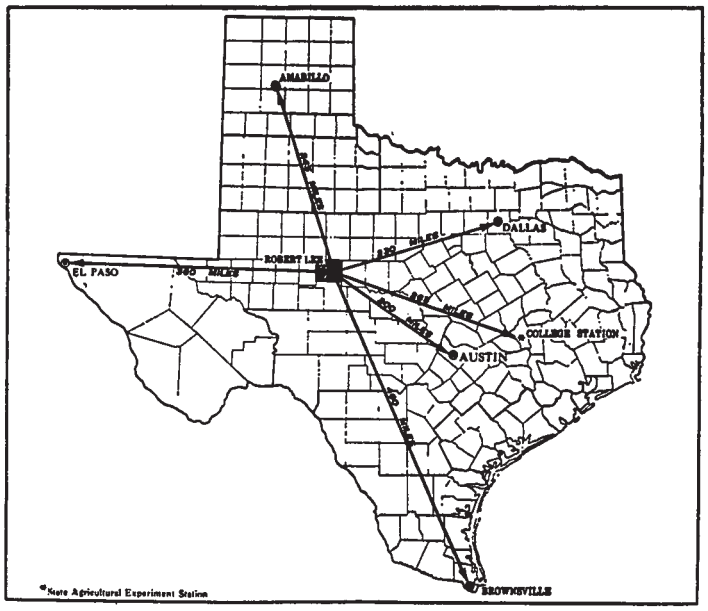

Figure 1.—Location of Coke County in Texas.

The Colorado River enters the county near the northwest corner and runs diagonally across the county in a southeasterly direction until it passes into Runnels County. Ranges of high hills are on each side of the river and parallel to it. These hills are continuous chains and are about 10 miles from the river at the eastern side of the county and about 4 miles at the western side. Between these hills and along both sides of the Colorado River is a nearly level to gently sloping or undulating plain that averages about 14 miles in width and 35 miles in length. Elevation of the valley averages about 1,800 feet, and the bordering hills are at an elevation of about 2,250 feet.

With minor exceptions, most creeks and draws originate in the hills bordering the valley on its northern and southern edges and are perpendicular to the Colorado River. These watercourses are numerous and fall rapidly toward the river. Runoff waters from the hills to the river have worn deep, narrow courses across the valley.

The North Concho River crosses the county in a southeasterly direction in the extreme southwestern corner of the county. Its tributaries collect waters from the western and southern parts of the county.

About one-tenth of the county is cultivated. Small grain, grain sorghum, and cotton are the main dryfarmed crops. Only about 200 acres of the cultivated soil is irrigated. About 90 percent of the county is used as range.

How This Survey Was Made

Soil scientists made this survey to learn what kinds of soil are in Coke 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. As they traveled over the county, 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 distant. 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. Bronte and Miles, for example, are the names of two soils 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 soil and in slope, stoniness, or some other characteristic

[1] Assisting with the fieldwork were—CLARENCE C. WIEDENFELD, CLIFFORD J. NOVASAD, and J. DEWAYNE MCANDREW, Soil Conservation Service.

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, Miles fine sandy loam, 1 to 3 percent slopes, is one of four phases within the Miles 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 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 the 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 other 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 Coke 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. The name of a soil complex consists of the names of the dominant soils, joined by a hyphen. Mereta-Nuvalde complex, 0 to 1 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. The name of an association consists of the names of the dominant soils, joined by a hyphen. Berda-Vernon-Potter 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. The name of an undifferentiated group consists of the names of the dominant soils, joined by "and." Cosh and Cobb soils, 1 to 3 percent slopes, is an example.

In most areas surveyed there are places where the soil material is so steep, so rocky, so shallow, or so severely eroded that it cannot be classified by soil series. These places are shown on the soil map and are described in the survey, but they are called land types and are given descriptive names. Stony steep land is a land type in Coke County.

While a soil survey is in progress, samples of soils are taken, as needed, for laboratory measurements and for engineering tests. Laboratory data from the same kinds of soil in other places are 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.

But only part of a soil survey is done when the soils have been named, described, and delineated on the map, and the laboratory data and yield data have been assembled. The mass of detailed information then needs to be organized in such a way as to be readily useful to different groups of users, among them farmers, managers of woodland and rangeland, and engineers.

On the basis of yield and practice tables and other data, the soil scientists set up trial groups. They test these groups by further study and by consultation with farmers, agronomists, engineers, and others, 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 present 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 Coke 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 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 six soil associations in Coke County are each described in the following pages. Textures described in the titles of the associations are those of the surface layer of the dominant soils. For example, the word "loamy" in the title of association 1 refers to the texture of the surface layer of the Kimbrough, Olton, and Mereta soils.

1. *Kimbrough-Olton-Mereta association*

Very shallow, deep, and shallow, loamy, calcareous and noncalcareous soils overlying outwash plains material

Association 1 consists of nearly level to strongly sloping soils. The drainage patterns are complex. Kimbrough and Mereta soils, which are closely related and intermixed, occupy drainageways, convex knolls, and plateaus. Olton soils are typically in broad, nearly level areas; their slope range is 0 to 3 percent.

This association makes up about 51 percent of the county. It is about 32 percent Kimbrough soils, 17 per-

cent Olton soils, 10 percent Mereta soils, and 41 percent other soils.

Kimbrough soils are typically dark-brown loams about 8 inches deep over indurated caliche. Mereta soils are dark-brown, calcareous clay loams and clays about 16 inches thick over strongly cemented caliche. Olton soils are dark-brown clay loams.

This association is used mainly as range, but about half the acreage could be cultivated.

2. *Tarrant association*

Shallow, clayey, calcareous soils on limestone hills

Association 2 consists of nearly level to steep soils on limestone hills.

This association makes up about 27 percent of the county. It is about 58 percent Tarrant soils. Other soils and miscellaneous land types make up the rest of the association.

Tarrant soils are very dark grayish-brown clays. Fractured limestone bedrock is at a depth of about 17 inches.

This association is used as range. The soils are not suitable for crops. Stoniness and the topography make the use of machinery difficult. The soils are suitable for wildlife.

3. *Olton-Miles association*

Deep, noncalcareous, loamy soils overlying outwash plains material

Association 3 consists of nearly level to gently sloping soils on broad terraces and adjoining uplands.

This association makes up about 9 percent of the county. It is about 22 percent Olton soils, 19 percent Miles soils, and 59 percent soils of lesser extent.

Olton soils are dark-brown clay loams, and the Miles soils are reddish-brown fine sandy loams.

Most of this association is cultivated, and the rest is used as range.

4. *Cobb-Cosh association*

Moderately deep and shallow, loamy, noncalcareous soils over sandstone

Association 4 consists of gently sloping to strongly sloping soils. The more gently sloping Cobb soils are in the lower areas, and the steeper Cosh soils are at the higher elevations.

This association makes up about 6 percent of the county. It is about 27 percent Cobb soils, 23 percent Cosh soils, and 50 percent soils of lesser extent.

Both Cobb and Cosh soils are reddish-brown fine sandy loams. Sandstone bedrock is at a depth of about 29 inches in Cobb soils and about 17 inches in Cosh soils.

The association is used mainly for range, but more than half the acreage could be cultivated.

5. *Miles-Colorado association*

Deep, noncalcareous and calcareous, loamy soils on terraces and bottom lands

Soils of association 5 are near the major streams of the county. Colorado soils are on the flood plains, and Miles and other soils occupy the adjoining terraces.

This association makes up about 5 percent of the county. It is about 40 percent Miles soils, 25 percent Colorado soils, and the rest is soils of lesser extent.

Miles soils are reddish-brown, noncalcareous fine sandy loams, and Colorado soils are reddish-brown calcareous loams.

Most of the association is cultivated.

6. *Tivoli-Brownfield association*

Deep, noncalcareous, sandy soils

Association 6 consists of nearly level to gently sloping, hummocky soils on uplands. The slope range is dominantly 2 to 5 percent. Tivoli soils are at the higher elevations, and Brownfield soils occupy the more nearly level areas.

This association makes up about 2 percent of the county. It is about 65 percent Tivoli soils, 14 percent Brownfield soils, and 21 percent soils of lesser extent.

Both Tivoli and Brownfield soils are brown fine sands. The profile of Tivoli soils extends to a depth of about 66 inches, and that of Brownfield soils to a depth of as much as 146 inches.

Most of the association is used for range.

Descriptions of the Soils

In this section the soils of Coke County are described in detail. The procedure is to describe first the soil series and then the mapping units, or kinds of soil, in that series. Thus, to get full information on any one mapping unit, it is necessary to read both the description of that unit and the description of the soil series to which the unit belongs. The approximate acreage and proportionate extent of each soil mapped are shown in table 1.

Each soil series description contains a short narrative description of a profile considered representative of the series and a much more detailed description of the same profile that scientists, engineers, and others can use in making technical interpretations. The colors described are for dry soil, unless otherwise noted. The content of coarse fragments in the soil is expressed as a percentage of the soil mass, by volume.

Some of the terms used in the soil descriptions are defined in the Glossary, some are defined in the section "How This Survey Was Made," and some are found in the Soil Survey Manual.[2] At the back of this soil survey is the "Guide to Mapping Units," which lists the mapping units in the county and shows the capability unit (irrigated, nonirrigated, or both) and range site each mapping unit is in, and the page where each mapping unit and each range site is described. Capability units are not described separately. Brief definitions of the units are given in the section "Capability Grouping," and information concerning the use of the soils for crops is included in the descriptions of the mapping units.

A substantial part of the total acreage was mapped at low intensity. The low-intensity mapping units can be identified among the soil descriptions and on the soil map by their map smbols, which are made up of two or three capital letters (BVB, for example), whereas the

[2] UNITED STATES DEPARTMENT OF AGRICULTURE. SOIL SURVEY MANUAL, Handbook 18, 503 pp., illus. 1951.

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

Soils	Area	Extent
	Acres	*Percent*
Berda loam, 2 to 5 percent slopes	27, 390	4. 7
Berda-Vernon-Potter association, undulating	17, 510	3. 0
Bronte fine sandy loam, 0 to 1 percent slopes	6, 990	1. 2
Bronte fine sandy loam, 1 to 3 percent slopes	8, 260	1. 4
Brownfield fine sand, 0 to 5 percent slopes	1, 720	. 3
Clairemont silt loam	3, 660	. 6
Cobb loamy fine sand, 0 to 3 percent slopes	2, 040	. 3
Cobb fine sandy loam, 1 to 3 percent slopes	12, 050	2. 1
Cobb fine sandy loam, 2 to 5 percent slopes, eroded	3, 500	. 6
Cobb and Cosh soils, 3 to 5 percent slopes	3, 290	. 6
Colorado loam	10, 910	1. 9
Cosh and Cobb soils, 1 to 3 percent slopes	8, 410	1. 4
Cosh and Latom soils, 1 to 10 percent slopes	7, 340	1. 3
Cottonwood loam, 1 to 3 percent slopes	220	(1)
Frio silty clay loam	2, 910	. 5
Kimbrough soils, undulating	104, 530	17. 8
Lipan clay	600	. 1
Mereta clay loam, 0 to 1 percent slopes	8, 900	1. 5
Mereta clay loam, 1 to 3 percent slopes	16, 990	2. 9
Mereta-Nuvalde complex, 0 to 1 percent slopes	6, 880	1. 2
Mereta-Nuvalde complex, 1 to 3 percent slopes	3, 040	. 5
Miles loamy fine sand, 0 to 3 percent slopes	1, 900	. 3
Miles fine sandy loam, 0 to 1 percent slopes	12, 050	2. 1
Miles fine sandy loam, 1 to 3 percent slopes	27, 710	4. 7
Miles fine sandy loam, 3 to 5 percent slopes	2, 240	. 4
Nuvalde silty clay loam, 0 to 1 percent slopes	13, 420	2. 3
Nuvalde silty clay loam, 1 to 3 percent slopes	29, 860	5. 1
Olton clay loam, 0 to 1 percent slopes	37, 280	6. 4
Olton clay loam, 1 to 3 percent slopes	26, 480	4. 5
Spade fine sandy loam, 1 to 3 percent slopes	1, 110	. 2
Stony steep land	33, 360	5. 7
Tarrant soils, undulating	35, 300	6. 0
Tarrant soils, hilly	65, 570	11. 2
Tivoli fine sand, hummocky	7, 650	1. 3
Vernon-Badland complex	1, 180	. 2
Weymouth loam, 1 to 3 percent slopes	7, 950	1. 3
Weymouth loam, 3 to 5 percent slopes	1, 860	. 3
Yahola very fine sandy loam	5, 150	. 9
Land area	567, 210	96. 9
Lakes and Colorado River channel	18, 390	3. 1
Total	585, 600	100. 0

[1] Less than 0.05 percent.

symbols for the medium-intensity units are made up of one or two capital letters and one small letter (Ca or CbB, for example).

Badland

Badland is a steep, barren land type that consists of broad and shallow gullies or eroded areas in regions of red marine clay. The red marine clay is exposed at the surface, and little or no soil development is evident. Badland is mapped with Vernon soils in the Vernon-Badland complex, which is described under the heading "Vernon series."

The slope is typically between 8 and 20 percent, but the range is from about 1 to 20 percent. The sides of some gullies are vertical or nearly so. Surfaces are concave. On the surface in most areas are few to many rounded quartzitic pebbles, chert fragments, or thin fragments of dolomitic limestone ¼ inch to 4 inches in diameter.

Some soil material is removed from the higher areas by water erosion during each measurable rain. The bottoms of a few gullies are covered by a 1- to 3-inch layer of partly weathered red clay.

Badland is productive only in a few areas where soil material has lodged. It is not suitable for cultivation, and the native vegetation is so sparse that it is not considered suitable for livestock.

Berda Series

The Berda series consists of deep, well-drained, loamy soils that are on foot slopes at the base of limestone hills. These soils formed in materials washed from areas of higher lying stony steep land and other soils.

In a typical profile (fig. 2) the surface layer is reddish-brown loam about 6 inches thick. The next layer is light reddish-brown clay loam about 25 inches thick. Below this and extending to a depth of about 60 inches is light reddish-brown clay loam.

Runoff is medium, permeability is moderate, and the available water capacity is high. Erosion is a hazard because of the slope and the position of these soils on the landscape.

Most areas of Berda soils are used for range.

Typical profile of Berda loam, 2 to 5 percent slopes, in a pasture 2.75 miles south of the intersection of Texas Highways 208 and 158 in Robert Lee, then 40 feet west of Texas Highway 208:

A1—0 to 6 inches, reddish-brown (5YR 5/4) loam, reddish brown (5YR 4/4) moist; weak, fine, subangular blocky structure; slightly hard, very friable; few fine roots; few siliceous pebbles 1/16 to ¼ inch in diameter; calcareous; moderately alkaline; clear, smooth boundary.

B21—6 to 31 inches, light reddish-brown (5YR 6/4) clay loam, reddish brown (5YR 4/4) moist; weak, fine, subangular blocky structure; hard, friable; few roots; few worm casts; many films and threads of calcium carbonate; few siliceous pebbles ⅛ to ¼ inch in diameter; calcareous; moderately alkaline; gradual, smooth boundary.

B22ca—31 to 60 inches, light reddish-brown (5YR 6/4) clay loam, reddish brown (5YR 4/4) moist; weak, fine, subangular blocky structure; hard, friable; few roots; many films and threads of calcium carbonate; few soft lumps of sandstone rubble; calcareous; moderately alkaline.

The A horizon is 6 to 14 inches thick. It ranges from grayish brown to reddish brown, and the structure ranges from weak, very fine, granular to weak, fine, subangular blocky.

The B horizon ranges from loam to clay loam and sandy clay loam. It has a clay content of 18 to 35 percent and ranges in color from brown to light reddish brown. Visible calcium carbonate occurs in forms ranging from films and threads to small hard concretions. The amount of calcium carbonate ranges from almost nothing to about 5 percent.

Berda loam, 2 to 5 percent slopes (BdC).—This soil is on foot slopes. The areas are generally long and narrow; typically they are 200 to 1,800 feet wide and 1,200 to 10,500 feet in length. Included in mapping are soils that have a sandy loam B horizon. Also included are small areas of Potter, Weymouth, and Spade soils.

This soil has the profile described as typical for the series.

Figure 2.—**Profile of Berda loam, 2 to 5 percent slopes.**

Surface runoff is medium, and permeability is moderate. The hazard of water erosion is severe.

This soil is used mainly for range. Runoff from higher slopes is a management concern where the soil is used for pasture or for crops. Overgrazed areas erode readily, and so do cultivated areas where the surface is left bare. Small grain and hay are better suited than other crops. Managing crop residue on the surface helps to control erosion and to keep the soil in good condition. Terracing and contour farming also help to control erosion. Capability unit IVe–2, dryfarmed; Sandy Loam range site.

Berda-Vernon-Potter association, undulating (BVB).—This association consists of deep and very shallow, loamy and clayey soils. The landscape is one of smooth hills separated by shallow valleys. Potter soils are on the crests of the hills; they have a slope range of 1 to 5 percent. Vernon soils are on the hillsides; their slope range is 3 to 12 percent. Berda soils occupy the foot slopes; their slope range is 1 to 6 percent (fig. 3).

Typically, a mapped area of the association is about 31 percent Berda soils, 19 percent Vernon soils, and 15 percent Potter soils. Included with these soils in mapping are areas of Kimbrough and Weymouth soils and soils that are similar to Vernon soils, but have a solum 4 to 10 inches thick. The composition of this mapping unit is more variable than that of most mapping units in the county.

The Berda, Vernon, and Potter soils in this association have profiles like those described as typical for the respective series.

These soils are used mostly as range. They support dense to sparse stands of short grasses and traces of mid grasses. A ground cover of only 20 to 50 percent is common on the Berda and Vernon soils. Capability unit VIe–1 dryfarmed; Berda soil in Sandy Loam range site, Vernon soil in Shallow Redland range site, Potter soil in Very Shallow range site.

Bronte Series

The Bronte series consists of deep, nearly level soils that occupy plains and wide valleys. These soils formed in reddish, loamy to clayey, old alluvium and valley-fill sediment.

In a typical profile the surface layer is reddish-brown fine sandy loam about 5 inches thick. The next layer is reddish-brown, friable sandy clay loam about 6 inches thick. The next layer is reddish-brown, firm clay about 13 inches thick, and the next lower layer is red, firm clay loam about 30 inches thick. The underlying material, to a depth of 85 inches, is red sandy clay loam.

Runoff is medium to slow, and the available water capacity is high.

Most areas of these soils are dryfarmed. Some areas are used as range.

Typical profile of Bronte fine sandy loam, 0 to 1 percent slopes, in a field 0.7 mile south of intersection of U.S. Highway 277 and Texas Highway 158 in Bronte, Texas, then, 650 feet east of U.S. Highway 277:

Ap—0 to 5 inches, reddish-brown (5YR 5/4) fine sandy loam, reddish brown (5YR 4/4) moist; weak, fine, subangular blocky and granular structure; hard, very friable; many roots; neutral; abrupt, smooth boundary.

B1t—5 to 11 inches, reddish-brown (5YR 4/4) sandy clay loam, dark reddish brown (5YR 3/4) moist; moderate, medium, prismatic structure and moderate, fine, subangular blocky structure; hard, friable; many roots; few pores and worm casts; few clay films; neutral; gradual, smooth boundary.

B21t—11 to 24 inches, reddish-brown (5YR 4/4) clay, dark reddish brown (5YR 3/4) moist; moderate, medium, prismatic structure parting to moderate, fine and medium, blocky structure; very hard, firm; few roots; few pores, worm casts, and tunnels; nearly continuous clay films on ped faces; neutral; gradual, smooth boundary.

B22t—24 to 48 inches, red (2.5YR 4/6) clay loam, dark red (2.5YR 3/6) moist; moderate, fine, blocky structure; very hard, firm; few roots; few pores, worm casts, and tunnels; patchy clay films; noncalcareous; mildly alkaline; gradual, wavy boundary.

B3—48 to 54 inches, red (2.5YR 5/6) clay loam, red (2.5YR 4/6) moist; moderate, fine, subangular blocky and blocky structure; very hard, firm; few, soft, fine calcium carbonate masses; calcareous; moderately alkaline; gradual, smooth boundary.

C1ca—54 to 72 inches, red (2.5YR 5/6) sandy clay loam, red (2.5YR 4/6) moist; structureless; hard, firm to friable; about 5 percent limestone and sandstone

Figure 3.—**Berda-Vernon-Potter association, undulating. Berda soils on foot slopes in foreground; Vernon and Potter soils on hills in background.**

pebbles coated with calcium carbonate; calcareous; moderately alkaline; gradual, wavy boundary.

C2ca—72 to 85 inches, red (2.5YR 5/6) sandy clay loam, red (2.5YR 4/6) moist; structureless; hard, firm; less than 2 percent calcium carbonate concretions and caliche-coated pebbles; calcareous; moderately alkaline.

The solum is about 40 to 60 inches thick. It is about 5 percent coarse fragments (rounded pebbles of sandstone or limestone). Secondary carbonates are at a depth of 30 to 48 inches. The reaction is neutral or mildly alkaline. The A horizon ranges from 4 to 10 inches in thickness and from reddish brown to brown or yellowish red. The B1t horizon ranges from 5 to 11 inches in thickness and from reddish brown to yellowish red. It is sandy clay loam or clay loam. The B2t horizon ranges from 25 to 50 inches in thickness, from reddish brown to red, and from clay loam to clay. Clay content is about 35 to 50 percent. The C horizon ranges from red to reddish brown and from sandy clay loam to clay loam. It is as much as 10 percent rounded limestone and sandstone pebbles.

Bronte fine sandy loam, 0 to 1 percent slopes (BrA).—This soil is on outwash plains and in wide valleys. The slope generally is more than 0.4 percent. Included in mapping are small areas of Olton, Cobb, and Miles soils, which make up about 5 percent of the unit. Also included are small areas of soils that are similar to the Bronte soils but have free carbonates at a depth of less than 24 inches.

This soil has the profile described as typical for the series.

This soil is easy to till. Surface drainage is medium to slow, and permeability is moderately slow. The hazard of water erosion is slight, and the hazard of soil blowing is moderate.

Most of the acreage is cultivated. Grain sorghum and small grain are the principal crops. Good management of crop residue helps to control erosion and soil blowing and to keep the soil in good tilth. Contour farming also helps to control erosion. Capability unit IIIe–4 dry-farmed, and I–3 irrigated; Sandy Loam range site.

Bronte fine sandy loam, 1 to 3 percent slopes (BrB).—This gently sloping soil is on outwash plains and in wide valleys. Included in mapping are small areas of Miles, Cobb, and Olton soils. Also included are soils that are similar to Bronte soils but have free carbonates to a depth of 24 inches. The inclusions make up less than 22 percent of this unit.

The surface layer is reddish-brown fine sandy loam about 7 inches thick. The next layer is reddish-brown sandy clay loam about 11 inches thick. Below this is about 30 inches of reddish-brown clay and about 10 inches of red clay loam. The underlying material, to a depth of 72 inches, is reddish-brown sandy clay loam.

The soil is easy to till. Surface runoff is medium, and permeability is moderately slow. Available water capacity is high. The hazards of soil blowing and water erosion are moderate.

Most of the acreage is cultivated. The major crops are grain sorghum, small grain, and cotton. Crops respond to good management. The proper use of crop residue on the soil surface helps to control soil blowing and erosion and to maintain good soil tilth. Terraces and contour farming also help to control erosion. Capability unit IIIe–4 dryfarmed, and IIe–7 irrigated; Sandy Loam range site.

Brownfield Series

The Brownfield series consists of deep soils on uplands. These soils are nearly level to gently undulating.

In a typical profile the surface layer is brown fine sand about 7 inches thick. The next layer is reddish-brown loamy fine sand about 17 inches thick. The subsoil is yellowish-red, firm sandy clay loam about 36 inches thick. Below this is a layer of yellowish-red, very friable fine sandy loam about 40 inches thick. The underlying material, to a depth of 161 inches, consists of sandy and loamy deposits.

Available water capacity is low. Runoff is very slow, and permeability is moderate. The hazard of soil blowing is severe. Almost all areas that were once cultivated are abandoned and are used for range.

Typical profile of Brownfield fine sand, 0 to 5 percent slopes, in a pasture 1.25 miles west of the intersection of Ranch Roads 2059 and 1672 in Silver, then 2.5 miles south on an old oilfield road, and 350 yards west:

A1—0 to 7 inches, brown (7.5YR 5/4) fine sand, dark brown (7.5YR 4/3) moist; single grain; loose, very friable; neutral; clear, smooth boundary.

A3—7 to 24 inches, reddish-brown (5YR 5/4) loamy fine sand, reddish brown (5YR 4/4) moist; single grain; soft, very friable; many fine tubes and pores; noncalcareous; neutral; gradual, smooth boundary.

B2t—24 to 60 inches, yellowish-red (5YR 4/6) sandy clay loam, yellowish red (5YR 3/6) moist; weak, fine, subangular blocky structure; hard, firm; sand grains coated and bridged with clay; neutral; gradual, smooth boundary.

B3—60 to 100 inches, yellowish-red (5YR 5/8) fine sandy loam, red (5YR 4/8) moist; weak, fine, subangular blocky structure; soft, very friable; neutral; gradual, smooth boundary.

C1—100 to 146 inches, reddish-yellow (5YR 6/6) loamy fine sand, yellowish red (5YR 5/6) moist; single grain; soft, very friable; neutral; gradual, smooth boundary.

IIC2—146 to 161 inches, light reddish-brown (5YR 6/4) fine sandy loam, reddish brown (5YR 5/4) moist; single grain; soft, friable; about 15 percent calcium carbonate lumps.

The A horizon ranges from 20 to 40 inches in thickness. The A1 horizon ranges from 4 to 8 inches in thickness and from yellowish brown to brown. The A3 horizon ranges from 10 to 35 inches in thickness and from reddish brown to brown. The B2t horizon ranges from 25 to 40 inches in thickness and from yellowish red to red. Clay content of this horizon is 18 to about 30 percent. The C horizon ranges from light sandy clay loam to fine sandy loam to loamy fine sand. Reaction is neutral or mildly alkaline throughout the profile.

Brownfield fine sand, 0 to 5 percent slopes (BsC).—This soil is near the Colorado River, but above the flood plain. Soil areas are generally large and irregularly shaped. They range in size from 100 to 500 acres. The slope is nearly level to gently undulating, and the surface is smooth. Included in mapping are small areas of Miles and Tivoli soils. Also included are soils that are similar to Brownfield soils; but some of these have lower layers of loamy fine sand or fine sandy loam, some have a surface layer less than 20 inches thick, and some have a surface layer more than 40 inches thick.

Most areas of this soil are used for range. Controlled grazing is needed to maintain a good grass cover and good tilth. Crop residue on the soil surface helps to control soil blowing. Capability unit VIe–7 dryfarmed, and IVe–7 irrigated; Deep Sand range site.

Clairemont Series

The Clairemont series consists of well-drained, silty alluvial soils that formed in alluvium on flood plains.

In a typical profile the surface layer is reddish-brown silt loam that extends to a depth of about 7 inches. The underlying material is reddish-brown silt loam that extends to a depth of about 60 inches. Bedding planes and thin strata of more clayey material are throughout the underlying material.

Permeability is moderate and available water capacity is high.

About half the acreage is range, and half is used for crops.

Typical profile of Clairemont silt loam, in a cultivated field 325 yards west of Ranch Road 2059; 4.7 miles by way of Ranch Road 2059 from intersection with Ranch Road 1672 in Silver:

Ap—0 to 7 inches, reddish-brown (5YR 5/3) silt loam, reddish brown (5YR 4/3) moist; weak, fine, subangular blocky structure; hard, friable; few fine roots; few to common worm casts; few films and threads of calcium carbonate; calcareous; moderately alkaline; clear, smooth boundary.

C1—7 to 40 inches, reddish-brown (5YR 5/4) silt loam, reddish brown (5YR 4/4) moist; massive; hard, firm; few bedding planes; few worm casts; common mica flakes; few films and threads of calcium carbonate; few thin strata of more clayey material; few masses of soft calcium carbonate; calcareous; moderately alkaline; diffuse, smooth boundary.

C2—40 to 60 inches, reddish-brown (2.5YR 5/4) silt loam, reddish brown (2.5YR 4/4) moist; massive; hard, friable; common bedding planes; few films and threads of calcium carbonate; calcareous; moderately alkaline.

The A horizon ranges from 6 to 12 inches in thickness and from reddish brown to light brown. The C horizon is 18 to 35 percent clay and is less than 15 percent sand coarser than very fine sand.

Clairemont silt loam (Ca).—This is a reddish-brown, loamy soil on the flood plains of major streams in the county. Slope is less than 1 percent. Included with this soil in mapping are small areas of Yahola and Colorado soils. Inclusions make up about 35 percent of the acreage mapped.

Most areas of Clairemont soils are flooded at least once every 5 years.

About half the acreage is used for range and half is used for crops. All crops commonly grown in the area are well suited to Clairemont soils. The major crops are cotton, grain sorghum, and wheat. Crop residue managed on the soil helps to maintain good tilth. Capability unit IIce–3 dryfarmed, and I–4 irrigated; Loamy Bottomland range site.

Cobb Series

The Cobb series consists of moderately deep, well-drained soils on uplands. These soils formed in noncalcareous and calcareous red and brown sandstone. They are nearly level to gently sloping.

In a typical profile the surface layer is reddish-brown fine sandy loam about 5 inches thick. The next layer is friable, reddish-brown sandy clay loam about 19 inches thick (fig. 4). The underlying material is about 5 inches of pink sandy clay loam. At a depth of about 29 inches is cemented, yellow sandstone.

The soils are moderately permeable, and available water capacity is low.

Most areas of these soils are cultivated. Some areas are in native range.

Typical profile of Cobb fine sandy loam, 1 to 3 percent slopes, in a cultivated field 8.0 miles north of the intersection of U.S. Highway 277 and Texas Highway 158 in Bronte, then 0.2 mile east on a county road and 200 feet north:

Ap—0 to 5 inches, reddish-brown (5YR 5/3) fine sandy loam, reddish brown (5YR 4/3) moist; weak, fine, granular and subangular blocky structure; slightly hard, very friable; few fine siliceous pebbles; neutral; clear, smooth boundary.

Bt—5 to 24 inches, reddish-brown (5YR 4/4) sandy clay loam, dark reddish brown (5YR 3/4) moist; weak, fine, subangular blocky structure; very hard, friable; many worm casts; common tubes and pores; few siliceous and sandstone pebbles 1/16 to 1/2 inch in diameter; sand grains coated and bridged with clay; neutral; clear, wavy boundary.

Cca—24 to 29 inches, pink (7.5YR 7/4) sandy clay loam, brown (7.5YR 5/4) moist; weak, subangular blocky structure; very hard, friable; few roots; many worm casts and pores; about 15 to 20 percent diffused calcium carbonate with only a few soft masses; calcareous; moderately alkaline; clear, wavy boundary.

R—29 to 46 inches, weakly cemented to strongly cemented yellow sandstone; few roots in upper part.

The A horizon ranges from 4 to 12 inches in thickness and from reddish brown to brown. It is fine sandy loam and loamy fine sand. The Bt horizon ranges from 14 to 36 inches in thickness and from reddish brown and red to yellowish red. Clay content of this horizon ranges from 20 to 30 percent. Siliceous pebbles 1/4 to 1/2 inch in diameter are few to common in most profiles. Depth to sandstone ranges from 20 to 48 inches, and color of the sandstone ranges from dark red to strong brown and yellow.

The Cobb soils of Coke County are outside the range of the series in that they have soft secondary carbonates within 28 inches of the surface. This difference does not alter the suitability and behavior of the soils.

Cobb loamy fine sand, 0 to 3 percent slopes (CbB).—This soil is on uplands. Slopes are convex to plane. They range from 0 to 5 percent, but are dominantly 0 to 3 percent. Included in mapping are small areas of Latom and Cosh soils. Also included are a few areas of soils that are similar to Cobb soils, but that have a sandy clay subsoil without free lime to a depth of 40 inches.

Figure 4.—**Profile of Cobb fine sandy loam, 1 to 3 percent slopes.**

The surface layer is brown loamy fine sand that extends to a depth of about 12 inches. The subsoil is reddish-brown sandy clay loam about 26 inches thick, and the underlying material is weakly cemented sandstone to a depth of about 60 inches.

The hazard of soil blowing is severe.

Most of the acreage is used for range. A few areas are cultivated. The main crops are cotton, grain sorghum, and wheat.

Crop residue should be left on the soil to control soil blowing and erosion. Capability unit IVe–6 dryfarmed, and IIIe–6 irrigated; Sandyland range site.

Cobb fine sandy loam, 1 to 3 percent slopes (CfB).—This soil is on uplands. Slopes are convex to plane. Included in mapping are small areas of soils that have no sandstone within a depth of 48 inches. Also included are small areas of Latom, Cosh, and Bronte soils.

This soil has the profile described as typical for the series.

The hazard of soil blowing is moderate, and there is a slight hazard of water erosion.

Most of the acreage is cultivated. A few areas are used as native range. The major crops are cotton, grain sorghum, and small grain. Crop residue needs to be managed on the soil to control soil blowing and erosion and to maintain good tilth. Capability unit IIIe–4 dryfarmed, and IIe–5 irrigated; Sandy Loam range site.

Cobb fine sandy loam, 2 to 5 percent slopes, eroded (CfC2).—This soil is on uplands. It commonly is in areas below steep hills and near prominent drainageways. Slopes range from 2 to 5 percent, but are dominantly 2 to 4 percent. Included in mapping are small areas of Cosh soils.

This Cobb soil has a surface layer of reddish-brown fine sandy loam about 4 inches thick and a subsoil of reddish-brown sandy clay loam about 24 inches thick. The underlying material is weakly cemented to strongly cemented sandstone that extends to a depth of about 60 inches.

The soil receives extra runoff water from nearby hills. Most of the topsoil has been removed by erosion. Gullies 5 to 20 feet wide and 3 to 12 feet in depth are common.

Most of the acreage was cultivated at one time, but is now used as range. Many areas once produced good stands of grass but have since been overgrazed.

Terracing, contour farming, and grassed waterways are needed to control erosion on cultivated areas. The management of grazing and use of crop residue on the soil help to control erosion and maintain good tilth. Capability unit IVe–4 dryfarmed, and IIIe–3 irrigated; Sandy Loam range site.

Cobb and Cosh soils, 3 to 5 percent slopes (ChC).—These soils are on convex knolls. Slopes range from 1 to 5 percent, but are dominantly 3 to 5 percent. Included in mapping are small areas of Latom soils, sandstone rock outcrops, and badlands.

The Cosh soils are on the convex areas and the Cobb soils are on the lower concave slopes. Typically, Cobb soils make up 45 percent of this mapping unit, Cosh soils 26 percent, and other soils about 29 percent.

The Cobb soils have a surface layer of reddish-brown fine sandy loam about 5 inches thick and a subsoil of reddish-brown sandy clay loam about 19 inches thick. The next layer is pink sandy clay loam about 5 inches thick. It rests on weakly cemented sandstone.

The Cosh soils have a surface layer of reddish-brown fine sandy loam about 5 inches thick. The next layer is yellowish-red sandy clay loam about 12 inches thick. It rests on weakly cemented sandstone.

All the acreage is range. It supports a wide variety of grasses and shrubs. Capability unit IVe–5 dryfarmed; Cobb soil is in Sandy Loam range site, Cosh soil is in Sandstone Hills range site.

Colorado Series

The Colorado series consists of deep, well-drained soils that formed in recently deposited alluvium. These soils are on flood plains of rivers and streams.

In a typical profile the surface layer is reddish-brown loam that extends to a depth of 14 inches. The underlying material is reddish-brown loam stratified with layers of loamy fine sand to silty clay loam 1 to 4 inches thick. This material extends to a depth of 60 inches. Bedding planes are common.

Permeability is moderate, and available water capacity is high.

Almost all the acreage is used for range.

Typical profile of Colorado loam, in a pasture 2.6 miles west of the intersection of Ranch Roads 2059 and 1672 in Silver, then 0.75 mile northwest on a private road and 100 feet south:

A1—0 to 14 inches, reddish-brown (5YR 5/4) loam, reddish brown (5YR 4/4) moist; weak, fine, granular structure; hard, friable; calcareous; moderately alkaline; gradual, smooth boundary.

C—14 to 60 inches, reddish-brown (5YR 5/4) loam, reddish brown (5YR 4/4) moist; structureless; stratified with layers of loamy fine sand to silty clay loam 1 to 4 inches thick; hard, friable; common bedding planes; calcareous; moderately alkaline.

The A horizon ranges from 5 to 14 inches in thickness, and it ranges from light reddish brown to brown in color. It is 18 to 35 percent clay. Stratification of the C horizon varies from a few strata to many thin strata.

Colorado loam (Cm).—This is a deep, nearly level soil on the flood plains. Included in mapping are small areas of Yahola soils. Also included are the streambeds and steeper banks of small streams.

Evidence of floodwater erosion and sedimentation is apparent in most areas. The lowest areas may be flooded yearly or at least in 1 out of 3 years. Higher areas are flooded in about 1 year out of 10.

Most of the acreage is used for range. The soil generally is unsuited to cultivation because of the hazard of flooding. Pastures can be established by clearing undesirable brush and seeding to adapted grasses. Capability unit Vw–1 dryfarmed; Loamy Bottomland range site.

Cosh Series

The Cosh series consists of shallow, well-drained, gently sloping, loamy soils that have convex to plane surfaces. These soils formed in noncalcareous to calcareous sandstone.

In a typical profile the surface layer is reddish-brown fine sandy loam about 5 inches thick, and the subsoil is a yellowish-red sandy clay loam about 12 inches thick. The underlying material is weakly cemented sandstone. It extends to a depth of about 23 inches.

Runoff is slow to rapid. Permeability is moderate, and available water capacity is low. Bare areas are subject to soil blowing during dry, windy periods.

Most of the acreage is used for range. These soils support a wide variety of grasses and shrubs. Cultivated crops best suited are small grain and forage sorghum.

Typical profile of Cosh fine sandy loam in an area of Cosh and Cobb soils, 1 to 3 percent slopes, 0.3 mile west of the intersection of U.S. Highway 277 and Texas Highway 158 in Bronte, 3.2 miles north on county road, 2.2 miles north on oilfield road, then 150 feet east:

A1—0 to 5 inches, reddish-brown (5YR 5/3) fine sandy loam, reddish brown (5YR 3.5/3) moist; weak, fine, subangular blocky structure; soft, very friable; neutral; clear, smooth boundary.

Bt—5 to 17 inches, yellowish-red (5YR 4.5/6) sandy clay loam, yellowish red (5YR 4/6) moist; weak, fine, subangular blocky structure; very hard, friable; sand grains coated and bridged with clay; ped surfaces slightly stained; few fine pores; few rounded fragments of sandstone ¼ to ½ inch in diameter; few

fine soft masses of calcium carbonate in lower part; mildly alkaline; abrupt, smooth boundary.

R—17 to 23 inches, yellowish-red (5YR 5/6) weakly cemented sandstone, yellowish red (5YR 4/6) moist; mildly alkaline.

The A horizon ranges from 4 to 10 inches in thickness and ranges from reddish brown through yellowish red to brown in color. The Bt horizon ranges from 6 to 14 inches in thickness and from reddish brown to yellowish red in color.

Depth to sandstone ranges from 12 to 20 inches. It may be strongly cemented sandstone of red and yellow or a combination of sandstone and silty red beds.

The Cosh soils of Coke County are outside the range of the series in that the color of the Bt horizon is in hue of 5YR.

Cosh and Cobb soils, 1 to 3 percent slopes (CnB).—These soils are on uplands. Cosh soils generally are in convex areas, and Cobb soils occupy concave slopes at lower elevations. In a typical area about 55 percent is Cosh soils, about 25 percent is Cobb soils, and other soils make up about 20 percent. Included in mapping are small areas of Latom soils and small areas of rock outcrop.

Cosh soils have the profile described as typical for the Cosh series. Cobb soils have a surface layer of reddish-brown fine sandy loam about 5 inches thick. The subsoil is reddish-brown sandy clay loam about 22 inches thick over cemented sandstone.

Most of the acreage is used for range. A few areas are cultivated. Good management is needed to control soil blowing and water erosion. Forage sorghum and small grain are the best suited cultivated crops. Crop residue on the soil helps to control soil blowing and erosion and maintain good tilth. Terracing and contour farming also help to control erosion. Capability unit IIIe–8 dryfarmed; Cosh soil is in Sandstone Hills range site, Cobb soil is in Sandy Loam range site.

Cosh and Latom soils, 1 to 10 percent slopes (CoD).—These are gently sloping to strongly sloping soils on convex knolls. Cosh soils generally have slopes of 1 to 5 percent, and Latom soils generally have slopes of 3 to 10 percent. Gently sloping areas of Cosh soils intermixed with knobs and narrow bands of Latom soils are characteristic of these areas. Cosh soils are dominant and are present in all areas mapped. In a typical area, about 40 percent is Cosh soils, about 35 percent is Latom soils, and other soils similar to Cosh soils make up about 25 percent. Included in mapping are soils that are similar to Cosh soils but are more clayey. Also included are small areas of Cobb soils and rock outcrop. Inclusions generally make up 25 to 35 percent of this mapping unit.

Cosh soils have a surface layer of reddish-brown fine sandy loam about 5 inches thick. They have a friable, yellowish-red sandy clay loam subsoil about 12 inches thick. The underlying material is yellowish-red, weakly cemented sandstone that extends to a depth of about 24 inches.

Latom soils have a surface layer of calcareous, brown fine sandy loam about 8 inches thick. The underlying material to a depth of about 20 inches is a cemented sandstone.

Because of rock outcrops, shallow depth, and low available water capacity, these soils are best suited to range, and they are used mostly for that purpose. They support a wide variety of vegetation. The soils are also suited to wildlife habitat. Capability unit VIIs–1 dryfarmed; Sandstone Hills range site.

Cottonwood Series

The Cottonwood series consists of well-drained, gently sloping, very shallow soils on uplands. These soils formed in thick beds of gypsum in areas dissected by small, shallow drainageways.

In a typical profile the surface layer is grayish-brown loam about 4 inches thick. The underlying material is white gypsum. It extends to a depth of about 28 inches.

Runoff is rapid, permeability is moderate, and the available water capacity is low.

Most of the acreage is used for range.

Typical profile of Cottonwood loam, 1 to 3 percent slopes, in a pasture 10 miles west of the intersection of Texas Highways 208 and 158 in Robert Lee, then 1 mile north on Ranch Road 2059, 2.75 miles east on county road, and 30 feet south:

A1—0 to 4 inches, grayish-brown (10YR 5/2) loam, dark grayish brown (10YR 4/2) moist; weak, fine, subangular blocky structure; soft, very friable; calcareous; moderately alkaline; abrupt, smooth boundary.

C—4 to 28 inches, white (10YR 8/2) chalky gypsum.

The solum ranges from 4 to 8 inches in thickness and from grayish brown to brown in color. The C horizon ranges from soft beds of caliche that are up to 50 percent gypsum to those that are hard, almost pure gypsum.

Cottonwood loam, 1 to 3 percent slopes (CtB).—This gently sloping soil is on uplands that are dissected by small, shallow drainageways. Included in mapping are small areas of Kimbrough and Weymouth soils and small areas of gypsum beds that have little or no soil. Also included are areas of soils similar to Cottonwood soils, but the surface layer is more than 10 inches thick.

Almost all of this soil is used as range. Vegetation is sparse. Careful management of grazing is needed to maintain adequate vegetative cover to control soil blowing and erosion. Capability unit VIIs–1 dryfarmed; Gyp range site.

Frio Series

The Frio series consists of deep, well-drained, nearly level, loamy, calcareous soils on flood plains. These soils formed in alluvium.

In a typical profile the surface layer is very dark grayish-brown silty clay loam about 15 inches thick. The next layer is friable, dark grayish-brown clay about 21 inches thick. The underlying material is brown clay loam to a depth of about 60 inches.

Runoff is slow, permeability is moderately slow, and available water capacity is high.

Most of the acreage is in native range. The vegetation is good stands of grasses and a few trees.

Typical profile of Frio silty clay loam in a pasture 1.7 miles northwest of Tom Green County line on U.S. Highway 87, then 4 miles north on county road and 300 yards west:

A11—0 to 15 inches, very dark grayish-brown (10YR 3/2) silty clay loam, very dark grayish brown moist; weak, subangular blocky and granular structure; very hard, friable; common fine roots; common, very fine and fine fragments of limestone on surface; calcareous; moderately alkaline; clear, smooth boundary.

A12—15 to 36 inches, dark grayish-brown (10YR 4/2) clay, very dark grayish brown (10YR 3/2) moist; moderate, fine, subangular blocky structure; hard, friable; few roots; few films and threads of calcium carbonate; calcareous; moderately alkaline; gradual, smooth boundary.

C—36 to 60 inches, brown (10YR 5/3) clay loam, dark brown (10YR 4/3) moist; structureless; hard, firm; a few thin strata of water-rounded limestone pebbles and fragments 1 millimeter to 1 inch in diameter; calcareous; moderately alkaline.

The A horizon ranges from brown to very dark grayish brown. The C horizon ranges from 27 to 50 inches in thickness. The solum ranges from 0 to 5 percent chert and rounded pebbles and cobblestones of limestone, by volume. Weak stratification is common at depths between 35 and 50 inches. Some strata are as much as 25 percent rounded pebbles and cobblestones.

Frio silty clay loam (Fr).—This soil is on flood plains adjacent to streams. Slopes rarely exceed 1 percent. The areas are much longer than they are wide and range in size from about 15 to more than 600 acres. Flooding occurs on this soil from once in 4 to once in 10 years. Included in mapping are small areas of less clayey alluvial soils and small areas of Nuvalde and Mereta soils. Some Frio soils that have slopes of up to 2 percent are also included.

Most of the acreage is in native range. A few areas are cultivated. These soils are well suited to all crops commonly grown in the county. Crop residues managed on the surface help to maintain good tilth. Capability unit IIIc–1 dryfarmed, and I–1 irrigated; Bottomland range site.

Kimbrough Series

The Kimbrough series consists of well-drained, loamy soils that are shallow to very shallow over indurated caliche. These gently sloping to strongly sloping soils are on upland plains.

In a typical profile the surface layer is dark-brown loam about 8 inches thick. The underlying material is indurated, fractured caliche. It extends to a depth of about 28 inches.

Runoff is slow to medium. Permeability is moderate, and the available water capacity is low. All of the acreage of Kimbrough soils is used for range or for wildlife habitat.

Typical profile of Kimbrough loam in an area of Kimbrough soils, undulating, in a pasture 2.75 miles east of intersection of Texas Highways 158 and 208 in Robert Lee, then 0.2 mile north and 70 feet west:

A1—0 to 8 inches, dark-brown (10YR 4/3) loam, dark brown (10YR 3/3) moist; weak, fine, granular and subangular blocky structure; slightly hard, friable; many fine roots; few worm casts, few tubes and pores; few fragments of caliche 1/16 inch to 3/4 inch in diameter; lower 3 inches is about 30 percent fragments of caliche 1 to 2 inches thick and 2 to 6 inches in diameter; mildly alkaline; abrupt, smooth boundary.

Ccam—8 to 28 inches, indurated caliche containing few fractures, pink (7.5YR 8/4) moist; upper 8 inches somewhat platy and has less than 1 percent soil between plates.

The A horizon is 4 to 14 inches thick, and it ranges from brown to very dark grayish brown and dark brown. Texture is loam, clay loam, and gravelly loam; and the clay content ranges from 18 to 30 percent. The Ccam horizon ranges from fractured, indurated, and thinly laminar caliche to continuously indurated caliche several to many feet thick. It is pinkish white to pink.

Kimbrough soils, undulating (KMB).—These soils are shallow or very shallow over indurated caliche. Texture is loam, clay loam, and gravelly loam. Slopes range from 1 to 12 percent but are dominantly 1 to 5 percent. Included in mapping are small areas of Mereta and Potter soils. Also included are areas of a soil similar to Kimbrough soils, but the surface layer is pale brown or grayish brown. All inclusions make up 10 to 30 percent of the total acreage.

These soils are used for range and wildlife habitat. In some areas the thick deposits of caliche are quarried and used locally for roadbed materials. Capability unit VIIs–1 dryfarmed; Very Shallow range site.

Latom Series

The Latom series consists of moderately well drained, shallow to very shallow, calcareous fine sandy loams. These soils formed in sandstone or conglomerate.

In a typical profile the surface layer is brown fine sandy loam about 8 inches thick. It is underlain by cemented calcareous sandstone to a depth of about 14 inches.

Runoff is slow, permeability is slow, and available water capacity is low.

Most areas of Latom soils in Coke County are used for range.

In Coke County, Latom soils are mapped only with Cosh soils. The mapping unit is described under the heading "Cosh Series."

Typical profile of Latom fine sandy loam in an area of Cosh and Latom soils, 1 to 10 percent slopes, 200 feet west of site 5 of the Kickapoo Flood Prevention Project; or 0.3 mile west of the intersection of Texas Highway 158 and U.S. Highway 277 in Bronte, then 3.2 miles north on county road, 1 mile north on private road, and 100 feet east:

A1—0 to 8 inches, brown (7.5YR 5/4) fine sandy loam, dark brown (7.5YR 4/4) moist; weak, fine, subangular blocky structure; soft, very friable; a few sandstone fragments and quartz pebbles are on the surface; calcareous; moderately alkaline; abrupt, smooth boundary.

R—8 to 14 inches, light-brown (7.5YR 6/4) cemented sandstone; difficult to break with spade; calcareous; moderately alkaline.

The A1 horizon ranges from 4 to 20 inches in thickness, and ranges from reddish brown to brown. It is from 5 to 10 percent rounded or irregularly shaped fragments of sandstone and conglomerate. The R layer is sandstone, caliche coated sandstone, and conglomerates, either singly or in any combination. Gravel, stones, and cobblestones cover 1 to 50 percent of the surface.

Lipan Series

The Lipan series consists of deep, nearly level, moderately well drained, clayey soils. These soils are in slight depressions or intermittent shallow lakes. They are under water for a few days to several weeks in most years.

In a typical profile the surface layer is gray clay about 30 inches thick. The next layer is grayish-brown clay

about 35 inches thick, and the underlying material is pale-brown clay to a depth of about 70 inches.

Runoff is slow, permeability is very slow, and available water capacity is high.

The acreage is mainly used for range. In a few areas where runoff is controlled, the soils are cultivated.

Typical profile of Lipan clay, in a pasture about 15 miles southwest of Robert Lee on Ranch Road 2034, then 3.3 miles west and north on county road, and 500 yards east:

A11—0 to 8 inches, gray (10YR 5/1) clay, dark gray (10YR 4/1) moist; weak, fine, subangular blocky and granular structure; hard, firm, sticky; few fragments of limestone ½ inch to 4 inches in diameter; many roots; calcareous; moderately alkaline; abrupt, smooth boundary.

A12—8 to 30 inches, gray (10YR 5/1) clay, dark gray (10YR 4/1) moist; weak to moderate, fine, blocky and angular blocky structure; very hard, very firm, very sticky; wedge-shaped peds have shiny surfaces; few fragments of limestone ¼ inch to 2 inches in diameter; calcareous; moderately alkaline; gradual, smooth boundary.

AC—30 to 65 inches, grayish-brown (10YR 5/2) clay, dark grayish brown (10YR 4/2) moist; moderate, fine and medium, blocky structure; very hard, very firm; wedge-shaped peds have shiny surfaces throughout; slickensides intersect and are 3 or more inches across; wedge-shaped aggregates have long axes tilted 10 to 45 degrees from horizontal; few, soft, white masses of calcium carbonate in the lower 4 inches; calcareous; moderately alkaline; gradual, smooth boundary.

Cca—65 to 70 inches, pale-brown (10YR 6/3) clay, brown (10YR 5/3) moist; massive; very hard, very firm; about 5 percent soft lumps of calcium carbonate; calcareous; moderately alkaline.

The A horizon ranges from 13 to 31 inches in thickness, and color is gray or dark gray. The AC horizon is clay 18 to 40 inches thick. Texture ranges from clay to silty clay, and color ranges from light brownish gray to grayish brown. The depth to calcium carbonate accumulation ranges from 48 to 66 inches. The content of calcium carbonate ranges from a few films and threads and soft masses to 40 percent.

Lipan clay (Lc).—This is a nearly level soil that is in smooth, slightly depressional areas. Slopes are dominantly less than 0.5 percent. Typically, the areas are round or oval shaped and range from 4 to 30 acres in size. Areas that have never been plowed have gilgai microrelief that consists of knolls 5 to 8 feet in diameter and 3 to 8 inches higher than surrounding depressions. Included in mapping are areas of soils similar to Lipan soil, but the surface layer is darker.

Most areas of this Lipan soil are in range. Crops are grown in a few acres where runoff is controlled. Crop residue on the surface helps to control erosion and maintain good tilth. Capability unit IIIw–1 dryfarmed, and IIs–1 irrigated; Lakebed range site.

Mereta Series

The Mereta series consists of well-drained, nearly level to gently sloping, calcareous soils that are shallow over caliche. These soils formed on outwash plains that have a convex surface.

In a typical profile the surface layer is about 16 inches thick. It is dark-brown clay loam in the upper part and dark-brown clay in the lower part. The underlying material is caliche to a depth of about 36 inches. It is strongly cemented in the upper 12 inches.

Available water capacity is low, runoff is slow, and permeability is moderately slow.

Most areas of these soils are used for range. A few areas are cultivated.

Typical profile of Mereta clay loam, 0 to 1 percent slopes, in a pasture about 15 miles southwest of Robert Lee on Ranch Road 2034, then 2.75 miles west on county road, and 100 feet north:

A11—0 to 8 inches, dark-brown (10YR 4/3) clay loam, dark brown (10YR 3/3) moist; moderate, fine and very fine, subangular blocky and granular structure; hard, friable; many fine roots; few fragments of caliche, ⅛ to ¼ inch in diameter, on the surface and throughout the horizon; calcareous; moderately alkaline; clear, smooth boundary.

A12—8 to 16 inches, dark-brown (7.5YR 4/3) clay, dark brown (7.5YR 3/3) moist; weak to moderate, fine, subangular blocky and granular structure; hard, firm; few roots; few earthworm casts and burrows, few tubes and pores; few films and threads of calcium carbonate; concretions of calcium carbonate, 2 to 10 millimeters in diameter, are common in lower 2 inches; calcareous; moderately alkaline; abrupt, irregular boundary.

C1cam—16 to 28 inches, pink (7.5YR 8/4) strongly cemented caliche that is platy and cracked, pink (7.5YR 7/4) moist; about 1 percent fine soil between plates and in cracks; few fine roots in cracks; clear, smooth boundary.

C2ca—28 to 36 inches, reddish-yellow (5YR 7/6) limy clay loam, reddish yellow (5YR 6/6) moist; structureless; hard; about 50 percent calcium carbonate in cemented concretions, soft masses, and fine particles.

The A11 or Ap horizon ranges from 4 to 10 inches in thickness. It is dark grayish brown, dark brown, or brown, and ranges from weak to moderate subangular blocky to granular in structure. The A12 horizon ranges from 6 to 16 inches in thickness, from dark grayish brown to dark brown, and from clay loam to clay. Structure ranges from weak to moderate subangular blocky or granular to weak blocky. Depth to the strongly cemented caliche ranges from 14 to 20 inches. The thickness of this layer ranges from 4 to 15 inches.

Mereta clay loam, 0 to 1 percent slopes (McA).—This soil is on plains dissected by small shallow drainageways. Slopes are dominantly less than 0.6 percent. Included in mapping are small areas of Kimbrough, Nuvalde, and Weymouth soils, which make up about 15 percent of the acreage of this mapping unit.

This soil has the profile described as typical for the series.

Most of the acreage is used for range. Some areas are cultivated. Small grain is better suited than other crops because it grows mostly in spring, when rainfall is highest. Land leveling, terracing, and depth of plowing are limited by soil depth. Crop residue on the soil helps to control erosion and maintain tilth. Capability unit IIIe–6 dryfarmed, and IIIs–2 irrigated; Shallow range site.

Mereta clay loam, 1 to 3 percent slopes (McB).—This shallow, well-drained soil is on plains that are dissected by small shallow drainageways. Slopes are dominantly about 2 percent. Areas are irregular in shape and mostly less than 300 acres in size. Included in mapping are small areas of Nuvalde, Kimbrough, and Weymouth soils, and small areas of a soil that is similar to the Mereta soil, but is 20 to 24 inches deep over cemented caliche.

The surface layer is dark grayish-brown clay loam about 5 inches thick. The next layer is dark grayish-

brown clay loam about 12 inches thick. Depth to the cemented zone of calcium carbonate is about 17 inches. Few roots penetrate this layer.

This soil is used mainly for range. A few areas are used for crops. Small grain and forage sorghum used as hay or for supplemental grazing are better suited than other crops. Crop residue on the soil, terraces, and contour farming help to control erosion and maintain tilth. Capability unit IIIe–7 dryfarmed, and IIIe–7 irrigated; Shallow range site.

Mereta-Nuvalde complex, 0 to 1 percent slopes (MeA).—This complex is about 60 percent Mereta soils, 30 percent Nuvalde soils, and about 10 percent Lipan soils and soils that are similar to the Mereta soil but are 20 to 24 inches deep over a zone of cemented caliche. Areas are irregular in shape and range from 30 to 300 acres in size. Slopes are dominantly more than 0.5 percent.

The Mereta soil has a surface layer of dark-brown clay loam about 5 inches thick. The next layer is dark grayish-brown clay about 12 inches thick. Depth to a cemented zone of calcium carbonate is about 17 inches.

The Nuvalde soil is in small irregularly shaped areas surrounded by Mereta soils at the same elevation. It has a surface layer of dark grayish-brown silty clay loam about 18 inches thick. The next layer is reddish-brown clay loam about 16 inches thick. The underlying material, to a depth of 60 inches, is pink silty clay loam that is 15 to 50 percent calcium carbonate.

Most of this complex is used for range. A few areas are used for crops. The main crop is small grain planted for supplemental grazing. Cotton and grain sorghum are grown on a small acreage. Crop residue left on the soil helps to control erosion and maintain tilth. Capability unit IIIe–6 dryfarmed, and IIIs–2 irrigated; Mereta soil is in Shallow range site, Nuvalde soil is in Clay Loam range site.

Mereta-Nuvalde complex, 1 to 3 percent slopes (MeB).—This complex is about 70 percent Mereta soils, 20 percent Nuvalde soils, and about 10 percent Kimbrough and Tarrant soils. Included in mapping are small areas of soils that are similar to Nuvalde soils, but they are more clayey and crack when dry. Slopes are mostly 1.5 to 3 percent. Areas are irregular in shape and range from 25 to 250 acres in size.

The Mereta soil has a surface layer of dark-brown clay loam about 5 inches thick. The next layer is dark grayish-brown clay about 12 inches thick. The underlying material consists of thick beds of caliche that is strongly cemented in the upper part. It extends to a depth of about 60 inches.

The Nuvalde soil is in small irregularly shaped areas that are surrounded by and intermingled with Mereta soils. It has a surface layer of dark grayish-brown silty clay loam about 18 inches thick. The next layer is a reddish-brown clay loam about 16 inches thick. The underlying material, to a depth of about 60 inches, is pink silty clay loam that is 15 to 50 percent calcium carbonate.

Most of this complex is used for range, but a few small areas are used for crops. At one time about 20 percent of the acreage was cultivated. The areas now cultivated are used mainly for small grain and sorghum. Crop residue on the soil helps to control erosion and maintain good tilth. Terraces and contour farming also help to control erosion. Capability unit IIIe–7 dryfarmed, and IIIe–7 irrigated; Mereta soil is in Shallow range site, Nuvalde soil is in Clay Loam range site.

Miles Series

The Miles series consists of deep, well-drained, noncalcareous, loamy and sandy soils. They formed on outwash plains or on old, high terraces along major streams. Slopes range from less than 1 percent to about 5 percent.

In a typical profile the surface layer is reddish-brown fine sandy loam about 13 inches thick. The next lower layer is sandy clay loam. It is red in the upper 41 inches, light red in the next 12 inches, and yellowish red in the lower 28 inches. The underlying material is calcareous sandy clay loam. It extends to a depth of about 156 inches.

Permeability is moderate, available water capacity is high, and runoff is slow to moderate.

Most areas of these soils are cultivated.

Typical profile of Miles fine sandy loam, 0 to 1 percent slopes, in a cultivated field 4.5 miles southwest of the intersection of Ranch Roads 2059 and 1672 in Silver, then 0.25 mile east:

Ap—0 to 9 inches, reddish-brown (5YR 5/4) fine sandy loam, reddish brown (5YR 4/4) moist; weak, fine, subangular blocky structure; soft, very friable; neutral; abrupt, smooth boundary.

A12—9 to 13 inches, reddish-brown (5YR 4/4) fine sandy loam, dark reddish brown (5YR 3/4) moist; weak, fine, subangular blocky structure; slightly hard, very friable; few fine tubes, pores, and worm casts; neutral; clear, smooth boundary.

B21t—13 to 34 inches, red (2.5YR 5/6) sandy clay loam, red (2.5YR 4/6) moist; weak, fine, subangular blocky and coarse, prismatic structure; hard, friable; few fine tubes, pores, and worm casts; sand grains coated and bridged with clay, few thin clay films on ped surfaces; neutral; gradual, smooth boundary.

B22t—34 to 54 inches, red (2.5YR 5/8) sandy clay loam, red (2.5YR 4/8) moist; weak to moderate, fine, subangular blocky structure; hard, friable; sand grains coated and bridged with clay; few faint clay films; neutral; gradual, smooth boundary.

B3t—54 to 66 inches, light-red (2.5YR 6/8) sandy clay loam, red (2.5YR 5/8) moist; weak, fine, subangular blocky structure; hard, friable; sand grains coated and bridged with clay; neutral; gradual, smooth boundary.

B3ca—66 to 94 inches, yellowish-red (5YR 5/8) sandy clay loam, yellowish red (5YR 4/8) moist; weak, subangular blocky structure; hard, friable; peds have bridgings and coatings of clay under carbonate coats; 20 percent soft and hard masses of calcium carbonate; calcareous; moderately alkaline; diffuse, wavy boundary.

C—94 to 156 inches, yellowish-red (5YR 5/8) sandy clay loam; 5 to 15 percent calcium carbonate.

The A horizon ranges from loamy fine sand to fine sandy loam in texture and from about 5 to 20 inches in thickness. Color ranges from reddish brown or brown to light reddish brown. The Bt horizon ranges from fine sandy loam to sandy clay loam and ranges from 42 to 69 inches in thickness. Colors range from red, light red, and yellowish red to reddish brown. The B3ca horizon ranges from reddish yellow through yellowish red in color and from 6 to 28 inches in thickness. It is 5 to 30 percent calcium carbonate. The C horizon ranges in texture from loamy fine sand to sandy clay loam, and it is 5 to 25 percent calcium carbonate.

Miles loamy fine sand, 0 to 3 percent slopes (MlB).—This soil is on terraces along streams. Included in mapping are small areas of Brownfield soils and a few small eroded areas.

This soil has a surface layer of brown loamy fine sand about 18 inches thick. The next lower layer is reddish-brown sandy clay loam about 48 inches thick, and the underlying material is yellowish-red loamy fine sand to a depth of about 80 inches.

The hazard of soil blowing is severe, and in some areas soil blowing has formed low dunes along fence rows and around vegetation.

Most of the acreage is used for range, but about 40 percent is cultivated. The soil is better suited to sorghums than to other uses.

Fertilized crop residue on the soil helps to maintain good tilth and control soil blowing. Capability unit IVe–6 dryfarmed, and IIIe–6 irrigated; Sandyland range site.

Miles fine sandy loam, 0 to 1 percent slopes (MmA).—This soil is on terraces along streams and rivers. Surfaces are plane, and slopes average about 0.5 percent. Included in mapping are small areas of Bronte, Olton, and Weymouth soils. Also included are small areas of soils that are similar to Miles soil, but calcareous throughout the profile.

This soil has the profile described as typical for the series.

The hazard of soil blowing is moderate.

Fertilized crop residue on the soil helps to control soil blowing and maintain good tilth. This soil is easily tilled and is suited to cotton, grain sorghum, and other crops. Most areas are cultivated. Capability unit IIIe–4 dryfarmed, and IIe–4 irrigated; Sandy Loam range site.

Miles fine sandy loam, 1 to 3 percent slopes (MmB).—This soil is on broad terraces near streams. Surfaces are convex and smooth, and slopes are dominantly 1 to 2 percent. Included in mapping are small areas of Olton and Weymouth soils. Also included are soils similar to Miles soil, but they are calcareous throughout the profile.

The surface layer is reddish-brown fine sandy loam about 14 inches thick. The next layer is red sandy clay loam about 56 inches thick, and the underlying material is yellowish-red, limy sandy clay loam to a depth of about 80 inches.

The hazard of soil blowing is moderate. Fertilized crop residue on the soil helps to control soil blowing and maintain good tilth. Terraces and contour farming are needed in places to control water erosion.

This soil is easily tilled, and most of the acreage is cultivated. Cotton, grain sorghum, and small grain are the main crops. Capability unit IIIe–4 dryfarmed, and IIe–5 irrigated; Sandy Loam range site.

Miles fine sandy loam, 3 to 5 percent slopes (MmC).—This soil is on broad terraces near rivers and streams. It has convex, smooth surfaces, and slopes are dominantly 3 to 4 percent. Included in mapping are small areas of Berda and Weymouth soils and soils that are similar to Miles soil, but that are calcareous throughout the profile.

The surface layer of this soil is reddish-brown fine sandy loam about 10 inches thick. The next layer is reddish-brown sandy clay loam about 50 inches thick, and the underlying material is yellowish-red sandy clay loam to a depth of about 80 inches. The underlying material is 10 to 40 percent calcium carbonate.

This soil is moderately susceptible to soil blowing and water erosion. About 50 percent of the acreage is cultivated, and the rest is used for range. Principal crops are small grain and forage sorghum. Crop residue managed on the soil is needed to control soil blowing and erosion. Terraces and contour farming are also needed to control erosion. Capability unit IVe–4 dryfarmed, and IIIe–3 irrigated; Sandy Loam range site.

Nuvalde Series

The Nuvalde series consists of moderately deep, well-drained, nearly level to gently sloping, loamy soils on plains.

In a typical profile the surface layer is about 18 inches thick. It is dark grayish-brown silty clay loam in the upper 10 inches and dark-brown clay loam in the lower 8 inches. The next layer is reddish-brown clay loam about 16 inches thick, and the next lower layer, about 14 inches thick, is pink silty clay loam. The underlying material is light reddish-brown clay loam to a depth of about 60 inches.

Permeability is moderate, runoff is slow, and available water capacity is high.

Most of the acreage is range. A few areas are used for crops. These soils are well suited to cotton, grain sorghum, and small grain.

Typical profile of Nuvalde silty clay loam, 0 to 1 percent slopes, in a pasture about 12 miles west of Robert Lee, 0.2 mile north and 60 feet east of the intersection of Ranch Road 2059 and Texas Highway 158:

A11—0 to 10 inches, dark grayish-brown (10YR 4/2) silty clay loam, very dark grayish brown (10YR 3/2) moist; moderate, fine, granular and subangular blocky structure; hard, friable; calcareous; moderately alkaline; clear, smooth boundary.

A12—10 to 18 inches, dark-brown (7.5YR 4/2) clay loam, dark brown (7.5YR 3/2) moist; moderate, fine, subangular blocky structure; hard, firm; few worm casts, tubes, and pores; common films and threads of calcium carbonate; calcareous; moderately alkaline; clear, smooth boundary.

B—18 to 34 inches, reddish-brown (5YR 5/3) clay loam, reddish brown (5YR 4/5) moist; moderate, fine, subangular blocky structure; hard, firm: few insect burrows and root channels; common films and threads of calcium carbonate; few soft masses of calcium carbonate in lower 6 inches; calcareous; moderately alkaline; gradual, wavy boundary.

C1ca—34 to 48 inches, pink (5YR 8/3) silty clay loam, light reddish brown (5YR 6/4) moist; massive; slightly hard, friable; about 50 percent pinkish-white, soft and hard lumps of calcium carbonate; calcareous; moderately alkaline; gradual, wavy boundary.

C2—48 to 60 inches, light reddish-brown (5YR 6/4) clay loam, light reddish brown (5.5/4) moist; massive; slightly hard, friable; 20 percent soft and hard lumps of calcium carbonate; calcareous; moderately alkaline.

The A horizon ranges from 8 to 20 inches in thickness and from dark grayish brown and dark brown to brown. The B horizon ranges from 14 to 28 inches in thickness and from brown to reddish brown. It ranges from clay loam to silty clay in texture and is 35 to 45 percent clay. The C1ca horizon ranges from 6 to 30 inches in thickness and is 15 to 50 percent calcium carbonate. Depth to this Cca horizon ranges from 22 to 40 inches.

Nuvalde silty clay loam, 0 to 1 percent slopes (NuA).—This soil has the profile described as typical for the series. Included in mapping are small areas of Mereta, Weymouth, and Olton soils. Also included are small areas of soils that are similar to Nuvalde soils, but they are less than 35 percent clay.

The acreage is mainly used for range, but about 20 percent is cultivated. Small grain, cotton, and grain sorghum are the main crops. This soil is easily worked and responds to good management. Crop residue on the soil helps to control erosion and maintain good tilth. Capability unit IIIc–1 dryfarmed, and I–1 irrigated; Clay Loam range site.

Nuvalde silty clay loam, 1 to 3 percent slopes (NuB).—This soil is on plains. Slopes are dominantly 1 to 2 percent. Included in mapping are small areas of Weymouth, Mereta, and Kimbrough soils.

This Nuvalde soil has a surface layer of dark-brown silty clay loam about 10 inches thick. The next layer is brown clay loam about 28 inches thick. The underlying material is pink silty clay loam to a depth of about 60 inches.

Most of the acreage is used for range, but about 10 percent is in crops. The principal crops are sorghums and small grain. The hazard of water erosion is slight.

Crop residue on the soil helps to control erosion and maintain good tilth. Terraces and contour farming also help to control erosion. Capability unit IIIe–1 dryfarmed, and IIe–1 irrigated; Clay Loam range site.

Olton Soils

The Olton series consists of deep, well-drained, nearly level to gently sloping, loamy soils on uplands and old terraces. These soils formed in loamy outwash materials under a grass cover.

In a typical profile the surface layer is dark-brown clay loam about 8 inches thick. The next layer is about 57 inches thick. The upper 7 inches is dark reddish-gray firm clay loam; the next 20 inches is reddish-brown very firm clay loam; the next 20 inches is pink friable clay loam; and the lower 10 inches is light reddish-brown friable clay loam.

Permeability is moderately slow, runoff is slow to very slow, and available water capacity is high. The hazard of soil blowing is slight and the hazard of water erosion is slight to moderate.

Most of the acreage is used for range, and about 35 percent is cultivated.

Typical profile of Olton clay loam, 1 to 3 percent slopes, about 6.5 miles south of Bronte on U.S. Highway 277, 1.2 miles west on Ranch Road 2662, then 90 yards north:

A1—0 to 8 inches, dark-brown (7.5YR 4/2) clay loam, dark brown (7.5YR 3/2) moist; moderate, very fine and medium, subangular blocky structure; hard, firm; many roots, few worm casts, few pores; mildly alkaline; gradual, smooth boundary.

B21t—8 to 15 inches, dark reddish-gray (5YR 4/2) clay loam, dark reddish brown (5YR 3/2) moist; moderate, medium and very fine, subangular blocky structure; very hard, firm; few faint clay films on peds; many roots, few pores, few worm casts; mildly alkaline; gradual, smooth boundary.

B22t—15 to 24 inches, reddish-brown (5YR 4/3) clay loam, reddish brown (5YR 4/3) moist; moderate, fine and medium, blocky structure; very hard, very firm; peds are smooth and shiny and slightly redder when crushed; few distinct clay films, few worm casts and pores; few films of calcium carbonate; calcareous; moderately alkaline; gradual, smooth boundary.

B23t—24 to 35 inches, reddish-brown (5YR 4/4) clay loam, reddish brown (5YR 4/4) moist; weak to moderate, fine and medium, blocky structure; very hard, very firm; few thin clay films; lower 3 inches is 2 to 5 percent calcium carbonate; calcareous; moderately alkaline; clear, wavy boundary.

B24tca—35 to 55 inches, pink (5YR 7/4) clay loam, reddish brown (5YR 5/4) moist; weak, medium, subangular blocky structure; hard, friable; about 30 percent soft calcium carbonate, and about 5 percent calcium carbonate concretions; calcareous; moderately alkaline; diffuse, wavy boundary.

B25tca—55 to 65 inches, light reddish-brown (5YR 6/5) clay loam, reddish brown (5YR 5/5) moist; weak, medium, subangular blocky structure; hard, friable; a few small calcium carbonate concretions; a total of about 10 percent carbonates.

The A horizon ranges from brown to dark brown to reddish brown in color and from 4 to 12 inches in thickness. The Bt horizon is dark reddish gray, reddish brown, pink, or light reddish brown. Depth to the Btca horizon ranges from 28 to 48 inches. The Btca horizon is pink or light reddish brown and is 15 to 60 percent calcium carbonate.

Olton clay loam, 0 to 1 percent slopes (OcA).—This soil is on broad uplands and old terraces. Slopes are dominantly more than 0.4 percent. Included in mapping are small areas of Miles, Bronte, and Nuvalde soils, which make up about 25 percent of the acreage of this unit.

The surface layer is reddish-brown clay loam about 6 inches thick. The next layer is about 56 inches thick. The upper 7 inches is reddish-brown clay loam, the next 20 inches is reddish-brown clay loam, the next 19 inches is pink clay loam, and the lower 10 inches is light reddish-brown clay loam.

The hazard of soil blowing is slight, and the hazard of water erosion is slight to moderate. Slight surface crusting occurs after rain of high intensity. Crop residue on the soil helps to control soil blowing, water erosion, and surface crusting. Contour farming also helps to control water erosion. Capability unit IIce–4 dryfarmed, and I–1 irrigated; Clay Loam range site.

Olton clay loam, 1 to 3 percent slopes (OcB).—This soil is on broad uplands and old terraces. Included in mapping are small areas of Miles, Bronte, and Nuvalde soils that make up about 25 percent of the total acreage of the unit.

This soil has the profile described as typical for the series.

The hazard of water erosion is moderate, and the hazard of soil blowing is slight.

Most of the acreage is used for range. About 30 percent is used for crops. The main crops are grain sorghum, small grain, and cotton. Crop residue on the soil helps to control erosion and soil blowing and maintain good tilth. Terraces and contour farming also help to control water erosion. Capability unit IIIe–2 dryfarmed, and IIe–2 irrigated; Clay Loam range site.

Potter Series

The Potter series consists of shallow to very shallow, well-drained, loamy soils over caliche. These soils are on breaks and on the sides and tops of hills. Slopes are 1 to 5 percent.

In a typical profile the surface layer is grayish-brown loam about 8 inches thick. The underlying material is caliche to a depth of about 30 inches. The upper part is very pale brown loam; the lower part is pink soft caliche and a few plates and fragments.

Runoff is moderate to rapid, permeability is moderate, and the available water capacity is low.

Most of the acreage is used for range. In a few areas the underlying caliche is mined and used locally as base material for roadbeds.

In Coke County, Potter soils are mapped only in association with Berda and Vernon soils.

Typical profile of Potter loam in an area of Berda-Vernon-Potter association, undulating, in a pasture 4 miles east of Robert Lee on Texas Highway 158, then 3.3 miles north on county road, then 60 feet east:

A1—0 to 8 inches, grayish-brown (10YR 5/2) loam, dark grayish brown (10YR 4/2) moist; weak, fine, subangular blocky structure; slightly hard, friable; common fine roots; many fragments of caliche as large as ¼ inch in diameter; common fragments of caliche, chert, and flint ½ inch to 3 inches in diameter on the surface; calcareous; moderately alkaline; abrupt, smooth boundary.

C1ca—8 to 19 inches, very pale brown (10YR 7/3) caliche that has loam texture, pale brown (10YR 6/3) moist; massive; hard, friable; few roots; about 50 percent soft calcium carbonate; a few concretions ¼ inch to 1 inch in diameter; calcareous; moderately alkaline; clear, smooth boundary.

C2ca—19 to 30 inches, soft caliche, pink (7.5YR 8/4) moist; massive (structureless); hard, friable; few plates and fragments have a hardness of slightly more than 3 on Moh's scale and are ¼ inch to 3 inches thick.

The A horizon ranges from 4 to 12 inches in thickness and from grayish brown to brown, dark brown, and light brownish gray in color. The C horizon ranges from pink to very pale brown. It consists of soft calcareous earths that are 50 to 75 percent or more soft and hard nodules of calcium carbonate to weakly cemented caliche.

Spade Series

The Spade series consists of moderately deep to deep, well-drained, loamy soils. These soils are on convex knolls and erodible uplands. They formed in calcareous sandstone or sandy conglomerate.

In a typical profile the surface layer is brown fine sandy loam about 10 inches thick. The next layer is pale-brown fine sandy loam about 14 inches thick. The underlying material is sandstone to a depth of about 46 inches. It is weakly cemented in the upper part and cemented in the lower part.

Permeability is moderately rapid, available water capacity is low, and runoff is medium.

Most of the acreage is used for range. A few areas are cultivated.

Typical profile of Spade fine sandy loam, 1 to 3 percent slopes, 120 feet northeast of the northeast corner of a cemetery that is 3.7 miles west by county road and 4.3 miles south of Blackwell by Texas Highway 70:

A1—0 to 10 inches, brown (10YR 5/3) fine sandy loam, dark brown (10YR 4/3) moist; weak, fine, subangular blocky structure; soft, very friable; calcareous; moderately alkaline; gradual, smooth boundary.

B—10 to 24 inches, pale-brown (10YR 6/3) fine sandy loam, dark yellowish brown (10YR 4/4) moist; weak, fine, subangular blocky structure; soft, very friable; few tubes and pores; common worm casts; few small fragments of sandstone; calcareous; moderately alkaline; gradual, smooth boundary.

Cca—24 to 36 inches, light-gray (2.5Y 7/2) weakly cemented sandstone, light yellowish brown (2.5Y 6/4) moist; about 40 percent of soil around the fragments is similar to that of B horizon and has many worm casts, few fine roots, few lumps of soft calcium carbonate, and many films of calcium carbonate; broken sandstone pieces are noncalcareous, the rest is calcareous; moderately alkaline; gradual, wavy boundary.

R—36 to 46 inches, pale-yellow (2.5Y 8/4) cemented sandstone, light yellowish brown (2.5Y 6/4) moist; difficult to auger below a depth of 46 inches; thin lime coatings in cracks and seams of the sandstone, but broken surfaces are noncalcareous.

The A horizon ranges from pale brown to reddish brown, from 4 to 12 inches in thickness, and from neutral to moderately alkaline. The B horizon ranges from fine sandy loam to loam, from pale brown to reddish brown, and from 8 to 36 inches in thickness. The content of visible calcium carbonate in the B horizon ranges from a few films and threads to about 5 percent. The depth to sandstone ranges from 20 to 48 inches.

Spade fine sandy loam, 1 to 3 percent slopes (SpB).—This soil is on uplands. Included in mapping are small areas of Latom, Cobb, and Potter soils that make up less than 15 percent of the total acreage. Also included are small areas of soils that have slopes of 3 to 8 percent and are moderately eroded. These eroded soils make up about 10 percent of the total acreage.

The hazards of soil blowing and water erosion are moderate.

Most of the acreage is used for range. A few areas are cultivated, but they are small and irregularly shaped. The main crops are sorghum and small grain.

Crop residue on the soil helps to control soil blowing and water erosion and maintains soil condition. Terraces and contour farming also help to control water erosion. Capability unit IIIe–5 dryfarmed; Sandy Loam range site.

Stony Steep Land

Stony steep land (SS) is a miscellaneous land type that consists of steep to very steep hills that have a shallow covering of soil over limestone, chalky marl, sandstone, or red marine clays. Slopes range from 20 percent to nearly vertical but are dominantly 30 to 60 percent. On hilltops, slopes are 20 to 30 percent.

Some areas have a thin, patchy soil cover, mostly less than 6 inches thick, and small pockets of deeper soils between stones and boulders. The soil material is dominantly clay loam and loam, but in a few areas it is fine sandy loam, clay, and silty clay loam.

The content of coarse fragments in the soil material ranges from 60 to 98 percent. The size of fragments ranges from fine gravel to stones and boulders. A few boulders are 30 feet in diameter. Some of the more clayey soil contains only a few coarse fragments, but other areas have just enough fines to fill the areas around coarse fragments.

All the acreage is used for range. Stony steep land is so steep and stony that it is suitable only for sheep and goats. It can easily be overgrazed, and overgrazed areas erode readily. Some areas are not accessible to livestock.

Stony steep land is suitable for wildlife habitat. Capability unit VIIs–3 dryfarmed; Steep Rocky range site.

Tarrant Series

The Tarrant series consists of shallow, well-drained, nearly level to steep soils on limestone uplands.

In a typical profile the surface layer is very dark grayish-brown clay about 7 inches thick. The next layer is about 10 inches thick. It is very dark brown clay that is 85 to 90 percent fragments of limestone, gravel, and stones. The underlying material is fractured limestone bedrock to a depth of 20 inches.

Runoff is rapid, permeability is slow, and available water capacity is low.

These soils are used for range. They are unsuited to cultivation.

Typical profile of Tarrant stony clay in an area of Tarrant soils, undulating, about 20 miles west of Robert Lee on Texas Highway 158 to Sterling County line, then 0.7 mile west, 1 mile south, 3 miles east on county road, then 200 feet east of corner of road:

A11—0 to 7 inches, very dark grayish-brown (10YR 3/2) clay, very dark brown (10YR 2/2) moist; weak to moderate, fine and very fine, granular structure; hard, friable; fragments of limestone up to 1 inch in diameter make up about 10 percent of soil mass and cover 30 percent of the surface; calcareous; moderately alkaline; clear, smooth boundary.

A12—7 to 17 inches, very dark brown (10YR 3/2) clay, very dark brown (10YR 2/2) moist; weak to moderate, fine, subangular blocky structure; hard, firm; many roots in vertical and horizontal crevices; fines are 10 to 15 percent of the interstitial material; broken cobblestone- and stone-size fragments of caliche-coated limestone are generally oriented in a horizontal plane and have cracks or crevices up to 1 inch horizontally; calcareous; moderately alkaline; abrupt, wavy boundary.

R—17 to 20 inches, fractured limestone bedrock that has thin seams, ½ inch to 3 inches thick, of soft limestone that contains some clay in the narrow cracks; roots extend into the cracks.

The A11 horizon ranges from very dark grayish brown to brown in color and from 5 to 10 inches in thickness. Limestone fragments the size of stones, cobblestones, and gravel cover 20 to 90 percent of the surface. The A12 horizon ranges from very dark grayish brown through dark brown in color, from 6 inches to about 10 inches in thickness, and from silty clay loam to clay. It is 35 to 60 percent clay. The solum ranges from 12 to 20 inches in thickness. Coarse fragments make up 10 to 50 percent of the A11 horizon and from 70 to 90 percent of the A12 horizon. Reaction ranges from neutral to moderately alkaline.

Tarrant soils, undulating (TAB).—These nearly level to sloping soils are on limestone uplands. Slopes range from 0 to 8 percent, but are dominantly 1 to 6 percent. Fragments of limestone on the surface range from pebble size to stone size. Included in mapping are small areas of Stony steep land. Also included are small areas of soils that are similar to Tarrant soils but have a solum 10 to 20 inches thick and a hardened layer of caliche resting on limestone bedrock. Inclusions make up about 12 percent of the total acreage.

These Tarrant soils have the profile described as representative for the series.

Runoff is rapid. Available water capacity is low because the soils are shallow and have a high content of coarse fragments. Light rain provides water for some plant growth because runoff is concentrated into the area around stones. The hazard of erosion is slight if the soil has a good vegetative cover.

These soils are used for range. They produce a wide variety of forage plants for livestock and wildlife. Capability unit VIs–2 dryfarmed; Low Stony Hill range site.

Tarrant soils, hilly (TAE).—These are strongly sloping to steep soils on uplands. Slopes range from 8 to 30 percent but are dominantly 8 to 20 percent. Fragments of limestone on the surface range from pebble size to stone size. Included in mapping are small areas of Stony steep land and soils that are similar to Tarrant soils but have a solum 6 to 10 inches thick that is less than 35 percent clay. These inclusions make up about 18 percent of the total acreage.

The surface layer is very dark grayish-brown clay about 6 inches thick. Fragments of limestone make up 50 to 90 percent of the soil mass and cover 30 to 95 percent of the surface. The next layer is dark-brown clay about 10 inches thick. It is 85 to 90 percent fragments of limestone. The underlying material is fractured limestone bedrock to a depth of about 20 inches.

Runoff is rapid, and available water capacity is low. Light rain provides water for some plant growth because it is concentrated in the area around the stones. A good vegetative cover reduces the hazard of erosion. When the soils are bare from overgrazing, the hazard of erosion is severe. The slopes and stony surfaces make it difficult to handle livestock.

These soils are used for range. They produce a wide variety of forage plants for livestock and wildlife. Capability unit VIs–2 dryfarmed; Low Stony Hill range site.

Tivoli Series

The Tivoli series consists of deep, excessively drained, gently undulating, sandy soils that have a hummocky surface. These soils are on uplands, and they formed in sandy, eolian sediments.

In a typical profile the surface layer is brown fine sand about 12 inches thick. The underlying material is reddish-yellow fine sand to a depth of about 66 inches.

Available water capacity is low. Runoff is slow, and permeability is rapid. In bare areas the hazard of soil blowing is severe.

These soils are used for range.

Typical profile of Tivoli fine sand, hummocky, in a pasture 400 feet south of Ranch Road 2059, from a point 1.3 miles west of its intersection with Ranch Road 1672 in Silver:

A1—0 to 12 inches, brown (10YR 5/3) fine sand, dark brown (10YR 4/3) moist; single grain; loose, very friable; soil darkened by organic matter; few fine roots; neutral; gradual, smooth boundary.

C1—12 to 34 inches, reddish-yellow (7.5YR 6/6) fine sand, strong brown (7.5YR 5/6) moist; single grain; loose; few fine roots; neutral; gradual, smooth boundary.

C2—34 to 66 inches, reddish-yellow (5YR 6/8) fine sand, yellowish red (5YR 5/8) moist; single grain; loose; neutral.

The A horizon ranges from 4 to 30 inches in thickness and from pale brown, grayish brown, and brown to light yellowish brown in color. The C horizon extends to a depth of 60 inches

or more. It ranges from pink and reddish yellow to light reddish brown or reddish yellow. Reaction ranges from neutral to moderately alkaline at depths below 40 inches.

Tivoli fine sand, hummocky (ThC).—This is a gently undulating soil. Slopes are dominantly 1 to 5 percent. Included in mapping are small areas of Miles and Brownfield soils and small areas of a soil that has short slopes up to 20 percent. These inclusions make up about 25 percent of the unit.

Available water capacity of this Tivoli soil is low. The surface is hummocky, and a few dunes as much as 20 feet high have formed but are now stabilized.

Almost all the acreage is used for range. Good management of grazing is needed, and the hazard of soil blowing is severe on bare soils. Capability unit VIIe–1 dryfarmed; Deep Sand range site.

Vernon Series

The Vernon series consists of well-drained, calcareous clays that are moderately deep to shale or to partly weathered red beds. These soils are gently sloping to strongly sloping.

In a typical profile the surface layer is reddish-brown clay about 5 inches thick. The next layer is reddish-brown clay about 9 inches thick, and the underlying material is red clay to a depth of about 30 inches.

Runoff is rapid, permeability is very slow, and available water capacity is low.

Typical profile of Vernon clay in an area of Vernon-Badland complex in a pasture 5.3 miles east of Robert Lee on Texas Highway 158, then 3.75 miles south on county road, and 50 feet west:

A1—0 to 5 inches, reddish-brown (2.5YR 5/4) clay, reddish brown (2.5YR 4/4) moist; weak, subangular blocky structure; hard, friable; many siliceous pebbles on surface; common fine roots; calcareous; moderately alkaline; abrupt, smooth boundary.

B—5 to 14 inches, reddish-brown (2.5YR 5/4) clay, reddish brown (2.5YR 4/4) moist; moderate, very fine, angular blocky structure; very hard, firm; few soft fragments of sandstone; few worm casts; few siliceous pebbles ⅛ to ¼ inch in diameter; calcareous; moderately alkaline; clear, smooth boundary.

C—14 to 30 inches, red clay; some fragments of gray clayey shale; few roots; few soft masses of soft calcium carbonate; calcareous; moderately alkaline.

The A horizon ranges from reddish brown to brown and red in color and from 4 to 9 inches in thickness. The B horizon ranges from red through reddish brown in color and from 6 to 15 inches in thickness. The C horizon ranges from slightly altered red-bed clays and shales to partly weathered red beds with carbonate accumulations in the upper few inches.

Vernon-Badland complex (Vb).—These are gently sloping to steep soils on uplands. The complex is about 34 percent Vernon soils and 44 percent Badland. About 22 percent is Latom soils and soils that have a solum less than 10 inches thick. Slopes range from 2 to 20 percent. Areas of this unit range in size from 30 to 250 acres.

The Vernon soils are on low knolls, mounds, or ridges. They have slopes of 2 to 8 percent. They have the profile described as typical for the Vernon series.

The Badland component of this unit is in small, irregularly shaped areas that surround the more sloping Vernon soils. Badland consists of broad and shallow gullies or eroded areas in regions of red marine clay.

This complex is used for range and wildlife habitat. Little or no vegetation grows on the areas of Badland. Capability unit VIIe–2 dryfarmed; Vernon soils are in Shallow Redland range site, Badland not placed in a range site.

Weymouth Series

The Weymouth series consists of well-drained, gently sloping, calcareous soils that are moderately deep to shale or beds of partially weathered red clay. These soils are on uplands.

In a typical profile the surface layer is light-brown loam about 5 inches thick, and the next layer is light-brown clay loam about 12 inches thick. The underlying material is pink clay loam to a depth of about 50 inches.

Permeability is moderate, and available water capacity is high.

Most areas are used for range.

Typical profile of Weymouth loam, 1 to 3 percent slopes, in a pasture 500 feet north of Texas Highway 158, from a point 9.5 miles west of junction of Texas Highways 158 and 208 in Robert Lee:

A1—0 to 5 inches, light-brown (7.5YR 6/4) loam, dark brown (7.5YR 4/4) moist; weak, fine, subangular blocky structure; soft, friable; few fine roots; calcareous; moderately alkaline; gradual, smooth boundary.

B2—5 to 17 inches, light-brown (7.5YR 6/4) clay loam, brown (7.5YR 4.5/4) moist; weak, fine, subangular blocky structure; soft, friable; many worm casts; common films and threads of calcium carbonate; few caliche-coated limestone pebbles ¼ inch to 2½ inches in diameter; few calcium carbonate concretions ⅛ to ¼ inch in diameter; calcareous; moderately alkaline; clear, smooth boundary.

B3ca—17 to 35 inches, pink (5YR 8/4) clay loam, light reddish brown (5YR 5.5/4) moist; weak, fine, subangular blocky structure; hard, friable; about 35 percent quartz pebbles coated with concretions of calcium carbonate; calcareous; moderately alkaline; gradual, wavy boundary.

C—35 to 50 inches, pink (5YR 6.5/4) clay loam, reddish brown (5YR 5/4) moist; massive; hard, friable; few roots; about 15 percent calcium carbonate concretions; calcareous; moderately alkaline.

The A and B horizons range from light brownish gray to brown. The A horizon ranges from 5 to 9 inches in thickness, and the B2 horizon ranges from 5 to 13 inches. The depth to the B3ca horizon ranges from 10 to 20 inches. The B3ca horizon is 10 to 50 percent calcium carbonate, and it ranges from 12 to 38 inches in thickness.

Weymouth loam, 1 to 3 percent slopes (WeB).—This soil is on the tops and sides of hills in uplands. Included in mapping are small areas of Potter, Mereta, Spade, and Nuvalde soils. The inclusions make up 20 percent of the acreage of this unit.

This soil has the profile described as typical for the series.

Water erosion is a moderate hazard. Most of the acreage is used for range, but a small percentage is planted to small grain and used for supplemental grazing. The soil is easily tilled. Crop residue on the soil helps to control erosion and maintain good tilth. Terraces and contour farming also help to control erosion. Capability unit IIIe–7 dryfarmed; Shallow range site.

Weymouth loam, 3 to 5 percent slopes (WeC).—This soil is on the tops and sides of hills and breaks to drainageways. Areas of this soil are much longer than they are wide, and they follow slope contours of the drainage patterns. Slopes are complex. Areas of this unit are generally less than 35 acres in size. Included in mapping are small areas of Potter, Mereta, and Spade soils. These inclusions make up 25 percent of the unit.

The surface layer is light brownish-gray loam about 6 inches thick. The next layer is light-brown clay loam about 10 inches thick. The underlying material is pink clay loam to a depth of about 40 inches.

Most of the acreage is used for range. A few areas are cultivated. The main crops are small grain and sorghum for supplemental grazing. Terraces, contour farming, and crop residue on the soil help to control erosion. Capability unit IVe–2 dryfarmed; Shallow range site.

Yahola Series

The Yahola series consists of deep, well-drained, nearly level, calcareous, loamy soils. These soils formed in alluvium on flood plains.

In a typical profile the surface layer is reddish-brown very fine sandy loam about 13 inches thick. The next layer is reddish-brown fine sandy loam about 23 inches thick. The underlying material, to a depth of about 62 inches, is reddish-yellow sandy loam that has bedding planes.

Runoff is slow, permeability is moderately rapid, and available water capacity is moderate.

Most of the acreage is used for range.

Typical profile of Yahola very fine sandy loam in a pasture about 3 miles south of Bronte, then 1,400 feet west of U.S. Highway 277, then 300 feet south of the Colorado River:

A1—0 to 13 inches, reddish-brown (5YR 5/3) very fine sandy loam, reddish brown (5YR 4/3) moist; weak, fine, subangular blocky and granular structure; soft, very friable; few to common worm casts; many very fine roots; few threads of calcium carbonate; calcareous; moderately alkaline; gradual, smooth boundary.

C1—13 to 36 inches, reddish-brown (5YR 5/4) fine sandy loam, reddish brown (5YR 4/4) moist; massive; slightly hard, very friable; few fine roots; few to common worm casts; few threads of calcium carbonate; thin strata of finer and coarser materials in lower 8 inches; calcareous; moderately alkaline; gradual, smooth boundary.

C2—36 to 62 inches, reddish-yellow (5YR 6/6) sandy loam, yellowish red (5YR 5/6) moist; massive; slightly hard, very friable; bedding planes; several thin strata of coarser materials; calcareous; moderately alkaline.

The A1 horizon ranges from 6 to 20 inches in thickness and from reddish brown to yellow in color. The C horizon ranges from loam to loamy fine sand. It is 5 percent to slightly less than 18 percent clay. Thin strata of finer and coarser soil material range from few to common.

Yahola very fine sandy loam (Ya).—This soil is on the flood plain of rivers and streams. The slopes are smooth and nearly level. Included in mapping are areas of Colorado and Clairemont soils that make up 25 percent of the acreage.

This soil is subject to occasional flooding and flooding is expected once in 5 to 10 years. Soil blowing and water erosion are slight hazards.

Most of the acreage is used for range. About 10 percent is used for crops. Cotton, grain sorghum, and small grain are well suited to this soil. Crop residue on the soil helps to maintain good tilth and control soil blowing and erosion. Capability unit IIce–3 dryfarmed, and I–4 irrigated; Loamy Bottomland range site.

Use and Management of the Soils

This section discusses briefly the problems of managing cultivated soils in Coke County; gives predicted yields of the major dryfarmed crops; explains the system of capability grouping used by the Soil Conservation Service and shows the classification of the soils of Coke County according to that system; discusses range management and describes the range sites recognized in the county; shows the general classification of the soils according to capacity to support wildlife; and presents data pertinent to the use of the soils in engineering.

Management of Cultivated Soils

Control of erosion, conservation of moisture, and maintenance of good tilth are the main objectives in the management of cultivated soils. Erosion is one of the chief hazards in Coke County. Most of the soils in the county have a slope of more than 1 percent. Management practices that help to control erosion are managing crop residue on the soil, terracing, and contour farming (fig. 5). Other helpful management practices are stripcropping and rotation of crops. Soils that are too steep, too stony, or too shallow for cultivation are better suited to pasture.

Soil tests have shown that most of the soils in Coke County that have been farmed intensively for a long time are deficient in nitrogen and phosphorus, and some are deficient in potassium.

The use of commercial fertilizer should be based on needs determined by soil tests.

Fertilizer is not generally used on dryfarmed soils because of moisture limitations. Field tests have shown that when moisture conditions are favorable, most soils in Coke County do respond to fertilization.

Yield Predictions

The predictions of average yields given in table 2 are based on records of experiment stations and on information from farmers and others familiar with the soils and farming of the county. From year to year, yields vary greatly from these averages because of variations in the weather.

The figures in table 2 represent yields to be obtained under a high level of management, in which it is assumed that (1) improved varieties are planted at the ideal rate, on the right dates, and at the right depth; (2) water is conserved and erosion controlled effectively by means of contour cultivation, terracing, and proper management of crop residue; (3) all tillage is timed to take advantage of rainfall; (4) crops are kept free of weeds, and control of insects is timely and effective; (5) large amounts of organic material are returned to the soil; (6) rotations are designed to hold cotton root rot and other plant

Figure 5.—**Cotton and grain sorghum planted on the contour between terraces. The soil is Miles fine sandy loam, 0 to 1 percent slopes.**

diseases to a minimum; and (7) fertilizer is applied according to the results of soil tests.

Yields of small grain are relatively low in this county. In many years when these are planted with the intention of harvesting grain, the weather becomes adverse and the crop is harvested by livestock.

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 engineering.

In the capability system, the kinds of soil are grouped at three levels: the capability class, the subclass, and the unit. These are discussed in the following paragraphs.

Capability Classes, the broadest groups, are designated by Roman numerals I through VIII. The numerals indicate progressively greater limitations and narrower choices for practical use, 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 habitat.

Class VI soils have severe limitations that make them generally unsuited to cultivation and limit their use largely to pasture or range, woodland, or wildlife habitat.

TABLE 2.—*Predicted average yields per acre of principal dryfarmed crops*

[Soils not listed in this table are not suited to the crops]

Soil	Cotton	Grain sorghum	Wheat
	Lb. of lint	*Lb.*	*Bu.*
Bronte fine sandy loam, 0 to 1 percent slopes	200	1, 200	10
Bronte fine sandy loam, 1 to 3 percent slopes	200	1, 100	10
Clairemont silt loam	250	1, 300	10
Cobb loamy fine sand, 0 to 3 percent slopes	200	1, 400	10
Cobb fine sandy loam, 1 to 3 percent slopes	200	1, 400	10
Cobb fine sandy loam, 2 to 5 percent slopes, eroded	175	1, 300	10
Cobb and Cosh soils, 3 to 5 percent slopes	175	1, 400	10
Cosh and Cobb soils, 1 to 3 percent slopes	125	600	5
Frio silty clay loam	250	1, 200	10
Lipan clay	125	600	10
Mereta clay loam, 0 to 1 percent slopes	175	600	10
Mereta clay loam, 1 to 3 percent slopes	125	600	10
Mereta-Nuvalde complex, 0 to 1 percent slopes	175	700	10
Mereta-Nuvalde complex, 1 to 3 percent slopes	150	700	10
Miles loamy fine sand, 0 to 3 percent slopes	225	1, 500	10
Miles fine sandy loam, 0 to 1 percent slopes	225	1, 500	10
Miles fine sandy loam, 1 to 3 percent slopes	225	1, 400	10
Miles fine sandy loam, 3 to 5 percent slopes	175	1, 100	10
Nuvalde silty clay loam, 0 to 1 percent slopes	200	1, 100	10
Nuvalde silty clay loam, 1 to 3 percent slopes	175	1, 000	10
Olton clay loam, 0 to 1 percent slopes	175	1, 000	10
Olton clay loam, 1 to 3 percent slopes	150	900	10
Weymouth loam, 1 to 3 percent slopes	125	600	10
Weymouth loam, 3 to 5 percent slopes	125	400	5
Yahola very fine sandy loam	250	1, 300	10

Class VII soils have very severe limitations that make them unsuited to cultivation and that restrict their use largely to pasture or range, woodland, or wildlife habitat.

Class VIII soils and landforms have limitations that preclude their use for commercial plants and restrict their use to recreation, wildlife habitat, or water supply, or to esthetic purposes. (None in Coke County.)

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 habitat, 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 IIIe–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 paragraph; and the Arabic numeral specifically identifies the capability unit within each subclass.

In the following pages the capability units in Coke County are described. The capability classification of an individual mapping unit is given in two places; at the end of the mapping unit description in the section "Descriptions of the Soils," and in the "Guide to Mapping Units," which is at the back of this publication with the soil map. Suggestions for management of crops are included in the description of each mapping unit that is suitable for cultivation.

CAPABILITY UNITS FOR DRYFARMED SOILS

Unit IIce–3. Deep, nearly level silt loams and very fine sandy loams that are moderately permeable and moderately rapidly permeable.

Unit IIce–4. Deep, nearly level clay loams that are moderately slowly permeable.

Unit IIIc–1. Deep to moderately deep, nearly level silty clay loams that are moderately permeable to moderately slowly permeable.

Unit IIIe–1. Moderately deep, gently sloping silty clay loams that are moderately permeable.

Unit IIIe–2. Deep, gently sloping clay loams that are moderately slowly permeable.

Unit IIIe–4. Deep to moderately deep, nearly level to gently sloping fine sandy loams that are moderately permeable to moderately slowly permeable.

Unit IIIe–5. Moderately deep to deep, gently sloping fine sandy loams that are moderately rapidly permeable.
Unit IIIe–6. Shallow to moderately deep, nearly level silty clay loams and clay loams that are moderately permeable to moderately slowly permeable.
Unit IIIe–7. Shallow to moderately deep, gently sloping loams to silty clay loams that are moderately permeable to moderately slowly permeable.
Unit IIIe–8. Shallow to moderately deep, gently sloping fine sandy loams that are moderately permeable.
Unit IIIw–1. Deep, nearly level to slightly depressed clays that are very slowly permeable.
Unit IVe–2. Moderately deep, gently sloping loams that are moderately permeable.
Unit IVe–4. Deep to moderately deep, gently sloping fine sandy loams that are moderately permeable.
Unit IVe–5. Shallow to moderately deep, gently sloping fine sandy loams that are moderately permeable.
Unit IVe–6. Deep to moderately deep, nearly level to gently sloping loamy fine sands that are moderately permeable.
Unit Vw–1. Deep, nearly level loams that are moderately permeable.
Unit VIe–1. Moderately deep to very shallow, gently sloping to strongly sloping loams and clays that are slowly permeable to moderately permeable.
Unit VIe–7. Deep, nearly level to gently sloping fine sands that are moderately permeable.
Unit VIs–2. Shallow, nearly level to steep clays that are moderately permeable.
Unit VIIe–1. Deep, gently sloping fine sands that are rapidly permeable.
Unit VIIe–2. Rough areas of moderately deep, eroded red clays.
Unit VIIs–1. Shallow to very shallow, gently sloping to strongly sloping loams to fine sandy loams that are slowly permeable to moderately permeable.
Unit VIIs–3. Steep to very steep, rough and stony lands that have much rock and little soil material.

CAPABILITY UNITS FOR IRRIGATED SOILS

Unit I–1. Deep to moderately deep, nearly level clay loams to silty clay loams that are moderately slowly permeable to moderately permeable.
Unit I–3. Deep, nearly level fine sandy loams that are moderately slowly permeable.
Unit I–4. Deep, nearly level silt loams or very fine sandy loams that are moderately permeable to moderately rapidly permeable.
Unit IIe–1. Moderately deep, gently sloping silty clay loams that are moderately permeable.
Unit IIe–2. Deep, gently sloping clay loams that are moderately slowly permeable.
Unit IIe–4. Deep, nearly level fine sandy loams that are moderately permeable.
Unit IIe–5. Deep to moderately deep, gently sloping fine sandy loams that are moderately permeable.
Unit IIe–7. Deep, gently sloping fine sandy loams that are moderately slowly permeable.
Unit IIs–1. Deep, nearly level to slightly depressed clays that are very slowly permeable.
Unit IIIe–3. Deep to moderately deep, gently sloping fine sandy loams that are moderately permeable.
Unit IIIe–6. Deep to moderately deep, nearly level to gently sloping loamy fine sands that are moderately permeable.
Unit IIIe–7. Shallow to moderately deep, gently sloping silty clay loams or clay loams that are moderately slowly permeable or moderately permeable.
Unit IIIs–2. Shallow to moderately deep, nearly level silty clay loams or clay loams that are moderately permeable or moderately slowly permeable.
Unit IVe–7. Deep, nearly level to gently sloping fine sands that are moderately permeable.

Range Management [3]

About 90 percent of the county is used for the production of native vegetation that is grazed by domestic livestock and by deer and other wildlife. There are about 280 ranches and farms that produce livestock.

Most of the soils produce a mixture of plants suitable for grazing by cattle, sheep, and goats. Breeding stock of cattle and sheep is the primary domestic livestock. A few stocker-type lambs and calves are stocked. Goats and horses are only a small part of the total stocking. Deer and other wildlife are increasing in number and value, but at present they use only a small part of the forage produced.

The soils on the limestone hills produce live oak, shin oak, and other browse plants, as well as grasses and forbs. This area is well suited to use by sheep and goats. The deeper soils in the valleys and lower lying plains have a natural potential for the production of mixed prairie vegetation consisting of medium and short grasses, some forbs, and some woody plants. Mesquite has increased and invaded on the deeper soils; redberry juniper has increased greatly on the shallow soils.

Growth of native vegetation is greatest during April, May, and June when rainfall and temperatures are most favorable. Another growth generally occurs in fall during September and October. The deeper soils produce some grasses that grow in the cool seasons, as well as those that grow in the warm seasons. The forage plants produced on rangeland are marketed through the sale of livestock, mohair, and wool. The success of the stockman depends largely upon how successfully he keeps the soil productive of good forage plants. This is done primarily by managing the time and intensity of grazing and by applying needed treatment to each soil to permit reestablishment of the natural plant community.

Range sites and condition classes

The soils of the rangelands are classified into range sites according to their ability to produce native vegetation. A range site is a distinctive kind of rangeland that differs from other kinds of rangeland in its potential to produce native plants. In the absence of abnormal dis-

[3] By R. J. PEDERSON, range conservationist, Soil Conservation Service.

turbances and physical site deterioration, it supports a plant community characterized by an association of plant species different from that of other range sites in terms of kind or proportion of species or in total annual yield.

The different soils of any one range site have the potential to produce the same kind and amount of climax vegetation. Climax vegetation is the potential plant community of a particular site; it is capable of reproducing itself and does not change greatly so long as the environment remains undisturbed. Throughout most of the county, the climax vegetation consists of the plants that were growing there when the region was first settled. The most productive combination of grasses, forbs, and woody plants on a range site is generally the climax type of vegetation.

The entire climax plant community changes with continuous heavy grazing. Animals graze the more palatable plants first and graze them repeatedly. These plants lose vigor, develop smaller root systems, and produce fewer seeds. If they are continually closely grazed, they decrease in relative amounts and eventually die out. These palatable plants are called decreasers. When a decreaser plant is killed by too much grazing, its place is taken by less palatable or shorter plants called increasers.

When most of the decreasers are gone, animals graze more of the increaser plants for food. Then, as the increasers are reduced in vigor and reproduction is slowed or stopped, plants from another community fill the interspaces. These plants are called invaders, and they are usually of low value for grazing. They are capable of increasing under more adverse conditions.

Range condition is the present state of the vegetation of a range site in relation to the potential plant community for that site. The purpose of determining range condition is to provide an approximate measure of the deterioration or improvement that has taken place in the plant community. This provides a basis for determining the degree of improvement needed.

Four range condition classes are used to indicate the degree of departure from the potential or climax vegetation brought about by grazing or other use. The classes show the present condition of the vegetation on a range site in relation to the native vegetation that could grow there. The site is in *excellent condition* if 76 to 100 percent of the present vegetation is of the same kind as the climax vegetation. It is in *good condition* if the percentage is between 51 and 75; in *fair condition* if the percentage is between 26 to 50; and in *poor condition* (fig. 6) if the percentage is less than 25.

One of the main objectives of good range management is to improve range that is in fair or poor condition and to maintain range that is in excellent or good condition. If this is done, water is conserved, yields are improved, and the soils are protected. Natural plant succession will lead toward reestablishment of the climax vegetation. Grazing management is designed to improve range condition to the desired degree. Improvement is speeded up by brush control and range seeding.

Descriptions of range sites

In the following pages the range sites in Coke County are described. Each description names the climax plants and the principal invaders on the particular site and gives an estimate of the annual production of forage. The range site classification of each individual soil is given in two places: at the end of the description of the mapping unit in the section "Descriptions of the Soils," and in the "Guide to Mapping Units," which is at the back of this publication with the soil maps. Two or more kinds of soil mapped together in a complex, association, or undifferentiated group may each be in a different range site.

BOTTOMLAND RANGE SITE

The one soil on this site is a deep, fertile silty clay loam of the Frio series. It is on nearly level flood plains. Extra moisture is provided by occasional flooding or by runoff from adjacent higher land. The soils are moderately slowly permeable, and the available water capacity is high.

The potential plant community is made up of switchgrass, Canada wildrye, cane or silver bluestem, side-oats grama, vine-mesquite, Englemanndaisy, and other decreaser plants. Increaser plants are buffalograss, Texas wintergrass, tobosa, and curly mesquite. Plants that invade on this site are red grama, three-awn, annual weeds, mesquite, and a few species of woody plants. Mesquite has increased and developed thick stands in some places (fig. 7).

Livestock and game animals prefer to graze the bottom lands and have concentrated grazing in these areas. As a result, overgrazing has contributed much to the loss of the original plant cover. Forage production can be improved or increased by brush control and by managing the time and amount of grazing. Reseeding of the original plants can be done after brush has been controlled.

Total annual herbage yield from an acre of this site in excellent condition varies between 2,900 and 1,500 pounds (air-dry weight), depending on the amount of rainfall and overflow.

CLAY LOAM RANGE SITE

These soils are deep and moderately deep, nearly level to gently sloping clay loams to silty clay loams on uplands. They have moderate to moderately slow permeability and a high available water capacity.

The potential plant community consists of prairie grasses. The first plants to decrease under heavy continuous use are side-oats grama, vine-mesquite, cane bluestem, and silver bluestem. Increasers are buffalograss, Texas wintergrass, tobosa, sand dropseed, and curly mesquite. Plants that invade the site are red grama, Texas grama, mesquite, western ragweed, rescuegrass, and other annual plants. Mesquite invades readily on the deep soil and is now abundant (fig. 8).

Forage production is improved mainly by managing the time and amount of grazing in order to keep the forage plants healthy and productive. Mesquite can be controlled. Reseeding can be done successfully after a good seedbed is prepared.

The total annual herbage yield from an acre of this site in excellent condition varies between 2,500 and 1,000 pounds (air-dry weight), depending on the amount and season of rainfall.

DEEP SAND RANGE SITE

This site consists of nearly level to gently undulating deep fine sand. Available water capacity is low, and per-

Figure 6.—An area of the Sandy Loam range site in poor condition. Brush is invading. The soil is Bronte fine sandy loam, 0 to 1 percent slopes.

meability is moderate to rapid. Plants that can most efficiently utilize the site are the deep-rooted grasses, forbs, and trees. Bare areas are subject to soil blowing.

The decreaser grasses in the climax plant community are little bluestem, side-oats grama, indiangrass, switchgrass, purpletop, and sand lovegrass. Increasers are fall witchgrass, hairy grama, Wright's three-awn, giant dropseed, and fringeleaf paspalum. Plants that invade when the range condition deteriorates are grassbur and other annuals and annual weeds, gummy lovegrass, red lovegrass, and purple sandgrass. Some shin oak and post oak are natural but may increase. Mesquite can invade on this site, and bullnettle is common.

Reseeding is difficult because the surface layer dries quickly after rains. Oak and other woody plants can be controlled.

Total annual herbage yield from an acre of this site in excellent condition is about 1,800 pounds (air-dry weight) in favorable years. In dry years the yield may be 800 pounds per acre.

GYP RANGE SITE

The one soil on this site is a gently sloping, very shallow loam of the Cottonwood series that contains varying amounts of gypsum. The areas are dissected by shallow drainageways. The available water capacity is low, and permeability is moderate.

The plant community varies greatly because of variations in the gypsum content of the soil. The potential plant community is made up of side-oats grama, hairy grama, cane bluestem, and other decreaser plants. Increaser plants are buffalograss, fall witchgrass, and cane bluestem. Among the invaders are hairy tridens, Texas grama, mesquite, catclaw, and annual weeds.

Much of this site has been overgrazed, and the original plant cover has been destroyed. Improvement of forage production can be achieved by managing the time and amount of grazing.

The total annual herbage yield from an acre of this site varies from about 750 pounds (air-dry weight) in

Figure 7.—**An area of the Bottomland range site. Vegetation is mostly buffalograss and tobosagrass; mesquite is invading. The soil is Frio silty clay loam.**

years of favorable rainfall to 250 pounds or less in dry years.

LAKEBED RANGE SITE

The only soil in this site is a very slowly permeable clay of the Lipan series located in intermittent lakes. The available water capacity is high.

The potential plant community is made up of buffalograss, vine-mesquite, and white tridens associated with many species of annual weeds.

Total annual herbage yield from an acre of this site is about 2,000 pounds (air-dry weight) in years of favorable rainfall. Low yields of 500 pounds per acre can be expected in dry years.

LOAMY BOTTOMLAND RANGE SITE

The soils of this site are deep loams, very fine sandy loams, and silt loams located along major streams. Extra moisture is provided by occasional flooding or by runoff from adjacent higher land. The soil has a moderate to high available water capacity. Permeability is moderate to moderately rapid.

The potential plant community varies because of differences in the amount of flooding or extra water. The most productive area is adjacent to the stream, where switchgrass, indiangrass, little bluestem, and other tall grasses grow.

The potential plant community is made up of sideoats grama, silver bluestem, Arizona cottontop, plains bristlegrass, Canada wildrye, vine-mesquite, Engelmann-daisy, and other decreaser plants. Increaser plants are hooded windmillgrass, white tridens, meadow dropseed, buffalograss, and Texas wintergrass. Plants that commonly invade the site are numerous annual weeds and grasses, three-awn, johnsongrass, croton, tumble windmillgrass, sunflower, western ragweed, rescuegrass, mesquite, lotebush, cactus, catclaw, and other perennials and woody plants. Some elm, hackberry, and pecan are native to the site. Mesquite has increased and developed to thick mature stands, except where it has been controlled. Livestock prefer to graze the bottom lands, and grazing has been concentrated on these areas. This has resulted in loss of the original plant cover. Improvement of forage production is achieved by brush control and managing the time and amount of grazing. Reseeding of the original plants can be done after brush has been controlled.

Total annual herbage yield from an acre of this site in excellent condition varies between 3,000 to 1,600 pounds (air-dry weight), depending on the amount of rainfall and overflow.

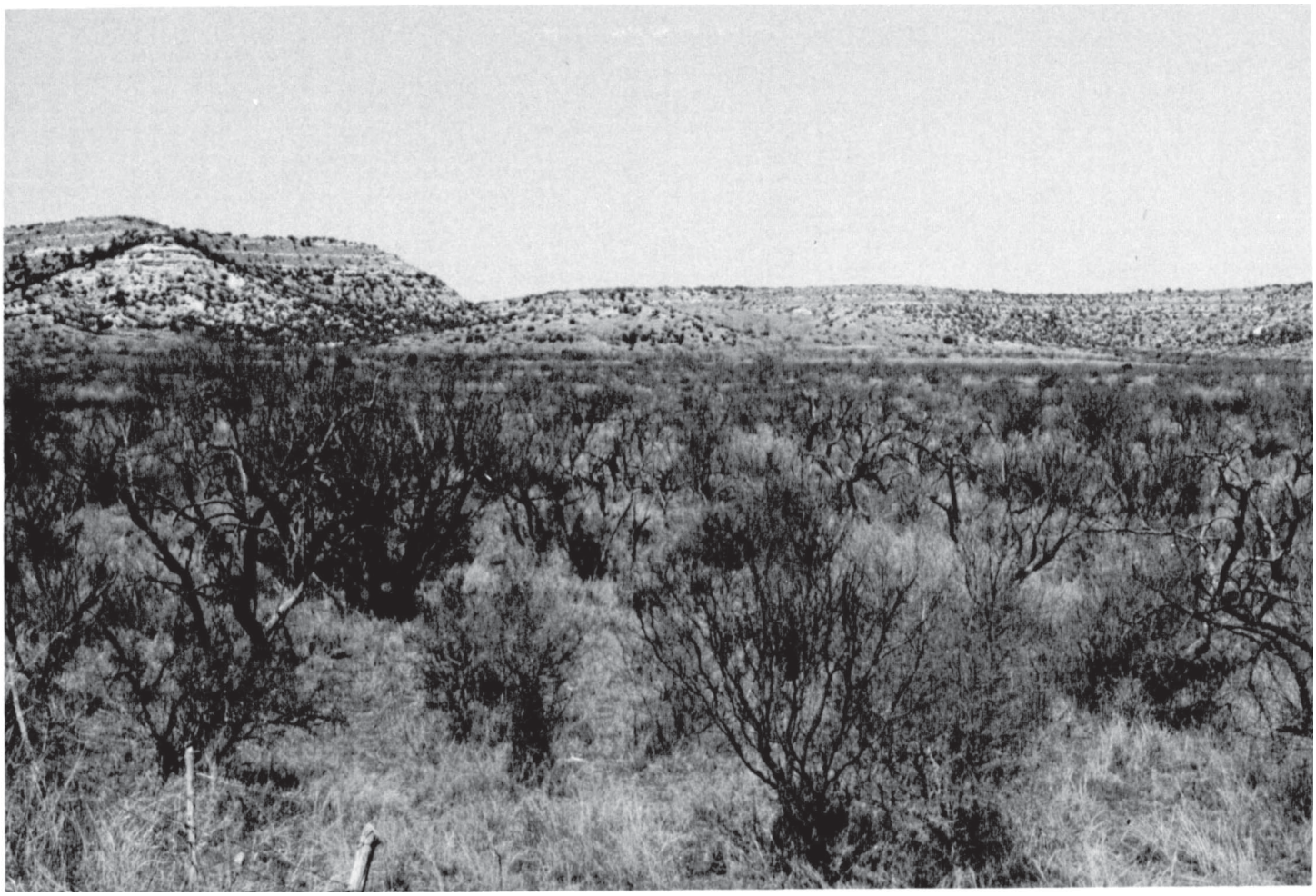

Figure 8.—An area of the Clay Loam range site. Vegetation is mainly buffalograss and sand dropseed. Mesquite and tasajillo are invading. The soil is Nuvalde silty clay loam, 1 to 3 percent slopes.

LOW STONY HILL RANGE SITE

This site is on limestone hills. The soils are shallow clays mixed with stones. Limestone fragments and rock outcrops are common. The available water capacity is low. The rocks concentrate moisture from light rains, and plant growth is benefited. Heavy rains result in runoff or percolation into the rock crevices. Runoff is rapid where the range has been overgrazed and is depleted.

The potential, or climax, vegetation is a mixture of grasses and forbs and shin oak, live oak, sumac, and other browse plants. The grasses that decrease with overuse are little bluestem, side-oats grama, green sprangletop, indiangrass, and Canada wildrye. Increaser plants are perennial three-awn, hairy grama, slim tridens, live oak, shin oak, and orange zexmenia. Common invaders are redberry juniper, mesquite, croton, ragweed, mealycup sage, pricklypear, red grama, and annuals.

Grazing management is the best way to maintain and improve the vegetation. Selective control of oak, where it is thick, can be done mechanically, by uprooting, or chemically. The mixture of vegetation and the topography make the site suitable for deer, sheep, goats, and cattle.

Total annual herbage yield from an acre of this site in excellent condition varies between 1,400 and 800 pounds (air-dry weight), depending on the frequency and amount of rainfall.

SANDSTONE HILLS RANGE SITE

The soils of this site are very shallow to shallow, gently sloping to strongly sloping fine sandy loams. Rock outcrops in places. Available water capacity is low (fig. 9).

The potential plant community is grasses, forbs, and oak. Decreaser grasses are side-oats grama, plains bristlegrass, cane bluestem, sand lovegrass, and little bluestem. Increasers in the climax community are hairy grama, sand dropseed, hooded windmillgrass, slim tridens, black grama, and bristle panicum. Sagewort, sundrop, and bluebonnet are important forbs. Plants that invade are tumble windmillgrass, red grama, Texas grama, hairy tridens, juniper, and mesquite.

Properly managed grazing and brush control will provide gradual improvement in forage growth.

Total annual herbage yield from an acre of this site in excellent condition is about 1,000 pounds (air-dry weight) in years of good rainfall. In dry years the yield may be 600 pounds or less.

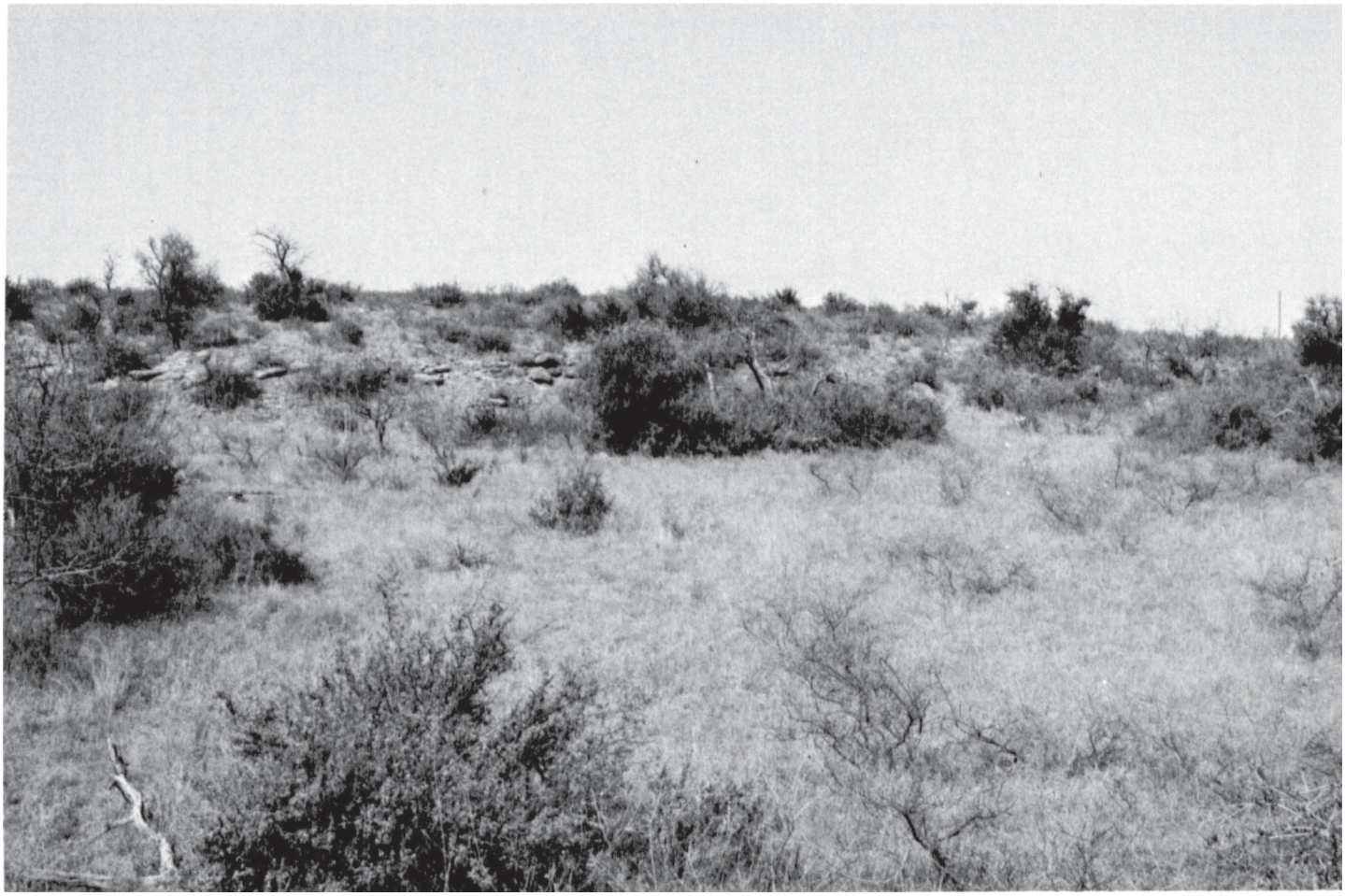

Figure 9.—An area of the Sandstone Hills range site. The soils are Cosh and Latom soils, 1 to 10 percent slopes.

SANDYLAND RANGE SITE

This site consists of deep to moderately deep loamy fine sands. Permeability is moderate, and available water capacity is low to high. The hazard of soil blowing is severe.

The potential plant community consists of grass and scattered trees. Decreaser plants are little bluestem, switchgrass, indiangrass, and sand bluestem in open or scattered stands associated with cane bluestem, side-oats grama, lovegrass, and tall dropseed (fig. 10). Increaser grasses are hooded windmillgrass, perennial three-awn, and sand dropseed. Plants that commonly invade under heavy grazing are gummy lovegrass, tumble lovegrass, fringed signalgrass, mesquite, pricklypear, and many species of annual weeds.

The total annual herbage yield from an acre of this site in excellent condition is approximately 3,000 pounds (air-dry weight) in years of favorable rainfall, and 1,000 pounds in dry years.

SANDY LOAM RANGE SITE

Soils on this site are deep to moderately deep fine sandy loams and loams. Permeability is moderately rapid to moderately slow, and available water capacity is low to high. Range seeding is effective on this site.

The potential plant community consists of grass and scattered oak. Decreaser grasses are side-oats grama, cane bluestem, and little bluestem. Increasers are blue grama, Texas wintergrass, buffalograss, hairy grama, and hooded windmillgrass. Species that invade are sand dropseed, lovegrasses, three-awn, and numerous annual weeds and grasses. Mesquite invades this site. Other invaders are tasajillo, catclaw acacia, and pricklypear.

Total annual herbage yield from an acre of this site in excellent condition is about 2,000 pounds (air-dry weight) in years of good moisture, and about 1,000 pounds in dry years.

SHALLOW RANGE SITE

Soils on this site are shallow to moderately deep, nearly level to gently sloping loams and clay loams. The available water capacity is low to high, and permeability is moderate to moderately slow.

The potential plant community consists of a mixture of short and medium height grasses and a few forbs and live oak trees. Side-oats grama makes up ¼ to ½ the yield when the site is in excellent condition. Other decreaser plants are cane bluestem, vine-mesquite, and green sprangletop. Continuous close grazing permits buffalograss, fall witchgrass, slim tridens, and curly mesquite

Figure 10.—An area of the Sandyland range site in excellent condition. The soil is Miles loamy fine sand, 0 to 3 percent slopes.

to increase. Further deterioration results in invasion by purple three-awn, Texas grama, red grama, annual weeds, mesquite, agarito, and pricklypear.

Improvement of this site is achieved by managing the time and amount of grazing. Brush control and reseeding after seedbed preparation are successful on these soils (fig. 11).

The total annual herbage yield from an acre of this site in excellent condition ranges from about 1,600 pounds (air-dry weight) in years of favorable growing conditions to 1,000 pounds in dry years.

SHALLOW REDLAND RANGE SITE

Soils of this site are moderately deep and clayey. Permeability is very slow, and available water capacity is low. The site needs careful grazing management to maintain adequate cover at all times.

The decreaser grasses in the potential plant community are side-oats grama and Arizona cottontop. Increasers are curly mesquite, slim tridens, and perennial three-awn. Plants that invade are red grama, hairy tridens, and small amounts of mesquite, juniper, and cactus.

The total annual herbage yield from an acre of this site in excellent condition is approximately 1,000 pounds in years of favorable rainfall. In some dry years the yield is below 500 pounds per acre.

STEEP ROCKY RANGE SITE

This site is made up of Stony steep land, a land type that has a very thin soil covering. It occupies steep, rocky hillsides and rough breaks. Runoff from the stones is concentrated in the soil between the rocks and provides water for plant growth.

The potential plant community is oak, juniper, and other woody plants, as well as grasses and forbs.

The decreaser plants are tall grama, side-oats grama, little bluestem, and Canada wildrye. Gaura, sagewort,

Figure 11.—An area of the Shallow range site successfully reseeded after measures were taken to control brush. The soil is Mereta clay loam, 1 to 3 percent slopes.

bush sunflower, and other forbs decrease when heavily grazed by sheep or goats. Plants that increase as range condition is lowered are three-awn, slim tridens, live oak, Texas oak, and juniper. Plants that invade are red grama, pricklypear, and persimmon.

The total annual herbage yield from an acre of this site in excellent condition is about 1,000 pounds (air-dry weight) in years of good rainfall. In dry years the yield may be 600 pounds. The yield varies considerably, depending on stoniness and exposure.

VERY SHALLOW RANGE SITE

The soils of this site are shallow to very shallow loams. Permeability is moderate, and the available water capacity is low (fig. 12).

The climax plant community on open grassland is little bluestem, side-oats grama, green sprangletop, other decreaser grasses, and forbs such as bush sunflower, gayfeather, gaura, and sagewort. Increasers are purple three-awn, buffalograss, curly mesquite, fall witchgrass, hairy tridens, and hairy grama. Invaders are red grama, annual weeds, croton, pricklypear, mesquite, condalia, and agarito.

A seedbed can be prepared on parts of this site by using chisel-type equipment. Reseeding can then be done successfully. Good grazing management generally improves the site gradually.

The total annual herbage yield from an acre of this site in excellent condition is about 1,000 pounds (air-dry weight) in years of good growing conditions and about 500 pounds in dry years.

Wildlife

Antelope, deer, buffalo, and squirrel were abundant in Coke County in early periods of the county's history. There were a few bear and many wild turkeys, prairie chickens, quail, dove, and migratory waterfowl. The buffalo were destroyed before the county was settled. After the county was settled and when livestock were introduced, fencing, cultivation, and indiscriminate slaughter practically exterminated the antelope and bear and limited the population of deer, squirrel, turkey, and other small animals and birds. Prairie chickens and prairie dogs, once numerous, are no longer to be found. A large number of quail, doves, songbirds, small animals, and predators still inhabit the land. Intermittent lakes,

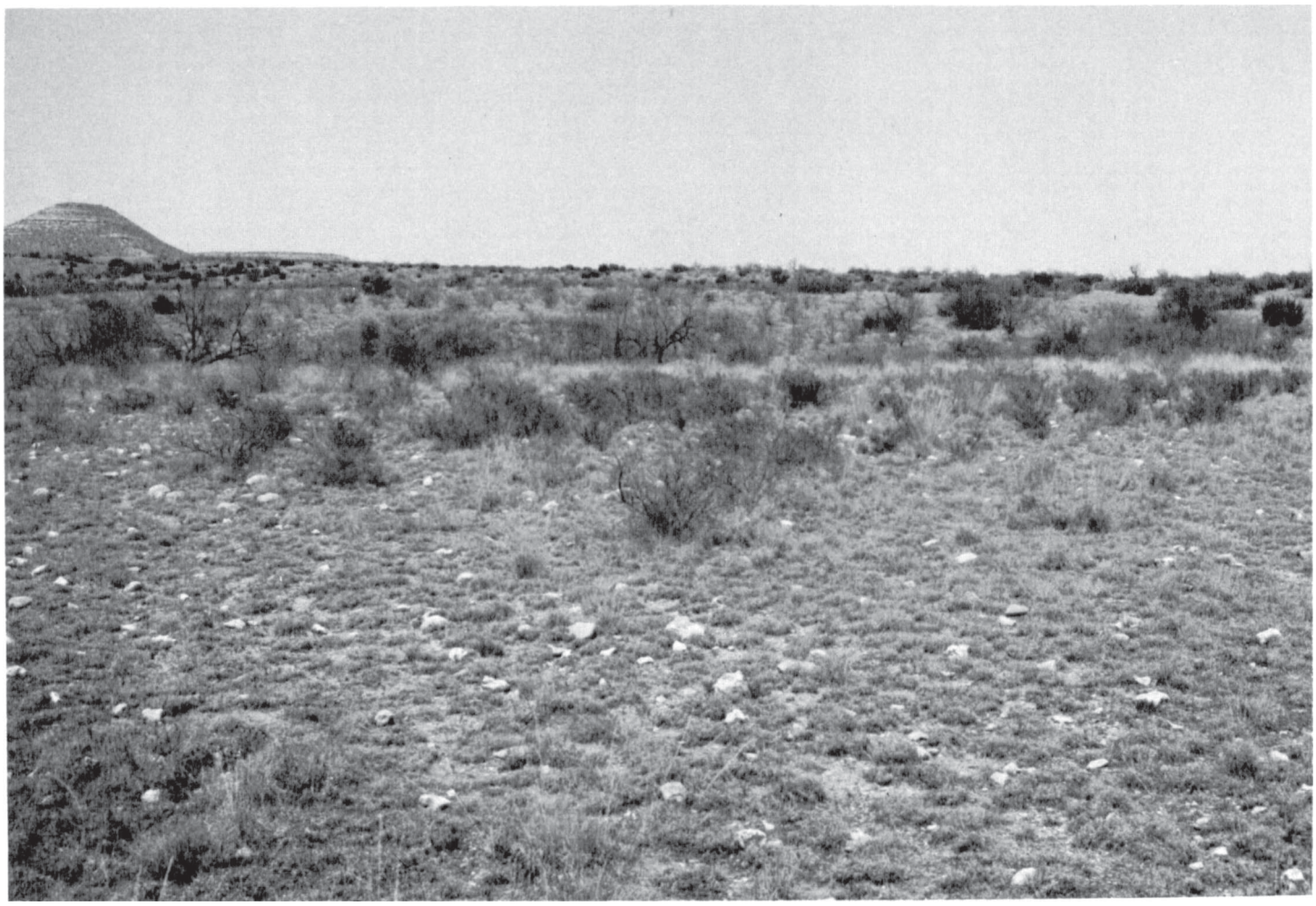

Figure 12.—An area of the Very Shallow range site in poor condition. Kimbrough soils, undulating, is the mapping unit.

streams, ponds, and grainfields attract a few ducks and geese during migration. Habitat for fish is limited to the Colorado River and artificial impoundments, such as the Robert Lee Reservoir, other lakes, and ponds on ranches.

The soils of this county can be placed in three wildlife sites, grouped by soil associations. The soil associations are shown on the general soil map at the back of this publication and are described in the section "General Soil Map." Each wildlife site is unique in topography, productivity, kind and amount of vegetation, and principal species of wildlife that inhabit the site.

WILDLIFE SITE 1

Wildlife site 1 consists of the Tarrant association, which makes up the rougher part of the county. The soils in the association are shallow.

This site has a stand of woody vegetation that includes live oak, shin oak, redberry juniper, catclaw, redbud, agarito, skunkbush, littleleaf sumac, cactus, mesquite, and a variety of other browse plants. Grasses and forbs are green sprangletop, side-oats grama, ragweed, croton, red grama, and others.

Wildlife that use this site are white-tailed deer, turkey, squirrels, rabbits, dove, quail, and many species of small animals and birds. Ducks and geese are sometimes attracted to the intermittent lakes. Wildlife habitat can be improved by growing feed in well-distributed, small fields throughout the area and by restricting livestock grazing to improve vegetation.

WILDLIFE SITE 2

Wildlife site 2 consists of the Miles-Colorado soil association. These are deep loamy soils on terraces and bottom lands.

Vegetation on this site is a mixture of grasses, trees, and forbs. Grasses are mostly panicums, bristlegrass, sand dropseed, and hooded windmillgrass. Johnsongrass, rescuegrass, and sunflowers are common in most years. Some areas have pecan, elm, hackberry, and other trees in addition to mesquite and catclaw.

Turkey, quail, dove, squirrels, rabbits, a few deer, and other small animals and birds use this site. The preservation of food-producing shrubs and trees, den trees for squirrels, and food plantings are important in managing this site for increased wildlife production.

WILDLIFE SITE 3

Wildlife site 3 consists of the Kimbrough-Olton-Mereta, the Olton-Miles, the Tivoli-Brownfield, and the Cobb-Cosh soil associations. The soils in these associations range from very shallow to deep and from nearly level to strongly sloping.

Most of the cultivated soils of the county are in this site, and much of the wildlife food is waste grain from crop harvest. Food and cover plants on ranges and in fence rows include sunflower, cactus, catclaw, ragweed, croton, mesquite trees, johnsongrass, plains bristlegrass, rescuegrass, and other grasses and forbs.

A few deer and turkey use this site, but the wildlife is mostly quail, doves, rabbits, and many small animals and birds.

Unharvested grains and fence-row plantings are most important to wildlife on this site. Trees and shrubs that produce food and cover should be preserved.

Engineering Uses of the Soils [4]

This section provides information of special interest to engineers, contractors, land developers, town and city planners, farmers, and others who deal with soils as structural material or as foundation material upon which structures are built. It concerns those properties of the soils that affect construction and maintenance of roads and airports, pipelines, building foundations, water storage facilities, erosion control structures, drainage systems, and sewage disposal systems. Among the soil properties most important in engineering are permeability, compressibility, shear strength, density, shrink-swell potential, water-holding capacity, grain-size distribution, plasticity, and reaction.

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 soil 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 3, 4, and 5, which show, respectively, results of engineering laboratory tests on soil samples, estimates of soil properties significant to engineering, and interpretations for various engineering uses.

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 table 5, and it also can be used to make other useful maps.

This information, however, does not eliminate the need for further investigation 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. Also, inspection of sites, especially of small ones, is needed because many delineated areas of a given soil mapping unit 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 different meanings in soil science than in engineering. The Glossary defines many of these terms as they are commonly used in soil science.

Engineering classification systems

The two systems most commonly used in classifying soils for engineering are the AASHO system adopted by the American Association of State Highway Officials,[5] and the Unified system,[6] used by Soil Conservation Service engineers, the Department of Defense, and others.

The AASHO system is used to classify soils according to those properties that affect use in highway construction. 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. The best soils for subgrade are classified A–1, the next best A–2, and so on to class A–7, the poorest soils for subgrade. If 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, and A–7–5, A–7–6. If soil material is near a classification boundary, it is given a symbol showing both classes; for examples, A–2 or A–4. The relative engineering values of the soils within each group can be indicated by group index numbers ranging from 0 for the best material to 20 for the poorest. Group indexes have not been determined for the soils of Coke County.

In the Unified system, soils are classified according to particle size distribution, plasticity index, liquid limit, and organic-matter content. Soils are grouped in 15 classes. These are 8 classes of coarse-grained soils, identified as GW, GP, GM, GC, SW, SP, SM, and SC; 6 classes of fine-grained soils, identified as ML, CL, OL, MH, CH, and OH; and 1 class of highly organic soils, identified as Pt. Soils on the borderline between two classes are designated by symbols for both classes; for example, SM–SC.

The AASHO classification and the Unified classification of the soils tested in connection with this soil survey are shown in table 3. The samples were collected by soil scientists, and the tests were made by the Texas Highway Department. Estimated classifications of all the soils of

[4] By WILLIAM R. EVANS, civil engineer, Soil Conservation Service.

[5] AMERICAN ASSOCIATION OF STATE HIGHWAY OFFICIALS. STANDARD SPECIFICATIONS FOR HIGHWAY MATERIALS AND METHODS OF SAMPLING AND TESTING. Ed. 10, 2 v., illus. 1970.

[6] UNITED STATES DEPARTMENT OF DEFENSE. UNIFIED SOIL CLASSIFICATION SYSTEM FOR ROADS, AIRFIELDS, EMBANKMENTS AND FOUNDATIONS. MIL–STD–619B, 30 pp., illus. 1968.

TABLE 3.—*Engineering*

[Tests performed by the

Soil and location of sample	Parent material	Report number	Depth from surface	Shrinkage limit	Linear shrinkage	Shrinkage ratio	Mechanical analysis [1]		
							Percentage passing sieve—		
							1¾ in.	1¼ in.	⅞ in.
Berda loam:			*In.*	*Pct.*	*Pct.*				
From Texas Highway 158 in Bronte, north 6.5 mi. on county road, west 3 mi. to Nipple Peak, then north 0.2 mi., in pasture. Modal profile.	Slope alluvium.	67–266–R	9–32	16	3. 3	1. 85	------	------	------
		67–267–R	48–66	15	7. 0	1. 90	------	100	97
Bronte fine sandy loam:									
2 mi. north of Colorado River on U.S. Highway 277, then 0.12 mi. east, in field. Modal profile.	Old stream alluvium or plains outwash.	67–272–R	11–39	15	8. 8	1. 91	------	------	------
		67–273–R	47–71	13	6. 5	1. 94	100	98	98
		67–274–R	71–74	15	3. 6	1. 88	------	100	97
1 mi. west on Texas Highway 158 from junction with U.S. 277, then 300 ft. north, in cultivated field. Nonmodal, light textured.	Old stream alluvium or plains outwash.	67–269–R	12–32	15	9. 6	1. 89	------	------	------
		67–270–R	46–64	15	6. 9	1. 89	------	100	98
		67–271–R	64–73	15	6. 5	1. 85	------	------	------
8 mi. west on Texas Highway 158 from junction with Texas Highway 208 in Robert Lee, then 1 mi. north on county road, and 50 ft. north, in pasture. Nonmodal, minimum depth.	Old stream alluvium or plains outwash.	67–296–R	23–35	18	8. 1	1. 78	------	------	------
		67–297–R	35–50	16	4. 6	1. 84	------	------	------
		67–298–R	50–74	20	2. 7	1. 70	100	98	97
Cobb fine sandy loam:									
8 mi. north of Bronte on U.S. Highway 277, then east 0.2 mi., in cultivated field. Modal profile.	Medium-grained and fine-grained sandstone.	67–292–R	5–24	16	5. 1	1. 84	------	------	------
		67–293–R	24–29	19	4. 8	1. 77	------	------	------
North on Texas Highway 70, 0.8 mi. from intersection with U.S. Highway 277. then 0.25 mi. west on county road. Nonmodal, heavy textured.	Medium-grained and fine-grained sandstone.	67–299–R	11–32	16	7. 7	1. 87	------	------	------
1.3 mi. northwest from Bronte on county road, and 150 ft. west in cultivated field. Nonmodal, heavy textured.	Medium-grained and fine-grained sandstone.	67–291–R	4–22	15	10. 1	1. 89	100	96	96
Lipan clay:									
14 mi. west on Ranch Road 2034 from junction with Texas Highway 208, then 2.7 mi. west on county road, and north 0.8 mi. in pasture. odal.	Old alluvium or outwash.	67–277–R	5–48	16	19. 2	1. 88	------	100	99
		67–278–R	48–66	24	15. 1	1. 64	------	------	------
14 mi. west on Ranch Road 2034 form junction with Texas Highway 208, then 2.7 mi. west on county road. then north 0.9 mi., in pasture. Nonmodal, heavy textured.	Old alluvium or outwash.	67–275–R	0–18	14	18. 8	1. 90	------	------	------
		67–276–R	18–72	15	20. 2	1. 94	------	------	------
Nuvalde silty clay loam:									
14 mi. west on Ranch Road 2034 from junction with Texas Highway 208, then 2.5 mi. west on county road, then 100 ft. north, in pasture. Modal.	Limestone bedrock and marls.	67–280–R	14–37	17	13. 2	1. 84	------	------	------
		67–281–R	37–54	19	9. 0	1. 80	------	------	------

test data

Texas Highway Department]

Mechanical analysis [1]—Continued									Liquid limit	Plasticity index	Classification [2]	
Percentage passing sieve—Continued						Percentage smaller than—						
⅝ in.	⅜ in.	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.			AASHO	Unified
100	99	98	97	94	53	42	18	15	22	7	A-4	CL
96	94	89	85	79	56	48	22	18	28	14	A-6	CL
-------	-------	100	99	98	65	56	36	31	33	20	A-6	CL
94	92	81	78	76	51	46	24	20	25	13	A-6	CL
94	92	90	89	88	47	39	18	16	21	6	A-4	SM-SC
100	99	98	97	95	68	60	37	32	34	20	A-6	CL
95	90	83	79	75	57	52	24	18	27	15	A-6	CL
100	99	98	97	95	69	58	24	21	27	13	A-6	CL
-------	-------	-------	100	98	70	56	30	27	34	19	A-6	CL
100	98	94	92	90	67	48	26	17	25	9	A-4	CL
96	91	88	86	84	70	47	12	8	26	5	A-4	ML-CL
-------	-------	100	99	98	49	29	23	21	26	13	A-6	SC
-------	100	98	95	89	56	47	26	20	28	11	A-6	CL
100	99	98	96	95	50	42	31	27	30	17	A-6	SC
96	95	94	93	93	53	48	36	33	35	19	A-6	CL
98	97	96	96	95	93	83	54	42	63	33	A-7-5	CH
-------	-------	100	99	99	97	93	68	56	62	36	A-7-6	CH
-------	-------	-------	100	99	96	93	67	55	59	31	A-7-6	CH
-------	-------	-------	100	99	97	93	67	56	65	40	A-7-6	CH
-------	100	99	97	96	91	85	57	43	45	25	A-7-6	CL
-------	-------	100	99	98	93	91	66	46	39	22	A-6	CL

TABLE 3.—*Engineering*

Soil and location of sample	Parent material	Report number	Depth from surface	Shrinkage limit	Linear shrinkage	Shrinkage ratio	Mechanical analysis [1]		
							Percentage passing sieve—		
							1¾ in.	1¼ in.	⅞ in.
			In.	*Pct.*	*Pct.*				
14 mi. west on Ranch Road 2034 from junction with Texas Highway 208, then 2.4 mi. west on county road, then 500 ft. north, in cultivated field. Nonmodal, light textured.	Limestone bedrock and marls.	67-285-R	12-23	14	14. 2	1. 93	------	------	100
		67-286-R	29-48	21	5. 8	1. 74	------	100	97
Weymouth loam:									
9.5 mi. west from Robert Lee on Texas Highway 158, then 500 ft. north, in pasture. Modal.	Old alluvium or outwash.	67-287-R	5-17	17	6. 3	1. 81	------	100	99
		67-288-R	17-35	18	6. 0	1. 81	------	------	100
2 mi. northwest from Robert Lee on Texas Highway 208, then 1 mi. north on county road. Nonmodal, heavy textured.	Old alluvium or outwash.	67-294-R	5-16	17	5. 7	1. 78	------	------	------
		67-295-R	16-29	16	4. 7	1. 86	------	100	98

[1] Mechanical analysis according to AASHO Designation: T 88, "Mechanical Analysis of Soils," in "Standard Specifications for Highway Materials and Methods of Sampling and Testing," pt. 2, Ed. 10 (1970), published by American Association of State Highway Officials. Results obtained by this procedure may differ from results obtained by the soil survey procedure of the Soil Conservation Service (SCS). In the AASHO 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 more than 2 millimeters in diameter. In the SCS soil survey procedure, the fine material is analyzed by the pipette method and the material more than 2 millimeters in diameter is excluded from calculations of grain-size fractions. The mechanical analysis data used in this table are not suitable for use in establishing the textural class of a soil.

[2] Classifications made by SCS personnel.

TABLE 4.—*Estimated*

[An asterisk in the first column indicates that at least one mapping unit in the series is made up of two or more kinds of soil. The soils in for referring to other series. Symbol>

Soil series and map symbols	Hydrologic soil group	Depth to bedrock	Depth from surface	Classification		
				USDA texture	Unified	AASHO
		In.	*In.*			
Badland:						
Mapped only with Vernon soils. Properties too variable to be estimated.						
*Berda: BdC, BVB	B	>60	0-6	Loam	SC or CL	A-6, A-4
			6-60	Clay loam	SC or CL	A-6, A-4
For Vernon and Potter parts of BVB, see Vernon series and Potter series.						
Bronte: BrA, BrB	C	>60	0-5	Fine sandy loam	SM	A-2
			5-11	Sandy clay loam	SC	A-6
			11-24	Clay	CL	A-6
			24-54	Clay loam	CL	A-6, A-4
			54-72	Sandy clay loam	CL, SM-SC, ML-CL	A-6, A-4
			72-85	Sandy clay loam	ML-CL, SM-SC, CL	A-4 or A-6

test data—Continued

Mechanical analysis [1]—Continued									Liquid limit	Plasticity index	Classification [2]	
Percentage passing sieve—Continued						Percentage smaller than—					AASHO	Unified
½ in.	¾ in.	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.				
99	98	96	95	93	85	78	48	36	44	24	A–7–6	CL
96	92	86	80	73	66	63	48	30	32	14	A–6	CL
98	96	93	90	87	66	52	26	18	29	13	A–6	CL
99	98	94	89	84	68	58	30	20	29	12	A–6	CL
			100	99	66	51	23	18	28	12	A–6	CL
96	94	92	91	90	65	51	27	17	24	9	A–4	CL

engineering properties

such mapping units may have different properties and limitations, and for this reason it is necessary to follow carefully the instruction means more than; symbol < means less than]

Percentage passing sieve—				Permeability	Available water capacity	Reaction	Shrink-swell potential
No. 4 (4.7 mm.)	No. 10 (2.0 mm.)	No. 40 (0.42 mm.)	No. 200 (0.074 mm.)				
				In. per hr.	*In. per in. of soil*	*pH*	
85–100	85–100	75–95	40–55	0. 63–2. 0	0. 14–0. 17	7. 9–8. 4	Low.
85–100	85–100	75–95	40–60	0. 63–2. 0	0. 14–0. 17	7. 9–8. 4	Low.
95–100	95–100	90–100	25–35	2. 0–6. 30	0. 05–0. 07	6. 6–7. 8	Low.
95–100	95–100	90–100	35–50	0. 2–0. 63	0. 10–0. 12	6. 6–7. 8	Low.
94–100	95–100	90–100	60–70	0. 2–0. 63	0. 12–0. 16	6. 6–7. 8	Low.
80–100	78–100	75–100	51–70	0. 2–0. 63	0. 12–0. 16	6. 6–7. 8	Low.
80–98	75–97	75–95	47–70	0. 2–0. 63	0. 10–0. 12	6. 6–7. 8	Low.
85–100	85–100	80–95	45–70	0. 2–0. 63	0. 10–0. 12	6. 6–7. 8	Low.

TABLE 4.—*Estimated*

Soil series and map symbols	Hydrologic soil group	Depth to bedrock	Depth from surface	Classification		
				USDA texture	Unified	AASHO
		In.	*In.*			
Brownfield: BsC	A	>60	0–24	Fine sand and loamy fine sand	SM, SP–SM	A–2–4
			24–60	Sandy clay loam	SC	A–2 or A–6
			60–100	Fine sandy loam	SM	A–4, A–2
			100–161	Loamy fine sand and fine sandy loam.	SM, SP–SM	A–2
Clairemont: Ca	B	>60	0–60	Silt loam	CL, ML–CL	A–6
*Cobb: CbB, CfB, CfC2, ChC. For Cosh part of ChC, see Cosh series.	B	20–48	0–5	Fine sandy loam	SM	A–4, A–2
			5–29	Sandy clay loam	SC, CL	A–6
			29–46	Weakly to strongly cemented sandstone.		
Colorado: Cm	B	>60	0–60	Loam	ML–CL	A–4, A–6
*Cosh: CnB, CoD For Cobb part of CnB, see Cobb series; for Latom part of CoD, see Latom series.	C	12–20	0–5	Fine sandy loam	SM	A–4
			5–17	Sandy clay loam	SC, CL	A–6
			17–23	Weakly cemented sandstone.		
Cottonwood: CtB	C	4–8	0–4	Loam	ML, CL	A–4
			4–28	Chalky gypsum.		
Frio: Fr	B	>60	0–15	Silty clay loam	CL	A–6
			15–36	Clay	CL	A–6
			36–60	Clay loam	CL	A–6
Kimbrough: KMB	C	4–14	0–8	Loam	ML or CL	A–4
			8–28	Indurated caliche.		
Latom: Mapped only with Cosh soils.	D	4–20	0–8	Fine sandy loam	SM, SM–SC	A–2–4
			8–14	Cemented sandstone.		
Lipan: Lc	D	>60	0–70	Clay	CH	A–7–6
*Mereta: McA, McB, MeA, MeB For Nuvalde parts of MeA and MeB, see Nuvalde series.	C	14–20	0–8	Clay loam	CL	A–7–6
			8–16	Clay	CL	A–7–6
			16–36	Strongly cemented caliche and limy earth.		
Miles: MlB, MmA, MmB, MmC	B	>60	0–13	Fine sandy loam	SM	A–2–4, A–4
			13–94	Sandy clay loam	SC, CL	A–6, A–2–4
			94–156	Sandy clay loam	SC, SM–SC	A–6, A–2–4
Nuvalde: NuA, NuB	C	>60	0–10	Silty clay loam	CL	A–7
			10–34	Clay loam	CL	A–7, A–6
			34–48	Silty clay loam	CL	A–6, A–7
			48–60	Clay loam	CL	A–6
Olton: OcA, OcB	C	>60	0–8	Clay loam	CL	A–4, A–6
			8–35	Clay loam	CL	A–7, A–6
			35–65	Clay loam	CL	A–6
Potter: Mapped only with Berda and Vernon soils.	C	>60	0–8	Loam	ML or CL	A–4, A–6
			8–30	Soft caliche	SC	A–4
Spade: SpB	B	20–48	0–24	Fine sandy loam	SM	A–4
			24–46	Cemented sandstone.		
Stony steep land: SS. Properties too variable to be estimated.						
Tarrant: TAB, TAE	C	12–20	0–7	Clay	CH	A–7
			7–20	Limestone.		

engineering properties—Continued

Percentage passing sieve—				Permeability	Available water capacity	Reaction	Shrink-swell potential
No. 4 (4.7 mm.)	No. 10 (2.0 mm.)	No. 40 (0.42 mm.)	No. 200 (0.074 mm.)				
				In. per hr.	*In. per in. of soil*	*pH*	
100	100	95–100	10–20	6. 3–20. 0	0. 04–0. 07	6. 6–7. 8	Low.
100	100	95–100	30–45	0. 63–2. 0	0. 12–0. 16	6. 6–7. 8	Low.
100	100	95–100	30–45	2. 0–6. 3	0. 07–0. 09	6. 6–7. 8	Low.
100	100	55–75	15–25	2. 0–6. 3	0. 04–0. 08	6. 6–7. 8	Low.
100	100	100	85–98	0. 63–2. 0	0. 16–0. 19	7. 9–8. 4	Low.
100	100	75–90	25–50	2. 0–6. 3	0. 10–0. 14	6. 6–7. 3	Low.
94–100	90–99	89–98	40–60	0. 63–2. 0	0. 12–0. 16	6. 6–7. 9	Low.
100	100	85–95	60–75	0. 63–2. 0	0. 14–0. 18	7. 9–8. 4	Low
100	100	70–85	35–50	2. 0–6. 3	0. 10–0. 14	6. 6–7. 3	Low.
100	100	80–90	35–55	0. 63–2. 0	0. 12–0. 16	7. 4–7. 8	Low.
100	100	85–95	60–75	0. 63–2. 0	0. 12–0. 16	7. 9–8. 4	Low.
95–100	95–100	90–100	80–95	0. 2–0. 63	0. 15–0. 20	7. 9–8. 4	Moderate.
95–100	95–100	90–100	80–95	0. 2–0. 63	0. 15–0. 20	7. 9–8. 4	Moderate.
100	100	90–100	70–80	0. 2–0. 63	0. 15–0. 20	7. 9–8. 4	Moderate.
90–100	85–95	70–90	50–70	0. 63–2. 0	0. 12–0. 16	7. 4–7. 8	Low.
95–100	85–95	80–90	25–35	0. 06–0. 20	0. 10–0. 14	7. 9–8. 4	Low.
90–100	90–100	85–100	85–100	0. 06	0. 16–0. 20	7. 9–8. 4	High.
100	95–100	80–90	65–80	0. 20–0. 63	0. 15–0. 20	7. 9–8. 4	Moderate.
95–100	90–100	80–90	70–85	0. 20–0. 63	0. 15–0. 20	7. 9–8. 4	Moderate.
95–100	90–100	80–95	25–50	2. 0–6. 3	0. 11–0. 14	6. 6–7. 3	Low.
98–100	95–100	90–99	33–60	0. 63–2. 0	0. 13–0. 17	6. 6–8. 4	Low.
90–100	90–95	82–92	29–50	0. 63–2. 0	0. 12–0. 16	7. 9–8. 4	Low.
95–100	95–100	90–100	60–91	0. 63–2. 0	0. 15–0. 20	7. 9–8. 4	Moderate.
95–100	80–100	70–100	60–91	0. 63–2. 0	0. 15–0. 20	7. 9–8. 4	Moderate.
85–100	65–99	60–98	50–93	0. 63–2. 0	0. 10–0. 14	7. 9–8. 4	Low.
85–100	65–99	60–98	50–93	0. 63–2. 0	0. 10–0. 14	7. 9–8. 4	Low.
95–100	95–100	85–100	60–75	0. 63–2. 0	0. 15–0. 20	7. 4–7. 8	Moderate.
95–100	95–100	90–100	65–85	0. 2–0. 63	0. 15–0. 20	7. 4–8. 4	Moderate.
90–100	90–100	75–90	60–75	0. 2–0. 63	0. 10–0. 15	7. 9–8. 4	Moderate.
85–95	80–90	70–85	50–70	0. 63–2. 0	0. 14–0. 17	7. 9–8. 4	Low.
40–70	40–70	40–60	35–50	0. 63–2. 0	0. 14–0. 17	7. 9–8. 4	Low.
100	100	75–85	40–50	2. 0–6. 3	0. 12–0. 14	6. 6–8. 4	Low.
90–100	90–100	70–95	70–95	0. 2–0. 63	0. 15–0. 20	6. 6–8. 4	High.

TABLE 4.—*Estimated*

Soil series and map symbols	Hydrologic soil group	Depth to bedrock	Depth from surface	Classification		
				USDA texture	Unified	AASHO
		In.	*In.*			
Tivoli: TnC	A	>60	0–66	Fine sand	SP–SM	A–2
*Vernon: Vb For Badland part of Vb, see Badland.	D	>60	0–14 14–30	Clay Clay with clayey shale	CL, CH CL, CH	A–7–6, A–6 A–6, A–7–6
Weymouth: WeB, WeC	B	>60	0–5 5–17 17–50	Loam Clay loam Clay loam	ML or CL CL CL	A–6 A–6 A–4, A–6
Yahola: Ya	B	>60	0–13 13–36 36–62	Very fine sandy loam Fine sandy loam Sandy loam	SM SM SM or SC	A–4 A–4 A–4

TABLE 5.—*Interpretations of*

[An asterisk in the first column indicates that at least one mapping unit in the series is made up of two or more kinds of soil. The soils in for referring to

Soil series and map symbols	Suitability as source of—			Degree and cause of limitation for—			
	Topsoil	Road subgrade	Highway location	Foundations for low buildings	Septic tank filter fields	Sewage lagoons	Farm ponds Reservoir areas
Badland: Mapped only with Vernon soils; properties too variable to be interpreted.							
*Berda: BdC, BVB For Vernon and Potter parts of BVB, see Vernon series and Potter series.	Good	Fair: fair traffic-supporting capacity.	Moderate: fair traffic-supporting capacity.	None to slight	Moderate: moderate permeability; slope of 5 to 6 percent.	Moderate: moderate permeability; slope of 2 to 6 percent.	Moderate: moderate permeability.
Bronte: BrA, BrB	Poor where fine sandy loam is 4 to 6 inches thick; fair where it is 6 to 10 inches thick.	Fair: fair traffic-supporting capacity.	Moderate: fair traffic-supporting capacity.	None to slight	Severe: moderately slow permeability.	Slight where slope is 0 to 2 percent; moderate where it is 2 to 3 percent.	Moderate: moderately slow permeability.
Brownfield: BsC	Poor: fine sand texture.	Good	None to slight	None to slight	None to slight	Moderate: moderate permeability; slope of 2 to 5 percent.	Moderate: moderate permeability.
Clairemont: Ca	Good	Fair: fair traffic-supporting capacity.	Severe: flood hazard.	Severe: flood hazard.	Severe: flood hazard.	Moderate: moderate permeability.	Moderate: moderate permeability.
*Cobb: CbB, CfB, CfC2, ChC For Cosh part of ChC, see Cosh series.	Poor where fine sandy loam is 4 to 6 inches thick; fair where it is 6 to 9 inches thick.	Fair: fair traffic-supporting capacity.	Moderate: fair traffic-supporting capacity.	None to slight	Severe: bedrock at a depth of 20 to 48 inches.	Severe where bedrock is at a depth of 20 to 40 inches; moderate where it is at a depth of 40 to 48 inches; moderate permeability.	Severe where bedrock is at a depth of 20 to 36 inches; moderate where it is at a depth of 36 to 48 inches; moderate permeability.
Colorado: Cm	Good	Fair: fair traffic-supporting capacity.	Severe: flood hazard.	Severe: flood hazard.	Severe: flood hazard.	Moderate: moderate permeability.	Moderate: moderate permeability.
*Cosh: CnB, CoD For Cobb part of CnB, see Cobb series; for Latom part of CoD, see Latom series.	Poor where fine sandy loam is 4 to 6 inches thick; fair where it is 6 to 9 inches thick.	Fair: fair traffic-supporting capacity.	Severe: bedrock is at a depth of 12 to 20 inches.	Severe: bedrock is at a depth of 12 to 20 inches.	Severe: bedrock is at a depth of 12 to 20 inches.	Severe: bedrock is at a depth of 12 to 20 inches.	Severe: bedrock is at a depth of 12 to 20 inches.

engineering properties—Continued

Percentage passing sieve—				Permeability	Available water capacity	Reaction	Shrink-swell potential
No. 4 (4.7 mm.)	No. 10 (2.0 mm.)	No. 40 (0.42 mm.)	No. 200 (0.074 mm.)				
				In. per hr.	*In. per in. of soil*	*pH*	
100	95–100	80–90	5–12	6. 3 –20. 0	0. 05–0. 08	6. 6–8. 4	Low.
95–100	90–100	90–100	75–95	<0. 06	0. 16–0. 20	7. 9–8. 4	High.
90–100	90–100	90–100	70–90	<0. 06	0. 08–0. 12	7. 9–8. 4	High.
90–100	90–100	85–95	60–75	0. 63–2. 0	0. 15–0. 18	7. 9–8. 4	Low.
90–100	85–100	87–100	60–80	0. 63–2. 0	0. 15–0. 18	7. 9–8. 4	Low.
80–100	70–100	70–90	60–70	0. 63–2. 0	0. 15–0. 18	7. 9–8. 4	Low.
100	100	85–95	40–50	2. 0–6. 3	0. 10–0. 12	7. 9–8. 4	Low.
100	100	85–95	40–50	2. 0–6. 3	0. 10–0. 12	7. 9–8. 4	Low.
100	100	85–95	40–50	2. 0–6. 3	0. 10–0. 12	7. 9–8. 4	Low

engineering properties

such mapping units may have different properties and limitations, and for this reason it is necessary to follow carefully the instructions other series]

Degree and cause of limitation for—Continued					Soil features affecting—			Corrosivity class for uncoated steel, and contributing soil features
Farm ponds—Con.	Recreation facilities							
Embankments	Camp areas	Picnic areas	Playgrounds	Paths and trails	Irrigation	Terraces and diversions	Grassed waterways	
Moderate: fair resistance to piping and erosion.	None to slight	None to slight	Slight where slope is 1 to 2 percent; moderate where it is 2 to 6 percent.	None to slight	Slope	Slope; channels subject to siltation.	Slope; difficult to establish vegetation.	Moderate: clay loam texture.
Moderate: fair resistance to piping and erosion.	Moderate: moderately slow permeability.	None to slight	Moderate: moderately slow permeability; slope of 2 to 3 percent.	None to slight	Erosion hazard	Erosion hazard	Erosion hazard	Moderate: clay loam texture.
Severe: poor resistance to piping and erosion.	Severe: fine sand texture.	Severe: fine sand texture.	Severe: fine sand texture.	Severe: fine sand texture.	Sandy texture; erosion hazard.	Sandy texture; erosion hazard.	Sandy texture; erosion hazard.	Moderate: sandy clay loam texture.
Moderate: fair resistance to piping and erosion.	Severe: flood hazard.	Moderate: flood hazard.	Severe: flood hazard.	None to slight	Flood hazard	Flood hazard	Flood hazard	Low.
Moderate: fair resistance to piping and erosion.	None to slight where texture is fine sandy loam; moderate where it is loamy fine sand.	None to slight where texture is fine sandy loam; moderate where it is loamy fine sand.	Slight where slopes are 1 to 2 percent; moderate where they are 2 to 5 percent; loamy fine sand texture.	None to slight where texture is fine sandy loam; moderate where it is loamy fine sand.	Bedrock at a depth of 20 to 48 inches.	Bedrock at a depth of 20 to 48 inches.	Bedrock at a depth of 20 to 48 inches.	Low.
Moderate: fair resistance to piping and erosion.	Severe: flood hazard.	Moderate: flood hazard.	Severe: flood hazard.	Moderate: flood hazard.	Flood hazard	Flood hazard	Flood hazard	Low.
Severe: borrow material 12 to 20 inches thick.	None to slight	None to slight	Severe: bedrock is at a depth of 12 to 20 inches.	None to slight	Bedrock at a depth of 12 to 20 inches.	Bedrock at a depth of 12 to 20 inches.	Bedrock at a depth of 12 to 20 inches.	Low.

TABLE 5.—*Interpretations of*

Soil series and map symbols	Suitability as source of—		Degree and cause of limitation for—				
	Topsoil	Road subgrade	Highway location	Foundations for low buildings	Septic tank filter fields	Sewage lagoons	Farm ponds: Reservoir areas
Cottonwood: CtB	Poor where loam is 4 to 6 inches thick; fair where it is 6 to 8 inches thick.	Poor: material is 4 to 8 inches thick.	Severe: bedrock is at a depth of 4 to 8 inches.	Severe: bedrock is at a depth of 4 to 8 inches.	Severe: bedrock is at a depth of 4 to 8 inches.	Severe: bedrock is at a depth of 4 to 8 inches.	Severe: bedrock is at a depthof 4 to 8 inches.
Frio: Fr	Fair: silty clay loam texture.	Fair fair traffic-supporting capacity; moderate shrink-swell potential.	Severe: flood hazard.	Severe: flood hazard.	Severe: flood hazard.	Moderate: moderate permeability.	Moderate: moderate permeability.
Kimbrough: KMB	Poor where loam is 4 to 6 inches thick; fair where it is 6 to 14 inches.	Poor: indurated caliche at a depth of 4 to 14 inches.	Severe: indurated caliche at a depth of 4 to 14 inches.	Severe: indurated caliche at a depth of 4 to 14 inches.	Severe: indurated caliche at a depth of 4 to 14 inches.	Severe: indurated caliche at a depth of 4 to 14 inches.	Severe: indurated caliche at a depth of 4 to 14 inches.
Latom: Mapped only with Cosh soils.	Poor wnere fine sandy loam is 4 to 6 inches thick; fair where it is 6 to 20 inches thick.	Poor: material is 4 to 20 inches thick.	Severe: bedrock at a depth of 4 to 20 inches.	Severe: bedrock at a depth of 4 to 20 inches.	Severe: bedrock at a depth of 4 to 20 inches.	Severe: bedrock at a depth of 4 to 20 inches.	Severe: bedrock at a depth of 4 to 20 inches.
Lipan: Lc	Poor: clay texture.	Poor: poor traffic-supporting capacity; high shrink-swell potential.	Severe: poor traffic-supporting capacity; high shrink-swell potential.	Severe: high shrink-swell potential.	Severe: very slow permeability.	None to slight	None to slight
*Mereta: McA, McB, MeA, MeB. For Nuvalde parts of MeA and MeB, see Nuvalde series.	Fair: clay loam texture.	Fair: fair traffic-supporting capacity; moderate shrink-swell potential.	Moderate: fair traffic-supporting capacity; moderate shrink-swell potential.	Moderate: moderate shrink-swell potential.	Severe: moderately slow permeability.	Severe: 14 to 20 inches of strongly cemented caliche.	Severe: seepage
Miles: MIB, MmA, MmB, MmC	Poor where fine sandy loam is 5 to 6 inches thick; fair where it is 6 to 20 inches thick.	Fair: fair traffic-supporting capacity.	Moderate: fair traffic-supporting capacity.	None to slight	None to slight	Moderate: moderate permeability.	Moderate: moderate permeability.
Nuvalde: NuA, NuB	Fair: silty clay loam texture.	Fair: fair traffic-supporting capacity; moderate shrink-swell potential.	Moderate: fair traffic-supporting capacity; moderate shrink-swell potential.	Moderate: moderate shrink-swell potential.	Moderate: moderate permeability.	Moderate: moderate permeability.	Severe: seepage
Olton: OcA, OcB	Fair: clay loam texture.	Fair: fair traffic-supporting capacity; moderate shrink-swell potential.	Moderate: fair traffic-supporting capacity; moderate shrink-swell potential.	Moderate: moderate shrink-swell potential.	Moderate: moderately slow permeability.	Slight where slope is 0 to 2 percent; moderate where it is 2 to 3 percent.	Slight
Potter: Mapped only with Berda and Vernon soils.	Poor where loam is 4 to 6 inches thick; fair where it is 6 to 12 inches.	Fair: fair traffic-supporting capacity.	Moderate: fair traffic-supporting capacity.	Slight	Slight	Moderate: permeability.	Severe: calcareous, permeable substratum.
Spade: SpB	Good	Poor where material is 20 to 24 inches thick; fair where it is 24 to 48 inches.	Severe where bedrock is at a depth of 20 to 36 inches; none to slight where bedrock is at a depth of 36 to 48 inches.	None to slight	None to slight	Severe: moderately rapid permeability.	Severe: moderately rapid permeability.
Stony steep land: SS. Properties too variable to be interpreted.							
Tarrant: TAB, TAE	Poor: clay texture.	Poor: poor traffic-supporting capacity; high shrink-swell potential.	Severe: bedrock at a depth of 12 to 20 inches.	Severe: bedrock at a depth of 12 to 20 inches.	Severe: bedrock at a depth of 12 to 20 inches.	Severe: bedrock at a depth of 12 to 20 inches.	Severe: bedrock at a depth of 12 to 20 inches.

engineering properties—Continued

Degree and cause of limitation for—Continued					Soil features affecting—			Corrosivity class for uncoated steel, and contributing soil features
Farm ponds—Con.	Recreation facilities							
Embankments	Camp areas	Picnic areas	Playgrounds	Paths and trails	Irrigation	Terraces and diversions	Grassed waterways	
Severe: borrow material 4 to 8 inches thick.	None to slight	None to slight	Severe: bedrock at a depth of 4 to 8 inches.	None to slight	Very shallow soils.	Very shallow soils.	Very shallow soils.	High: conductivity.
Moderate: fair resistance to piping and erosion.	Severe: flood hazard.	Moderate: flood hazard; silty clay loam texture.	Moderate: flood hazard; silty clay loam texture.	Moderate: silty clay loam texture.	Flood hazard	Flood hazard	Flood hazard	High: conductivity.
Severe: borrow material 4 to 14 inches thick.	None to slight where slope is 1 to 8 percent; moderate where slope is 8 to 12 percent.	None to slight where slope is 1 to 8 percent; moderate where slope is 8 to 12 percent.	Severe: indurated caliche at a depth of 4 to 14 inches.	None to slight	Indurated caliche at a depth of 4 to 14 inches.	Indurated caliche at a depth of 4 to 14 inches.	Indurated caliche at a depth of 4 to 14 inches.	High: conductivity.
Severe: borrow material 4 to 20 inches thick.	None to slight where slopes are 1 to 8 percent; moderate where slopes are 8 to 10 percent.	None to slight where slopes are 1 to 8 percent; moderate where slopes are 8 to 10 percent.	Severe: bedrock at a depth of 4 to 20 inches.	None to slight	Bedrock at a depth of 4 to 20 inches.	Bedrock at a depth of 4 to 20 inches.	Bedrock at a depth of 4 to 20 inches.	Low.
Moderate: fair slope stability.	Severe: clay texture.	Severe: clay texture.	Severe: clay texture.	Severe: clay texture.	Very slow permeability.	Clayey texture	Clayey texture	High: clay texture.
Severe: 14 to 20 inches of material.	Moderate: clay loam texture.	Moderate: clay loam texture.	Moderate: clay loam texture.	Moderate: clay loam texture.	Caliche at a depth of 14 to 20 inches.	Caliche at a depth of 14 to 20 inches.	Caliche at a depth of 14 to 20 inches.	High: conductivity.
Moderate: fair resistance to piping and erosion.	None to slight where texture is fine sandy loam; moderate where it is loamy fine sand.	None to slight where texture is fine sandy loam; moderate where it is loamy fine sand.	None to slight where texture is fine sandy loam and slopes are 0 to 2 percent; moderate where texture is loamy fine sand and slopes are 2 to 5 percent.	None to slight where texture is sandy loam; moderate where it is loamy fine sand.	All features favorable.	All features favorable.	All features favorable.	Low.
Moderate: medium compressibility.	Moderate: silty clay loam texture.	Moderate: silty clay loam texture.	Moderate: silty clay loam texture.	Moderate: silty clay loam texture.	All features favorable.	All features favorable.	All features favorable.	High: conductivity.
Moderate: fair resistance to piping and erosion.	Moderate: clay loam texture; moderately slow permeability.	Moderate: clay loam texture.	Moderate: clay loam texture; moderately slow permeability.	Moderate: clay loam texture.	All features favorable.	All features favorable.	All features favorable.	Moderate: clay loam texture.
Moderate: poor resistance to piping and erosion.	None to slight	None to slight	Severe: soft and hard caliche at a depth of 4 to 12 inches.	None to slight	Caliche at a depth of 4 to 12 inches.	Caliche at a depth of 4 to 12 inches.	Caliche at a depth of 4 to 12 inches.	High: conductivity.
Severe where material is 20 to 24 inches thick; moderate where it is 24 to 48 inches thick; poor resistance to piping and erosion.	None to slight	None to slight	None to slight where slopes are 1 to 2 percent; moderate where slopes are 2 to 3 percent.	None to slight	Bedrock is at a depth of 20 to 48 inches.	Bedrock is at a depth of 20 to 48 inches.	Bedrock is at a depth of 20 to 48 inches.	Low.
Severe: borrow material 12 to 20 inches thick.	Severe: clay texture; 30 to 95 percent fragments on surface.	Severe: clay texture; 30 to 95 percent fragments on surface.	Severe: clay texture; 30 to 95 percent fragments on surface.	Severe: clay texture; 30 to 95 percent fragments on surface.	Bedrock at a depth of 12 to 20 inches.	Bedrock at a depth of 12 to 20 inches.	Bedrock at a depth of 12 to 20 inches.	High: clay texture.

TABLE 5.—*Interpretations of*

Soil series and map symbols	Suitability as source of—		Degree and cause of limitation for—				
	Topsoil	Road subgrade	Highway location	Foundations for low buildings	Septic tank filter fields	Sewage lagoons	Farm ponds: Reservoir areas
Tivoli: ThC	Poor: fine sand texture.	Good	None to slight	None to slight	Severe: inadequate filtration.	Severe: rapid permeability.	Severe: rapid permeability.
*Vernon: Vb. For Badland part of Vb, see Badland.	Poor: clay texture.	Poor: poor traffic-supporting capacity; high shrink-swell potential.	Severe: poor traffic-supporting capacity; high shrink-swell potential.	Severe: high shrink-swell potential.	Severe: very slow permeability.	Severe where slopes are 7 to 12 percent; moderate where slopes are 2 to 7 percent.	None to slight
Weymouth: WeB, WeC	Poor where loam is 5 to 6 inches thick; fair where it is 6 to 9 inches.	Fair: fair traffic-supporting capacity.	Moderate: fair traffic-supporting capacity.	None to slight	Moderate: moderate permeability.	Moderate: moderate permeability.	Moderate: moderate permeability.
Yahola: Ya	Good	Fair: fair traffic-supporting capacity.	Moderate: fair traffic-supporting capacity; flood hazard.	Severe: flood hazard.	Moderate: flood hazard.	Severe: moderately rapid permeability.	Severe: moderately rapid permeability.

the county are given in table 4, which shows ranges in soil characteristics based on the data in table 3 and on field observations.

Engineering test data

Table 3 contains the results of engineering tests performed by the Texas Highway Department on samples of selected soils in Coke County. The table shows the specific location where each sample was taken, the depth to which sampling was done, and the results of tests to determine particle-size distribution and other soil properties, described in the following paragraphs, that are significant in engineering.

Shrinkage limit is the percentage of moisture in the soil at the point where shrinkage of the soil material stops, although additional moisture is removed.

Lineal 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.

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 oven-dry.

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. If the moisture content is further increased, the material changes from plastic to liquid. The plastic limit is the moisture content at which the soil material changes from semisolid to plastic. The liquid limit is the moisture content at which it changes from plastic to liquid. 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.

Estimated engineering properties

Table 4 provides estimates of soil properties important in engineering. The estimates are based on field classification and descriptions, laboratory tests of selected representative samples, test data from comparable soils in adjacent areas, and detailed experience in working with the individual kind of soil in the survey area.

None of the soils in Coke County has a seasonal high water table, and none has a problem of salinity.

Hydrologic soil group.—Runoff potential is the basis for the hydrologic soil groups. The soils are classified on the basis of intake of water at the end of long-duration storms occurring after prior wetting and opportunity for swelling, and without the protective effects of vegetation.

There are four hydrologic groups; group A has the lowest runoff potential, and group D the highest.

Group A consists of soils that have high infiltration rates even when thoroughly wetted. These are chiefly deep, well-drained to excessively drained sands or gravels. These soils have a high rate of water transmission; that is, water passes through them readily.

Group B consists of soils that have moderate infiltration rates when thoroughly wetted. These are chiefly moderately deep to deep, moderately well drained and well drained, moderately fine textured to moderately coarse textured soils. The rate of water transmission is moderate.

Group C consists of soils that have slow infiltration rates when thoroughly wetted. These are chiefly moderately deep to deep, moderately well drained to well drained, moderately fine textured to moderately coarse textured soils. The rate of water transmission is moderate.

Group D consists of soils that have very slow infiltration rates when thoroughly wetted. These are chiefly clay

engineering properties—Continued

Degree and cause of limitation for—Continued					Soil features affecting—			Corrosivity class for uncoated steel, and contributing soil features
Farm ponds—Con.	Recreation facilities							
Embankments	Camp areas	Picnic areas	Playgrounds	Paths and trails	Irrigation	Terraces and diversions	Grassed waterways	
Severe: poor resistance to piping and erosion; poor stability.	Severe: fine sand texture.	Severe: fine sand texture.	Severe: fine sand texture.	Severe: fine sand texture.	Sandy texture; erosion hazard.	Sandy texture; erosion hazard.	Sandy texture; erosion hazard.	Low.
Moderate: fair slope stability.	Severe: clay texture; very slow permeability.	Severe: clay texture.	Severe: clay texture; very slow permeability.	Severe: clay texture.	Very slow permeability.	Clayey texture	Difficult to establish vegetation.	High: clay texture.
Moderate: fair resistance to piping and erosion.	None to slight	None to slight	None to slight where slopes are 1 to 2 percent; moderate where slopes are 2 to 5 percent.	None to slight	All features favorable.	All features favorable.	All features favorable.	Moderate: clay loam texture.
Moderate: poor resistance to piping and erosion.	None to slight	None to slight	Moderate: flood hazard.	None to slight	Flood hazard	Flood hazard	Flood hazard	Low.

soils that have a high swelling potential, soils that have a permanent high water table, soils that have a claypan or clay layer at or near the surface, and shallow soils over nearly impervious material. The rate of water transmission is very slow.

Depth to bedrock.—This column shows the distance from the surface of the soil to the upper surface of rock or other consolidated material.

Classification.—USDA texture is determined by the relative proportions of sand, silt, and clay particles in the soil material. "Sand," "silt," "clay," and some of the other terms used in the USDA textural classification are defined in the Glossary. The AASHO and Unified classifications are explained under the heading "Engineering classification systems."

Permeability.—As used in table 4, this term relates only to movement of water downward through undisturbed and uncompacted soil. It does not include lateral seepage. The estimates are based on the structure and porosity of the soil. Plowpans, surface crusts, and other properties resulting from use of the soils are not considered.

Available water capacity.—This is the amount of water a soil can hold and make available to plants. It is the numerical difference between the percentage of water at field capacity and the percentage of water at the time plants wilt.

Reaction.—Reaction is the degree of acidity or alkalinity of a soil, expressed as a pH value. The pH values and relative terms used to describe soil reaction are explained in the Glossary.

Shrink-swell potential.—This is an indication of the volume change to be expected of the soil material with changes in moisture content. Shrinking and swelling of soils cause much damage to building foundations, roads, and other structures. A high shrink-swell potential indicates hazards to structures.

Interpretations of engineering properties

Table 5 contains selected information useful to engineers and others who plan to use soil material in construction of highways, farm facilities, buildings, sewage disposal systems, and other uses. Detrimental or undesirable features are emphasized. The ratings and other interpretations in this table are based on estimated engineering properties of the soils in table 4; on available test data, including those in table 3; and on field experience. In general, the information applies to soil depths as indicated in table 4.

A column for sand and gravel was not included since most soils are not good sources. Brownfield and Tivoli soils may be a source of sand. Clairemont, Colorado, and Yahola soils may also be fair sources of sand.

A column for drainage was not included since drainage was not a problem on soils of the county. Temporary inundation may occur on Clairemont, Colorado, Frio, Lipan, and Yahola soils following periods of heavy rainfall.

Topsoil.—This designates a fertile soil or soil material, ordinarily rich in organic matter, used as a topdressing for lawns, gardens, roadbanks, and the like. The ratings indicate suitability for such use.

Road subgrade.—This is soil material on which a subbase is laid and a pavement built. Suitability ratings are based on the performance of the soil material as subgrade when excavated and compacted, or compacted and used in place. In general, sandy material that contains adequate binder is the best. No specific values should be inferred from the estimates of traffic-supporting capacity.

Highway location.—This is influenced by features of the undisturbed soil that affect construction and maintenance of highways. The soil features, favorable as well as unfavorable, are the principal ones that affect geographic location of highways. No specific values should

be inferred from the estimates of traffic-supporting capacity.

Foundations for low buildings.—These are affected chiefly by features of the undisturbed soil that influence its capacity to support low buildings that have normal foundation loads. Specific values of bearing capacity are not assigned.

Septic tank filter fields.—These are affected mainly by seepage loss, depth of the water table, and susceptibility to flooding. The degree of limitations and principal reasons for assigning moderate or severe limitations are given.

Sewage lagoons.—These are influenced chiefly by soil features such as seepage loss, depth of the water table, and slope. The degree of limitation and principal reasons for assigning moderate or severe limitations are given.

Farm pond reservoir areas.—These areas are affected mainly by seepage loss of water, and the soil features are those that influence such seepage.

Farm pond embankments.—These serve as dams. Features of the soil and the underlying material, such as resistance to piping and erosion, stability of slope, and compressibility, are those important to the use of soils for constructing embankments.

Camp areas.—Campgrounds for overnight or week-long camping need to be on soils that do not require hard surfacing for parking, and that have no hard layers to interfere with setting tent pegs. Load-bearing strength of the natural soil as influenced by soil texture and soil moisture are particularly important criteria in this rating. Flooding, dust or muddiness, slope, and stoniness are other criteria used in rating the soils for camp areas. Grass-covered, tree-shaded grounds are most desirable for campsites.

Picnic areas.—These are defined as tree-shaded, park-type areas that are complete with tables and cooking grills and readily accessible by automobile. It is assumed that vehicular traffic will be confined to access roads. Flooding, slope, texture of the surface, and amount of coarse fragments on the surface are considered in making the evaluation.

Playgrounds.—These are natural soil areas to be used intensively as playing grounds for sports such as baseball, football, volleyball, soccer, and other similar organized games. Subject to intensive foot traffic, these areas need to be nearly level, have good drainage, and have a firm surface free of rock outcrops and stones.

Paths and trails.—These are defined as footpaths, hiking trails, or bridlepaths along which the seeker of recreation has the opportunity to enjoy the beauties of nature. In making the rating, it is assumed that only enough natural vegetation is removed to provide a pathway, and that there are few if any excavations or fills along the pathway. Since a grass cover cannot be maintained in the pathway, muddiness or dustiness are particularly important soil features considered in the rating. Other important soil features include stony or gravelly surfaces, steep slopes, and flooding. These trafficways need to be designed and maintained to minimize erosion.

Irrigation.—The soil features that affect irrigation include slope, permeability, thickness of the soil, and the hazard of potential floods that might wash out irrigation borders and tabs.

Terraces and diversions.—The soil features that affect these structures include cracking, thickness of the soil, and slope. These structures are not generally used on some soils.

Waterways.—These are natural or shaped watercourses, covered with a close-growing grass, that are used to carry off excess water from the terrace system. Soil features that affect waterways include cracking, water-holding capacity, soil structure, thickness of the soil, slope, and erodibility.

Corrosivity.—Soils are rated at a depth of 4 feet. Soil properties that affect the corrosion of buried uncoated steel pipe include drainage, texture, acidity, resistivity, and conductivity. Properties that affect corrosion of concrete include texture, reaction, and the amount of sodium, magnesium sulphate, or sodium chloride present in the soil. A column for concrete was not included, since all the soils of Coke County are rated low.

Formation and Classification of the Soils

The first part of this section is a description of the five factors of soil formation and how they have affected the formation of the soils in Coke County. The second part describes the classification of soils and their placement in the nationwide soil classification system.

Factors of Soil Formation

The characteristics of the soil at any given point are determined mainly by five factors: the physical and mineralogical composition of the parent materials; the climate under which the soil material has accumulated and existed since accumulation; the plant and animal life on and in the soil; the relief, or lay of the land; and the length of time the forces of soil development have acted on the soil material.

Climate and vegetation are the active factors of soil genesis. They act on the parent material that has accumulated through the weathering of rocks and bring about the development of genetically related horizons. The effects of climate and vegetation are conditioned by relief. The parent material also affects the kind of profile that forms. Finally, time is needed for the changing of the parent material into a soil profile. Usually a long time is required for the development of distinct horizons.

The factors of soil genesis are so closely interrelated in their effects on the soil that few generalizations can be made regarding the effect of any one unless conditions are specified for the other four. Many of the processes of soil development are unknown.

Parent material

Parent material is the consolidated and unconsolidated mass from which a soil is formed. It determines the limits of the chemical and mineralogical composition of the soils. If the parent material contains much clay, the resulting soils also contain much clay. Sandy material generally gives rise to sandy soils. The calcareous, loamy uplands provide materials for calcareous, medium-textured alluvial soils.

The soils of Coke County formed in five kinds of parent material: residuum derived from Permian shale, sandstone, and gypsum; sandy to clayey outwash or old alluvium; recent alluvium; recent eolian material; and material weathered from limestone.

Soils that formed in material weathered from Permian shale are the Weymouth and Vernon soils. Those that formed in material weathered from Permian sandstone are the Cobb, Cosh, and Latom soils; and those that formed in the gypsum material are the Cottonwood soils.

The soils that formed in outwash materials of varying thickness and texture are the most common in the county. The finer textured outwash materials were deposited by slow-moving waters. They have a smooth topography. The Olton and Nuvalde soils formed in these materials.

The eolian material occurs mostly along the Colorado River. This material was deposited in areas paralleling the river. Soils such as Tivoli formed in this material.

Soils that formed in recent alluvium are the Colorado, Yahola, Clairemont, and Frio soils.

Soils that formed in material weathered from limestone are the Tarrant soils.

Climate

The warm subtropical climate of Coke County has promoted moderately rapid soil development. Climate is uniform throughout the county, but its effect is modified locally by runoff. Because much of the rain falls as short, heavy showers, much of the total precipitation is lost as runoff. Water seldom penetrates the deep soils below the root zone, and lime and other minerals have not been leached out of the soils. High summer temperatures have retarded the accumulation of organic matter.

Living organisms

Plants, animals, insects, bacteria, fungi, and even men have contributed to the development of soils. Gains or losses of organic matter, nitrogen, and plant nutrients, and changes in soil structure and porosity are some of the changes caused by living organisms.

Plants have played a major role in soil development in Coke County. The mid and short grasses on the prairies have added much organic matter to the soils. Roots of grasses and trees have decayed and left pores and holes that serve as passageways for water. Tree roots have loosened the stones beneath the soil surface and have made it possible for grass roots to penetrate to greater depths.

Earthworms, insects, rodents, and other animals have worked and mixed the soils to a great degree. Worms hasten the decay of organic matter, and worm casts improve the soil structure to aid in the movement of water and the growth of plant roots. Fungi, bacteria, and other micro-organisms help to decay organic matter and improve fertility.

Tillage and other uses of the soils by man have affected soil development. Man has depleted many soils of fertility, destroyed tilth, sped up erosion, and compacted the soils and slowed their intake of water. The misuse of native grassland has changed the kinds and amounts of plants in a given area, and these plants further affect the character of the soils.

Topography

Topography, or relief, affects soil formation through its influence on drainage, erosion, soil temperature, and plant cover. The topography of Coke County ranges from nearly level to very steep.

The degree of profile development depends on the amount and depth of penetration of moisture if other factors of soil formation are equal. On steep slopes runoff is rapid, little water enters the soil, and soil formation proceeds slowly. The rate of development of soils on steep slopes is often equalled or exceeded by the rate of erosion, and soils have little chance to develop deep profiles. In nearly level to gently sloping areas that receive runoff from other soils, the soil material accumulates and moisture penetrates to greater depths.

Time

Soil formation requires time, usually a long time. Many thousands of years may be required for well-defined horizons to develop. The differences in length of time that parent materials have been in place are reflected in the degree of development of the soil profile.

The soils in Coke County range from soils that have little profile development to soils that have well-defined horizons. Soils of the Colorado series are an example of soils that are poorly developed. Miles soils are an example of those that have well-developed horizons. Miles soils have developed distinct A and B horizons that bear little resemblance to the original parent material.

Classification of the Soils

Soils are classified so that we may more easily remember their significant characteristics; assemble knowledge about them; see their relationships to one another and to the whole environment; and develop principles that help us understand their behavior and 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 or parcels of land.

The current system of classification defines classes in terms of observable or measurable properties of soils. The properties chosen are primarily those that permit grouping of soils that are similar in genesis. Genesis, or mode of soil origin, does not appear in the definitions of the classes. The classification is designed to accommodate all soils. It employs a unique nomenclature that is both connotative and distinctive.

The system of soil classification used in this survey is that adapted as standard for all soil surveys in the United States, effective January 1, 1965.[7] The classification system has six categories. Beginning with the most inclusive, the categories are the order, suborder, great group, subgroup, family, and series. The categories are explained in the following paragraphs. The classification of the soil series in Coke County by families, subgroups, and orders is shown in table 6.

[7] UNITED STATES DEPARTMENT OF AGRICULTURE, soil classification, a comprehensive system, 7th approximation. Soil Survey Staff, Soil Conservation Service. 265 pp., illus. 1960. [Supplements issued in March 1967 and September 1968]

TABLE 6.—*Classification of soil series by higher categories*

Series	Family	Subgroup	Order
Berda	Fine-loamy, mixed, thermic	Typic Ustochrepts	Inceptisols.
Bronte	Fine, mixed, thermic	Udic Haplustalfs	Alfisols.
Brownfield	Loamy, mixed, thermic	Airenic Aridic Paleustalfs	Alfisols.
Clairemont	Fine-silty, mixed, (calcareous), thermic	Typic Ustifluvents	Entisols.
Cobb [1]	Fine-loamy, mixed, thermic	Udic Haplustalfs	Alfisols.
Colorado	Fine-loamy, mixed, (calcareous), thermic	Typic Ustifluvents	Entisols.
Cosh [2]	Loamy, mixed, thermic, shallow	Typic Rhodustalfs	Alfisols.
Cottonwood	Loamy, carbonatic, thermic, shallow	Ustic Torriothents	Entisols.
Frio	Fine, mixed, thermic	Cumulic Haplustolls	Mollisols.
Kimbrough	Loamy, mixed, thermic, shallow	Petrocalcic Calciustolls	Mollisols.
Latom	Loamy, mixed, (calcareous), thermic	Lithic Ustic Torriorthents	Entisols.
Lipan	Fine, montmorillonitic, thermic	Entic Pellusterts	Vertisols.
Mereta	Clayey, mixed, thermic, shallow	Petrocalcic Calciustolls	Mollisols.
Miles	Fine-loamy, mixed, thermic	Udic Paleustalfs	Alfisols.
Nuvalde	Fine, mixed, thermic	Typic Calciustolls	Mollisols.
Olton	Fine, mixed, thermic	Aridic Paleustolls	Mollisols.
Potter	Loamy, carbonatic, thermic, shallow	Ustollic Calciorthids	Aridisols.
Spade	Coarse-loamy, mixed, thermic	Typic Ustochrepts	Inceptisols.
Tarrant	Clayey-skeletal, montmorillonitic, thermic	Lithic Haplustolls	Mollisols.
Tivoli	Mixed, thermic	Typic Ustipsamments	Entisols.
Vernon	Fine, mixed, thermic	Typic Ustochrepts	Inceptisols.
Weymouth	Fine-loamy, mixed, thermic	Typic Ustochrepts	Inceptisols.
Yahola	Coarse-loamy, mixed, (calcareous), thermic	Typic Ustifluvents	Entisols.

[1] Soils named in this series in Coke County are taxadjuncts. They are outside the defined range for the series in that they have soft secondary carbonates within 28 inches of the surface.

[2] Soils named in this series in Coke County are taxadjuncts. They are outside the defined range for the series in that the color of the Bt horizon has a hue of 5YR.

ORDER.—Soils are grouped into orders according to properties that seem to have resulted from the same processes acting to about the same degree on the parent material. Ten soil orders are recognized in the current system: Alfisols, Aridisols, Entisols, Histosols, Inceptisols, Mollisols, Oxisols, Spodosols, Ultisols, and Vertisols. The properties used to differentiate the soil orders are those that tend to give broad climatic groupings of soils. Two exceptions, Entisols and Histosols, occur in many different climates. Of the ten soil orders, six are represented in Coke County: Alfisols, Aridisols, Entisols, Inceptisols, Mollisols, and Vertisols.

SUBORDER.—Each order is divided into suborders, primarily on the basis of soil characteristics that indicate genetic similarity. The suborders have a narrower climatic range than the order. The criteria for suborders reflect either the presence or absence of waterlogging or soil differences resulting from climate or vegetation.

GREAT GROUP.—Each suborder is divided into great groups on the basis of uniformity in kind and sequence of genetic horizons. The great group is not shown in table 6, because the name of the great group is the same as the last word in the name of the subgroup.

SUBGROUP.—Each great group is divided into subgroups, one representing the central (typic) concept of the group, and other groups, called intergrades, that have properties of one great group but also one or more properties of another great group.

FAMILY.—Families are established within subgroups, primarily on the basis of properties important to plant growth. Some of these properties are texture, mineralogy, reaction, soil temperature, permeability, consistence, and thickness of horizons.

SERIES.—The series is a group of soils that have major horizons that, except for texture of the surface layer, are similar in important characteristics and in arrangement in the profile.

Climate [3]

The climate of Coke County is subtropical, characterized by dry winters and hot, humid summers. It is also continental in that it is marked by a wide range of annual temperature extremes.

The precipitation data in table 7 were derived from records kept at Robert Lee. No temperature records actually kept in Coke County are available, but the temperature data in table 7, derived from records kept at San Angelo, Tom Green County, are considered typical for Coke County also. The rainfall is typical of the Southern Rolling Red Plains and Edwards Plateau, where most precipitation occurs during thunderstorm activity. Mean total annual rainfall is 17.88 inches. Rainfall amounts vary considerably, both spatially and in time. Prolonged drought periods are common. Since 1948 the wettest year of record is 1961, when a total of 31.40 inches fell at Robert Lee; the year 1956 is the driest of record with only 9.22 inches. Precipitation in exceptionally wet years is often in the form of heavy downpours that produce rapid runoff and erosion of the soil. Heavy showers in June, July, and September contributed to the large 1961 total. In the same year there was no precipitation at Robert Lee in either April or December and only 0.17 inch fell in August. In an average year, 79 percent of the annual precipitation occurs during the warm season, April through October. A primary rainfall maximum occurs in May, and a secondary maximum occurs in October.

[3] By ROBERT ORTON, State climatologist, National Weather Service, United States Department of Commerce.

In the period November through March, precipitation is most often in the form of light general rain or drizzle. Snowfall is an insignificant source of moisture in Coke County. In a 9-year period, the only recorded snowfall was a trace during the month of February. During the cold season, frequent surges of dry polar air close off the Gulf of Mexico as a source of moisture and cause a comparatively dry period. In April moist, tropical maritime air from the Gulf of Mexico invades the area more frequently to clash with polar fronts moving down from the north. The result is an increase in thunderstorm activity and precipitation. In midsummer polar fronts retreat far to the north, out of Texas; and though the tropical maritime air is heavily laden with moisture, the flow is anticyclonic (clockwise), and rainfall decreases. Polar fronts again push into the Coke County area in September and October while tropical maritime air is still over the area in abundance. The result is the secondary rainfall maximum that occurs early in fall.

Polar air masses and occasional arctic air masses bring sudden drops in temperature in the period November through March, but periods of cold weather are short. Even in January fair, mild weather is frequent. Hot daytime temperatures prevail for a long period in summer, but these are broken by thunderstorm activity an average of about five times a month. Rapid cooling occurs after nightfall.

Coke County receives annually about 71 percent of the total possible sunshine. Seasonally, this percentage varies from about 65 percent in winter to 80 percent in summer.

The prevailing wind direction is southwesterly in the period November through March and southerly from April through October. Mean annual relative humidity is 76 percent at 6:00 a.m., Central Standard Time; 47 percent at noon; 42 percent at 6:00 p.m.; and 65 percent at midnight. Mean annual class A pan evaporation is estimated at 102 inches, of which 66 percent occurs in the period May through October. Mean annual lake evaporation is estimated at 70 to 72 inches.

Hail or locally damaging winds may accompany any thunderstorm; however, such severe storms usually occur late in spring or early in summer, and they are comparatively infrequent. Thunderstorms occur on an average of 36 days annually.

The average length of the warm season (freeze-free period) is 226 days, but this period varies considerably from year to year. The average number of days between the last occurrence of 28°F. in spring and the first occurrence of 28° in fall is 250 days. The average date of the last occurrence of 32° in spring is March 31. The average date of the first occurrence of 32° in fall is November 12. As an average, in 1 year out of 5 a freeze will occur before November 1, and in 1 year out of 5 a freeze will occur after April 10.

Settlement and Population

Roving bands of Indians of the "Lipan Apache" tribes once inhabited the area now known as Coke County. These Indians were not warlike, but they did raid nearby settlers occasionally in search of horses and food. The settlers began to come into the area after the establishment of Fort Chadbourne in 1852, but the fort was abandoned in 1867. Settlement was slow, and in 1876 no more than 100 people lived in the area that is now Coke County. Coke County was organized in 1889 and was named for Richard Coke, former Texas Governor and U.S. Senator. The first county seat was Hayrick, at the foot of the mountain which bears the same name. The county seat was moved to Robert Lee in 1891. In 1890 the population of the county was 2,059. The first railroad came into Coke County in 1908, and the first automobiles in the county were 1908 models. By 1910 the population had increased to 6,412. Since that time the population has generally declined. In 1960 it was 3,589. The 1967 estimated population of the towns in the county was Robert Lee, 1,050; Bronte, 981; Silver, 70; Sanco, 40; and Tennyson, 40.

Glossary

Aggregate, soil. Many fine particles held together in a single mass or cluster. Natural soil aggregates such as crumbs, blocks, or prisms are called peds. Clods are aggregates produced by tillage or logging.

Alluvium. Soil material that has been deposited on land by streams.

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 as a result of 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.

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 with 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.

Contour farming. Plowing, cultivating, planting, and harvesting in rows that are at a right angle to the natural direction of the slope or that are parallel to terrace grade.

Dryfarming. Production of crops that require some tillage in a subhumid or semiarid region, without irrigation. Usually involves periods of fallow, during which moisture accumulates in the soil.

Eolian soil material. Earthy parent material accumulated through wind action; commonly refers to sandy material in dunes or to loess in blankets on the surface.

TABLE 7.—*Temperature*

[Temperature data from records at San Angelo, Tom Green County, elevation 1,963 feet. Precipitation

Month	Temperature				Precipitation
	Mean daily maximum [1]	Mean monthly maximum [2]	Mean daily minimum [1]	Mean monthly minimum [2]	Mean total
	°F.	°F.	°F.	°F.	In.
January	59. 4	79. 4	34. 3	14. 2	0. 79
February	62. 7	82. 6	38. 3	19. 6	. 84
March	70. 2	87. 4	43. 7	24. 2	. 63
April	80. 6	93. 9	53. 6	36. 0	1. 92
May	86. 5	99. 5	62. 1	46. 3	2. 96
June	94. 4	102. 2	70. 5	59. 1	1. 93
July	96. 9	102. 9	72. 7	64. 3	1. 59
August	97. 5	103. 7	72. 6	62. 6	1. 13
September	90. 4	99. 1	66. 1	51. 1	2. 07
October	81. 3	92. 2	55. 3	37. 6	2. 48
November	67. 6	84. 5	41. 9	25. 7	. 94
December	60. 2	78. 3	35. 2	19. 7	. 60
Year	79. 0	92. 1	53. 9	38. 4	17. 88

[1] Climatological Standard Normals 1931–1960.
[2] For the period 1941–1970.
[3] For the period 1948–1967.

Forb. Any herbaceous plant of the western ranges that is neither a grass nor a sedge.

Gravel. Rounded or angular rock fragments, not prominently flattened and up to 3 inches in diameter.

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:

O horizon.—The layer of organic matter on the surface of a mineral soil. This layer consists of decaying plant residues.

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 it is marked by the accumulation of humus. The horizon may have lost one or more of the following: 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. The 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 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 the A or B horizon.

Infiltration. The downward entry of water into the immediate surface of a soil, as contrasted with percolation, which is movement of water through layers of soil material.

Irrigation. Application of water to soils to assist in production of crops.

Leaching. The removal of soluble material from soils or other material by percolating water.

Marl. An earthy, unconsolidated deposit formed in fresh-water lakes that consists chiefly of calcium carbonate mixed with various amounts of clay or other impurities.

Overgrazing. Grazing so heavy as to impair future forage production and to cause deterioration of plants or soil or both.

Permeability. The quality of a soil horizon that enables water or air to move through it. Terms used to describe permeability are as follows: *very slow, slow, moderately slow, moderate, moderately rapid, rapid,* and *very rapid.*

Profile, soil. A vertical section of the soil through all its horizons and extending into the parent material.

Range. Land that, for the most part, produces native plants suitable for grazing by livestock; includes land on which there are some forest trees.

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. An acid, or "sour" soil is one that gives an acid reaction. In words, the degrees of acidity or alkalinity are expressed thus:

Extremely acid	Below 4.5
Very strongly acid	4.5 to 5.0
Strongly acid	5.1 to 5.5
Medium acid	5.6 to 6.0
Slightly acid	6.1 to 6.5
Neutral	6.6 to 7.3
Mildly alkaline	7.4 to 7.8
Moderately alkaline	7.9 to 8.4
Strongly alkaline	8.5 to 9.0
Very strongly alkaline	9.1 and higher.

Relief. The elevations or inequalities of a land surface, considered collectively.

Sand. As a soil separate, rock or mineral fragments ranging from 0.05 to 2.0 millimeters in diameter. Most sand grains consist of quartz, but sand may be of any mineral composition. As a textural class, soil that is 85 percent or more sand and not more than 10 percent clay.

Silt. As a soil separate, mineral particles that range in diameter from the upper limit of clay (0.002 millimeter) to the lower limit of very fine sand (0.05 millimeter). As a textural class, soil that is 80 percent or more silt and less than 12 percent clay.

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);

ana precipitation data

data from records at Robert Lee, Coke County, elevation 1,780 feet. For length of record, see footnotes]

Precipitation [3]—Continued										
Probability of receiving specified amounts during month								Mean number of days with— [4]		
0 in. or trace	0.5 in. or more	1 in. or more	2 in. or more	3 in. or more	4 in. or more	5 in. or more	6 in. or more	0.1 in. or more	0.5 in. or more	1 in. or more
Pct.	*Pct.*	*Pct.*	*Pct.*	*Pct.*	*Pct.*	*Pct.*	*Pct.*			
5	55	30	10	5	1	1	1	2	1	(5)
5	55	35	10	4	1	1	1	2	1	(5)
1	50	28	8	4	1	1	1	2	(5)	(5)
1	80	70	40	15	7	4	1	4	1	(5)
1	95	90	70	50	30	20	10	4	2	1
1	78	60	40	20	14	8	5	3	2	1
5	75	58	38	20	11	10	5	3	1	(5)
5	70	50	30	12	7	4	2	2	1	(5)
5	78	60	40	30	20	10	10	4	2	(5)
4	80	80	40	27	15	10	5	4	2	1
10	60	35	14	7	2	1	1	2	1	(5)
5	60	35	14	5	2	1	1	2	1	0
								34	15	3

[4] Average length of record 12 years.
[5] Less than half a day.

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 0.2 millimeter); III (0.2 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 a 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.

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 (1) *single grain* (each grain by itself as in dune sand) or (2) *massive*) (the particles adhering together without any regular cleavage, as in many claypans and hardpans.

Taxadjunct. A soil that does not fit in any already established series, but that differs from some series in ways too small to be of significance in interpreting its usefulness or behavior. Such a soil is designated a taxadjunct to the series for which it is named.

Texture, soil. The relative proportions of sand, silt, and clay particles in a mass of soil. The basic textural classes, in order of increasing proportions 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."

Tilth. The conditions 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.

☆ U.S. GOVERNMENT PRINTING OFFICE 1974—555-444/10

Accessibility Statement

This document is not accessible by screen-reader software. The Natural Resources Conservation Service (NRCS) is committed to making its information accessible to all of its customers and employees. If you are experiencing accessibility issues and need assistance, please contact our Helpdesk by phone at (800) 457–3642 or by e-mail at ServiceDesk-FTC@ftc.usda.gov. For assistance with publications that include maps, graphs, or similar forms of information, you may also wish to contact our State or local office. You can locate the correct office and phone number at http://offices.sc.egov.usda.gov/locator/app.

The U.S. Department of Agriculture (USDA) prohibits discrimination against its customers. If you believe you experienced discrimination when obtaining services from USDA, participating in a USDA program, or participating in a program that receives financial assistance from USDA, you may file a complaint with USDA. Information about how to file a discrimination complaint is available from the Office of the Assistant Secretary for Civil Rights. USDA prohibits discrimination in all its programs and activities on the basis of race, color, national origin, age, disability, and where applicable, sex (including gender identity and expression), marital status, familial status, parental status, religion, sexual orientation, political beliefs, genetic information, reprisal, or because all or part of an individual's income is derived from any public assistance program. (Not all prohibited bases apply to all programs.)

To file a complaint of discrimination, complete, sign, and mail a program discrimination complaint form, available at any USDA office location or online at www.ascr.usda.gov, or write to:

USDA
Office of the Assistant Secretary for Civil Rights
1400 Independence Avenue, S.W.
Washington, DC 20250-9410

Or call toll free at (866) 632-9992 (voice) to obtain additional information, the appropriate office or to request documents. Individuals who are deaf, hard of hearing, or have speech disabilities may contact USDA through the Federal Relay service at (800) 877-8339 or (800) 845-6136 (in Spanish). USDA is an equal opportunity provider, employer, and lender.

Persons with disabilities who require alternative means for communication of program information (e.g., Braille, large print, audiotape, etc.) should contact USDA's TARGET Center at (202) 720-2600 (voice and TDD).