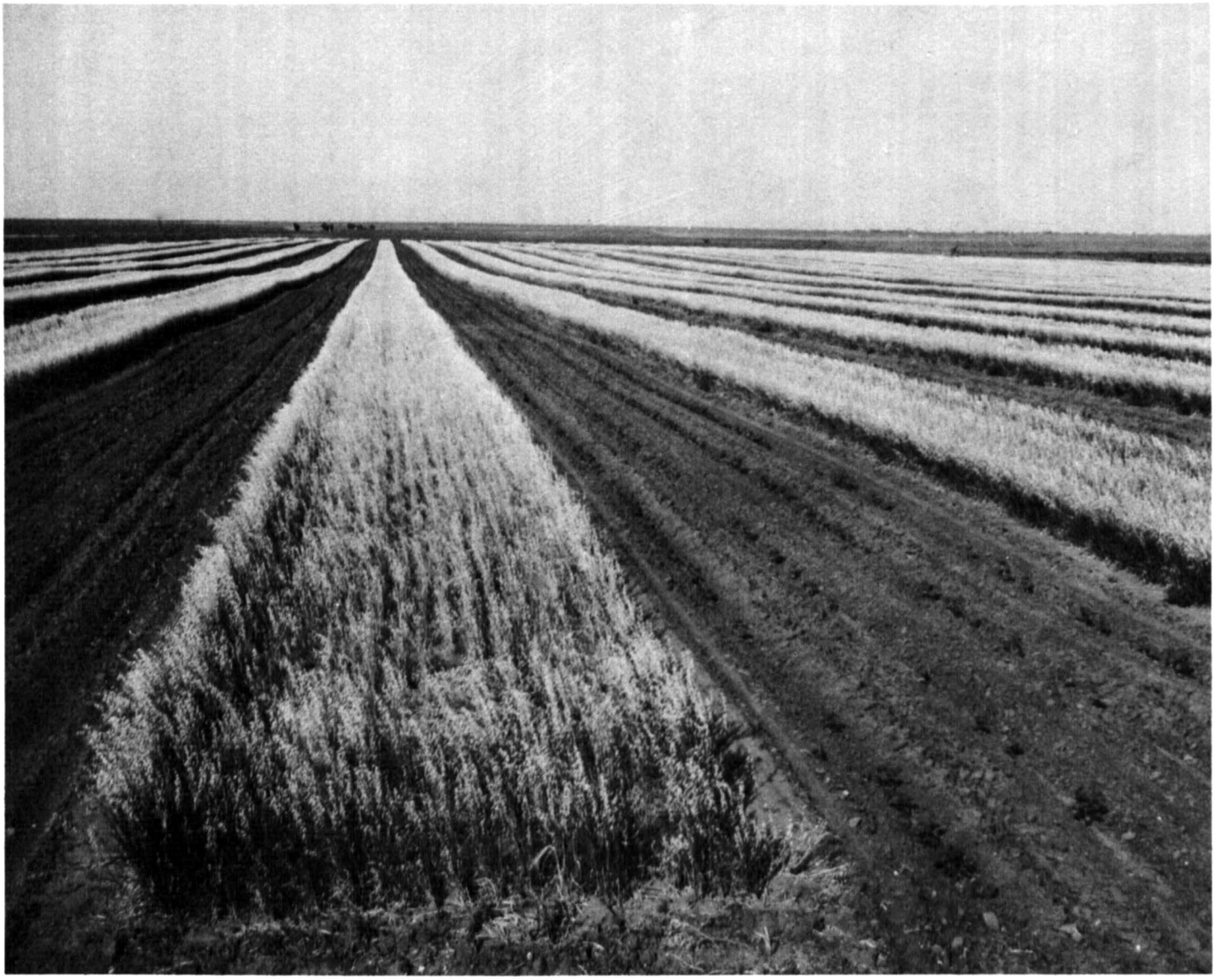
SOIL SURVEY OF
Martin County, Texas



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

Issued December 1974

Major fieldwork for this soil survey was done in the period 1964–68. Soil names and descriptions were approved in 1968. Unless otherwise indicated, statements in the 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 Mustang Soil and Water Conservation District.

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, United States Department of Agriculture, Washington, D.C. 20250.

HOW TO USE THIS SOIL SURVEY

THIS SOIL SURVEY contains information that can be applied in managing farms, ranches, and woodlands; 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 Martin County are shown on the detailed map at the back of this publication. This map consists of many sheets that are made from aerial photographs. Each sheet is numbered to correspond with a number on the Index to Map Sheets.

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

Finding and Using Information

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

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

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

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

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

Community planners and others can read about soil properties that affect the choice of sites for nonindustrial buildings and for recreation areas in the section "Town and Country Planning."

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

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

Newcomers in Martin County will be especially interested in the section "General Soil Map," where broad patterns of soils are described. They may also be interested in the information about the county given in the section "General Nature of the County."

Cover: **Strips of small grain ready for harvesting alternated with strips of cotton. The soil is an Amarillo fine sandy loam.**

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SOIL SURVEY OF MARTIN COUNTY, TEXAS

BY HERBERT R. STONER AND MARVIN L. DIXON, SOIL CONSERVATION SERVICE

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

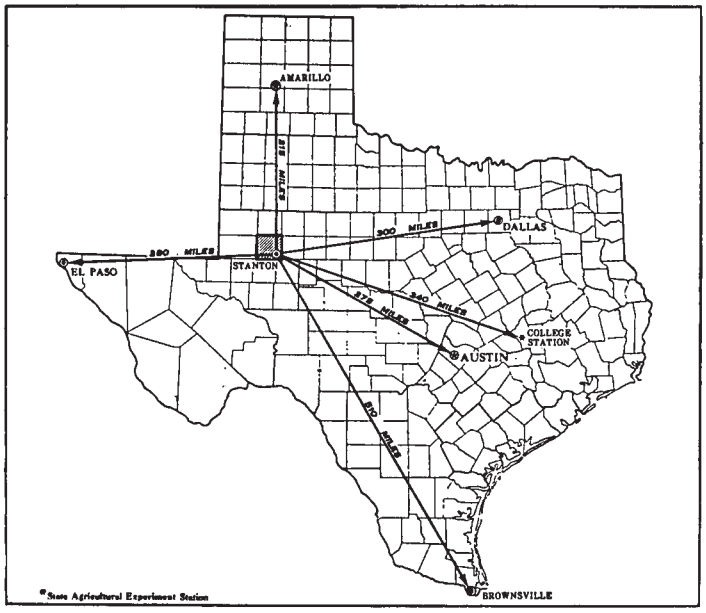

Figure 1.—**Location of Martin County in Texas.**

MARTIN COUNTY is in the southern part of the High Plains in the Great Plains. The total land area is 583,040 acres or 911 square miles. The county is about 30 miles square. The location of Martin County in Texas is shown in Figure 1.

The area is generally a nearly level to undulating plain that slopes upward from the southeast to northwest. The elevation rises from about 2,500 feet in the southeast corner to about 3,000 feet above sea level in the northwest corner.

This is a farming county. About 210,000 acres are cultivated; of this area about 168,000 acres are dry farmed, and about 42,000 acres are irrigated. Cotton and grain sorghum are the main crops. Other crops grown are alfalfa, forage sorghums, and small grain. Much of the cropland is subject to soil blowing and water erosion. There are periods of drought similar to those in other areas in the Southern Great Plains.

How This Survey Was Made

Soil scientists made this survey to learn what kinds of soil are in Martin 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. Amarillo and Portales, for example, are the names of two soil series. All the soils in the United States having the same series name are essentially alike in those characteristics that affect their behavior in the undisturbed landscape.

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

After a guide for classifying and naming the soils had been worked out, the soil scientists drew the boundaries of the individual soils on aerial photographs. These photographs show woodlands, buildings, field borders, trees, and other details that help in drawing boundaries accurately. The soil map in 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. Two such kinds of mapping units are shown on the soil map of Martin County—soil complexes 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. Kimbrough-Slaughter complex, 0 to 2 percent slopes, 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." Kimbrough and Upton soils, nearly level, is an example.

In most areas surveyed there are places where the soil material is 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. Mixed alluvial land, saline, is a land type in Martin County.

General Soil Map

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

A map showing soil associations is useful to people who want a general idea of the soils in a county, who want to compare different parts of a county, or who want to know the location of large tracts that are suitable for a certain kind of land use. Such a map is a useful general guide in managing a watershed, a wooded tract, or a wildlife area, or in planning engineering works, recreational facilities, and community developments. It is not a suitable map for planning the management of a farm or field, or for selecting the exact location of a road, building, or similar structure, because the soils in any one association ordinarly differ in slope, depth, stoniness, drainage, and other characteristics that affect their management.

The soil associations in Martin County are discussed in the following pages. The terms for texture used in the title for each association apply to the surface layer. For example, in the title for association 1, the words "loamy soils" refer to texture of the surface layer.

1. Amarillo association

Deep, nearly level to gently sloping, loamy soils

This association consists of broad areas of nearly level to gently sloping soils. It covers about 35 percent of the county. Amarillo soils make up about 76 percent of the association, Arvana and Sharvana soils 11 percent, and minor soils 13 percent.

The Amarillo soils have a fine sandy loam surface layer and lower layers of sandy clay loam. The Arvana and Sharvana soils are similar to the Amarillo soils, but are shallower and are underlain by indurated caliche (deposits of calcium carbonate). Minor soils in this association are the Olton, Roscoe, Portales, Miles, Acuff, Gomez, and Veal.

Almost all of this association is cultivated. Both irrigated and dryland crops are grown. About 5 percent of the association is in native range consisting of mid and short grasses.

2. Miles-Patricia association

Deep, nearly level to gently sloping, sandy soils

This association consists of nearly level to gently sloping soils on undulating plains. It makes up about 19 percent of the county. Miles soils cover about 61 percent of the association, Patricia soils 12 percent, and other less extensive soils 27 percent.

The noncalcareous Miles soils have a loamy fine sand surface layer and lower layers of sandy clay loam. Patricia soils have a fine sand surface layer and sandy clay loam lower layers. Minor soils in the association are the Brownfield, Gomez, Tivoli, Springer, and Amarillo.

Most of this association is in range. Mid and tall grasses are dominant. Brush is a problem on most ranges. About 10 percent of the association is in irrigated and dryland crops.

3. Slaughter-Kimbrough association

Shallow and very shallow, nearly level to gently sloping, loamy soils

This association is made up of nearly level to gently sloping soils and covers about 16 percent of the county. It contains a large part of the rangeland in the county. Slaughter soils occupy about 33 percent of the association, Kimbrough soils 31 percent, Upton and Stegall soils 20 percent, and other soils 16 percent.

The shallow Slaughter soils have a loam surface layer and clay loam lower layers underlain by indurated caliche at a depth of 10 to 20 inches. These soils are in the more depressed areas. The Kimbrough soils are shallow to very shallow loam underlain by indurated caliche 7 to 12 inches below the surface. The Upton and Stegall soils are intermixed with the Slaughter and the Kimbrough soils. Also included are areas of Olton, Sharvana, Simona, Lipan, and Roscoe soils.

Almost all of this association is in native range that produces mid and short grasses. Control of invading brush is the chief concern in managing the soils.

4. *Portales-Acuff association*

Deep, nearly level to gently sloping, neutral to calcareous, loamy soils

This association consists of broad areas of nearly level to gently sloping soils. It occupies about 15 percent of the county. Portales soils make up about 47 percent of the association, Acuff soils 19 percent, and less extensive soils 34 percent.

The Portales soils are mainly on large flats, but a few areas are gently sloping. They have a calcareous loam surface layer and loam or clay loam lower layers. The nearly level Acuff soils have a loam surface layer and sandy clay loam lower layers. Other less extensive soils in this association are the Olton, Zita, Gomez, Amarillo, and Midessa.

Most of this association is cultivated to irrigated and dryland crops. Part of the association is range consisting of mid and short grasses.

5. *Midessa-Drake-Arch association*

Deep, nearly level to gently sloping, calcareous, loamy soils

This association consists of broad areas of nearly level to gently sloping soils. It makes up about 13 percent of the county. Midessa soils occupy about 68 percent of this association, Drake soils 12 percent, Arch soils 9 percent, and Portales and Gomez soils 11 percent.

The nearly level to gently sloping Midessa soils have a fine sandy loam surface layer and loam to sandy clay loam lower layers. The gently sloping Drake soils also have a fine sandy loam surface layer and have loam to fine sandy loam lower layers. Arch soils are nearly level and have a fine sandy loam surface layer and loam and clay loam lower layers.

About half of this association is cultivated to irrigated and dryland crops. The other half is native range consisting of mid and short grasses.

6. *Potter-Mansker association*

Very shallow to deep, nearly level to steep, loamy soils

This association consists of nearly level to steep soils along natural drains. It makes up about 2 percent of the county. Potter soils cover about 30 percent of the association, Mansker soils 23 percent, and less extensive soils 47 percent.

Potter soils are shallow to very shallow and calcareous. They are underlain by a chalky earth. The calcareous Mansker soils are deep and lie above areas of Potter soils. They have a loam surface layer and clay loam lower layers. Less extensive in this association are Spur, Mobeetie, Berda, Kimbrough, Bippus, and Colorado soils, and Mixed alluvial land, saline.

Almost all of this association is in native range consisting of mid and short grasses. Invading brush is the chief management problem in this association.

Descriptions of the Soils

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

An important part of the description of each soil series is the soil profile, that is, the sequence of layers from the surface downward to rock or other underlying material. Each series contains two descriptions of this profile. The first is brief and in terms familiar to the layman. The second, detailed and in technical terms, is for scientists, engineers, and others who need to make thorough and precise studies of soils. Unless it is otherwise stated, the colors given in the descriptions are those of a dry soil.

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

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

The acreage and proportionate extent of each mapping unit are shown in table 1. Many of the terms used in describing soils can be found in the Glossary at the end of this survey, and more detailed information about the terminology and methods of soil mapping can be obtained from the Soil Survey Manual (*5*).[1]

Acuff Series

The Acuff series consists of deep, well-drained soils that have a noncalcareous surface layer and a prominent accumulation of lime in the lower layers. These nearly level soils are on concave and plane surfaced uplands.

In a representative profile, the surface layer is dark-brown loam about 12 inches thick. The next layer is sandy clay loam. It is reddish brown in the upper 22 inches, yellowish red in the next 8 inches, pink in the next 20 inches, and light brown to a depth of 68 inches.

Runoff is slow on these soils; permeability is moderate, and the available water capacity is high.

Representative profile of Acuff loam, 0 to 1 percent slopes, 100 feet west of a county road, from a point 1 mile west and 1.5 miles south of Ackerly, Tex., by Farm Road 2002 and the county road.

Ap—0 to 8 inches, dark-brown (7.5YR 4/3) loam, dark brown (7.5YR 3/3) when moist; structureless; slightly hard when dry, friable when moist; neutral; clear, smooth boundary.

A1—8 to 12 inches, dark-brown (7.5YR 4/2) loam, dark brown (7.5YR 3/2) when moist; weak, fine, subangular blocky structure; slightly hard when dry, friable when moist; common fine roots and pores; mildly alkaline; clear, smooth boundary.

[1] Italic numbers in parentheses refer to Literature Cited, page 53.

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

Soil	Area	Extent
	Acres	*Percent*
Acuff loam, 0 to 1 percent slopes	18,445	3.2
Amarillo fine sandy loam, 0 to 1 percent slopes	100,212	17.2
Amarillo fine sandy loam, 1 to 3 percent slopes	66,820	11.5
Arch soils, 0 to 1 percent slopes	7,310	1.3
Arvana fine sandy loam, 0 to 1 percent slopes	7,592	1.3
Arvana fine sandy loam, 1 to 3 percent slopes	5,965	1.0
Berda loam, 1 to 3 percent slopes	872	(1)
Bippus and Colorado soils	989	(1)
Brownfield fine sand, gently undulating	10,562	1.8
Drake soils, 1 to 3 percent slopes	5,576	.9
Drake soils, 3 to 5 percent slopes	3,310	.5
Gomez loamy fine sand, gently undulating	6,211	1.0
Gomez fine sandy loam, 0 to 1 percent slopes	12,994	2.2
Gomez fine sandy loam, 1 to 3 percent slopes	5,182	.9
Kimbrough-Slaughter complex, 0 to 2 percent slopes	31,686	5.4
Kimbrough and Upton soils, nearly level	22,618	3.9
Lipan-Roscoe complex	4,873	.8
Mansker loam, 0 to 3 percent slopes	3,135	.5
Midessa fine sandy loam, 0 to 1 percent slopes	45,303	7.7
Midessa fine sandy loam, 1 to 3 percent slopes	10,705	1.8
Miles loamy fine sand, 0 to 3 percent slopes	71,174	12.0
Mixed alluvial land, saline	1,600	.3
Mobeetie fine sandy loam, 1 to 3 percent slopes	3,987	.7
Olton loam, 0 to 1 percent slopes	9,776	3.4
Patricia fine sand, gently undulating	12,427	2.1
Patricia-Brownfield complex, hummocky	1,580	.3
Portales loam, 0 to 1 percent slopes	37,349	6.4
Portales loam, 1 to 3 percent slopes	2,528	.4
Potter soils	4,160	.6
Roscoe clay	2,482	.4
Sharvana fine sandy loam, 0 to 3 percent slopes	13,136	2.2
Simona fine sandy loam, 1 to 3 percent slopes	4,351	.7
Slaughter loam, 0 to 1 percent slopes	16,750	2.9
Springer loamy fine sand, undulating	5,668	1.0
Spur clay loam, slightly saline	475	(1)
Stamford clay, 0 to 1 percent slopes	630	(1)
Stegall clay loam, 0 to 1 percent slopes	8,699	1.5
Tivoli fine sand	1,063	.2
Upton loam, 0 to 2 percent slopes	922	(1)
Veal fine sandy loam, 1 to 3 percent slopes	6,256	1.0
Veal fine sandy loam, 3 to 5 percent slopes	811	(1)
Vernon clay, 1 to 3 percent slopes	1,156	.2
Zita loam, 0 to 1 percent slopes	4,968	.8
Total land area	582,308	
Salt Lakes	732	(1)
Total area in county	583,040	100.0

[1] Less than 0.1 percent.

B21t—12 to 22 inches, reddish-brown (5YR 4/4) sandy clay loam, dark reddish brown (5YR 3/4) when moist; moderate, coarse, prismatic and weak, medium, subangular blocky structure; hard when dry, friable when moist; common fine roots and pores; few insect burrows and wormcasts; clay films on ped faces; mildly alkaline; gradual, wavy boundary.

B22t—22 to 34 inches, reddish-brown (5YR 4/4) sandy clay loam, dark reddish brown (5YR 3/4) when moist; moderate, coarse, prismatic and moderate, medium, subangular blocky structure; hard when dry, friable when moist; few films and threads of calcium carbonate; few fine roots and pores; clay films on ped faces; calcareous; mildly alkaline; clear, wavy boundary.

B23t—34 to 42 inches, yellowish-red (5YR 5/6) sandy clay loam, yellowish red (5YR 4/6) when moist; weak to moderate, medium, subangular blocky structure; hard when dry, friable when moist; common films and threads of calcium carbonate; few very fine roots and pores; clay films on ped faces; calcareous; moderately alkaline; clear, wavy boundary.

B24tca—42 to 62 inches, pink (5YR 8/4) sandy clay loam, pink (5YR 7/4) when moist; weak, medium, subangular blocky structure; hard when dry, friable when moist; few clay films on ped faces; calcareous; about 30 percent, by volume, soft lumps and cemented concretions of calcium carbonate; gradual, wavy boundary.

B25t—62 to 68 inches, light-brown (7.5YR 6/5) sandy clay loam, brown (7.5YR 5/5) when moist; weak, medium, subangular blocky structure; clay bridging sand grains; about 15 percent, by volume, calcium carbonate equivalent; calcareous; moderately alkaline.

The A horizon ranges from 8 to 15 inches in thickness and from dark reddish brown to brown in color.

The B2t horizons above the lime accumulation range from 22 to 35 inches in thickness, from red and yellowish red to reddish brown in color, and from sandy clay loam to clay loam or loam in texture.

Depth to the B24tca horizon ranges from 30 to 50 inches. This horizon is 20 to 50 percent, by volume, soft lumps and hard concretions of calcium carbonate. Depth to the B25t horizon ranges from 45 to 70 inches.

Acuff loam, 0 to 1 percent slopes (AcA).—This nearly level soil is on a smooth plain. Slopes are mainly between 0.2 and 0.5 percent and are plane to weakly convex.

Included with this soil in mapping are small rounded areas of Mansker loam, 0 to 3 percent slopes, and Portales loam. Also included are small areas of Roscoe clay and Amarillo fine sandy loam.

Nearly all of this Acuff loam is cultivated. Capability Unit IIIce–2, dryland, and I–2, irrigated; Deep Hardland range site.

Amarillo Series

The Amarillo series consists of deep, well-drained soils that have a prominent accumulation of lime in the lower layers. These nearly level to gently sloping soils formed in unconsolidated sediment on broad uplands (fig. 2).

In a representative profile, the surface layer is fine sandy loam about 10 inches thick. It is brown in the upper part and reddish brown in the lower part. The next layer is reddish-brown sandy clay loam in the upper 28 inches, yellowish-red fine sandy loam in the next 4 inches, and pinkish-white sandy loam to a depth of more than 60 inches.

Runoff is slow to medium, and internal drainage is medium. Permeability is moderate, and the available water capacity is high.

Representative profile of Amarillo fine sandy loam, 0 to 1 percent slopes, 20 yards north of a county road, from a point 0.5 mile south and 2.5 miles west of Tarzan, Tex., by county roads.

Ap—0 to 6 inches, brown (7.5YR 4/4) fine sandy loam, dark brown (7.5YR 3/4) when moist; structureless; slightly hard when dry, friable when moist; few fine roots; neutral; abrupt, smooth boundary.

A12—6 to 10 inches, reddish-brown (5YR 4/4) fine sandy loam, dark reddish brown (5YR 3/4) when moist; weak, coarse, prismatic structure and weak, medium, subangular blocky and granular structure; slightly hard when dry, friable when moist; few fine roots, tubes, and pores; few insect burrows and wormcasts; neutral; clear, smooth boundary.

B21t—10 to 26 inches, reddish-brown (5YR 5/4) sandy clay loam, reddish brown (5YR 4/4) when moist; weak, coarse, prismatic structure and weak, medium, subangular blocky structure; hard when dry, friable when moist; few fine roots, tubes, and pores; few wormcasts; common

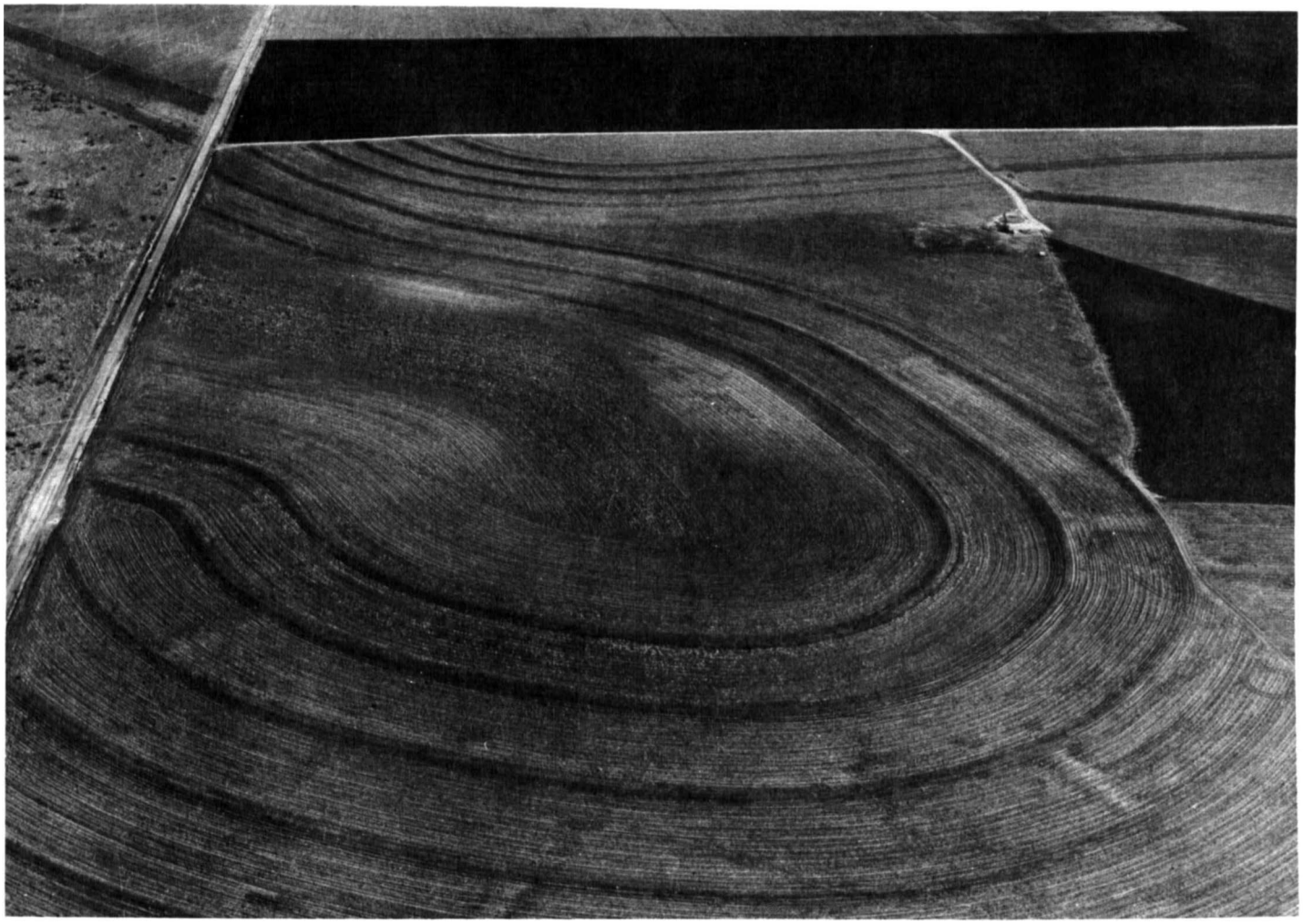

Figure 2.—**Parallel terraces in a cultivated area of Amarillo fine sandy loam.**

clay films on ped faces; mildly alkaline; gradual, smooth boundary.

B22t—26 to 38 inches, reddish-brown (5YR 5/4) sandy clay loam, reddish brown (5YR 4/4) when moist; weak, coarse, prismatic structure and moderate, medium, subangular blocky structure; hard when dry, friable when moist; common clay films on ped faces; few fine roots, tubes, and pores; mildly alkaline; gradual, wavy boundary.

B23t—38 to 42 inches, yellowish-red (5YR 5/6) fine sandy loam, yellowish red (5YR 4/6) when moist; weak, medium, subangular blocky structure; slightly hard when dry, friable when moist; patchy clay films on ped faces; calcareous; moderately alkaline; abrupt, wavy boundary.

B24tca—42 to 60 inches, pinkish-white (5YR 8/2) fine sandy loam, pinkish gray (5YR 7/2) when moist; weak, medium, subangular blocky structure; up to 40 percent, by volume, calcium carbonate; patchy clay films on ped faces; calcareous; moderately alkaline.

The A horizon ranges from 7 to 16 inches in thickness and from brown to reddish brown in color.

The B2t horizons above the lime accumulation range from 22 to 40 inches in combined thickness, from brown and reddish brown to yellowish red in color, and from fine sandy loam to sandy clay loam in texture. Films, threads, or soft masses of lime are below a depth of 28 inches.

Depth to the B24tca horizon ranges from 32 to 50 inches. Soft lumps and hard concretions of calcium carbonate make up an estimated 20 to 60 percent of this horizon.

Amarillo fine sandy loam, 0 to 1 percent slopes (AfA).—This nearly level soil is on smooth plains in irregular areas mostly 50 to 250 acres in size. Slopes are mainly between 0.1 and 0.5 percent.

This soil has the profile described as representative for the Amarillo series.

Mapped with this soil are small, rounded and oval areas, mostly less than 5 acres in size, of Acuff loam, 0 to 1 percent slopes; Arvana fine sandy loam; and Midessa fine sandy loam. Also included are a few areas less than 3 acres in size of Miles loamy fine sand, 0 to 3 percent slopes; and Amarillo fine sandy loam, 1 to 3 percent slopes.

This Amarillo fine sandy loam, 0 to 1 percent slopes, is used mostly for crops. Capability Unit IIIe–4, dryland, and IIe–4, irrigated; Sandy Loam range site.

Amarillo fine sandy loam, 1 to 3 percent slopes (AfB).—This gently sloping soil occupies irregular, convex areas 10 to 150 acres in size.

The surface layer is brown to reddish-brown fine sandy loam about 8 inches thick. The next layer is reddish-brown sandy clay loam in the upper part and yellowish-

red fine sandy loam in the lower part. Below this is calcareous loamy material.

Included with this soil in mapping are areas of Arvana fine sandy loam; Veal fine sandy loam; Gomez fine sandy loam; and Miles loamy fine sand, 0 to 3 percent slopes.

This Amarillo fine sandy loam is used mostly for crops. Capability Unit IIIe–4, dryland, and IIe–6, irrigated; Sandy Loam range site.

Arch Series

The Arch series consists of loamy, calcareous soils that have a prominent accumulation of lime at shallow depths. These nearly level soils formed in old alluvium or plains outwash that appears to have been modified by deposition of calcium carbonate from ground water.

In a representative profile, the surface layer is light brownish-gray fine sandy loam about 8 inches thick. The next layer is light-gray loam about 6 inches thick. The underlying material, to a depth of 60 inches, is white to light-gray clay loam.

These soils are well drained. Surface runoff is very slow, and the available water capacity is moderate.

Representative profile of Arch fine sandy loam, in an area of Arch soils, 0 to 1 percent slopes, 16 miles north of intersection of Texas Highways 349 and 176, 3 miles west of Texas Highway 349 on rural road and 2 miles west in rangeland.

A—0 to 8 inches, light brownish-gray (10YR 6/2) fine sandy loam, grayish brown (10YR 5/2) when moist; weak, fine, subangular blocky structure; slightly hard when dry, very friable when moist; common fine roots and pores; common fine calcium carbonate concretions; few insect burrows and wormcasts; calcareous; moderately alkaline; gradual, smooth boundary.

B2—8 to 14 inches, light-gray (10YR 7/2) loam, light brownish gray (10YR 6/2) when moist; weak, fine, subangular blocky and granular structure; slightly hard when dry, very friable when moist; few fine roots, many fine pores; calcareous; moderately alkaline; gradual, smooth boundary.

C1ca—14 to 54 inches, white (10YR 8/1) clay loam, light gray (10YR 7/1) when moist; more than 50 percent soft calcium carbonate; chalky; gradual, wavy boundary.

C2—54 to 60 inches, light-gray (10YR 7/1) clay loam, light gray (10YR 6/1) when moist; about 30 percent, by volume, calcium carbonate.

The A horizon ranges from 4 to 12 inches in thickness, from light brownish gray to brown in color, and from loam to fine sandy loam in texture. The B2 horizon is 4 to 16 inches thick, pale brown to white, and fine sandy loam to clay loam. Depth to the C1ca horizon ranges from 12 to 20 inches. Depth to the C2 horizon is 24 to 60 inches.

Arch soils, 0 to 1 percent slopes (ArA).—This mapping unit occupies shallow valleys and benches around playas in areas 10 to 200 acres in size. Slopes are mainly less than 0.3 percent, and the areas have the general appearance of an old lake bed. Texture of the surface layer ranges from loam to fine sandy loam.

Included in this mapping unit are small areas of Midessa fine sandy loam, Drake soils, and Gomez fine sandy loam.

This mapping unit can be cultivated, but it is best suited to grass. Capability unit IVes–1, dryland, and IIIes–1, irrigated; High Lime range site.

Arvana Series

The Arvana series consists of nearly level to gently sloping soils of the uplands. These soils are moderately deep over indurated caliche.

In a representative profile, the surface layer is brown fine sandy loam about 10 inches thick. The next layer is sandy clay loam that is reddish brown in the upper 14 inches and yellowish red in the lower 11 inches. The underlying material, to a depth of more than 37 inches, is indurated caliche.

These soils are well drained and moderately permeable. The available water capacity is moderate.

Representative profile of Arvana fine sandy loam, 0 to 1 percent slopes, 0.3 mile north of U.S. Highway 80, from a point 6 miles west of Stanton, Tex.

A1—0 to 10 inches, brown (7.5YR 4/4) fine sandy loam, dark brown (7.5YR 3/4) when moist; weak, fine, subangular blocky and granular structure; slightly hard when dry, friable when moist; few fine roots, tubes, and pores; neutral; clear, smooth boundary.

B2t—10 to 24 inches, reddish-brown (5YR 4/4) sandy clay loam, dark reddish brown (5YR 3/4) when moist; weak, coarse, prismatic structure and weak medium, subangular blocky and granular structure; hard when dry, friable when moist; common clay films on ped faces, few fine roots, tubes, and pores; many insect burrows up to 5 millimeters in diameter; mildly alkaline; gradual, smooth boundary.

B3—24 to 35 inches, yellowish-red (5YR 4/6) sandy clay loam, yellowish red (5YR 3/6) when moist; weak, coarse, prismatic structure and medium, subangular blocky structure; hard when dry, friable when moist; few fine roots, tubes, and pores; few insect burrows; mildly alkaline; abrupt, smooth boundary.

Ccam—35 to 37 inches, indurated caliche several inches thick; roots are noted between the upper plates; laminae on plates range in thickness from 1/16 of an inch up to 3/4 of an inch.

The A horizon ranges from 8 to 12 inches in thickness and from brown to reddish brown in color. The Bt horizon is 12 to 28 inches thick and reddish brown to yellowish red. Texture of the Bt horizon ranges from loam to sandy clay loam. A B3 horizon commonly occurs in the deeper areas. The Ccam horizon is at a depth of 20 to 40 inches.

Arvana fine sandy loam, 0 to 1 percent slopes (AvA).—This nearly level soil is on smooth plains throughout the county. Most areas of this soil are irregular and range from 15 to 150 acres in size but are dominantly about 50 acres in size. Slopes are mainly between 0.2 and 0.7 percent.

This soil has the profile described as representative for the Arvana series.

Included in mapped areas of this soil are small irregular areas of Sharvana fine sandy loam, 0 to 3 percent slopes; Amarillo fine sandy loam; and Arvana fine sandy loam, 1 to 3 percent slopes.

This Arvana fine sandy loam, 0 to 1 percent slopes, is used for range and crops. Capability unit IIIe–4, dryland, and IIe–4, irrigated; Sandy Loam range site.

Arvana fine sandy loam, 1 to 3 percent slopes (AvB).—This gently sloping soil occupies irregular, elongated areas 10 to 100 acres in size on uplands.

The surface layer is reddish-brown fine sandy loam about 8 inches thick. The next layer is reddish-brown sandy clay loam. Depth to the indurated caliche layer is about 30 inches.

Included with this soil in mapping are areas of Sharvana fine sandy loam, 0 to 3 percent slopes; Amarillo fine sandy loam, 0 to 1 percent slopes; and Arvana fine sandy loam, 0 to 1 percent slopes.

This Arvana fine sandy loam, 1 to 3 percent slopes, is used both for crops and range. Capability unit IIIe–4, dryland, and IIe–6, irrigated; Sandy Loam range site.

Berda Series

The Berda series consists of calcareous, loamy soils that formed in calcareous, loamy colluvial material.

In a representative profile, the surface layer is brown loam about 10 inches thick. The next layer is pale-brown loam about 20 inches thick. The underlying material, to a depth of 60 inches, is light-brown loam.

These soils are well drained. Surface runoff is medium, permeability is moderate, and the available water capacity is high.

Representative profile of Berda loam, 1 to 3 percent slopes, in range 1.2 miles north of U.S. Highway 80, from a point 3 miles east of downtown Stanton, Tex.

A1—0 to 10 inches, brown (10YR 5/3) loam, dark brown (10YR 4/3) when moist; moderate, fine, granular structure and weak, fine, subangular blocky structure; soft when dry, very friable when moist; many fine roots; few wormcasts; few calcium carbonate concretions; calcareous; moderately alkaline; gradual, smooth boundary.

B2—10 to 30 inches, pale-brown (10YR 6/3) loam, dark yellowish brown (10YR 4/4) when moist; moderate, medium, subangular blocky structure and fine granular structure; slightly hard when dry, very friable when moist; many fine roots and wormcasts; few threads and concretions of calcium carbonate; few hard calcium carbonate concretions; calcareous; moderately alkaline; gradual, wavy boundary.

Cca—30 to 60 inches, light-brown (7.5YR 6/4) loam, brown (7.5YR 5/4) when moist; weak, fine, granular structure; few fine roots and wormcasts; common threads and fine calcium carbonate concretions that increase with depth.

The A horizon ranges from 6 to 14 inches in thickness and from brown to light yellowish brown in color. The B2 horizon is 14 to 28 inches thick and brown to light yellowish brown. The texture of the B2 horizon ranges from loam to clay loam. Depth to the Cca horizon is 20 to 40 inches.

Berda loam, 1 to 3 percent slopes (BeB).—This gently sloping soil lies below escarpments and on alluvial fans. Most areas of this soil range from 40 to 100 acres in size. They are elongated and about 0.2 to 0.5 mile wide. Slopes are mainly between 1.5 and 3 percent.

Included with this soil in mapping are small areas of Potter soils; Mansker loam, 0 to 3 percent slopes; and Portales soils.

This Berda loam is not well suited to crops because soil areas are irregular in shape and lie below escarpments. Almost all of this soil is in native range. Capability unit IIIe–3, dryland, and IIIe–4, irrigated; Deep Hardland range site.

Bippus Series

The Bippus series consists of deep, nearly level, well-drained soils along natural drains. These soils have concave slopes of less than 1 percent.

In a representative profile, the surface layer is clay loam that is dark brown in the upper 20 inches and dark grayish brown in the lower 16 inches. The underlying material, to a depth of 50 inches, is reddish-brown clay loam.

These soils are well drained, and permeability is moderate. They have a high available water capacity, and receive runoff from adjacent slopes. In Martin County, the Bippus soils are mapped only in an undifferentiated mapping unit with the Colorado soils.

Representative profile of Bippus clay loam, in an area of Bippus and Colorado soils, in pasture 0.4 mile west of a county road, from a point 6 miles west of the intersection of State Highway 137 and Interstate 20 in Stanton, Tex., and 1.8 miles north on a county road.

A11—0 to 20 inches, dark-brown (7.5YR 4/2) clay loam, dark brown (7.5YR 3/2) when moist; weak, medium, subangular blocky structure; hard when dry, friable when moist; common fine roots and pores; calcareous; moderately alkaline; clear, smooth boundary.

A12—20 to 36 inches, dark grayish-brown (10YR 4/2) clay loam, very dark grayish brown (10YR 3/2) when moist; weak, coarse, prismatic structure and weak, medium, subangular blocky structure; hard when dry, friable when moist; few fine roots; common pores; calcareous; moderately alkaline; gradual, smooth boundary.

C—36 to 50 inches, reddish-brown (5YR 5/4) clay loam, reddish brown (5YR 4/4) when moist; structureless; hard when dry, friable when moist; common fine roots; common pores; few films and threads of calcium carbonate that make up less than 2 percent, by volume; calcareous; moderately alkaline.

The A11 horizon ranges from 12 to 35 inches in thickness and from dark brown to dark grayish brown in color. Texture is dominantly clay loam, but some areas have a surface accumulation of fine sandy loam 3 to 6 inches thick. The A12 horizon is 10 to 20 inches thick and brown to dark grayish brown. The combined thickness of the A horizons ranges from 22 to 50 inches. The C horizon is brown to reddish brown.

Bippus and Colorado soils (Bc).—This mapping unit consists of Bippus and Colorado soils. These nearly level to slightly concave soils are on the flood plains of intermittent streams. Most areas of this mapping unit are narrow. Few exceed 1,200 feet in width but some are several miles long. Any given area may be composed of a mixture of Bippus and Colorado soils or only one of these soils.

The Bippus soil has the profile described as representative for the Bippus series. The Colorado soil has the profile described as representative for the Colorado series.

Included in this mapping unit are small areas of Spur clay loam, slightly saline.

Most areas of this mapping unit are used for range. A small acreage is cultivated. Capability unit IIIe–4, dryland, and IIe–4 irrigated; Valley range site.

Brownfield Series

The Brownfield series consists of deep, loose, sandy soils that have sandy clay loam lower layers. These nearly level to undulating soils are on plains. Slopes are mostly less than 2 percent.

In a representative profile, the surface layer is fine sand 26 inches thick. It is brown in the upper part and light brown in the lower part. The next layer is yellowish-red and red sandy clay loam about 24 inches thick. Below this to a depth of 60 inches is a red fine sandy loam.

These soils are well drained. Surface runoff is very slow, and permeability is moderate. The available water capacity is low.

Representative profile of Brownfield fine sand, gently undulating, in range 3 miles west of Texas Highway 137, from a point 1.7 miles south of Flower Grove School, at the junction of Farm Road 2002 and Texas Highway 137.

A11—0 to 10 inches, brown (10YR 5/3) fine sand, dark brown (10YR 4/3) when moist; structureless; loose; neutral; clear, smooth boundary.

A12—10 to 26 inches, light-brown (7.5YR 6/4) fine sand, brown (7.5YR 5/4) when moist; structureless to very weak, fine, subangular blocky structure; loose when dry, very friable when moist; few fine roots and few shinnery oak roots up to 1 inch in diameter; neutral; clear, smooth boundary.

B21t—26 to 36 inches, yellowish-red (5YR 5/6) sandy clay loam, yellowish red (5YR 4/6) when moist; moderate, coarse, prismatic structure and weak, medium, subangular blocky structure; hard when dry, friable when moist; few fine roots, tubes, and pores; neutral; gradual, smooth boundary.

B22t—36 to 50 inches, red (2.5YR 5/6) sandy clay loam, red (2.5YR 4/6) when moist; moderate, coarse, prismatic structure and weak, medium, subangular blocky structure; hard when dry, friable when moist; few very fine roots and pores, few clay films on ped faces; mildly alkaline; gradual, wavy boundary.

B3—50 to 60 inches, red (2.5YR 5/8) fine sandy loam, red (2.5YR 4/8) when moist; weak, medium, subangular blocky structure; slightly hard when dry, very friable when moist; splotches of pink and light red that appear to be stripped sand grains; mildly alkaline.

The A horizon ranges from 20 to 36 inches in thickness and from brown to light yellowish brown in color. The Bt horizon is 16 to 42 inches thick and red to yellowish red.

Brownfield fine sand, gently undulating (BfB).—This soil lies in large areas that have slopes mainly less than 2 percent.

Included with this soil in mapping are areas of Tivoli fine sand that are less than 10 acres in size; a few areas of Patricia fine sand, gently undulating; a few small areas of Miles loamy fine sand, 0 to 3 percent slopes; and Springer loamy fine sand, undulating.

This Brownfield fine sand is best suited to grass. A few small areas are cultivated. If irrigated, this soil produces adequate yields. Capability unit VIe-6, dryland, and IVe-5, irrigated; Deep Sand range site.

Colorado Series

The Colorado series consists of deep, calcareous soils of the bottom lands. These soils have no distinct horizons and are stratified at various depths. Some areas have vertical cuts caused by erosion. They are nearly level and have concave slopes of less than 1 percent.

In a representative profile, the surface layer is brown fine sandy loam about 18 inches thick. The underlying material is sandy clay loam. It is brown to a depth of 36 inches and light brown to a depth of 60 inches.

These soils are well drained, and permeability is moderate. The available water capacity is high. In Martin County, the Colorado soils are mapped only in an undifferentiated mapping unit with the Bippus soils.

Representative profile of Colorado fine sandy loam, in an area of Bippus and Colorado soils, 100 feet west of a county road, from a point 6 miles west of Stanton, Tex., on Interstate Highway 20, and 0.8 mile north on the county road.

A1—0 to 18 inches, brown (7.5YR 5/4) fine sandy loam, brown (7.5YR 4/4) when moist; weak, fine, granular structure; hard when dry, friable when moist; few fine pores; neutral; clear, smooth boundary.

C1—18 to 36 inches, brown (7.5YR 5/4) sandy clay loam, brown (7.5YR 4/4) when moist; thin, platy structure related to bedding planes; hard when dry, friable when moist; few fine pores; calcareous; moderately alkaline; gradual, wavy boundary.

C2—36 to 60 inches, light-brown (7.5YR 6/4) sandy clay loam, brown (7.5YR 5/4) when moist; structureless; hard when dry, friable when moist; few films and threads of calcium carbonate.

The A horizon ranges from 10 to 26 inches in thickness and from brown to light brown in color. The C horizon ranges from light brown to reddish brown in color and from loam to clay loam in texture.

Drake Series

The Drake series consists of loamy, calcareous soils of the uplands. These soils have no distinct horizons. They formed in loamy sediments that had a high lime content. They have convex slopes less than 5 percent.

In a representative profile, the surface layer is light brownish-gray fine sandy loam about 10 inches thick. The underlying material is very pale brown fine sandy loam to a depth of 34 inches and white loam to a depth of 60 inches.

These soils are well drained. Permeability is moderate, and the available water capacity is high. The high lime content of these soils make some nutrients unavailable to plants.

Representative profile of Drake fine sandy loam, in an area of Drake soils, 1 to 3 percent slopes, 50 feet east of Texas Highway 137, from a point 6.5 miles south of Flower Grove School, which is at the junction of Farm Road 2002 and Texas Highway 137.

A1—0 to 10 inches, light brownish-gray (10YR 6/2) fine sandy loam, dark grayish brown (10YR 4/2) when moist; weak, fine, granular structure; slightly hard when dry, friable when moist; few to common fine roots; calcareous; moderately alkaline; gradual, smooth boundary.

C1—10 to 34 inches, very pale brown (10YR 7/3) fine sandy loam, pale brown (10YR 6/3) when moist; weak, fine, subangular blocky and granular structure; slightly hard when dry, friable when moist; few fine roots; calcareous; moderately alkaline; gradual, wavy boundary.

C2—34 to 60 inches, white (10YR 8/1) loam, light gray (10YR 7/1) when moist; structureless; slightly hard when dry, friable when moist; few hard concretions of calcium carbonate up to 5 millimeters in diameter; calcareous; moderately alkaline.

The A horizon ranges from 8 to 12 inches in thickness, from grayish brown to light brownish gray in color, and from loam to fine sandy loam in texture. The C1 horizon is 8 to 30 inches thick, light gray to very pale brown, and loam to fine sandy loam. Depth to the C2 horizon is 16 to 36 inches.

Drake soils, 1 to 3 percent slopes (DrB).—These soils occupy low dunes adjacent to playas, ancient waterways, and salt lakes. Most areas are oblong and irregular and are mostly 20 to 50 acres in size. Some areas are as much as 150 acres in size. Slopes are mainly between 2 and 3 percent.

The profile of these soils is the one described as representative for the series. Texture of the surface layer ranges from fine sandy loam to loam.

Mapped with these soils are small areas of Midessa soils; Gomez soils; and Arch soils.

These Drake soils are mostly in range. A few areas are cultivated. Capability unit IVes–1, dryland, and IIIes–1, irrigated; High Lime range site.

Drake soils, 3 to 5 percent slopes (DrC).—These gently sloping soils are on dunes adjacent to old waterways and salt lakes. Most areas are oblong and narrow and 10 to 20 acres in size. Slopes are dominantly 4.5 percent.

The surface layer is fine sandy loam or loam about 8 inches thick. The next layer is very pale brown, calcareous fine sandy loam or loam.

Mapped with these soils are small areas of Drake soils, 1 to 3 percent slopes, and Arch soils, 0 to 1 percent slopes.

These Drake soils are mostly in range. A few small areas are cultivated. Capability unit VIe–3, dryland, and IVe–4, irrigated; High Lime range site.

Gomez Series

The Gomez series consists of deep, nearly level to undulating, calcareous soils on uplands. These soils formed in unconsolidated sediment. Slopes are mostly less than 2 percent but range up to 3 percent.

In a representative profile, the surface layer is fine sandy loam about 14 inches thick. It is brown in the upper part and grayish brown in the lower part. The next layer is light brownish-gray fine sandy loam 22 inches thick. The underlying material, to a depth of 70 inches, is white fine sandy loam.

These soils are well drained, are moderately rapidly permeable, and have a moderate available water capacity.

Representative profile of Gomez fine sandy loam, 0 to 1 percent slopes, in range 0.7 mile north of Texas Highway 176, from a point 9 miles west of the intersection of Texas Highways 137 and 176.

A11—0 to 8 inches, brown (10YR 5/3) fine sandy loam, brown (10YR 4/3) when moist; weak, fine, subangular blocky and granular structure; soft when dry, very friable when moist; comomn fine roots and pores; few insect burrows and wormcasts; mildly alkaline; clear, smooth boundary.

A12—8 to 14 inches, grayish-brown (10YR 5/2) fine sandy loam, dark grayish brown (10YR 4/2) when moist; weak, coarse, prismatic structure and weak, fine, subangular blocky structure; soft when dry, very friable when moist; common fine roots and pores; few insect burrows and wormcasts; few hard calcium carbonate concretions; calcareous; moderately alkaline; clear, smooth boundary.

B2—14 to 36 inches, light brownish-gray (10YR 6/2) fine sandy loam, grayish brown (10YR 5/2) when moist; weak, coarse, prismatic and fine subangular blocky structure; slightly hard when dry, friable when moist; few fine roots and pores; few calcium carbonate concretions; calcareous; moderately alkaline; abrupt, smooth boundary.

C1ca—36 to 62 inches, white (10YR 8/2) fine sandy loam, light gray (10YR 7/2) when moist; structureless; cemented concretions and soft masses of calcium carbonate make up about 40 percent of horizon, by volume; calcareous; moderately alkaline; gradual, wavy boundary.

C2—62 to 70 inches, white (10YR 8/2) fine sandy loam, light gray (10YR 7/2) when moist; structureless; about 20 percent, by volume, calcium carbonate.

The A horizon ranges from 10 to 20 inches in thickness, from grayish brown to brown in color, and from loamy fine sand to fine sandy loam in texture. The B2 horizon is 12 to 28 inches thick, grayish brown to pale brown, and loam to fine sandy loam. Depth to the C1ca horizon is 22 to 40 inches.

Gomez fine sandy loam, 0 to 1 percent slopes (GsA).—This nearly level soil is on smooth plains in areas that range from 20 to 500 acres in size but are dominantly 200 acres. Slopes are mainly less than 0.7 percent.

This soil has the profile described as representative for the Gomez series.

Included with this soil in mapping are areas of Midessa and Amarillo fine sandy loam and Portales loam that are less than 5 acres in size, and small areas of Drake soils, 3 to 5 percent slopes.

Although this Gomez soil is best suited to range, most of the acreage is cultivated. Part of it is irrigated. Capability unit IIIe–6, dryland, and IIe–5, irrigated; Mixed Plains range site.

Gomez fine sandy loam, 1 to 3 percent slopes (GsB).—This gently sloping soil occupies convex areas that are mostly 15 to 75 acres in size. Slopes are mainly between 1.5 and 2 percent.

The surface layer is brown fine sandy loam about 13 inches thick. The next layer is pale-brown fine sandy loam. Depth to the underlying white caliche material is about 34 inches.

Included with this soil in mapping are small areas of Midessa, Veal, and Amarillo fine sandy loams.

Although this Gomez soil is best suited to range, most of the acreage is cultivated. A few acres are irrigated. Capability unit IIIe–6, dryland, and IIIe–6, irrigated; Mixed Plains range site.

Gomez loamy fine sand, gently undulating (GoB).—This smooth, gently sloping soil is in convex, irregular to elongated areas 20 to 100 acres in size. Slopes are mainly between 1.5 and 2 percent.

The surface layer is loamy fine sand about 16 inches thick that is underlain by a fine sandy loam lower layer 18 inches thick.

Included with this soil in mapping are small areas, less than 2 acres in size, of Springer loamy fine sand, undulating; Miles loamy fine sand, 0 to 3 percent slopes; Patricia fine sand, gently undulating; and a few small areas of Midessa fine sandy loam and Gomez fine sandy loam.

This Gomez loamy fine sand, gently undulating, is best suited to range. Capability unit VIe–5, dryland, and IVe–5, irrigated; Sandyland range site.

Kimbrough Series

The Kimbrough series consists of shallow to very shallow, loamy soils of the uplands. These nearly level to gently sloping soils are underlain by thick beds of indurated caliche. Slopes are mostly less than 2 percent.

In a representative profile, the surface layer is brown loam about 7 inches thick. The next layer, to a depth of 11 inches, is white indurated caliche.

These are well-drained, moderately permeable soils. They have a low available water capacity.

Representative profile of Kimbrough loam, in an area of Kimbrough-Slaughter complex, 0 to 2 percent slopes, in a pasture 2 miles east of Farm Road 349, from a point 5.7 miles north of the Midland-Martin County line marker.

A1—0 to 7 inches, brown (7.5YR 4/2) loam, dark brown (7.5YR 3/2) when moist; weak, subangular blocky struc-

ture; slightly hard when dry, friable when moist; common fine roots; few concretions of caliche; mildly alkaline; abrupt, smooth boundary.
Ccam—7 to 11 inches, white indurated caliche.

The A horizon ranges from 7 to 12 inches in thickness, from brown to dark grayish brown in color, and from loam to clay loam in texture. The Ccam horizon is 7 to 12 inches below the surface. The indurated caliche layer is 1 to 7 feet thick over softer, more massive caliche that is several feet thick.

Kimbrough-Slaughter complex, 0 to 2 percent slopes (KsA).—This mapping unit is made up of nearly level to gently sloping soils on smooth uplands. Most areas of this unit are several hundred acres in size. Slopes are mainly between 0.5 and 2 percent.

This mapping unit consists of about 52 percent Kimbrough soils, 43 percent Slaughter soils, 4 percent Mansker soils, and 1 percent Potter soils.

The Kimbrough soils have a profile like that described as representative for the Kimbrough series, but texture of the surface layer ranges from loam to clay loam.

The Slaughter soils in this mapping unit have a brown loam surface layer about 5 inches thick. The next layer is reddish-brown clay loam 12 inches thick that is underlain by hard caliche.

Included in this mapping unit are small areas of Upton loam, 0 to 2 percent slopes; Stegall clay loam, 0 to 1 percent slopes; Mansker loam, 0 to 3 percent slopes; and Potter soils.

The Kimbrough soils are on the upper ridges, and the Slaughter soils are mostly on the flats and in depressions. Caliche fragments and cobbles lie on the surface in about 25 percent of the acreage of this mapping unit. The vegetation is mainly grass and a few mesquite trees.

The areas of this mapping unit are in range. Capability unit VIs–1, dryland; Kimbrough soil in Very Shallow range site; Slaughter soil in Deep Hardland range site.

Kimbrough and Upton soils, nearly level (KuA).—This mapping unit consists of very shallow and shallow Kimbrough soils and shallow Upton and Slaughter soils. The slopes are smooth and nearly level. Most areas of this unit are 20 to 500 acres in size, but some areas are as large as 1,500 acres.

The Kimbrough soils are on the upper ridges, and the Upton and Slaughter soils are on the flats and in depressions. Approximately 60 percent of this mapping unit is made up of Kimbrough soils, 20 percent is Upton soils, and 20 percent is Slaughter soils.

The Kimbrough soils have a brown loam surface layer about 7 inches thick that is underlain by hard platy caliche. The Slaughter soils have a brown loam surface layer about 5 inches thick. The next layer is reddish-brown clay loam 12 inches thick underlain by hard platy caliche. The Upton soils have a brown loam surface layer about 5 inches thick. The lower layer is grayish-brown clay loam about 10 inches thick that is over hard platy caliche.

Included in this mapping unit are small areas of Lipan and Roscoe soils; Stegall clay loam, 0 to 1 percent slopes; Sharvana fine sandy loam, 0 to 3 percent slopes; and Potter soils.

The areas of this mapping unit are in range. Capability unit VIs–1, dryland; Kimbrough soil in Very Shallow range site; Upton soil in Mixed Plains range site.

Lipan Series

The Lipan series consists of deep, nearly level clayey soils in playas. These soils formed in calcareous clay material. They are in depressed areas throughout the county.

In a representative profile, the surface layer is gray clay about 16 inches thick. The next layer is grayish-brown clay about 30 inches thick. The underlying material, to a depth of 62 inches, is light brownish-gray clay.

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

Representative profile of Lipan clay, in an area of Lipan-Roscoe complex, 100 feet east of Texas Highway 349, from a point 3 miles northwest of the Martin-Midland County line marker on Texas Highway 349.

A—0 to 16 inches, gray (10YR 5/1) clay, dark gray (10YR 4/1) when moist; moderate, medium, blocky structure; very hard when dry, very firm when moist, very sticky and plastic when wet; common fine roots; calcareous; moderately alkaline; gradual, smooth boundary.
AC—16 to 46 inches, grayish-brown (10YR 5/2) clay, dark grayish brown (10YR 4/2) when moist; moderate, medium, blocky structure; extremely hard when dry, very firm when moist, very sticky and plastic when wet; few fine roots; few shiny faces on peds and few slickensides; slickensides intersect and become more strongly expressed with depth; calcareous; moderately alkaline; gradual, smooth boundary.
Cca—46 to 62 inches, light brownish-gray (10YR 6/2) clay, grayish brown (10YR 5/2) when moist; massive (structureless); hard when dry, firm when moist, sticky when wet; few fine calcium carbonate concretions; calcareous; moderately alkaline.

The A horizon ranges from 12 to 20 inches in thickness and from mildly alkaline to moderately alkaline in reaction. The AC horizon ranges from grayish brown to light grayish brown in color. The Cca horizon is 36 to 55 inches below the surface. It is grayish brown to light brownish gray.

Lipan-Roscoe complex (Lr).—This mapping unit consists of Lipan clay and Roscoe clay. These nearly level soils are on the bottom of depressions or playas and have a gilgai microrelief consisting of enclosed microbasins and microknolls. The areas of gilgai are 6 to 16 inches deep, 2 to 5 feet across, and 5 to 20 feet apart. The relief between the surrounding plains and playa bottom ranges from 4 to 20 feet. The areas of this mapping unit are circular or oval and 10 to 50 acres in size.

The Lipan soil has the profile described as representative for the Lipan series. The Roscoe soil has a dark-gray clay surface layer about 12 inches thick. The lower layer is dark grayish-brown clay.

Most areas of this mapping unit are in range. When dry, these soils develop cracks 1 to 2 inches wide and as deep as 26 inches. Capability Unit VIw–1, dryland; included with surrounding range sites.

Mansker Series

The Mansker series consists of loamy, calcareous soils on uplands. These soils have a prominent accumulation of lime in lower layers. Slopes are convex and plane and are mostly less than 3 percent.

In a representative profile, the surface layer is dark-brown loam about 8 inches thick (fig. 3). The underlying material is clay loam. It is brown to a depth of 16 inches, white to a depth of 34 inches, and light brown to a depth of 45 inches.

These soils are well drained. Surface runoff is medium, and the available water capacity is high.

Representative profile of Mansker loam, 0 to 3 percent slopes, in a pasture 0.8 mile north of Interstate Highway 20 at a point 2.7 miles east of Stanton, Tex.

A1—0 to 8 inches, dark-brown (10YR 4/3) loam, dark brown (10YR 3/3) when moist; weak, fine, subangular blocky and granular structure; slightly hard when dry, friable when moist; common fine roots and pores; calcareous; moderately alkaline; clear, smooth boundary.

Bca—8 to 16 inches, brown (10YR 5/3) clay loam, brown (10YR 4/3) when moist; weak to moderate, medium, subangular blocky structure; hard when dry, friable when moist; few fine roots and pores; few insect burrows and wormcasts; estimated 20 percent calcium carbonate; calcareous; moderately alkaline; clear, smooth boundary.

C1ca—16 to 34 inches, white (10YR 8/1) clay loam, light gray (10YR 7/1) when moist; weak, fine, subangular blocky structure; as much as 40 percent, by volume, soft lumps and hard concretions of calcium carbonate; calcareous; moderately alkaline; gradual, wavy boundary.

C2ca—34 to 45 inches, light-brown (7.5YR 6/4) clay loam, brown (7.5YR 5/4) when moist; structureless; calcareous but with less calcium carbonate in lumps or concretions.

The A horizon ranges from 7 to 10 inches in thickness and from dark brown to brown in color. The Bca horizon is 6 to 10 inches thick and brown to light brownish gray. Texture of the Bca horizon is clay loam or loam. The C1ca horizon is 13 to 20 inches below the surface and is 15 to 30 inches thick. Depth to the C2ca horizon is 28 to 50 inches.

Figure 3.—**Profile of Mansker loam, 0 to 3 percent slopes.**

Mansker loam, 0 to 3 percent slopes (MaB).—This nearly level to gently sloping soil is on uplands in elongated areas 10 to 80 acres in size. Slopes range from 0 to 3 percent but are mainly about 2 percent.

Included with this soil in mapping are areas less than 2 acres in size of Portales loam; Acuff loam, 0 to 1 percent slopes; Veal fine sandy loam; Simona fine sandy loam, 1 to 3 percent slopes; and Potter soils.

Most of this Mansker loam is in range. It is cultivated where associated with other tilled soils. Capability unit IVe–9, dryland, and IIIe–10, irrigated; Deep Hardland range site.

Midessa Series

The Midessa series consists of loamy, calcareous soils that have prominent lime accumulations. These soils formed in unconsolidated sediments on uplands. Slopes are convex and plane, and are mostly less than 1 percent but range to about 3 percent.

In a representative profile, the surface layer is brown fine sandy loam about 10 inches thick. The next layer is pale-brown loam about 20 inches thick. The underlying material is sandy clay loam. It is very pale brown to a depth of 60 inches and light brown to a depth of 70 inches.

These soils are well drained, have medium runoff, and are moderately permeable. The available water capacity is moderate.

Representative profile of Midessa fine sandy loam, 0 to 1 percent slopes, 50 yards south of a county road from a point 4 miles southeast on Farm Road 829 and 5 miles southwest on a county road from Grady School, which is located at the intersection of Texas Highway 176 and Farm Road 829.

A1—0 to 10 inches, brown (10YR 5/3) fine sandy loam, brown (10YR 4/3) when moist; weak, fine, subangular blocky and granular structure; slightly hard when dry, friable when moist; many fine and medium roots and pores; few wormcasts; few fine concretions of calcium carbonate; calcareous; moderately alkaline; gradual, smooth boundary.

B2—10 to 30 inches, pale-brown (10YR 6/3) loam, brown (10YR 5/3) when moist; weak, fine, subangular blocky and granular structure; slightly hard when dry, friable when moist; few fine roots and pores; few films, threads, and fine concretions of calcium carbonate; calcareous; moderately alkaline; clear, wavy boundary.

C1ca—30 to 60 inches, very pale brown (10YR 8/3) sandy clay loam, very pale brown (10YR 7/3) when moist; weak, fine, subangular blocky structure; slightly hard when dry, friable when moist; 25 percent, by volume, soft calcium carbonate and a few hard concretions of calcium carbonate; calcareous; moderately alkaline; gradual, wavy boundary.

C2—60 to 70 inches, light-brown (7.5YR 6/4) sandy clay loam, brown (7.5YR 5/4) when moist; structureless; about 5 percent, by volume, visible calcium carbonate; calcareous; moderately alkaline.

The A horizon ranges from 8 to 12 inches in thickness and from brown to pale brown in color. The B2 horizon is 15 to 28 inches thick and light brownish gray to light brown. Texture of the B2 horizon ranges from fine sandy loam to sandy clay loam. The C1ca horizon is 23 to 40 inches below the surface and is pink to very pale brown. Depth to the C2 horizon is 38 to 68 inches.

Midessa fine sandy loam, 0 to 1 percent slopes (MdA).—This nearly level soil occupies areas 10 acres to several hundred acres in size. Slopes are mainly between 0.4 and 1 percent.

This soil has the profile described as representative for the Midessa series.

Included with this soil in mapping are small areas of Veal fine sandy loam; Gomez soils; Portales loam; and Midessa fine sandy loam, 1 to 3 percent slopes.

This Midessa fine sandy loam, 0 to 1 percent slopes, is used for crops and range. Capability unit IIIe–6, dryland, and IIe–5, irrigated; Mixed Plains range site.

Midessa fine sandy loam, 1 to 3 percent slopes (MdB).—This gently sloping soil occupies irregular areas 10 to 100 acres in size. Slopes are mainly about 2 percent.

The surface layer is brown fine sandy loam about 9 inches thick. The next layer is pale-brown loam about 17 inches thick. The underlying material is sandy clay loam that contains a large amount of calcium carbonate.

Mapped with this soil are small areas of Veal fine sandy loam; Portales loam; Gomez fine sandy loam; and Midessa fine sandy loam, 0 to 1 percent slopes.

This Midessa fine sandy loam, 1 to 3 percent slopes, is used both for crops and range. Capability unit IIIe–6, dryland and irrigated; Mixed Plains range site.

Miles Series

The Miles series consists of deep, neutral, sandy soils on uplands. These soils are nearly level and gently undulating. Slopes are mostly less than 2 percent but range to 3 percent.

In a representative profile, the surface layer is brown loamy fine sand about 10 inches thick. The next layer is reddish-brown fine sandy loam about 4 inches thick. The next layer is yellowish-red and reddish-yellow sandy clay loam about 41 inches thick. Below this to a depth of 72 inches is reddish-yellow fine sandy loam.

These soils are well drained, surface runoff is slow, and permeability is moderate. The available water capacity is high.

Representative profile of Miles loamy fine sand, 0 to 3 percent slopes, in a field 100 feet east of a county road, from a point 2 miles east on Farm Road 2002 from Flower Grove School, which is near the intersection of Texas Highway 137 and Farm Road 2002, then 4 miles south on county road.

A1—0 to 10 inches, brown (7.5YR 5/4) loamy fine sand, brown (7.5YR 4/4) when moist; weak, fine, granular structure; loose when dry, very friable when moist; few medium and common fine roots; neutral; gradual, smooth boundary.

B1—10 to 14 inches, reddish-brown (5YR 5/4) fine sandy loam, reddish brown (5YR 4/4) when moist; weak, fine, granular structure and weak, fine, subangular blocky structure; slightly hard when dry, very friable when moist; common fine roots and pores; neutral; clear, smooth boundary.

B21t—14 to 34 inches, yellowish-red (5YR 5/6) sandy clay loam, yellowish red (5YR 4/6) when moist; weak, coarse, prismatic structure and weak, medium, subangular blocky structure; hard when dry, friable when moist; few fine roots and pores; few clay films; mildly alkaline; clear, wavy boundary.

B22t—34 to 55 inches, reddish-yellow (5YR 6/6) sandy clay loam, yellowish red (5YR 5/6) when moist; weak, coarse, prismatic structure and weak, medium, subangular blocky structure; hard when dry, friable when moist; few very fine roots and pores; bridged sand grains; mildly alkaline; gradual, wavy boundary.

B3—55 to 72 inches, reddish-yellow (5YR 7/6) fine sandy loam, reddish yellow (5YR 6/6) when moist; structureless; bridged sand grains; few indurated concretions of caliche and some waterworn gravel; calcareous; mildly alkaline.

The A horizon ranges from 8 to 16 inches in thickness and from brown to reddish brown in color. The B1 horizon ranges from 2 to 8 inches in thickness and from fine sandy loam to sandy clay loam in texture. The B2t horizon is 20 to 44 inches thick, reddish yellow to reddish brown, and sandy clay loam to loam. A few soft masses and hard concretions of calcium carbonate occur below a depth of 55 inches.

Miles loamy fine sand, 0 to 3 percent slopes (MlB).—This nearly level and gently undulating soil occupies broad areas 1,500 to 2,000 acres in size. Slopes are mainly between 1.5 and 2.5 percent.

Mapped with this soil are areas mostly less than 3 acres in size of Amarillo fine sandy loam; Patricia and Brownfield fine sand; and Springer loamy fine sand, undulating.

Nearly all of this Miles loamy fine sand is cultivated. A few areas are in range. Capability unit IVe–7, dryland, and IIIe–8, irrigated; Sandyland range site.

Mixed Alluvial Land

Mixed alluvial land, saline (Mm) consists of alluvium that has a fine sandy loam to clay loam surface layer. The areas of this mapping unit are underlain by clayey red beds at a depth of 3 to 20 feet. These areas lie on the flood plains of Mustang Creek and Sulphur Springs Draw and adjacent to salt lakes. They are often flooded and may stand under water for several weeks.

In most areas the soil material contains thin strata of various textures. Salt and gypsum crystals occur throughout and increase in quantity with depth. The conductivity of the saturation extract ranges from 4 to more than 15 millimhos per centimeter. The water table fluctuates with rainfall; it ranges from 2 to 20 feet below the surface and averages about 8 feet.

This mapping unit is not suitable for cultivation. The vegetation consists of a few salt-tolerant grasses. Some areas are barren. Capability unit VIw–2, dryland; Valley range site.

Mobeetie Series

The Mobeetie series consists of deep, loamy, calcareous soils that occupy foot slopes below escarpments and areas abutting drainageways. Many fragments and concretions of calcium carbonate occur throughout the soil profile (fig. 4). These soils have convex slopes that are mostly less than 3 percent.

In a representative profile, the surface layer is brown fine sandy loam about 10 inches thick. The next layer is pale-brown fine sandy loam about 16 inches thick. The underlying material, to a depth of 64 inches, is light-brown loam.

These soils are well drained. Surface runoff is medium, and permeability is moderately rapid. The available water capacity is moderate.

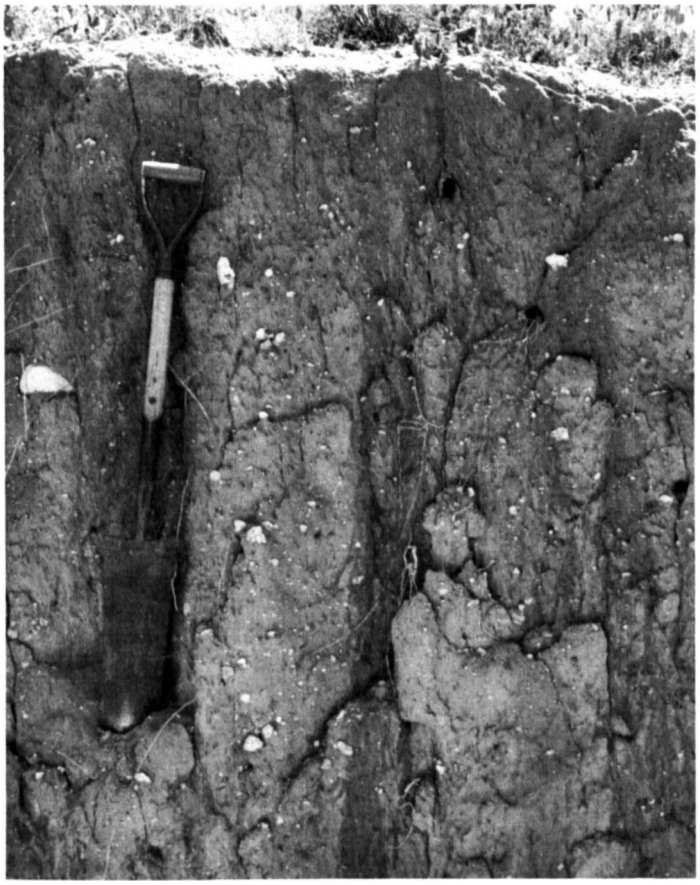

Figure 4.—**Profile of Mobeetie fine sandy loam, 1 to 3 percent slopes.**

Representative profile of Mobeetie fine sandy loam, 1 to 3 percent slopes, 50 feet east of a county road from a point 3.5 miles north on Texas Highway 137 from Stanton, Tex., and 2 miles east of the intersection of a county road and Texas Highway 137.

A1—0 to 10 inches, brown (10YR 5/3) fine sandy loam, brown (10YR 4/3) when moist; weak, fine, granular structure and weak, coarse, prismatic structure; slightly hard when dry, friable when moist; many fine roots and pores; common insect burrows and wormcasts; calcareous; moderately alkaline; clear, smooth boundary.

B2—10 to 26 inches, pale-brown (10YR 6/3) fine sandy loam, brown (10YR 5/3) when moist; moderate, fine, granular structure; slightly hard when dry, friable when moist; common fine roots and pores; few insect burrows and wormcasts; calcareous; moderately alkaline; gradual, wavy boundary.

C1ca—26 to 54 inches, light-brown (7.5YR 6/4) loam, brown (7.5YR 5/4) when moist; weak, fine, subangular blocky structure; slightly hard when dry, friable when moist; common threads and few soft masses of calcium carbonate; calcareous; moderately alkaline; gradual, wavy boundary.

C2—54 to 64 inches, light-brown (7.5YR 6/4) loam, brown (7.5YR 5/4) when moist; structureless; hard when dry, friable when moist; calcareous; moderately alkaline.

The A horizon ranges from 8 to 12 inches in thickness and from brown to grayish brown in color.

The B2 horizon ranges from 12 to 26 inches in thickness; from brown to light brownish gray in color; from loam to fine sandy loam in texture; and from weak granular to weak, coarse, prismatic in structure.

The C1ca horizon is 20 to 38 inches below the surface. It is pinkish white to light yellowish brown in color and loam to fine sandy loam in texture. Films, threads, soft masses, and concretions of calcium carbonate range from 2 to 12 percent, by volume. The C2 horizon is 36 to 60 inches below the surface.

Mobeetie fine sandy loam, 1 to 3 percent slopes (MoB).—This gently sloping soil occupies areas below escarpments and on alluvial fans along draws. Most areas of this soil are long, narrow, and 20 to 75 acres in size. Slopes are mainly between 2 and 3 percent.

Mapped with this soil are small areas of Potter soils, Veal fine sandy loam, and Midessa fine sandy loam.

Most of this Mobeetie fine sandy loam is in range. Capability unit IIIe–6, dryland and irrigated; Mixed Plains range site.

Olton Series

The Olton series consists of deep soils that have a dark, noncalcareous surface layer and a distinct lime accumulation in lower layers. These soils formed in moderately fine textured, calcareous sediments on uplands. Slopes are convex and plane and range to about 1.5 percent, but they are mainly less than 1 percent.

In a representative profile, the surface layer is dark-brown loam about 8 inches thick. The next layer is clay loam. It is dark brown in the upper 8 inches, reddish brown in the next 26 inches, and pink to a depth of 65 inches.

These soils are well drained. Surface runoff is slow, and permeability is moderately slow. The available water capacity is high.

Olton soils are mostly in crops, but a small acreage is in range.

Representative profile of Olton loam, 0 to 1 percent slopes, 0.5 mile west of Farm Road 3033 from a point 5 miles east of Stanton, Tex., on Interstate Highway 20 and 1 mile north on Farm Road 3033.

A—0 to 8 inches, dark-brown (10YR 4/3) loam, dark brown (10YR 3/3) when moist; moderate, fine, subangular blocky structure and weak, fine, granular structure; hard when dry, friable when moist; many fine roots; few fine pores and wormcasts; neutral; clear, smooth boundary.

B21t—8 to 16 inches, dark-brown (7.5YR 4/2) clay loam, dark brown (7.5YR 3/2) when moist; moderate, fine and medium, subangular blocky structure; very hard when dry, very firm when moist; many fine roots; few wormcasts; noncalcareous; mildly alkaline; clear, smooth boundary.

B22t—16 to 32 inches, reddish-brown (5YR4/4) clay loam, dark reddish brown (5YR 3/4) when moist; strong, medium, blocky structure; extremely hard when dry, very firm when moist; common fine roots that follow ped surfaces; thin discontinuous clay films; mildly alkaline; gradual, smooth boundary.

B23tca—32 to 42 inches, reddish-brown (5YR 5/4) clay loam, reddish brown (5YR 4/4) when moist; strong, fine and medium, blocky and subangular blocky structure; extremely hard when dry, very firm when moist; few, small, soft calcium carbonate concretions; few wormcasts and fine roots; calcareous; moderately alkaline; clear, wavy boundary.

B24tca—42 to 60 inches, pink (5YR 8/3) clay loam, pink (5YR 7/3) when moist; weak, fine, subangular blocky structure; very hard when dry, very firm when moist; many soft masses and concretions of calcium carbonate that make up about 30 percent of the horizon, by volume; calcareous; moderately alkaline; gradual, wavy boundary.

B25t—60 to 65 inches, pink (5YR 7/3) clay loam, light reddish brown (5YR 6/3) when moist; weak, medium, subangular blocky structure; bridged sand grains that contain about 20 percent less calcium carbonate than the horizon above.

The A horizon ranges from 7 to 10 inches in thickness and from dark reddish brown to brown in color.

The B21t and B22t horizons range from 14 to 26 inches in thickness, from dark reddish brown to reddish brown in color, and from clay loam to clay in texture. The combined thickness of the A and B21t horizons is 11 to 20 inches. The B23tca horizon is 10 to 18 inches thick, reddish brown to light red, and clay to clay loam. The B24tca horizon is 30 to 50 inches below the surface. Soft masses of calcium carbonate make up an estimated 15 to 40 percent, by volume, of this horizon.

Olton loam, 0 to 1 percent slopes (OlA).—This nearly level soil is on smooth plains. Most areas of this soil are 40 to 200 acres in size, but some areas are as large as 600 acres. Slopes are mainly between 0.4 and 1 percent.

Included with this soil in mapping are areas less than 5 acres in size of Amarillo soils; Acuff loam, 0 to 1 percent slopes; and Mansker loam, 0 to 3 percent slopes. Also included are a few areas less than 2 acres in size of Roscoe clay and a few small areas of Zeta loam, 0 to 1 percent slopes.

Most of this Olton loam is in crops. Capability unit IIIce–2, dryland, and I–1, irrigated; Deep Hardland range site.

Patricia Series

The Patricia series consists of deep, neutral, sandy soils on uplands. These soils formed in unconsolidated sediments. They are mostly gently undulating and have slopes between 2 and 3 percent.

In a representative profile, the surface layer is a brown fine sand about 14 inches thick. The next layer is sandy clay loam that is yellowish red in the upper 8 inches and red in the lower 30 inches. Below this, to a depth of 64 inches, is yellowish-red fine sandy loam.

These soils are well drained; surface runoff is slow, and permeability is moderate. They have a moderate available water capacity.

Representative profile of Patricia fine sand, gently undulating, in a pasture 50 feet west of Texas Highway 349, from a point 3 miles north of the junction of Texas Highways 349 and 176, which is 2.3 miles east of the Andrews-Martin County line.

A11—0 to 8 inches, brown (10YR 5/3) fine sand, dark brown (10YR 4/3) when moist; structureless; loose when dry or moist; neutral; abrupt, smooth boundary.

A12—8 to 14 inches, brown (7.5YR 5/4) fine sand, dark brown (7.5YR 4/4) when moist; structureless to very weak, fine subangular blocky structure; loose when dry, very friable when moist; few fine roots and few shinnery oak roots up to 1 inch in diameter; neutral; clear, smooth boundary.

B21t—14 to 22 inches, yellowish-red (5YR 5/6) sandy clay loam, yellowish red (5YR 4/6) when moist; moderate, coarse, prismatic structure and weak, medium, subangular blocky structure; hard when dry, friable when moist; few fine roots, tubes, and pores; neutral; gradual, smooth boundary.

B22t—22 to 41 inches, red (2.5YR 5/6) sandy clay loam, red (2.5YR 4/6) when moist; moderate, coarse, prismatic structure and weak, medium, subangular blocky structure; hard when dry, friable when moist; few very fine roots and pores; few clay films on ped faces; mildly alkaline; gradual, wavy boundary.

B23t—41 to 52 inches, red (2.5YR 5/8) sandy clay loam, red (2.5YR 4/8) when moist; weak, fine, subangular blocky structure; slightly hard when dry, very friable when moist; mildly alkaline; gradual, wavy boundary.

B3—52 to 64 inches, yellowish-red (5YR 5/6) fine sandy loam, yellowish red (5YR 4/6) when moist; weak, fine, subangular blocky structure; slightly hard when dry, very friable when moist; mildly alkaline.

The A horizon ranges from 8 to 20 inches in thickness and from brown to pale brown in color. The B2t horizon is red to reddish brown. Depth to the C horizon is 60 to more than 72 inches.

Patricia fine sand, gently undulating (PaB).—This soil occupies broad areas mostly less than 200 acres in size. Slopes are mainly between 2 and 3 percent.

This soil has the profile described as representative for the Patricia series.

Included with this soil in mapping are small areas of Brownfield fine sand, gently undulating; Miles loamy fine sand, 0 to 3 percent slopes; Springer loamy fine sand, undulating; and Tivoli fine sand.

This Patricia fine sand is used both for crops and range. Capability unit IVe–8, dryland, and IIIe–9, irrigated; Sandyland range site.

Patricia-Brownfield complex, hummocky (PbC).—This mapping unit consists of Patricia and Brownfield soils that have been severely eroded by soil blowing. The composition of this mapping unit averages about 52 percent Patricia soils, 27 percent Brownfield soils, 5 percent Tivoli soils, and 16 percent a soil that has a fine sand surface layer more than 40 inches thick underlain by sandy clay loam lower layers.

The surface layer of this soil has been reworked by wind. In places it has been completely removed and the sandy clay loam lower layer is exposed. These areas are almost bare. Some of these blowouts are as large as 15 acres in size. The sandy material from these blowouts has been deposited against existing vegetation and along fence lines in small dunes 10 to 150 feet wide and up to 8 feet high. These dunes are covered with grass and woody plants.

This mapping unit is not suited to cultivation. It is in range. Capability unit VIe–6, dryland; Patricia soil in Sandyland range site; Brownfield soil in Deep Sand range site.

Portales Series

The Portales series consists of deep, calcareous soils on uplands. These soils are nearly level to gently sloping and have a prominent accumulation of lime in the lower layers.

In a representative profile, the surface layer is dark grayish-brown loam about 12 inches thick. The next layer is brown clay loam 12 inches thick over pale-brown loam 14 inches thick. The underlying material, to a depth of 60 inches, is white loam.

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

Representative profile of Portales loam, 0 to 1 percent slopes, 0.5 mile west of a point on a county road that is 8 miles east of the intersection of Texas Highways 137 and 176, and 0.5 mile south of Texas Highway 176 on the county road.

A1—0 to 12 inches, dark grayish-brown (10YR 4/2) loam, very dark grayish brown (10YR 3/2) when moist; weak, fine, subangular blocky and granular structure; slightly hard when dry, friable when moist; few fine roots; many insect burrows and wormcasts; many fine tubes and pores; calcareous; moderately alkaline; gradual, smooth boundary.

B21—12 to 24 inches, brown (10YR 5/3) clay loam, dark brown (10YR 4/3) when moist; weak, coarse, prismatic structure to weak, medium, subangular blocky and granular structure; hard when dry, very friable when moist; few fine roots; many insect burrows and wormcasts; many tubes and pores; few calcium carbonate threads; calcareous; moderately alkaline; diffuse, smooth boundary.

B22—24 to 38 inches, pale-brown (10YR 6/3) loam, brown (10YR 5/3) when moist; weak, coarse, prismatic structure and weak, medium, subangular blocky and granular structure; hard when dry, very friable when moist; few calcium carbonate concretions, threads, and films; calcareous; moderately alkaline; gradual, wavy boundary.

Cca—38 to 60 inches, white (10YR 8/2) loam, light gray (10YR 7/2) when moist; weak, fine, subangular blocky structure; as much as 30 percent, by volume, soft masses and hard concretions of calcium carbonate; calcareous; moderately alkaline.

The A horizon ranges from 8 to 15 inches in thickness and from brown to dark grayish brown in color. The B2 horizon ranges from 14 to 30 inches in thickness, from brown to light brown in color, and from loam to clay loam in texture. Depth to the Cca horizon is 23 to 39 inches. This horizon is 15 to 40 percent, by volume, soft masses and hard concretions of calcium carbonate.

Portales loam, 0 to 1 percent slopes (PoA).—This nearly level soil is on smooth plains. Areas of this soil are irregular in shape. They range from 10 to 250 acres in size but are dominantly about 150 acres. Slopes are commonly between 0.4 and 1 percent.

This soil has the profile described as representative for the Portales series.

Included with this soil in mapping are areas less than 5 acres in size of Olton loam, 0 to 1 percent slopes; Acuff loam, 0 to 1 percent slopes; Zita loam, 0 to 1 percent slopes; and Mansker loam, 0 to 3 percent slopes. Also included are a few areas of Roscoe clay that are less than 2 acres in size.

Most of this Portales loam is cultivated. A small acreage is in range. Capability unit IIIce–3, dryland, and IIe–3, irrigated; Mixed Plains range site.

Portales loam, 1 to 3 percent slopes (PoB).—This gently sloping soil occupies irregular areas 10 to 200 acres in size.

The surface layer is dark-brown loam about 10 inches thick. The next layer is brown to pale-brown clay loam about 20 inches thick. The underlying material is soft caliche.

Mapped with this soil are areas less than 5 acres in size of Acuff loam, 0 to 1 percent slopes; Olton loam, 0 to 1 percent slopes; Mansker loam, 0 to 3 percent slopes; and Portales loam, 0 to 1 percent slopes.

Most of this Portales loam, 1 to 3 percent slopes, is in crops. Capability unit IIIe–3, dryland, and IIIe–4, irrigated; Mixed Plains range site.

Potter Series

The Potter series consists of shallow to very shallow, loamy, calcareous soils on uplands. These soils lie on escarpments and along drainageways. They have convex slopes that range up to 20 percent but are mainly less than 5 percent.

In a representative profile, the surface layer is brown loam about 8 inches thick. The underlying material, to a depth of 14 inches, is white chalky earth.

These soils are well drained. Surface runoff is rapid, and permeability is moderate. The available water capacity is low.

Representative profile of Potter soils, in range 0.5 mile north of a point on U.S. Highway 80 that is 2 miles east of Stanton, Tex.

A—0 to 8 inches, brown (10YR 5/3) loam, dark brown (10YR 4/3) when moist; weak, fine, subangular blocky and granular structure; slightly hard when dry, friable when moist; few fine roots, tubes, and pores; few insect burrows; common calcium carbonate concretions; calcareous; moderately alkaline; abrupt, smooth boundary.

Cca—8 to 14 inches, white (10YR 8/2) chalky earth, light gray (10YR 7/2) when moist; calcareous; many hard concretions of calcium carbonate; indurated plates of calcium carbonate.

The A horzion ranges from 4 to 12 inches in thickness, from pale brown to brown in color, and from clay loam to fine sandy loam in texture.

The Cca horizon is 4 to 12 inches below the surface. In most areas, the upper part of the Cca horizon contains weakly indurated layers, or plates, 2 to 3 inches thick.

Potter soils (Ps).—These gently sloping to steep soils occupy slopes along drainageways and on escarpments. Soil areas are elongated and 10 to 160 acres in size. The texture of the surface layer ranges from clay to fine sandy loam.

Potter soils are too shallow for cultivation and are in range. Capability unit VIIs–1, dryland; Very Shallow range site.

Roscoe Series

The Roscoe series consists of deep, clayey soils. These soils formed in fine-textured sediment. They are nearly level to weakly concave or slightly depressed, and slopes are less than 1 percent.

In a representative profile, the surface layer is dark-gray clay about 16 inches thick. The next layer is dark grayish-brown clay about 14 inches thick. The underlying material is light brownish-gray clay to a depth of 48 inches and light-gray clay to a depth of 65 inches.

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

Representative profile of Roscoe clay, in a pasture 0.9 mile east and 0.9 mile northeast on ranch road from the intersection of the ranch road and Texas Highway 349. This intersection is 2.7 miles north of the Midland-Martin County line marker on Farm Road 349.

A1—0 to 16 inches, dark-gray (10YR 4/1) clay, very dark gray (10YR 3/1) when moist; moderate, medium, blocky structure; very hard when dry, firm when moist, very sticky and plastic when wet; shiny pressure faces on peds; neutral; clear, smooth boundary.

AC—16 to 30 inches, dark grayish-brown (10YR 4/2) clay, very dark grayish brown (10YR 3/2) when moist; moderate, medium, blocky structure; intersecting slickensides; very hard when dry, firm when moist, very sticky and plastic when wet; few roots in upper part; shiny pressure faces on peds; calcareous; mildly alkaline; gradual, wavy boundary.

C1ca—30 to 48 inches, light brownish-gray (10YR 6/2) clay, grayish brown (10YR 5/2) when moist; moderate, medium, blocky structure; very hard when dry, firm when moist, sticky when wet; common films, threads, and soft masses of calcium carbonate that make up about 8 percent of the horizon, by volume; calcareous; moderately alkaline; gradual, wavy boundary.

C2—48 to 65 inches, light-gray (2.5Y 7/2) clay, light brownish gray (2.5Y 6/2) when moist; weak, fine, subangular blocky structure; very hard when dry, firm when moist, sticky when wet; few soft masses and threads of calcium carbonate that make up about 2 percent of the horizon, by volume; calcareous; moderately alkaline.

The A horizon ranges from 12 to 25 inches in thickness and from gray to dark gray in color. The AC horizon ranges from grayish brown to dark grayish brown in color and from weak, coarse, blocky to moderate, medium, blocky in structure. The C1ca horizon is 26 to 50 inches below the surface. It is light brownish gray to light gray.

Roscoe clay (Ro).—This nearly level soil occupies slightly depressed, circular to oval areas less than 15 acres in size. Slopes are concave and mainly between 0.2 and 0.6 percent.

Mapped with this soil are small, circular, lower-lying areas of Lipan clay and Mansker loam, 0 to 3 percent slopes, on the outer edges of the depressions.

Most of this soil is in range. Capability unit IIIce–1, dryland, and IIs–1, irrigated; Deep Hardland range site.

Sharvana Series

The Sharvana series consists of shallow soils that are over a prominent lower layer of indurated caliche. These nearly level to gently sloping soils are on uplands. Slopes are between 0 and 3 percent.

In a representative profile, the surface layer is brown fine sandy loam about 8 inches thick. The next layer is a reddish-brown sandy clay loam about 11 inches thick. The underlying material, to a depth of 21 inches, is indurated platy caliche.

These soils are well drained. Surface runoff is medium, and permeability is moderate. The available water capacity is low.

Representative profile of Sharvana fine sandy loam, 0 to 3 percent slopes, 0.5 mile west of Farm Road 829 at a point 6.5 miles north of the intersection of Farm Road 829 and Interstate Highway 20.

A1—0 to 8 inches, brown (7.5YR 4/4) fine sandy loam, dark brown (7.5YR 3/4) when moist; weak, fine, granular structure; hard when dry, friable when moist; few fine roots; neutral; abrupt, smooth boundary.

B2t—8 to 19 inches, reddish-brown (5YR 4/4) sandy clay loam, dark reddish brown (5YR 3/4) when moist; weak, coarse, prismatic structure and weak, medium, subangular blocky structure; very hard when dry, friable when moist; few roots; many fine pores and wormcasts; few clay films on faces of prisms; neutral; abrupt, smooth boundary.

Ccam—19 to 21 inches, indurated platy caliche.

The A horizon ranges from 6 to 10 inches in thickness; from brown to reddish brown in color; and from weak, fine, granular to weak, medium, subangular blocky in structure. The B2t horizon is 6 to 11 inches thick and red to reddish brown. Texture of the B2t horizon is loam to sandy clay loam. Depth to the Ccam horizon is 12 to 20 inches.

Sharvana fine sandy loam, 0 to 3 percent slopes (SaB).—This nearly level to gently sloping soil is on uplands in irregular to elongated areas 10 to 100 acres in size.

Included with this soil in mapping are small areas of Arvana fine sandy loam, Amarillo fine sandy loam, and Slaughter loam.

This Sharvana fine sandy loam is mostly in range. A few areas are cultivated. Capability unit IVe–10, dryland, and IIIe–10 irrigated; Sandy Loam range site.

Simona Series

The Simona series consists of gently sloping, loamy, calcareous soils on uplands. These soils are shallow over indurated, platy caliche. They have convex slopes that are mainly between 1 and 2 percent. Some slopes range up to 3 percent.

In a representative profile, the surface layer is brown fine sandy loam about 7 inches thick. The next layer is pale-brown fine sandy loam about 7 inches thick. The underlying material, to a depth of 15 inches, is whitish indurated platy caliche.

These soils are well drained. Runoff is slow, and permeability is moderately rapid. The available water capacity is low.

Representative profile of Simona fine sandy loam, 1 to 3 percent slopes, in range 1.5 miles west of a point on Texas Highway 137 that is 5.75 miles north of the intersection of Texas Highways 137 and 176.

A1—0 to 7 inches, brown (10YR 5/3) fine sandy loam, brown (10YR 4/3) when moist; weak, fine, granular structure; slightly hard when dry, very friable when moist; few fine roots and pores; few wormcasts; calcareous; moderately alkaline; gradual, smooth boundary.

B2—7 to 14 inches, pale-brown (10YR 6/3) fine sandy loam, brown (10YR 5/3) when moist; weak, fine, subangular blocky and granular structure; slightly hard when dry, friable when moist; few fine roots and pores; common calcium carbonate concretions; calcareous; moderately alkaline; abrupt, smooth boundary.

Ccam—14 to 15 inches, whitish indurated platy caliche that has nodules cemented to the bottom of the plates.

The A horizon ranges from 6 to 10 inches in thickness and from brown to light brown in color. The B horizon is 6 to 12 inches thick and brown to very pale brown. Depth to indurated caliche is 12 to 20 inches.

Simona fine sandy loam, 1 to 3 percent slopes (SfB).—This gently sloping soil lies in small convex areas.

Included with this soil in mapping are a few small areas of Veal fine sandy loam, Potter soils, and Upton loam, 0 to 2 percent slopes.

Most of this Simona fine sandy loam is in range. Capability unit IVe–10, dryland, and IIIe–10, irrigated; Mixed Plains range site.

Slaughter Series

The Slaughter series consists of shallow, loamy soils that have an indurated caliche lower layer. These soils formed on uplands in moderately fine textured, unconsolidated sediment. Slopes are plane to weakly concave and are less than 1 percent.

In a representative profile, the surface layer is dark-brown loam about 5 inches thick (fig. 5). The next layer is reddish-brown clay loam about 11 inches thick. The underlying material, to a depth of 20 inches, is indurated caliche.

Figure 5.—**Profile of Slaughter loam, 0 to 1 percent slopes.**

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

Representative profile of Slaughter loam, 0 to 1 percent slopes, 200 feet north of Texas Highway 176, from a point 7.5 miles west of Tarzan, Tex.

A1—0 to 5 inches, dark-brown (7.5YR 4/3) loam, dark brown (7.5YR 3/3) when moist; weak, fine, subangular blocky and granular structure; slightly hard when dry, friable when moist; few fine roots, tubes, and pores; mildly alkaline; clear, smooth boundary.

B21t—5 to 10 inches, reddish-brown (5YR 4/3) clay loam, dark reddish brown (5YR 3/3) when moist; moderate, medium, subangular blocky structure; hard when dry, firm when moist; few fine roots, tubes, and pores; few insect burrows; mildly alkaline; gradual, smooth boundary.

B22t—10 to 16 inches, reddish-brown (5YR 4/4) clay loam, dark reddish brown (5YR 3/4) when moist; moderate, medium, blocky structure; hard when dry, firm when moist; few fine roots on ped faces; few clay films; mildly alkaline; abrupt, smooth boundary.

Ccam—16 to 20 inches, indurated caliche in the form of indurated slabs 1 to 2 feet in diameter over larger indurated slabs several feet in diameter; laminae on plates from less than 1/16 of an inch to 3/4 of an inch thick.

The A horizon ranges from 4 to 8 inches in thickness and from brown to dark brown in color. The B2t horizon is 6 to 12 inches thick and reddish brown to dark brown. Texture of the B2t horizon is clay loam to clay. The Ccam horizon is 10 to 20 inches below the surface.

Slaughter loam, 0 to 1 percent slopes (SlA).—This nearly level soil is on smooth plains in irregular areas mostly 10 to 100 acres in size. Slopes are mainly 0.2 to 0.8 percent.

Included with this soil in mapping are areas less than 1 acre in size of Kimbrough soils; Stegall clay loam, 0 to 1 percent slopes; and Sharvana fine sandy loam, 0 to 3 percent slopes.

This Slaughter loam is mostly in range. Capability unit IVe–9, dryland, and IIIe–10, irrigated; Deep Hardland range site.

Springer Series

The Springer series consists of deep, neutral, sandy soils that are gently sloping and gently undulating. These soils formed in sandy deposits on uplands. Slopes are mostly less than 2 percent but range from 1 to 3 percent.

In a representative profile, the surface layer is brown loamy fine sand about 10 inches thick. The next layer is fine sandy loam. It is brown in the upper 16 inches and yellowish red in the lower 22 inches. The underlying material, to a depth of 68 inches, is light-brown loamy fine sand.

These soils are well drained. Surface runoff is slow, and permeability is moderately rapid. The available water capacity is low.

Representative profile of Springer loamy fine sand, undulating, in range 2 miles south of downtown Stanton, Tex., on county road and 2.5 miles east.

A1—0 to 10 inches, brown (10YR 5/3) loamy fine sand, dark brown (10YR 4/3) when moist; weak, fine, granular structure; loose when dry or moist; common fine roots; few insect burrows; neutral; clear, smooth boundary.

B2t—10 to 26 inches, brown (7.5YR 5/4) fine sandy loam, brown (7.5YR 4/4) when moist; weak, fine, subangular blocky structure; soft when dry, friable when moist; few fine and medium roots; neutral; clear, smooth boundary.

B3—26 to 48 inches, yellowish-red (5YR 5/6) fine sandy loam, yellowish red (5YR 4/6) when moist; weak, fine, subangular blocky structure; slightly hard when dry, friable when moist; few fine roots, tubes, and pores; few insect burrows; mildly alkaline; clear, smooth boundary.

C—48 to 68 inches, light-brown (7.5YR 6/4) loamy fine sand, brown (7.5YR 5/4) when moist; structureless, single grain; soft when dry, very friable when moist; mildly alkaline.

The A horizon ranges from 8 to 20 inches in thickness and from brown to reddish brown in color. The B2t horizon is 10 to 20 inches thick and brown to reddish brown. Texture of the B2t horizon ranges from loam to fine sandy loam. The B3 horizon is 12 to 24 inches thick, is reddish brown to yellowish red, and is fine sandy loam to loamy fine sand. The C horizon is 44 to 74 inches below the surface.

Springer loamy fine sand, undulating (SpC).—This soil is on plains. Slopes are mainly between 1.5 and 2 percent.

Included with this soil in mapping are areas less than 3 acres in size of Miles loamy fine sand, 0 to 3 percent slopes; Patricia fine sand, gently undulating; Brownfield fine sand, gently undulating; and Tivoli fine sand.

This Springer loamy fine sand is mostly in range. Capability unit VIe–5, dryland, and IVe–5, irrigated; Sandyland range site.

Spur Series

The Spur series consists of deep, dark, loamy soils that formed in calcareous loamy alluvium. These nearly level soils lie along drainageways.

In a representative profile, the surface layer is dark grayish-brown clay loam about 12 inches thick. The next layer is brown clay loam about 20 inches thick. The underlying material, to a depth of 62 inches, is a light-brown clay loam.

Spur soils are well drained. Surface runoff is slow, and permeability is moderate. The available water capacity is high.

Representative profile of Spur clay loam, slightly saline, 100 feet east of Farm Road 1212, from a point 4.5 miles west of Tarzan, Tex., on Texas Highway 176, and 5 miles south on Farm Road 1212.

A1—0 to 12 inches, dark grayish-brown (10YR 4/2) clay loam, very dark grayish brown (10YR 3/2) when moist; weak, fine, subangular blocky and granular structure; slightly hard when dry, very friable when moist; common fine and medium roots and pores; common insect burrows and wormcasts; common pockets of salts; electrical conductivity of saturation extract is 6.5 millimhos per cubic centimeter; calcareous; moderately alkaline; gradual, smooth boundary.

B2—12 to 32 inches, brown (7.5YR 5/4) clay loam, dark brown (7.5YR 4/4) when moist; weak, medium, subangular blocky structure and weak, fine, granular structure; slightly hard when dry, friable when moist; few fine roots and pores; few insect burrows and wormcasts; many pockets of salts; electrical conductivity of saturation extract is 6.5 millimhos per cubic centimeter; calcareous; moderately alkaline; gradual, smooth boundary.

C—32 to 62 inches, light-brown (7.5YR 6/4) clay loam, brown (7.5YR 5/4) when moist; moderate, fine, subangular blocky structure and fine granular structure; hard when dry, friable when moist; few very fine roots; few calcium carbonate concretions; few water-worn pebbles; deposits of gypsum and other salts; electrical conductivity of saturation extract is 4 millimhos per cubic centimeter.

The A horizon ranges from 10 to 18 inches in thickness and from brown to dark grayish brown in color. The B2 horizon is 14 to 25 inches thick and brown to reddish brown Texture of the B2 horizon is loam to clay loam. The C horizon is light brown to reddish brown and loam to clay loam.

Spur clay loam, slightly saline (St).—This nearly level soil is in drainageways throughout the county. Most areas are narrow and several miles long. Slopes are less than 1 percent.

Included with this soil in mapping are areas of Bippus and Colorado soils. Also included are small areas of Acuff loam, 0 to 1 percent slopes, and Zita loam, 0 to 1 percent slopes.

This Spur clay loam is mostly in range. It has a high water table, and in some places the surface has a thin white crust. Capability unit IIe–1, dryland, and I–2 irrigated; Valley range site.

Stamford Series

The Stamford series consists of deep, calcareous clays on uplands. These soils formed in red-bed clays. They are level except for some microrelief.

In a representative profile, the surface layer is reddish-brown, very firm clay about 12 inches thick. The next layer is reddish-brown, extremely firm clay about 18 inches thick. The underlying material, to a depth of 34 inches, is red clay.

These soils are well drained. Surface runoff is medium, and permeability is slow. The available water capacity is high.

Representative profile of Stamford clay, 0 to 1 percent slopes, in pasture 2.5 miles east, 0.5 mile south, and 0.5 mile east of Stanton, Tex., by county roads, and 0.1 mile east of road corner.

A1—0 to 12 inches, reddish-brown (2.5YR 4/4) clay, dark reddish brown (2.5YR 3/4) when moist; moderate, firm, subangular blocky structure; very hard when dry, very firm when moist; few to common fine roots; few pores; calcareous; moderately alkaline; gradual, smooth boundary.

AC—12 to 30 inches, reddish-brown (2.5YR 4/4) clay, dark reddish brown (5YR 3/4) when moist; weak, medium, blocky structure; shiny ped faces; extremely hard when dry, extremely firm when moist; few fine roots; few soft masses of calcium carbonate; few slickensides that intersect; calcareous; moderately alkaline; gradual, smooth boundary.

C—30 to 34 inches, weak-red (2.5YR 4/2) clay, dusky red (2.5YR 3/2) when moist; Triassic material that contains pockets and streaks of gray shale.

The A horizon ranges from 6 to 16 inches in thickness and from reddish brown to red in color. The AC horizon is 14 to 30 inches thick and red to dark reddish brown. The C horizon is 20 to 35 inches below the surface and is red to weak red.

Stamford clay, 0 to 1 percent slopes (SvA).—This nearly level soil occupies small areas. Slopes are mainly between 0.4 and 0.75 percent.

Included with this soil in mapping are areas less than 10 acres in size of Vernon clay and a few areas less than 5 acres in size of Olton loam.

Most areas of this Stamford clay are in range. Capability unit IIIs–2, dryland, and IIIs–1, irrigated; Clay Flats range site.

Stegall Series

The Stegall series consists of moderately deep, loamy soils on uplands. These soils have an indurated platy caliche lower layer. They formed in moderately fine textured, unconsolidated plains sediment. Slopes are nearly level to weakly concave and are less than 1 percent.

In a representative profile, the surface layer is dark-brown clay loam about 10 inches thick. The next layer is reddish-brown clay loam about 15 inches thick that rests on indurated platy caliche.

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

Representative profile of Stegall clay loam, 0 to 1 percent slopes, in a pasture 2.5 miles west by county and private roads from Farm Road 1212, from a point 7.3 miles south of the junction of Farm Road 1212 and Texas Highway 176.

A1—0 to 10 inches, dark-brown (7.5YR 4/3) clay loam, dark brown (7.5YR 3/3) when moist; weak, fine, subangular blocky and granular structure; hard when dry, friable when moist; many fine roots and pores; mildly alkaline; clear, smooth boundary.

B2t—10 to 25 inches, reddish-brown (5YR 4/4) clay loam, dark reddish brown (5YR 3/4) when moist; moderate, medium, blocky structure; very hard when dry, firm when moist; few roots and pores; few clay films; mildly alkaline; abrupt, smooth boundary.

Ccam—25 inches, indurated platy caliche; laminar in upper 2 inches; upper surface of the plates is smooth.

The A horizon ranges from 6 to 10 inches in thickness, from reddish brown to dark brown in color, and from loam to clay loam in texture. The Bt horizon is 10 to 20 inches thick and reddish brown to brown. The Ccam horizon is 21 to 30 inches below the surface.

Stegall clay loam, 0 to 1 percent slopes (SwA).—This nearly level soil is on smooth plains. The soil areas are irregular in shape. They range from 10 to 80 acres in size but are dominantly about 50 acres. Slopes are mainly 0.4 to 1 percent.

Included with this soil in mapping are small areas of Kimbrough and Slaughter soils; Olton loam, 0 to 1 percent slopes; and Acuff loam, 0 to 1 percent slopes.

This Stegall clay loam is mostly in range. A few areas are cultivated. Capability unit IIIce–2, dryland, and I–1, irrigated; Deep Hardland range site.

Tivoli Series

The Tivoli series consists of deep, pale-brown, sandy soils on uplands. These neutral, gently undulating and duny soils formed in deep sands.

In a representative profile, the surface layer is pale-brown fine sand about 15 inches thick. The underlying material, to a depth of 60 inches, is light yellowish-brown fine sand.

These soils are excessively drained. Surface runoff is very slow, and the available water capacity is low.

Representative profile of Tivoli fine sand, in range 2 miles south of downtown Stanton, Tex., on county road, and 2 miles east on a private road.

A1—0 to 15 inches, pale-brown (10YR 6/3) fine sand, brown (10YR 5/3) when moist; structureless, single grained; loose when dry or moist; few fine roots; neutral; clear, smooth boundary.

C—15 to 60 inches, light yellowish-brown (10YR 6/4) fine sand, yellowish brown (10YR 5/4) when moist; structureless, single grained; loose when dry or moist; few fine roots in the upper part; neutral.

The A horizon ranges from 4 to 20 inches in thickness and from pale brown to light yellowish brown in color. The C horizon is at a depth of 4 to 20 inches and is reddish yellow to brownish.

Tivoli fine sand (Tf).—This gently undulating and duny soil is on broad uplands in areas 200 to 1,500 acres in size. Slopes range from 1.5 to 5 percent.

Mapped with this soil are small areas of Springer loamy fine sand, undulating; Brownfield fine sand, gently undulating; and a few areas of Gomez loamy fine sand, gently undulating.

This Tivoli fine sand is not suited to cultivation; it is in range. Capability unit VIIe–1, dryland; Deep Sand range site.

Upton Series

The Upton series consists of calcareous soils on uplands. These soils are shallow and underlain by caliche (fig. 6). Slopes are less than 2 percent.

In a representative profile, the loam surface layer is light brownish gray in the upper 6 inches and brown in the lower 4 inches. The next layer is brown clay loam about 9 inches thick. The underlying layer, to a depth of 21 inches, is white indurated caliche.

These soils are well drained. Surface runoff is medium, and permeability is moderate. The available water capacity is low.

Figure 6.—**Profile of Upton loam, 0 to 2 percent slopes.**

Representative profile of Upton loam, 0 to 2 percent slopes, in a field 0.95 mile west of a point on Farm Road 1212 that is 3.2 miles south of the intersection of State Highway 176 and Farm Road 1212.

Ap—0 to 6 inches, light brownish-gray (10YR 6/2) loam, dark grayish brown (10YR 4/2) when moist; weak, fine, subangular blocky structure; slightly hard when dry, friable when moist; calcareous; moderately alkaline; clear, smooth boundary.

A12—6 to 10 inches, brown (10YR 5/3) loam, dark brown (10YR 4/3) when moist; weak, fine, subangular blocky and granular structure; slightly hard when dry, friable when moist; common films and threads of calcium carbonate on ped faces; calcareous; moderately alkaline; gradual, smooth boundary.

B2—10 to 19 inches, brown (10YR 5/3) clay loam, dark brown (10YR 4/3) when moist; weak, medium, subangular blocky structure and weak, fine, granular structure; hard when dry, friable when moist; slightly sticky when wet; common film sand threads of calcium carbonate; common hard concretions of calcium carbonate; calcareous; moderately alkaline; abrupt, smooth boundary.

Ccam—19 to 21 inches, white indurated caliche plates.

The A horizon ranges from 5 to 10 inches in thickness and from brown to light brownish gray in color. The B2 horizon is 6 to 14 inches thick and brown to very pale brown. Texture of the B2 horizon ranges from loam to clay loam. Depth to the Ccam horizon is 12 to 20 inches.

Upton loam, 0 to 2 percent slopes (UpA).—This nearly level to gently sloping soil is on uplands in irregular areas 10 to 50 acres in size.

Included with this soil in mapping are small areas of Slaughter loam, 0 to 1 percent slopes; Simona fine sandy loam, 1 to 3 percent slopes; and Kimbrough soils .

This Upton loam is used for both range and crops. Capability unit IVe–9, dryland, and IIIe–10, irrigated; Mixed Plains range site.

Veal Series

The Veal series consists of deep, friable, loamy soils on uplands. These soils have an accumulation of lime in the lower layers. They are gently sloping and calcareous.

In a representative profile, the surface layer is brown fine sandy loam about 8 inches thick. The next layer is pale-brown sandy clay loam about 10 inches thick. The underlying material is sandy clay loam. It is pink to a depth of 44 inches and brown to a depth of 50 inches.

These soils are well drained; surface runoff is medium, and permeability is moderate. The available water capacity is high.

Representative profile of Veal fine sandy loam, 1 to 3 percent slopes, 500 feet north of Texas Highway 176, from a point 10 miles east of Lenorah, Tex.

A1—0 to 8 inches, brown (10YR 5/3) fine sandy loam, brown (10YR 4/3) when moist; weak, fine, granular structure and weak, fine, subangular blocky structure; slightly hard when dry, very friable when moist; common fine and medium roots and pores; few calcium carbonate concretions; few wormcasts; few films and threads of calcium carbonate; calcareous; moderately alkaline; gradual, smooth boundary.

B2—8 to 18 inches, pale-brown (10YR 6/3) sandy clay loam, brown (10YR 5/3) when moist; weak, fine, subangular blocky and granular structure; slightly hard when dry, very friable when moist; few fine roots and pores; few calcium carbonate concretions; calcareous; moderately alkaline; gradual, smooth boundary.

C1ca—18 to 44 inches, pink (7.5YR 8/4) sandy clay loam, pink (7.5YR 7/4) when moist; weak, fine, subangular blocky structure; hard when dry, friable when moist; about 38 percent, by volume, soft masses and concretions of calcium carbonate; calcareous; moderately alkaline; gradual, wavy boundary.

C2—44 to 50 inches, brown (10YR 5/3) sandy clay loam, dark brown (10YR 4/3) when moist; structureless; hard when dry, friable when moist; about 20 percent, by volume, soft masses and concretions of calcium carbonate.

The A horizon ranges from 5 to 10 inches in thickness and from brown to pale brown in color. The B2 horizon is 6 to 15 inches thick and yellowish red to pale brown. Texture of the B2 horizon is loam to clay loam. The C1ca horizon is 11 to 20 inches below the surface and is loam to clay loam. Soft masses and hard concretions of calcium carbonate make up 20 to 50 percent by volume, of this horizon. The C2 horizon is 28 to 56 inches below the surface.

Veal fine sandy loam, 1 to 3 percent slopes (VeB).—This gently sloping soil occupies elongated areas that are mostly less than 25 acres in size. Some areas are more than 100 acres in size. Slopes are mainly between 1.5 and 2 percent.

This soil has the profile described as representative for the Veal series.

Included with this soil in mapping are small areas of Midessa soils, Gomez soils, and Zita loam, 0 to 1 percent slopes. Also included are a few areas of Veal fine sandy loam that have slopes of less than 1 percent and Veal fine sandy loam, 3 to 5 percent slopes.

This Veal fine sandy loam, 1 to 3 percent slopes, is used both for range and crops. Capability unit IVe–10, dryland, and IIIe–10, irrigated; Sandy Loam range site.

Veal fine sandy loam, 3 to 5 percent slopes (VeC).—This gently sloping soil occupies irregular areas 10 to 50 acres in size. These areas are along the side slopes of natural drains and on ridges along with the deeper soils of the uplands. Slopes are mainly about 4 percent.

The surface layer is fine sandy loam about 6 inches thick. The next layer is sandy clay loam about 7 inches thick. The underlying material is calcareous, pink sandy clay loam that contains free calcium carbonate.

Included with this soil in mapping are small areas of Potter soils; Mobeetie fine sandy loam, 1 to 3 percent slopes; and a few areas of Veal fine sandy loam, 1 to 3 percent slopes.

This Veal fine sandy loam, 3 to 5 percent slopes, is mostly in range. Capability unit VIe–2, dryland, and IVe–6, irrigated; Sandy Loam range site.

Vernon Series

The Vernon series consists of shallow, calcareous, clayey soils on uplands. These gently sloping soils formed in red-bed clay and shale.

In a representative profile, the surface layer is reddish-brown clay about 4 inches thick. The next layer is reddish-brown clay about 16 inches thick. The underlying material, to a depth of 30 inches, is weak-red clay.

These soils are well drained. Runoff is rapid, and permeability is slow. The available water capacity is low.

Representative profile of Vernon clay, 1 to 3 percent slopes, in a pasture 0.7 mile east of Farm Road 3033, at a point 2.5 miles north of Interstate Highway 20, 5 miles northeast of Stanton, Tex.

A1—0 to 4 inches, reddish-brown (2.5YR 4/4) clay, dark reddish brown (2.5YR 3/4) when moist; strong, medium, blocky structure; very hard when dry, very firm when moist; few fine roots, tubes, and pores; few calcium carbonate concretions; calcareous; moderately alkaline; clear, smooth boundary.

B2—4 to 20 inches, reddish-brown (2.5YR 5/4) clay, reddish brown (2.5YR 4/4) when moist; strong, fine, blocky structure; extremely hard when dry, very firm when moist; very few fine roots; calcareous; moderately alkaline; gradual, smooth boundary.

C—20 to 30 inches, weak-red (10R 4/4) clay, dusky red (10R 3/4) when moist; structureless, massive; extremely hard when dry, extremely firm when moist; calcareous; moderately alkaline; common pockets of gray (2.5YR 5/0) shale.

The A horizon ranges from 4 to 7 inches in thickness and from reddish brown to red in color. The B2 horizon is 9 to 16 inches thick and reddish brown to red. The C horizon is at a depth of 14 to 20 inches and is weak red to red.

Vernon clay, 1 to 3 percent slopes (VnB).—This gently sloping soil occupies smooth convex areas mostly less than 100 acres in size. Slopes are mainly between 1.5 and 2.5 percent.

Mapped with this soil are small areas of Stamford clay, 0 to 1 percent slopes.

This Vernon clay is mostly in range. Capability unit IVe–4, dryland; Shallow Redland range site.

Zita Series

The Zita series consists of deep soils of the uplands. These soils formed in loamy sediment. Slopes are less than 1 percent and are concave and plane.

In a representative profile, the surface layer is loam that is dark brown in the upper 7 inches and dark grayish brown in the lower 9 inches. The next layer is brown clay loam about 15 inches thick. The underlying material, to a depth of 62 inches, is pink clay loam.

These soils are well drained. Surface runoff is very

slow, and permeability is moderate. The available water capacity is high.

Representative profile of Zita loam, 0 to 1 percent slopes, in a cultivated field, 150 feet west of a point on a private road that is 7 miles west of Ackerly, Tex., on Farm Road 2002, and 1.5 miles south on the private road.

Ap—0 to 7 inches, dark-brown (10YR 4/3) loam, dark brown (10YR 3/3) when moist; weak, fine, granular structure; slightly hard when dry, friable when moist; few roots and pores; mildly alkaline; abrupt, smooth boundary.

A12—7 to 16 inches, dark grayish-brown (10YR 4/2) loam, very dark grayish brown (10YR 3/2) when moist; weak, coarse, prismatic structure to weak, fine, subangular blocky structure; hard when dry, friable when moist; few fine roots, tubes, and pores; common insect burrows and wormcasts; mildly alkaline; clear, smooth boundary.

B2—16 to 31 inches, brown (10YR 5/3) clay loam, dark brown (10YR 4/3) when moist; weak, coarse, prismatic structure to weak, medium, subangular blocky structure; hard when dry, friable when moist; few fine roots; many insect burrows; few films and threads of calcium carbonate; calcareous; moderately alkaline; gradual, smooth boundary.

C1ca—31 to 50 inches, pink (7.5YR 7/4) clay loam, light brown (7.5YR 6/4) when moist; weak, fine, subangular blocky structure; hard when dry, friable when moist; about 30 percent, by volume, soft masses of calcium carbonate; calcareous; moderate alkaline; gradual, wavy boundary.

C2—50 to 62 inches, pink (7.5YR 7/4) clay loam, light brown (7.5YR 6/4) when moist; structureless; hard when dry, friable when moist; about 20 percent, by volume, soft masses of calcium carbonate.

The A horizon ranges from 8 to 19 inches in thickness, from brown to dark grayish brown in color, and from loam to fine sandy loam in texture. The B2 horizon is 12 to 21 inches thick and grayish brown to pale brown. The C1ca horizon is 20 to 40 inches below the surface. An estimated 20 to 40 percent, by volume, of this horizon is made up of soft masses and a few hard concretions of calcium carbonate. Depth to the C2 horizon is 35 to 60 inches.

Zita loam, 0 to 1 percent slopes (ZtA).—This nearly level soil is on smooth uplands in irregular to rounded areas 10 to 150 acres in size. The soil areas are dominantly about 75 acres in size. Slopes are mainly between 0.4 and 1 percent.

Included with this soil in mapping are small areas of Portales, Midessa, and Gomez soils and Mansker loam, 0 to 3 percent slopes.

Almost all of this Zita loam is in cultivation. Capability unit IIIce–2, dryland, and I–2, irrigated; Deep Hardland range site.

Use and Management of the Soils

This section explains the system of capability classification used by the Soil Conservation Service, discusses management of the soils by capability units for dryland and irrigated crops, and gives estimated average acre yields of the principal dryland and irrigated crops. Use of the soils for range, wildlife habitat, engineering purposes, and recreation are also discussed.

Capability Grouping

Capability grouping shows, in a general way, the suitability of soils for most kinds of field crops. The groups are made according to the limitations of the soils 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 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 or engineering.

In the capability system, all kinds of soils are grouped at three levels, the capability class, subclass, and 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 not likely to erode but have other limitations, impractical to remove, that limit their use largely to pasture, range, woodland, or wildlife. (None in Martin County.)

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.

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.

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

CAPABILITY UNITS are soil groups within the subclasses. The soils in one capability unit are enough alike to be suited to the same crops and pasture plants, to require similar management, and to have similar productivity and other responses to management. Thus, the capability unit is a convenient grouping for making many statements about management of soils. Capability units are generally designated by adding an Arabic numeral to the subclass symbol, for example, IIe–4 or IIIe–6. Thus, in one symbol, the Roman numeral designates the capability class, or degree of limitation; the small letter indicates the subclass, or kind of limitation, as defined in the foregoing paragraph; and the Arabic numeral specifically identifies the capability unit within each subclass.

Management by capability units [2]

In the following pages, the capability units in Martin County are described and some suggestions for the use and management of the soils are given. The capability unit designation for each soil in the county can be found in the "Guide to Mapping Units."

CAPABILITY UNIT IIe–1, DRYLAND

Spur clay loam, slightly saline, is the only soil in this unit. It is deep, nearly level, and moderately permeable.

Grain sorghum and cotton are the principal crops on this soil. Small grain and forage sorghum also are grown.

Careful management is needed to keep crop residue on the surface of the soil through critical periods of erosion. Crop residue on the surface of the soil helps control soil blowing and water erosion, helps maintain productivity and tilth, and conserves moisture. When crop residue does not provide adequate protective cover, tillage is necessary to roughen the surface of the soil and reduce soil blowing.

CAPABILITY UNIT IIIe–3, DRYLAND

This unit consists of deep, gently sloping soils that have a loam surface layer and clay loam to loam lower layers. These soils have a high available water capacity, and the hazard of water erosion is moderate.

The soils of this unit are suitable for limited cultivation. The principal crops are cotton, grain sorghum, and forage sorghum.

Crop residue can be kept on the soil surface for protection against soil blowing and water erosion. In dry years when crop residue is not adequate to provide protective cover, tillage is needed to roughen the surface of the soil and reduce soil blowing. Contour farming and terraces also are needed on soils in this unit to control erosion and conserve moisture.

[2] By DOUGLAS R. LOWE, conservation agronomist, Soil Conservation Service.

CAPABILITY UNIT IIIe–4, DRYLAND

This unit consists of deep and moderately deep, nearly level to gently sloping soils that have a fine sandy loam or clay loam surface layer and sandy clay loam and clay loam lower layers. These soils have a moderate to high available water capacity. Soil blowing and water erosion are slight to moderate hazards.

The soils of this unit are suitable for cultivation. The principal crops are cotton and grain sorghum. Forage sorghum and small grains also are grown.

Crop residue kept on the surface of the soil gives protection against soil blowing and water erosion. This residue also aids in conserving moisture. In dry years when normal amounts of residue are not produced, tillage is needed to roughen the soil surface for protection against soil blowing. Terraces and contour farming also are needed to control erosion and conserve moisture on these soils.

CAPABILITY UNIT IIIe–6, DRYLAND

This unit consists of deep, nearly level to gently sloping soils that have a fine sandy loam surface layer and fine sandy loam and clay loam lower layers. These soils have a moderate available water capacity. Soil blowing is a moderate hazard, and water erosion is a slight to moderate hazard.

The soils in this unit are used for cotton and grain sorghum or small grain. Cropping systems that include grain sorghum or small grains maintain or improve soil productivity and tilth. Residue from these crops can be kept on the surface of the soil to protect against soil blowing and water erosion. In dry years crop residue is not adequate, and surface-roughening tillage is necessary to prevent soil blowing.

CAPABILITY UNIT IIIs–2, DRYLAND

This unit consists of the deep, nearly level Stamford clay, 0 to 1 percent slopes. This soil is clay throughout. The available water capacity is high, and the hazard of water erosion is slight.

This soil is not well suited to dryland cropping. Where it is cultivated, the principal crops are small grain, grain sorghum, and forage sorghum.

A large amount of crop residue kept on the surface of the soil helps control erosion and helps maintain good soil tilth. Diversion terraces and grassed waterways are needed to safely dispose of outside water.

CAPABILITY UNIT IIIce–1, DRYLAND

This unit consists of the deep, nearly level Roscoe clay. This soil is clay throughout. The available water capacity is high, and the hazard of soil blowing is slight.

Small grain, grain sorghum, and cotton are grown on this soil. Large amounts of crop residue are needed to maintain good soil tilth. Farming operations carried out when this soil is moist can cause compaction that limits growth of roots and movement of air and water through the soil. Crop residue kept on the soil surface helps prevent soil blowing and water erosion. Diversion terraces and grassed waterways help dispose of outside water safely.

CAPABILITY UNIT IIIce–2, DRYLAND

This unit consists of deep and moderately deep, nearly level soils that have a loam or clay loam surface layer

and sandy clay loam and clay loam lower layers. The available water capacity is low to high, and the hazard of soil blowing is slight.

Most areas of this unit are cultivated; the other areas are in range. These soils are suitable for large-scale farming. The principal crops are cotton and grain sorghum. Forage sorghum and small grain also are grown.

Large quantities of plant residue returned to the soil help control soil blowing and water erosion. Grassed waterways and diversion terraces are needed to dispose of outside water safely.

CAPABILITY UNIT IIIce–3, DRYLAND

This unit consists of the deep, nearly level Portales loam, 0 to 1 percent slopes. This soil has loam lower layers. The available water capacity is high, and the hazard of soil blowing is slight.

Most areas of this soil are cultivated; other areas are in range. This soil is suitable for large-scale farming. The principal crops are cotton and grain sorghum. Forage sorghum and small grain also are grown.

Large quantities of crop residue returned to the soil help control soil blowing and water erosion. Grassed waterways and diversion terraces are needed to dispose of outside water safely.

CAPABILITY UNIT IVe–4, DRYLAND

This unit consists of the gently sloping Vernon clay, 1 to 3 percent slopes. This soil is clay throughout. It is slowly permeable, and the available water capacity is low. The hazard of water erosion is moderate.

This soil is in native range. It is not suitable for cultivation, because it is shallow and has compact clayey lower layers.

CAPABILITY UNIT IVe–7, DRYLAND

This unit consists of the nearly level and gently undulating Miles loamy fine sand, 0 to 3 percent slopes. Lower layers are sandy clay loam. This soil is subject to a high hazard of soil blowing. The available water capacity is high, and permeability is moderate.

Most areas of this soil are cultivated and are suitable for large-scale farming. The other areas are in range. The principal crops are cotton and grain sorghum. Forage sorghum and small grain also are grown.

Crop residue kept on the surface of the soil helps control soil blowing.

CAPABILITY UNIT IVe–8, DRYLAND

This unit consists of the deep Patricia fine sand, gently undulating. This soil has sandy clay loam lower layers. It has moderate permeability and a moderate available water capacity. The hazard of soil blowing is high.

Most areas of this soil are in range. Some small areas are cultivated. The principal crops are grain and forage sorghum. Small grains also are grown. This soil is suitable for large-scale farming.

Crop residue kept on the surface of the soil helps control soil blowing, conserve moisture, and maintain fertility and tilth.

CAPABILITY UNIT IVe–9, DRYLAND

This unit consists of shallow to deep, nearly level to gently sloping soils that have a loam surface layer and clay loam lower layers. The available water capacity is low to high.

Most areas of this unit are in range. Small areas are cultivated. The principal crops are cotton and grain sorghum. Forage sorghum and small grain also are grown.

Leaving crop residue on the soil surface is important in controlling erosion and conserving moisture. Terraces and contour farming are needed on the sloping soils to help control erosion. Grassed waterways and diversion terraces are needed in some areas to safely dispose of outside runoff water.

CAPABILITY UNIT IVe–10, DRYLAND

This unit consists of shallow to deep, nearly level to gently sloping soils that have a fine sandy loam surface layer and fine sandy loam and sandy clay loam lower layers. These soils have moderately rapid permeability and low to high available water capacity. The hazard of soil blowing is moderate.

Some areas of this unit are cultivated. The remaining areas are in range. Grain sorghum, forage sorghum, and small grain are best suited to this unit. Cotton is also grown in some areas.

Crop residue kept on the surface of the soil is important in controlling erosion and conserving moisture. Terraces and contour farming are needed to control erosion and conserve moisture on the steeper slopes. Diversion terraces and grassed waterways help dispose of outside water safely.

CAPABILITY UNIT IVes–1, DRYLAND

This unit consists of nearly level to gently sloping soils that have a fine sandy loam or loam surface layer. The lower layers are loam to clay loam. Permeability is moderate, and the available water capacity is moderate to high. The hazard of soil blowing is moderate to high.

Most areas of this unit are in range. A few areas are cultivated. The principal crops are grain sorghum and forage sorghum.

The high lime content of these soils causes some plant nutrients to be unavailable. Yellowing of plants, especially grain sorghum, is common on the soils of this unit.

Leaving crop residue on the soil surface is important in controlling soil blowing and water erosion. Terraces and grassed waterways are needed where excess runoff water from long slopes or from outside sources is a problem.

CAPABILITY UNIT VIe–2, DRYLAND

This unit consists of Veal fine sandy loam, 3 to 5 percent slopes. This soil has sandy clay loam lower layers. The hazard of soil blowing is moderate, and the hazard of water erosion is high.

This soil is not suitable for cultivation. It is best suited to range, recreational use, or wildlife habitat.

CAPABILITY UNIT VIe–3, DRYLAND

This unit consists of Drake soils, 3 to 5 percent slopes. These soils have a fine sandy loam surface layer and loam lower layers. The available water capacity is high, and the hazards of soil blowing and water erosion are high.

These soils are not suitable for cultivation. They are best suited to range, recreational use, or wildlife habitat.

CAPABILITY UNIT VIe–5, DRYLAND

This unit consists of deep, undulating soils that have a loamy fine sand surface layer and fine sandy loam lower layers. Permeability is moderately rapid, and the available water capacity is moderate. The hazard of soil blowing is high.

These soils are not suited to cultivation. They are best suited to range, recreational use, or wildlife habitat.

CAPABILITY UNIT VIe–6, DRYLAND

This unit consists of deep, undulating soils that have a fine sand surface layer and moderately permeable sandy clay loam lower layers. Permeability is moderate, and the available water capacity is low to moderate. The soil blowing hazard is high to very high.

These soils are not suited to cultivation. They are best suited to range, recreational use, or wildlife habitat.

CAPABILITY UNIT VIw–1, DRYLAND

This unit consists of the deep, very slowly permeable Lipan-Roscoe complex. These soils are flooded periodically by runoff from adjacent land.

These soils are not suited to cultivation. They are best suited to range.

CAPABILITY UNIT VIw–2, DRYLAND

This unit consists of the deep, nearly level Mixed alluvial land, saline. Areas of this unit are subject to occasional flooding during periods of high rainfall. They are not suited to cultivation, but are best suited to range or wildlife habitat.

CAPABILITY UNIT VIs–1, DRYLAND

This unit consists of shallow and very shallow soils that have a loam surface layer and clay loam and caliche lower layers. The water erosion hazard is slight to moderate.

These soils are too shallow for cultivation. They are best suited to range or wildlife habitat.

CAPABILITY UNIT VIIe–1, DRYLAND

This unit consists of the deep, gently undulating and duny Tivoli fine sand. This soil is rapidly permeable and has a low available water capacity. It is highly erodible, and not suitable for cultivation. It is best suited to range or wildlife habitat.

CAPABILITY UNIT VIIs–1, DRYLAND

This unit consists of the very shallow to shallow Potter soils. These soils have a loam surface layer and a caliche lower layer. The hazard of water erosion is moderate to high. Permeability is moderate, and the available water capacity is low. These soils are too shallow for cultivation. They are best suited to range or wildlife habitat.

CAPABILITY UNIT I–1, IRRIGATED

This unit consists of deep and moderately deep, nearly level soils that have a loam or clay loam surface layer and moderately slowly permeable clay loam lower layers. These soils have a moderate to high available water capacity. The hazard of water erosion is slight.

The soils of this unit are well suited to cultivation. The principal crops are cotton and grain sorghum, but forage sorghum and small grain also are grown.

CAPABILITY UNIT I–2, IRRIGATED

This unit consists of deep, nearly level soils that have a loam or clay loam surface layer and sandy clay loam and clay loam lower layers. These soils are moderately permeable. The available water capacity is high, and the hazard of soil blowing is slight.

The soils of this unit are suitable for cultivation. The principal crops are cotton and grain sorghum, but forage sorghum and small grain also are grown.

CAPABILITY UNIT IIe–3, IRRIGATED

This unit consists of the deep, nearly level, calcareous Portales loam, 0 to 1 percent slopes. This soil is moderately permeable, and the available water capacity is high. The hazard of soil blowing is slight.

This soil is suitable for cultivation. The principal crops are cotton and grain sorghum. Alfalfa, forage sorghum, and small grain also are grown. The forage sorghum and small grain are used mostly for grazing.

CAPABILITY UNIT IIe–4, IRRIGATED

This unit consists of deep and moderately deep, nearly level soils that have a fine sandy loam or clay loam surface layer and sandy clay loam and clay loam lower layers. The available water capacity is moderate to high, and the hazard of soil blowing is moderate.

The soils of this unit are suitable for cultivation. The principal crops are grain sorghum and cotton. Small grain and alfalfa also are grown. The small grain is used mainly for grazing.

Fertilized crops produce sufficient residue to maintain or increase soil tilth, fertility, and moisture holding capacity. Crop residue kept on the surface or plowed into the first few inches of the soil also provides good protection from soil blowing and water erosion.

CAPABILITY UNIT IIe–5, IRRIGATED

This unit consists of deep, nearly level soils that have a fine sandy loam surface layer and fine sandy loam and clay loam lower layers. Their permeability is moderately rapid, and the available water capacity is moderate. The hazard of soil blowing is moderate.

The soils of this unit are suitable for cultivation. The principal crops are cotton and grain sorghum. Alfalfa, forage sorghum, and small grain also are grown. The forage sorghum and small grain are used mainly for grazing.

Crop residue left on the surface of the soil, or plowed into the upper few inches, helps control soil blowing and water erosion. Diversion terraces and grassed waterways are needed in some places to control outside water and runoff.

CAPABILITY UNIT IIe–6, IRRIGATED

This unit consists of deep and moderately deep, gently sloping soils that have a fine sandy loam surface layer and sandy clay loam lower layers. These soils are moderately permeable and have a moderate to high available water capacity. The hazards of soil blowing and water erosion are moderate.

The principal crops grown on the soils of this unit are cotton and grain sorghum. If fertilized, crops produce a large amount of residue that is needed to maintain or improve soil productivity and tilth. Leaving this

residue on the soil surface provides good protection from soil blowing and water erosion. Good water management is important when irrigating the soils in this unit.

CAPABILITY UNIT IIs–1, IRRIGATED

This unit consists of the deep, nearly level and slightly concave Roscoe clay. Permeability is very slow, and available water capacity is high. If unprotected, this soil is slightly susceptible to soil blowing.

This soil is suitable for cultivation. The principal crops are cotton, grain sorghum, and forage sorghum.

Crops such as small grain and grain sorghum produce large quantities of residue that should be kept on the surface of the soil to help control soil blowing and water erosion. This residue also helps maintain or improve soil productivity and tilth.

CAPABILITY UNIT IIIe–4, IRRIGATED

This unit consists of deep, gently sloping soils that have a loam surface layer and clay loam and loam lower layers. These soils have a high available water capacity. The hazard of water erosion is moderate.

The soils of this unit are suited to cultivation. The main crops are cotton and grain sorghum. Forage sorghum and small grain also are grown.

Crop residue can be kept on the surface of the soil to help protect against soil blowing and water erosion. Diversion terraces and grassed waterways are needed to control and dispose of outside water.

CAPABILITY UNIT IIIe–6, IRRIGATED

This unit consists of deep, gently sloping soils that have a fine sandy loam surface layer and fine sandy loam, loam, and clay loam lower layers. These soils have a moderate available water capacity. The hazards of soil blowing and water erosion are moderate.

The soils of this unit are suitable for cultivation. The principal crops are cotton and grain sorghum. Forage sorghum and small grain also are grown.

Nitrogen fertilizer can be used to produce a large amount of crop residue. Keeping this residue on the soil surface helps maintain soil productivity and tilth and provides protection from soil blowing.

Cropping systems that include a high proportion of grain sorghum, forage sorghum, and small grain are well suited to the soils of this unit.

CAPABILITY UNIT IIIe–8, IRRIGATED

This unit consists of the deep, nearly level and gently undulating Miles loamy fine sand, 0 to 3 percent slopes. This soil has sandy clay loam lower layers. The hazard of soil blowing is high, and the available water capacity is high.

The principal crops suited to the soil in this unit are cotton, grain sorghum, and small grain. Crop residue kept on the soil surface helps maintain or improve soil productivity and tilth and protect the soil from erosion.

CAPABILITY UNIT IIIe–9, IRRIGATED

This unit consists of the deep Patricia fine sand, gently undulating. This soil has sandy clay loam lower layers. It has a moderate available water capacity, and the hazard of soil blowing is high.

The soil of this unit is suitable for limited cultivation. The principal crops are cotton, grain sorghum, and forage sorghum.

In managing this soil, it is important to return large quantities of crop residue to the soil. Fertilizer can be used to increase the amount of residue produced. Crop residue should be kept on the surface of the soil to give protection from soil blowing.

CAPABILITY UNIT IIIe–10, IRRIGATED

This unit consists of shallow to deep, nearly level to gently sloping soils that have a loam or fine sandy loam surface layer and fine sandy loam, clay loam, and sandy clay loam lower layers. The available water capacity is low to high. The hazards of soil blowing and water erosion are slight to moderate.

This unit is suited to cotton, grain sorghum, and small grain. Crop residue should be kept on the surface of the soil to provide protection from erosion. This residue maintains or improves soil productivity and tilth. Diversion terraces and grassed waterways are needed in some areas to protect the soils from erosion by outside water.

CAPABILITY UNIT IIIes–1, IRRIGATED

This unit consists of deep, nearly level to gently sloping soils that have a fine sandy loam surface layer and loam or clay loam lower layers. The available water capacity is moderate to high, and the hazard of soil blowing is moderate to high.

The soils of this unit are suitable for limited cultivation. The principal crops are grain sorghum, forage sorghum, and small grain.

The high lime content of these soils makes some plant nutrients unavailable in quantities needed for good crop growth. Yellowing of plants, especially of grain sorghum, is common on the soils of this unit.

Management of crop residue to keep it on the surface of the soil is important in controlling soil blowing and water erosion. Erosion-control structures, such as terraces and waterways, are needed where excess runoff water is a problem.

CAPABILITY UNIT IIIs–1, IRRIGATED

This unit consists of the deep, nearly level Stamford clay, 0 to 1 percent slopes. This soil has clay lower layers. The available water capacity is high, and the hazard of water erosion is slight.

Small areas of this soil are cultivated; most areas are in range. This soil is not well suited to cultivation. Where it is cultivated, the principal crops are grain sorghum and forage sorghum.

Large quantities of crop residue returned to the soil help maintain good soil tilth and control erosion. Diversion terraces and grassed waterways can be used to safely dispose of outside water.

CAPABILITY UNIT IVe–4, IRRIGATED

This unit consists of Drake soils, 3 to 5 percent slopes. These are moderately permeable soils that have a high lime content. The available water capacity is high, and the hazard of soil blowing is high.

These soils are poorly suited to cultivation because of slopes and a limy surface layer. Where these soils are

cultivated, the principal crops are grain sorghum and forage sorghum.

The high lime content of these soils makes plant nutrients unavailable in quantities needed for good crop growth. Yellowing of plants, especially grain sorghum, is common.

Crop residue kept on the surface of the soil is important in the control of soil blowing and water erosion. Erosion-control structures, such as terraces and waterways, are needed to dispose of excess runoff water.

CAPABILITY UNIT IVe-5, IRRIGATED

This unit consists of deep, gently sloping and gently undulating soils that have a fine sand or loamy fine sand surface layer and fine sandy loam and sandy clay loam lower layers. Permeability is moderate to moderately rapid, and the available water capacity is low to moderate. The hazard of soil blowing is high.

These soils are not well suited to cultivation. In the few areas that are cultivated, the principal crops are grain sorghum and forage sorghum.

Where these soils are cultivated, large quantities of crop residue are needed on the surface of the soil to control soil blowing.

CAPABILITY UNIT IVe-6, IRRIGATED

This unit consists of the gently sloping Veal fine sandy loam, 3 to 5 percent slopes. The lower layers of this soil are sandy clay loam. This soil is moderately permeable and has a high available water capacity. The hazard of soil blowing is moderate, and the hazard of water erosion is high.

A few areas of this soil are cultivated; most areas are in range. The principal crops are cotton and grain sorghum. Forage sorghum and small grains also are grown.

Crop residue kept on the surface of the soil is important in the control of soil blowing and water erosion on cultivated areas. Terraces and contour farming also are needed. Diversion terraces and grassed waterways help control outside or excess runoff water.

Estimated Yields

Crop yields depend mainly on the tilth and fertility of the soil and on a sufficient supply of moisture at the time of planting and throughout the growing season. Lack of moisture is commonly the factor that limits crop yields in Martin County.

Consistent high yields on any soil indicate that the soil has been well managed; that is, fertility has been kept at a high level, good tilth has been maintained, and water has been conserved.

Table 2 gives estimated average acre yields of principal crops. Estimates are given for two major crops, cotton and grain sorghum, under a high level of management. This level of management is one in which all the best known methods of farming are used. It is a superior type of management, but it is within the reach of most farmers. Farmers using this level of management have successfully demonstrated their ability to maintain soil productivity, to use their land in accordance with its capability, and to protect the land from erosion.

The high level of management includes those practices and treatments that are needed for any specific combination of soils, crops, livestock, and climate. It consists of application of all needed erosion-control measures; timely tillage and control of weeds, insects, and plant diseases; and the use of quality seed.

A high level of management also requires conservation measures necessary for maximum utilization of rainfall, such as properly maintained terrace systems, contour farming, and stubble mulch tillage. Soil fertility is maintained or improved by timely application of fertilizers based on soil tests and crop needs. A high level of management also requires efficient use of crop residue, and use of barnyard manure or green manure crops, or use of both.

Use of the Soils for Range [3]

Approximately 373,400 acres of Martin County is in range. The 37 ranching units in the county range in size from 3 to 50 sections. Two large ranches contain more than 24,000 acres each, and eight contain more than 10,000 acres each. Seventy-five percent of the ranches have some cropland. The cropland is used primarily for the production of forage and for annual pasture crops to supplement the ranching operation.

The ranches maintain cow herds for the production of calves that are generally sold at weaning age. In years of above normal forage production, some calves are carried through the winter and sold in spring as feeder yearlings. Two ranches maintain registered herds in conjunction with larger herds of grade cattle.

A few horses are raised on most ranches, primarily for use on the ranch. In addition, a few horses are produced for special purposes, such as show stock, competitive events, and for breeding.

Range sites and condition classes

A range site is a distinctive kind of rangeland that differs from each other kind of range in its ability to produce significantly different kinds or proportions of plant species or in total annual yield. Significant differences are those great enough to require some variation in management, such as a different rate of stocking.

The differences in kinds, proportions, and production of plants that sites are capable of supporting are due mainly to differences in environmental factors, such as soil, topography, and climate. Range sites can be identified by the kinds of soil known to produce the distinctive potential plant community that characterizes a specific site.

Most of the native grasslands of Martin County have been heavily grazed for several generations, and their original plant cover has been altered. *Range condition* is the present state of the vegetation of a range site in relation to the potential plant cover for that site. *Range condition classes* measure the degree to which the present plant composition, expressed in percent, resembles that of the potential plant community of a range site. Four range condition classes are recognized: excellent, good,

[3] By HERSHEL M. BELL, range conservationist, Soil Conservation Service, Lubbock, Texas.

TABLE 2.—*Estimated yields per acre of principal crops*

[Absence of entry indicates the crop is not grown on the soil, or the soil is not suited to it]

Soil	Cotton (lint)		Grain sorghum	
	Dryland	Irrigated	Dryland	Irrigated
	Lbs.	*Lbs.*	*Bu.*	*Bu.*
Acuff loam, 0 to 1 percent slopes	200	850	19	100
Amarillo fine sandy loam, 0 to 1 percent slopes	200	850	20	110
Amarillo fine sandy loam, 1 to 3 percent slopes	175	825	17	90
Arch soils, 0 to 1 percent slopes		800	10	70
Arvana fine sandy loam, 0 to 1 percent slopes	200	850	20	100
Arvana fine sandy loam, 1 to 3 percent slopes	175	825	17	90
Berda loam, 1 to 3 percent slopes				
Bippus and Colorado soils	200	840	20	100
Brownfield fine sand, gently undulating				
Drake soils, 1 to 3 percent slopes				
Drake soils, 3 to 5 percent slopes				
Gomez loamy fine sand, gently undulating				70
Gomez fine sandy loam, 0 to 1 percent slopes	170	800	20	90
Gomez fine sandy loam, 1 to 3 percent slopes	160	750	17	70
Kimbrough-Slaughter complex, 0 to 2 percent slopes				
Kimbrough and Upton soils, nearly level				
Lipan-Roscoe complex				
Mansker loam, 0 to 3 percent slopes	105	750	12	70
Midessa fine sandy loam, 0 to 1 percent slopes	175	850	20	90
Midessa fine sandy loam, 1 to 3 percent slopes	160	750	17	70
Miles loamy fine sand, 0 to 3 percent slopes	145	775	15	80
Mixed alluvial land, saline				
Mobeetie fine sandy loam, 1 to 3 percent slopes				
Olton loam, 0 to 1 percent slopes	200	880	20	110
Patricia fine sand, gently undulating		800	10	70
Patricia-Brownfield complex, hummocky				
Portales loam, 0 to 1 percent slopes	170	850	18	90
Portales loam, 1 to 3 percent slopes	160	800	17	75
Potter soils				
Roscoe clay	250	850	24	100
Sharvana fine sandy loam, 0 to 3 percent slopes	100	750	10	70
Simona fine sandy loam, 1 to 3 percent slopes				
Slaughter loam, 0 to 1 percent slopes				
Springer loamy fine sand, undulating				60
Spur clay loam, slightly saline	275	850	23	100
Stamford clay, 0 to 1 percent slopes				
Stegall clay loam, 0 to 1 percent slopes	250	850	18	110
Tivoli fine sand				
Upton loam, 0 to 2 percent slopes	100	750	12	70
Veal fine sandy loam, 1 to 3 percent slopes	110	775	12	70
Veal fine sandy loam, 3 to 5 percent slopes				
Vernon clay, 1 to 3 percent slopes				
Zita loam, 0 to 1 percent slopes	170	850	17	110

fair, and poor. A range is in excellent condition if 76 to 100 percent of the existing vegetation is of the same composition as that of the potential stand. It is in good condition if the percentage is between 51 and 75, in fair condition if the percentage is between 26 and 50, and in poor condition if the percentage is less than 25.

In determining present range condition class, plants are grouped according to their response to the kind of grazing use on specific range sites. These groups of plants are *decreasers*, *increasers*, and *invaders*.

Decreaser plants are species in the potential plant community that decrease when the range is subjected to continued moderately heavy to heavy grazing. Most of these kinds of plants are preferred and decrease through overgrazing. The total of all such species is counted in determining range condition class.

Increaser plants are species that normally increase when the range is subjected to continued moderately heavy to heavy grazing. Some increasers that have moderately high grazing value may initially increase and then decrease as grazing pressure continues. Others of low grazing value may continue to increase either in actual plant numbers or in relative proportions. Only the percentages of increaser plants normally expected to occur in the potential plant community are counted in determining range condition.

Invader plants are not members of the potential plant community for the site. They invade the community as a result of disturbance. They may be annuals or perennials and may be grasses, weeds, or woody plants. Some have relatively high grazing value, but many are worthless. Invader plants are not counted in determining range condition class.

For most range sites and most range livestock operations, the higher the range condition class, the greater the quality and amount of forage produced.

Descriptions of range sites

Range sites may consist of one or more soil types, phases of soil types, complexes of soil types or phases, undifferentiated groups, or miscellaneous land types.

Ten range sites have been identified and described in Martin County. These range sites are described in the following pages. Each description gives important soil characteristics, principal plants, suggestions for management, and estimates for forage yields. The yield estimates are based on range clippings and the experience of ranchers. To find the range site in which a given soil has been placed, look in the "Guide to Mapping Units" at the back of this survey.

DEEP HARDLAND RANGE SITE

The soils of this range site lie on plains. These soils are deep to shallow, clayey to loamy, and nearly level to gently sloping. In many places they are adjacent to and below areas of shallow soils that furnish runoff water to the site.

When this site is in excellent condition, decreaser grasses make up approximately 55 percent of the vegetation. The principal decreasers are blue grama, side-oats grama, Arizona cottontop, vine-mesquite, cane bluestem, and silver bluestem. Increasers that make up the remaining 45 percent are buffalograss and tobosa. Deterioration of the range results in an invasion by three-awn, burrograss, annual weeds, pricklypear, and mesquite trees.

This range site responds favorably to the control of invading brush such as mesquite and pricklypear. The site may be seeded if necessary to restore a suitable stand of good-quality grass. Because soils of this range site are droughty, seeding and management after seeding must be carefully planned. Seeding is generally most feasible when areas are converted from crops to range. Structures and management practices that conserve and control water are appropriate on this site.

Where this site is in excellent condition, the total annual yield of air-dry herbage, in pounds per acre, ranges from 1,300 in dry years to 2,100 in wet years.

CLAY FLATS RANGE SITE

Stamford clay, 0 to 1 percent slopes, is the only soil in this range site. This soil is on uplands mainly at the base of shallow ridges. The extra runoff water received on this site increases the potential for plant production. Where this site is in excellent condition, the vegetation is mid and short grasses that have comparatively low water requirements.

In the potential plant community, the decreasers are blue grama, white tridens, and vine-mesquite. Increasers are tobosa and buffalograss. This site produces an abundance of tobosa. Under continuous heavy grazing, increasers and decreasers decline, and mesquite, pricklypear, cholla, and annual weeds invade the site.

Careful grazing management is essential to the production of quality forage on this site. A large amount of tobosa is generally produced even when rainfall is moderate, but rotational grazing must be practiced to get sufficient response to improve the overall range condition.

Where this site is in excellent condition, the potential yield of air-dry herbage, in pounds per acre, ranges from 800 in dry years to 2,000 in wet years.

DEEP SAND RANGE SITE

Soils of this site are deep, gently undulating and duny sands. They have moderate to rapid permeability. Both the soils and the vegetation on this site are unstable.

The site supports a wide variety of plants, predominantly tall grasses and lesser amounts of mid grasses. Decreasers that make up some 70 percent of the potential vegetation are sand bluestem, giant dropseed, little bluestem, mesa dropseed, and side-oats grama. Important increasers are sand dropseed, purple three-awn, and fall witchgrass. Invaders are annual weeds, yucca, red lovegrass, ridell groundsel, gummy lovegrass, and tumble windmillgrass.

Once this site has deteriorated, recovery is slow to start. After recovery is under way, however, rapid improvement in range condition may be expected under good management. Range seeding is fairly successful. When seeding, use of a cover of vegetative litter helps protect seedlings from soil blowing and unstable soil.

Where this site is in excellent condition, the potential yield of air-dry herbage, in pounds per acre, ranges from 1,200 in dry years to 3,200 in wet years.

HIGH LIME RANGE SITE

Soils of this site are nearly level to gently sloping. A few areas are duny and lie on the east side of salt lakes and playas (fig. 7). During heavy rains, runoff and erosion are severe on these soils.

The potential plant community, or climax vegetation, on this site consists of high-quality grasses in a mixture that produces moderately high yields. The decreasers are side-oats grama, blue grama, vine-mesquite, and plains bristlegrass. As this site deteriorates, the decreasers disappear. Then, under favorable conditions, black grama becomes dominant. Other increasers are sand dropseed and slim tridens. Invaders are broom snakeweed, mesquite, and annual weeds.

Control of grazing is important on this site. Brush invasion is not generally serious, but if the range is allowed to deteriorate, soil blowing and high surface temperature keep range seeding from being effective.

Where this site is in excellent condition, the potential yield of air-dry herbage, in pounds per acre, ranges from 1,100 in dry years to 1,800 in wet years.

MIXED PLAINS RANGE SITE

The nearly level to gently sloping soils of this range site are in broad areas near large depressions or lakes. The salinity of these soils ranges from none to slight.

When this site is in excellent condition, the vegetation is generally half mid and half short grasses. Decreasers are side-oats grama, cane bluestem, and lesser amounts of vine-mesquite and Arizona cottontop. Increasers are black grama, purple three-awn, sand dropseed, and four-wing saltbush. Common invaders are sand muhly, ring muhly, burrograss, annual weeds, and mesquite.

This site has a poor soil-plant-water relationship in that little available water is retained in the soil. Forage remains succulent only a short time following rains.

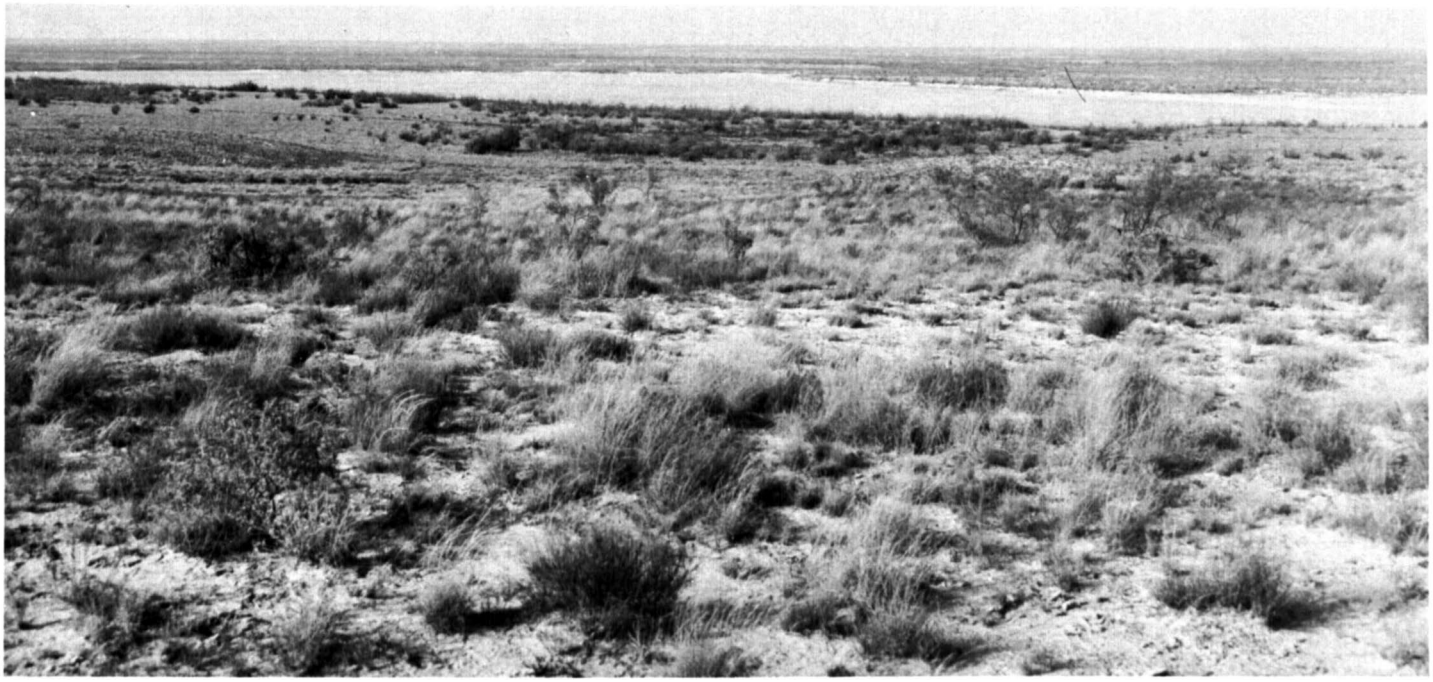

Figure 7.—**High Lime range site that has an overall slope toward a salt lake. The soil is a Drake fine sandy loam.**

Brush invasion is not severe on this site. Scattered stands of mesquite are interspersed with fourwing saltbrush. Seeding is most successful when done in connection with mechanical brush control.

Although this site has management limitations, it is productive. Where the site is in excellent condition, the potential yield of air-dry herbage, in pounds per acre, ranges from 1,400 in dry years to 2,200 in wet years.

SANDYLAND RANGE SITE

The soils of this site are nearly level to gently sloping and gently undulating. They have a low to high available water capacity. These soils are susceptible to soil blowing if not protected.

The potential plant community of this site is 75 percent decreasers, such as side-oats grama, little bluestem, giant dropseed, and mesa dropseed. Approximately 25 percent is increasers, such as silver bluestem, sand dropseed, hairy grama, fall witchgrass, and purple three-awn (fig. 8).

Any deterioration in this site results in a rapid increase of invaders. Among the invaders are annual weeds, fringed signalgrass, gummy lovegrass, tumble windmillgrass, and ridell groundsel. Shin oak also invades overgrazed range. Mechanical methods of controlling shin oak are not feasible.

Forage production varies greatly on this site. The moisture received during the growing season is the determining factor. Where this site is in excellent condition, the potential yield of air-dry herbage, in pounds per acre, ranges from 1,000 in dry years to 2,400 in wet years.

SANDY LOAM RANGE SITE

The nearly level to gently sloping soils of this site are mainly in broad areas of stable and productive range. In excellent condition, the site is characterized by a good stand of mid and short grasses. These decreasers are mostly side-oats grama, plains bristlegrass, cane bluestem, silver bluestem, and vine-mesquite. Increasers are black grama, sand dropseed, purple three-awn, hooded windmillgrass, and blue grama.

The wide variety of palatable and nutritious grasses provides a long and productive grazing season. Even after some deterioration, the plants continue to furnish good-quality forage. When over grazed for an extended period, the site becomes infested with mesquite and sparse stands of invader grasses and weeds.

This site responds to good range management. Brush control followed by resting of treated pastures restores grass. Response to range seeding is also good. Water-control measures, such as waterspreading, are appropriate to the site and bring good results.

Where this site is in excellent condition, the potential yield of air-dry herbage, in pounds per acre, ranges from 1,400 in dry years to 2,250 in wet years.

SHALLOW REDLAND RANGE SITE

Vernon clay, 1 to 3 percent slopes, is the only soil in this range site. This soil is on foot slopes and is underlain by red shale or clay.

Plants on this site require little water. Decreasers make up 65 percent of the climax vegetation. Among the decreasers are side-oats grama, blue grama, and vine-mesquite. Increasers that make up the other 35 percent are buffalograss, hairy grama, tobosa, silver bluestem, and purple three-awn. The main invaders are hairy tridens, Texas grama, tumblegrass, sand dropseed, broom snakeweed, and annual weeds.

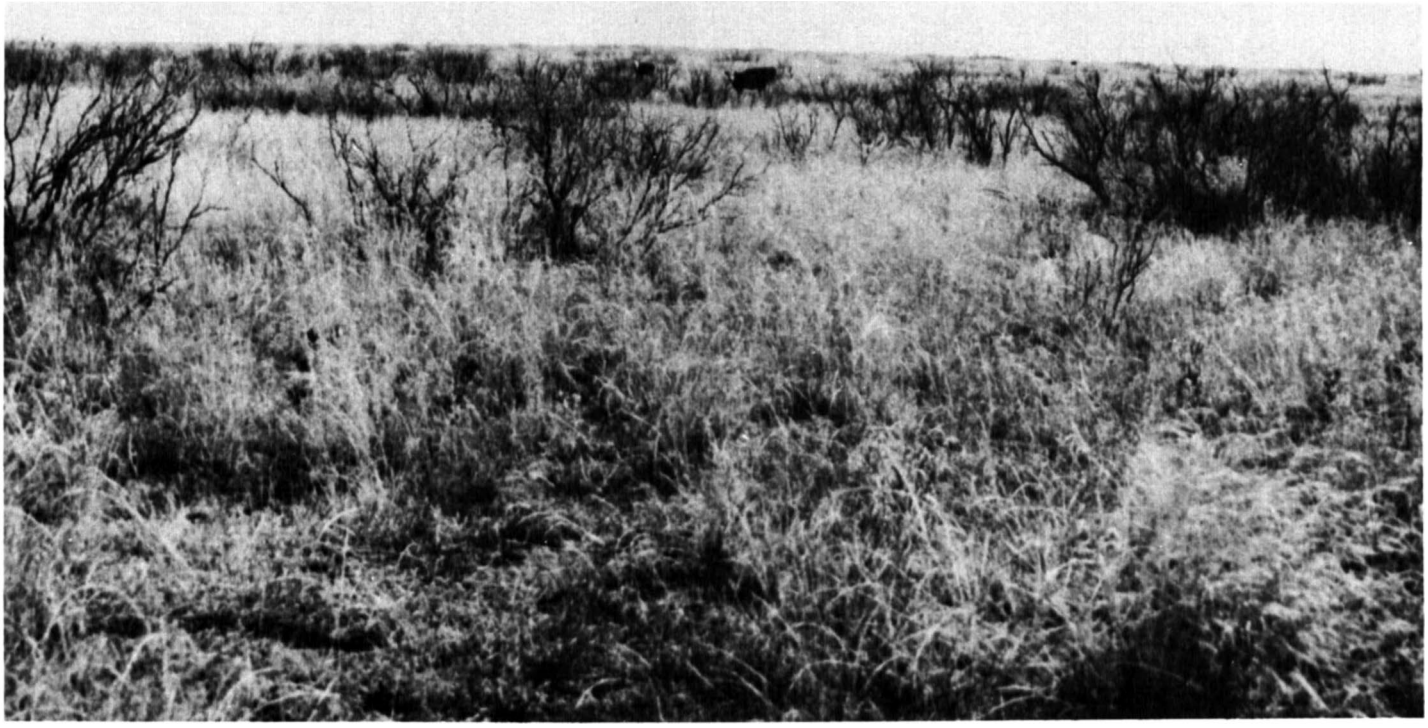

Figure 8.—**Sandyland range site in good condition after brush control. The soil is Miles loamy fine sand.**

Forage production on this site is limited by the shallow soil and dry climate. Where the site is in excellent condition, the potential yield of air-dry herbage, in pounds per acre, ranges from 900 in dry years to 1,600 in wet years.

VALLEY RANGE SITE

The soils of this site lie along the narrow bottoms of draws that contain water only during rainy periods. In the more rolling parts of the county, the water in some of these draws overflows and widens the draws. This site also receives runoff from upstream watersheds and adjacent lands. The extra water gives the site a high potential yield of good-quality range grasses.

This site is capable of producing good stands of mid grasses. When it is in excellent range condition, approximately 65 percent of the vegetation is decreasers, such as side-oats grama, cane bluestem, silver bluestem, white tridens, and vine-mesquite. Increasers that make up 35 percent of the vegetation are blue grama, buffalograss, tobosa, prairie-clover, Engelmanndaisy, and alkali sacaton in saline areas (fig. 9).

The invasion of mesquite is a serious problem on this site. Saltcedar invades the saline areas. Once established, brush increases, and the better grasses decrease. However, brush control is effective on this site.

Earth structures for water control generally are unsatisfactory because of occasional floods. Wire spreaders can increase the areas affected by extra water and increase the total intake by holding water on the land longer.

Where this site is in excellent condition, the potential yield of air-dry herbage, in pounds per acre, ranges from 1,900 in dry years to 3,100 in wet years.

VERY SHALLOW RANGE SITE

The soils of this range site lie on the sides of draws and adjacent uplands. The site serves as a watershed to the draws and the valley range site. The plant-soil-moisture relationship is fair to poor depending on slope and depth of soil, and the site supports sparse stands of forage.

This site has the appearance of a midgrass site when side-oats grama is dominant. Other decreasers are blue grama, black grama, cane bluestem, silver bluestem, and plains bristlegrass. Decreasers make up about 70 percent of the potential plant community. Among the wide variety of increasers that make up the other 30 percent are sand dropseed, slim tridens, purple three-awn, and hairy grama. Invaders are hairy tridens, fluffgrass, broom snakeweed, creosotebush, mesquite, and annual weeds.

This site responds to brush control, but range seeding is less successful because the soils do not retain available water for long periods. Water-control measures are not feasible. Controlled grazing is the most important conservation practice for this site.

Where the site is in excellent condition, the potential yield of air-dry herbage, in pounds per acre, ranges from 400 in dry years to 800 in wet years.

Use of the Soils for Wildlife

Most of the soils in Martin County are suited to, and support, one or more species of wildlife. In general, Martin County is nearly level to undulating, open prairie country. About 64 percent of the county is in native grassland, and about 36 percent is cultivated.

The early settlers encountered an abundance of wildlife in Martin County. Large numbers of antelope, buffalo, prairie chicken, and quail once lived in the county.

Figure 9.—Valley range site under abundant growth of meadow dropseed, alkali sacaton, and vine-mesquite. The soil is Spur clay loam, slightly saline.

The buffalo were killed by hunters about the time the county was settled. After the county was settled and livestock were introduced, overgrazing, fencing, and cultivation limited the number of antelope, deer, and prairie chicken. Prairie dogs, once numerous, are now very uncommon. A large number of quail, dove, songbirds, small animals, and predators still inhabit the county. The playa lakes, ponds, and grainfields attract ducks and geese during migration. Habitats for fish are limited to artificial impoundments, such as ponds on ranches.

In recent years, people have begun to realize the value and importance of wildlife. More and more people are looking to the land for recreation, and hunting and fishing are becoming more important. The county has a moderate potential for an economic return from the development of hunting, fishing, and recreation areas.

Management of wildlife by soil associations

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

WILDLIFE SITE 1

This site consists mainly of the Amarillo and the Portales-Acuff soil associations. Most of the acreage is cultivated. The soils are deep, loamy, and nearly level to gently sloping. The native vegetation consists mainly of side-oats grama, blue grama, plains bristlegrass, and associated legumes and forbs. Water-tolerant grasses, sedges, and forbs grow in and around the playas. The principal kinds of animals on this site are antelope, badger, coyote, and rabbit. Among the species of birds are turkey, dove, duck, geese, quail, sandhill crane, and songbirds.

WILDLIFE SITE 2

This site consists mainly of the Slaughter-Kimbrough, the Midessa-Drake-Arch, and the Potter-Mansker soil associations. Much of the acreage is in range. These soils are very shallow to deep, nearly level to steep, and loamy. The native vegetation consists of buffalograss, blue grama, side-oats grama, cane bluestem, silver bluestem, vine-mesquite, and Arizona cottontop. A few scattered mesquite trees grow on the soils.

Deer, bobcat, raccoon, rabbit, coyote, opossum, skunk, antelope, and badger inhabit this site. The main kinds of birds are turkey, dove, quail, prairie chicken, duck, geese, sandhill crane, and songbirds. Largemouth bass, channel catfish, and bream are suitable fish for stocking farm ponds on this site.

WILDLIFE SITE 3

This site consists mainly of the Miles-Patricia soil association. Most of the acreage is in range. These soils are deep, nearly level to gently sloping and sandy. Native

vegetation is mainly mid and tall grasses, such as giant dropseed, mesa dropseed, silver bluestem, little bluestem, fall witchgrass and side-oats grama. Shin oak grows on this site. Deer, skunk, raccoon, rabbit, bobcat, antelope, and coyote are the main animals on this site. Among the species of birds are turkey, quail, dove, prairie chickens, duck, geese, sandhill crane, and songbirds.

Engineering Uses of the Soils [4]

This section is useful to those who need information about soils used as structural material or as foundation upon which structures are built. Among those who can benefit from this section are planning commissions, town and city managers, land developers, engineers, contractors, and farmers.

Among the properties of soils most important in engineering are permeability, strength, compaction characteristics, drainage, shrink-swell potential, grain size, plasticity, and reaction. Also important are slope and depth to the water table and to bedrock. These properties, in various degrees and combinations, affect construction and maintenance of roads, airports, pipelines, foundations for small buildings, irrigation systems, ponds and small dams, and systems for disposal of sewage and refuse.

Information in this section of the soil survey can be helpful to those who—

1. Select potential residential, industrial, commercial, and recreational areas.
2. Evaluate alternate routes for roads, highways, pipelines, and underground cables.
3. Seek sources of gravel, sand, or clay.
4. Plan farm drainage systems, irrigation systems, ponds, terraces, and other structures for controlling water and conserving soil.
5. Correlate performance of structures already built with properties of the kinds of soil on which they are built for the purpose of predicting performance of structures on the same or similar kinds of soil in other locations.
6. Predict the trafficability of soils for cross-country movement of vehicles and of construction equipment.
7. Develop other preliminary estimates pertinent to construction in a particular area.

Most of the information in this section is presented in tables 3, 4, 5, and 6. Tables 3 and 4 show, respectively, several estimated soil properties significant to engineering and interpretations for various engineering uses. Table 5 rates the soils according to their suitability for specific uses in town and country planning, and table 6 gives engineering test data for some representative soils. This information, along with the soil maps and other parts of this publication, can be used to make interpretations in addition to those given in the tables. It also can be used to make other useful maps.

The engineering interpretations reported here do not eliminate the need for sampling and testing at the site of specific engineering works involving heavy loads and where the excavations are deeper than the depths of layers here reported. Estimates generally are made to a depth of about 5 feet and interpretations do not apply to greater depths. Also, engineers should not apply specific values to the estimates for bearing capacity and traffic-supporting capacity given in this survey. Investigation of each site is needed because many delineated areas of a given soil mapping unit may contain small areas of other kinds of soil that have strongly contrasting properties and different suitabilities or limitations for soil engineering. Even in these situations, however, the soil map is useful in planning more detailed field investigations and for indicating the kinds of problems that may be expected.

Some of the terms used in this soil survey have special meaning to soil scientists not known to all engineers. Many of the terms commonly used in soil science are defined in the Glossary at the back of this survey.

Engineering classification systems

The two systems most commonly used in classifying samples of soils for engineering are the Unified system (*7*) used by the SCS engineers, the Department of Defense, and others, and the AASHO system (*1*) adopted by the American Association of State Highway Officials.

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

The AASHO system is used to classify soils according to those properties that affect use in highway construction and maintenance. In this system, a soil is placed in one of seven basic groups ranging from A–1 through A–7 on the basis of grain-size distribution, liquid limit, and plasticity index. In group A–1 are gravelly soils of high bearing strength, or the best soils for subgrade (foundation). At the other extreme, in group A–7, are clay soils that have low strength when wet and that are the poorest soils for subgrade. Where laboratory data are available to justify a further breakdown, the A–1, A–2, and A–7 groups are divided as follows: A–1–a, A–1–b, A–2–4, A–2–5, A–2–6, A–2–7, A–7–5, and A–7–6. As additional refinement, the engineering value of a soil material can be indicated by a group index number. Group indexes range from 0 for the best material to 20 or more for the poorest. The AASHO classification for the tested soils, with group index numbers in parentheses, is shown in table 6. The estimated classification, without group index numbers, is given in table 3 for all soils mapped in the survey area.

Engineering properties of the soils

Table 3 provides estimates of soil properties important to engineering. The estimates are based on field classification and descriptions, physical and chemical tests of selected representative samples, test data from comparable soils in adjacent areas, and from detailed ex-

[4] By BEADE O. NORTHCUT, conservation engineer, Soil Conservation Service.

perience in working with the individual kind of soil in the survey area.

In the column headed "Hyrologic group", the soils are placed in one of four groups 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. The groups range from open sands that have the lowest runoff potential (Group A) to heavy clays that have the highest runoff potential (Group D). Descriptions of these four groups are as follows:

Group A.—Soils having high infiltration rates, even when thoroughly wetted, and consisting chiefly of deep, well-drained to excessively drained sands, gravel, or both. These soils have a high rate of water transmission and a low runoff potential.

Group B.—Soils having moderate infiltration rates when thoroughly wetted, and consisting chiefly of moderately deep to deep, moderately well drained to well drained soils of moderately fine to moderately coarse textures. These soils have a moderate rate of water transmission and a moderate runoff potential.

Group C.—Soils having slow infiltration rates when thoroughly wetted and consisting chiefly of (1) soils with a layer that impedes the downward movement of water, or (2) soils with moderately fine to fine texture and a slow infiltration rate. These soils have a slow rate of water transmission and a high runoff potential.

Group D.—Soils having very slow infiltration rates when thoroughly wetted and consisting chiefly of (1) clay soils with a high swelling potential; (2) soils with a high permanent water table; (3) soils with a claypan or clay layer at or near the surface; and (4) shallow soils over nearly impervious materials. These soils have a very slow rate of water transmission and a very high runoff potential.

In the column "Depth to Bedrock", the depth in inches is shown where consolidated material may be found.

Soil texture is described in table 3 in the standard terms used by the Department of Agriculture. These terms take into account relative percentages of sand, silt, and clay in soil material that is less than 2 millimeters in diameter. "Loam," for example, is soil material that is 7 to 27 percent clay, 28 to 50 percent silt, and less than 52 percent sand. If the soil contains gravel or other particles coarser than sand, an appropriate modifier is added, as for example, "gravelly loamy sand." "Sand," "silt," "clay," and some of the other terms used in USDA textural classification are defined in the Glossary of this soil survey.

The data on percentage passing sieves in table 3 show the percentage of soil material that is smaller in diameter than the openings in the given sieve. Since the estimates are for modal soils, considerable variation in the grain size of any specified soil should be anticipated.

Permeability, as used in table 3, relates only to movement of water downward through undisturbed and uncompacted soil. It does not include lateral seepage. The estimates are based on structure and porosity of the soil. Plowpans, surface crusts, and other properties resulting from use of the soils are commonly not considered.

Available water capacity is the capacity of soils to hold water available for use by most plants. It is commonly defined as the difference between the amount of soil water at field capacity and the amount at wilting point. It is commonly expressed as inches of water per inch of soil.

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

Shrink-swell potential 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 the maintenance of structures constructed in, on, or with such materials.

A seasonal high water table is not a problem in this county.

Salinity does not present a serious problem in Martin County and is not included in table 3.

Engineering interpretations of the soils

Table 4 contains selected information useful to engineers and others who plan to use soil material in construction of highways, farm facilities, buildings, and sewage disposal systems. The soil features affecting the use of the soil are shown. The ratings and other interpretations in this table are based on estimated engineering properties of the soils in table 3; on available test data, including those in table 6; and on field experience. The information applies only to soil depths indicated in table 3; it is reasonably reliable to depths of about 6 feet for most soils, and several more for some.

Topsoil is a term used to designate 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.

Sand and gravel ratings are not included in this table as the soils of Martin County are not generally considered as suitable sources.

Road subgrade is material used to build embankments. The ratings indicate performance of soil material moved from borrow areas for these purposes.

Highway location is influenced by features of the undisturbed soil that affect construction and maintenance of highways. A rating is given and the soil features affecting the rating is shown.

The factors considered for *foundations for low buildings* are those features and qualities of undisturbed soils that affect the suitability for supporting foundations of low buildings less than three stories high. The foundations of a building transmit the weight of the structure onto the natural undisturbed soils. It is the substratum of the soil that usually provides the base for foundations and therefore is the material which should be evaluated. The Unified Classification System was used for evaluating the soils in terms of their bearing capacity, shrink-swell potential, and shear strength.

Soil features that determine the limitations for *septic tank filter fields* and *sewage lagoons* are permeability, ground water level, flooding hazard, slope, depth to rock or other impervious materials, and creviced material that may cause pollution of water supplies.

TABLE 3.—*Estimated engineering*

[An asterisk in the first column indicates that at least one mapping unit in this series is made up of two or more kinds of soil. The soils in this column. The symbol > means greater

Soil series and map symbols	Hydrologic group	Depth to bedrock	Depth from surface	Classification		
				USDA	Unified	AASHO
		Inches	*Inches*			
Acuff: AcA	B	>60	0–12	Loam	CL	A–6 or A–4
			12–42	Sandy clay loam	CL	A–6
			42–68	Sandy clay loam	CL	A–6
Amarillo: AfA, AfB	B	>60	0–10	Fine sandy loam	SM or SC	A–4 or A–2
			10–38	Sandy clay loam	SC or CL	A–6
			38–60	Fine sandy loam	SM	A–4
Arch: ArA	B	>60	0–8	Fine sandy loam	SM or SC	A–4 or A–2
			8–14	Loam	CL	A–6
			14–60	Clay loam	CL	A–6
Arvana: AvA, AvB	C	20–40	0–10	Fine sandy loam	SM or SC	A–4 or A–2
			10–35	Sandy clay loam	SC or CL	A–6
			35–37	Indurated caliche.		
Berda: BeB	B	>60	0–60	Loam	CL or SC	A–6
*Bippus: Bc	B	>60	0–50	Clay loam	CL	A–6
For Colorado part of Bc, see Colorado series.						
Brownfield: BfB	A	>60	0–26	Fine sand	SP–SM	A–2
			26–50	Sandy clay loam	SC	A–6 or A–2
			50–60	Fine sandy loam	SM or SC	A–2
*Colorado	B	>60	0–18	Fine sandy loam	SM–SC or ML–CL	A–4
Mapped only in an undifferentiated group with Bippus soils.			18–60	Sandy clay loam	CL or SC	A–6
Drake: DrB, DrC	B	>60	0–34	Fine sandy loam	CL or SC	A–6
			34–60	Loam	CL, ML–CL	A–6
Gomez: GoB, GsA, GsB	B	>60	0–14	Fine sandy loam	SM, SC	A–4 or A–2, A–6
			14–70	Fine sandy loam	SM, SC	A–4, A–6
*Kimbrough: KsA, KuA	C	7–12	0–7	Loam	CL	A–6
For Slaughter part of KsA and for Upton part of KuA, see Slaughter and Upton series, respectively.			7–11	Indurated caliche.		
*Lipan: Lr	D	>60	0–46	Clay	CH	A–7
For Roscoe part of Lr, see Roscoe series.			46–62	Clay	CH	A–7
Mansker: MaB	B	>60	0–8	Loam	CL	A–6
			8–16	Clay loam	CL	A–6
			16–45	Clay loam	CL	A–6
Midessa: MdA, MdB	B	>60	0–10	Fine sandy loam	SM–SC or ML–CL	A–4
			10–30	Loam	CL	A–6
			30–70	Sandy clay loam	SC or CL	A–6
Miles: MlB	B	>60	0–10	Loamy fine sand	SM	A–2
			10–14	Fine sandy loam	SM	A–2 or A–4
			14–55	Sandy clay loam	SC	A–6
			55–72	Fine sandy loam	SM or SC	A–2 or A–6
Mixed alluvial land, saline: Mm. Properties too variable to rate.						

See footnote at end of table.

properties of the soils

such mapping units may have different properties and limitations, and for this reason the other series should be referred to as explained in than; the symbol < means less than.]

Percentage passing sieve—				Permeability	Available water capacity	Reaction	Shrink-swell potential
No. 4 [1] (4.7 mm.)	No. 10 [1] (2.0 mm.)	No. 40 [1] (0.42 mm.)	No. 200 [1] (0.074 mm.)				
				Inches per hour	*Inches per inch of soil*	*pH*	
100	100	60–75	95–100	0. 63–2. 0	0. 13–0. 15	6. 6–7. 8	Low.
100	100	95–100	70–80	0. 63–2. 0	0. 13–0. 15	7. 4–8. 4	Low.
90–100	90–100	80–95	60–80	0. 63–2. 0	0. 08–0. 11	7. 9–8. 4	Low.
100	100	95–100	30–45	2. 0–6. 3	0. 11–0. 13	6. 6–7. 3	Low.
100	100	95–100	45–60	0. 63–2. 0	0. 13–0. 15	6. 6–7. 8	Low.
100	90–99	80–95	35–45	2. 0–6. 3	0. 11–0. 13	7. 9–8. 4	Low.
100	100	95–100	30–50	2. 0–6. 3	0. 11–0. 13	7. 9–8. 4	Low.
98–100	90–100	85–95	60–75	0. 63–2. 0	0. 10–0. 12	7. 9–8. 4	Low.
98–100	90–100	85–95	50–88	0. 63–2. 0	0. 11–0. 13	7. 9–8. 4	Low.
100	100	70–85	30–45	2. 0–6. 3	0. 11–0. 13	6. 6–7. 3	Low.
100	100	80–90	40–65	0. 63–2. 0	0. 13–0. 15	7. 4–7. 8	Low.
100	95–100	80–95	40–55	0. 63–2. 0	0. 14–0. 16	7. 9–8. 4	Low.
100	100	80–100	60–70	0. 63–2. 0	0. 15–0. 17	7. 9–8. 4	Low.
100	100	95–100	10–20	6. 3–20. 0	0. 03–0. 05	6. 6–7. 3	Low.
100	100	95–100	30–45	0. 63–2. 0	0. 13–0. 15	6. 6–7. 8	Low.
100	100	95–100	15–30	2. 0–6. 3	0. 11–0. 13	7. 4–7. 8	Low.
100	100	70–85	40–55	2. 0–6. 3	0. 11–0. 13	6. 6–7. 3	Low.
100	100	80–90	35–55	0. 63–2. 0	0. 13–0. 15	7. 9–8. 4	Low.
98–100	98–100	85–98	40–60	0. 63–2. 0	0. 13–0. 15	7. 9–8. 4	Low.
98–100	97–100	85–98	50–75	0. 63–2. 0	0. 13–0. 15	7. 9–8. 4	Low.
98–100	95–100	85–100	30–50	2. 0–6. 3	0. 11–0. 13	7. 3–8. 4	Low.
96–100	95–100	85–100	35–50	2. 0–6. 3	0. 09–0. 11	7. 9–8. 4	Low.
95–100	95–100	80–95	60–75	0. 63–2. 0	0. 13–0. 15	7. 4–7. 8	Low.
98–100	90–100	90–100	85–98	<0. 06	0. 15–0. 17	7. 4–8. 4	High.
98–100	90–100	90–100	75–95	<0. 06	0. 15–0. 17	7. 9–8. 4	High.
98–100	95–100	80–95	60–70	0. 63–2. 0	0. 13–0. 15	7. 9–8. 4	Low.
98–100	90–100	85–95	60–75	0. 63–2. 0	0. 14–0. 15	7. 9–8. 4	Low.
98–100	65–95	60–90	50–80	0. 63–2. 0	0. 12–0. 14	7. 9–8. 4	Low.
95–100	95–100	85–95	45–55	2. 0–6. 3	0. 09–0. 11	7. 9–8. 4	Low.
95–100	95–100	90–100	60–70	0. 63–2. 0	0. 11–0. 13	7. 9–8. 4	Low.
90–100	80–85	70–80	40–55	0. 63–2. 0	0. 11–0. 13	7. 9–8. 4	Low.
100	90–100	80–95	15–25	2. 0–6. 3	0. 08–0. 10	6. 6–7. 3	Low.
100	90–100	80–95	25–40	2. 0–6. 3	0. 11–0. 13	6. 6–7. 3	Low.
100	95–100	90–97	35–50	0. 63–2. 0	0. 13–0. 15	6. 6–7. 8	Low.
100	90–95	82–92	30–45	2. 0–6. 3	0. 11–0. 15	7. 4–8. 4	Low.

TABLE 3.—*Estimated engineering*

Soil series and map symbols	Hydrologic group	Depth to bedrock	Depth from surface	Classification		
				USDA	Unified	AASHO
		Inches	*Inches*			
Mobeetie: MoB	B	>60	0–26	Fine sandy loam	SM or SC or CL	A–4
			26–64	Loam	SC or CL	A–6 or A–4
Olton: OlA	C	>60	0–8	Loam	CL	A–6
			8–16	Clay loam	CL	A–6
			16–42	Clay loam	CL	A–6
			42–65	Clay loam	CL	A–6
*Patricia: PaB, PbC For Brownfield part of PbC, see Brownfield series.	B	>60	0–14	Fine sand	SP–SM	A–2
			14–52	Sandy clay loam	SC	A–2 or A–6
			52–64	Fine sandy loam	SM or SC	A–2 or A–6
Portales: PoA, PoB	B	>60	0–12	Loam	SC or CL	A–6 or A–4
			12–24	Clay loam	CL or SC	A–6
			24–60	Loam	CL	A–6
Potter: Ps	C	4–12	0–8	Loam	ML or CL	A–4 or A–6
			8	Chalky earth.		
Roscoe: Ro	D	>60	0–65	Clay	CH	A–7
Sharvana: SaB	C	12–20	0–8	Fine sandy loam	SM	A–4 or A–2
			8–19	Sandy clay loam	SC or CL	A–6
			19	Indurated platy caliche.		
Simona: SfB	C	12–20	0–14	Fine sandy loam	SM–SC or ML–CL	A–4
			14–15	Indurated platy caliche.		
Slaughter: SlA	C	10–20	0–5	Loam	CL	A–6
			5–16	Clay loam	CL	A–6
			16	Indurated caliche.		
Springer: SpC	B	>60	0–10	Loamy fine sand	SM	A–2
			10–48	Fine sandy loam	SM or SM–SC	A–2
			48–68	Loamy fine sand	SM	A–2
Spur: St	B	>60	0–62	Clay loam	CL	A–6
Stamford: SvA	D	>60	0–34	Clay	CH	A–7
Stegall: SwA	C	21–30	0–10	Clay loam	CL	A–6
			10–25	Clay loam	CL	A–6
			25	Indurated platy caliche.		
Tivoli: Tf	A	>60	0–60	Fine sand	SP or SM	A–2
Upton: UpA	C	12–20	0–10	Loam	CL	A–6
			10–19	Clay loam	CL	A–6
			19	Indurated caliche.		
Veal: VeB, VeC	B	>60	0–8	Fine sandy loam	SM or ML	A–4
			8–50	Sandy clay loam	SC or CL	A–6
Vernon: VnB	D	12–20	0–20	Clay	CH	A–7
			20–30	Clay and shale.		
Zita: ZtA	B	>60	0–16	Loam	CL	A–4 or A–6
			16–62	Clay loam	CL	A–6

[1] Data estimated for modal soil and correlated with test data for similar soils from other counties.

properties of the soils—Continued

Percentage passing sieve—				Permeability	Available water capacity	Reaction	Shrink-swell potential
No. 4 [1] (4.7 mm.)	No. 10 [1] (2.0 mm.)	No. 40 [1] (0.42 mm.)	No. 200 [1] (0.074 mm.)				
				inches per hour	*inches per inch of soil*	*pH*	
100	100	80–95	40–55	2. 0–6. 3	0. 11–0. 13	7. 9–8. 4	Low.
100	95–100	75–85	40–60	2. 0–6. 3	0. 12–0. 14	7. 9–8. 4	Low.
100	100	85–95	60–75	0. 2–0. 63	0. 15–0. 17	6. 6–7. 3	Low.
100	100	90–100	70–80	0. 2–0. 63	0. 15–0. 17	7. 4–7. 8	Low.
100	100	90–100	70–80	0. 2–0. 63	0. 15–0. 17	7. 4–8. 4	Moderate.
100	100	90–100	65–75	0. 2–0. 63	0. 14–0. 16	7. 9–8. 4	Low.
100	100	95–100	10–20	6. 30–20. 0	0. 03–0. 05	6. 6–7. 3	Low.
100	100	95–100	30–45	0. 63–2. 0	0. 13–0. 15	6. 6–7. 8	Low.
100	100	95–100	30–45	0. 63–2. 0	0. 11–0. 13	7. 4–7. 8	Low.
98–100	95–100	85–95	45–70	0. 63–2. 0	0. 15–0. 17	7. 9–8. 4	Low.
98–100	90–100	85–95	45–55	0. 63–2. 0	0. 15–0. 17	7. 9–8. 4	Low.
100	95–100	90–98	50–65	0. 63–2. 0	0. 11–0. 13	7. 9–8. 4	Low.
90–95	70–85	60–85	50–70	0. 63–2. 0	0. 13–0. 15	7. 9–8. 4	Low.
100	100	92–100	75–95	<0. 06	0. 15–0. 17	6. 6–7. 8	High.
100	100	70–85	30–45	2. 0–6. 3	0. 11–0. 13	6. 6–7. 3	Low.
100	100	80–90	35–55	0. 63–2. 0	0. 13–0. 15	6. 6–7. 3	Low.
95–100	95–100	70–85	40–55	2. 0–6. 3	0. 10–0. 12	7. 9–8. 4	Low.
100	100	85–95	60–75	0. 63–2. 0	0. 13–0. 15	7. 4–7. 8	Low.
100	100	90–100	85–90	0. 20–0. 63	0. 13–0. 15	7. 4–7. 8	Moderate.
100	95–100	70–85	15–25	6. 30–20. 0	0. 06–0. 08	6. 6–7. 3	Low.
100	95–100	80–90	20–35	2. 0–6. 3	0. 09–0. 11	6. 6–7. 8	Low.
100	95–100	70–85	15–25	6. 30–20. 0	0. 06–0. 08	7. 4–7. 8	Low.
100	100	95–100	75–95	0. 63–2. 0	0. 14–0. 16	7. 9–8. 4	Low.
100	100	90–100	75–95	0. 06–0. 20	0. 15–0. 17	7. 9–8. 4	High.
100	100	85–95	60–75	0. 63–2. 0	0. 13–0. 15	7. 4–7. 8	Low.
100	100	90–100	70–80	0. 20–0. 63	0. 13–0. 15	7. 4–7. 8	Moderate.
100	100	65–80	10–20	6. 30–20. 0	0. 04–0. 06	6. 6–7. 3	Low.
90–100	90–100	80–95	60–75	0. 63–2. 0	0. 13–0. 15	7. 9–8. 4	Low.
98–100	90–100	80–95	60–75	0. 63–2. 0	0. 13–0. 15	7. 9–8. 4	Low.
100	100	85–95	40–55	2. 0–6. 3	0. 11–0. 13	7. 9–8. 4	Low.
100	100	90–100	35–55	0. 63–2. 0	0. 13–0. 15	7. 9–8. 4	Low.
100	100	90–100	80–90	0. 06–0. 20	0. 15–0. 17	7. 9–8. 4	High.
100	100	98–100	50–60	0. 63–2. 0	0. 15–0. 20	7. 4–7. 8	Low.
100	98–100	95–99	60–70	0. 63–2. 0	0. 12–0. 16	7. 9–8. 4	Low.

TABLE 4.—*Engineering*

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

Soil series and map symbols	Suitability as source of—		Degree of limitations and soil features affecting—		
	Topsoil	Road subgrade	Highway location	Foundations for low buildings	Septic tank filter fields
Acuff: AcA	Fair: 8 to 15 inches of loam.	Fair: fair traffic-supporting capacity.	Moderate: fair traffic-supporting capacity.	Slight	Slight
Amarillo: AfA, AfB	Fair: 7 to 16 inches of fine sandy loam.	Fair: fair traffic-supporting capacity.	Moderate: fair traffic-supporting capacity.	Slight	Slight
Arch: ArA	Poor: more than 30 percent calcium carbonate.	Fair: fair traffic-supporting capacity.	Moderate: fair traffic-supporting capacity.	Slight	Slight
Arvana: AvA, AvB	Fair: 8 to 12 inches of fine sandy loam.	Fair: fair traffic-supporting capacity.	Severe where depth to caliche is less than 36 inches. Moderate where depth to caliche is more than 36 inches; fair traffic-supporting capacity.	Slight	Severe: indurated caliche at depth of 20 to 40 inches.
Berda: BeB	Good	Fair: fair traffic-supporting capacity.	Moderate: fair traffic-supporting capacity.	Slight	Slight
*Bippus: Bc For Colorado part of Bc, see Colorado series.	Fair: clay loam texture.	Fair: fair traffic-supporting capacity.	Moderate: fair traffic-supporting capacity.	Slight	Slight
Brownfield: BfB	Poor: fine sand texture.	Fair: fair traffic-supporting capacity.	Moderate: fair traffic-supporting capacity.	Slight	Slight
*Colorado Mapped only in an undifferentiated group with Bippus soils.	Fair: 10 to 20 inches of fine sandy loam.	Fair: fair traffic-supporting capacity.	Severe: subject to flooding.	Severe: subject to flooding.	Severe: subject to flooding.
Drake: DrB, DrC	Poor: more than 30 percent calcium carbonate.	Fair: fair traffic-supporting capacity.	Moderate: fair traffic-supporting capacity.	Slight	Slight
Gomez:					
GsA, GsB	Fair: 10 to 20 inches of fine sandy loam.	Fair: fair traffic-supporting capacity.	Moderate: fair traffic-supporting capacity.	Slight	Slight
GoB	Poor: loamy fine sand texture.	Fair: fair traffic-supporting capacity.	Moderate: fair traffic-supporting capacity.	Slight	Slight

interpretations

such mapping units may have different properties and limitations, and for this reason the other series should be referred to as explained column]

Degree of limitations and soil features affecting—Con.			Soil features affecting—			Corrosivity class and contributing soil features for uncoated steel
Sewage lagoons	Farm ponds		Irrigation	Terraces and diversions	Waterways	
	Reservoir area	Embankments				
Moderate: moderate permeability.	Moderate: moderate permeability.	Moderate: fair resistance to piping and erosion.	All features favorable.	All features favorable.	All features favorable.	Moderate: sandy clay loam texture.
Moderate: moderate permeability.	Moderate: moderate permeability.	Moderate: poor resistance to piping and erosion.	All features favorable.	All features favorable.	All features favorable.	Moderate: conductivity.
Moderate: moderate permeability.	Moderate: moderate permeability.	Moderate: fair resistance to piping and erosion.	All features favorable.	All features favorable.	Soil high in lime, difficult to establish some plants.	High: conductivity.
Severe: indurated caliche at depth of 20 to 40 inches.	Severe: indurated caliche at depth of 20 to 40 inches.	Severe where borrow material is 20 to 24 inches thick. Moderate where borrow material is more than 24 inches thick.	Indurated caliche at depth of 20 to 40 inches.	Indurated caliche at depth of 20 to 40 inches.	Indurated caliche at depth of 20 to 40 inches.	High: conductivity.
Moderate: moderate permeability.	Moderate: moderate permeability.	Moderate: fair resistance to piping and erosion.	All features favorable.	All features favorable.	All features favorable.	Moderate: conductivity.
Moderate: moderate permeability.	Moderate: moderate permeability.	Moderate: fair resistance to piping and erosion.	Moderate intake rate.	Receives outside water.	All features favorable.	Moderate: clay loam texture.
Moderate: moderate permeability.	Severe: seepage.	Severe: poor slope stability; resistance to piping and erosion.	High intake rate	Highly erosive.	Highly erosive.	Moderate: sandy clay loam texture.
Moderate: moderate permeability.	Moderate: moderate permeability.	Moderate: fair resistance to piping and erosion.	Flood hazard----	Flood hazard----	Flood hazard----	Moderate: sandy clay loam texture.
Moderate: moderate permeability.	Moderate: moderate permeability.	Moderate: fair resistance to piping and erosion.	Slopes----------	All features favorable.	Soil high in lime, difficult to establish some plants.	High: conductivity.
Severe: moderately rapid permeability.	Severe: moderately rapid permeability.	Moderate: poor resistance to piping and erosion.	Rapid intake rate.	Poor stability, erodible.	Poor stability, erodible.	High: conductivity.
Severe: moderately rapid permeability.	Severe: moderately rapid permeability.	Moderate: poor resistance to piping and erosion.	Rapid intake rate.	Poor stability, erodible.	Poor stability, erodible.	High: conductivity.

TABLE 4.—*Engineering*

Soil series and map symbols	Suitability as source of—		Degree of limitations and soil features affecting—		
	Topsoil	Road subgrade	Highway location	Foundations for low buildings	Septic tank filter fields
*Kimbrough: KsA, KuA—For Slaughter part of KsA, see Slaughter series. For Upton part of KuA, see Upton series.	Fair: 7 to 12 inches of loam.	Poor: indurated caliche at depth of 7 to 12 inches.	Severe: indurated caliche at depth of 7 to 12 inches.	Severe: indurated caliche at depth of 7 to 12 inches.	Severe: indurated caliche at depth of 7 to 12 inches.
*Lipan: Lr—For Roscoe part of Lr, see Roscoe series.	Poor: clay texture.	Poor: high shrink-swell potential; poor traffic-supporting capacity.	Severe: high shrink-swell potential; poor traffic-supporting capacity.	Severe: high shrink-swell potential.	Severe: very slow permeability.
Mansker: MaB	Fair: 7 to 10 inches of loam.	Fair: fair traffic-supporting capacity.	Moderate: fair traffic-supporting capacity.	Slight	Slight
Midessa: MdA, MdB	Fair: 8 to 12 inches of loam.	Fair: fair traffic-supporting capacity.	Moderate: fair traffic-supporting capacity.	Slight	Slight
Miles: MlB	Poor: loamy fine sand texture.	Fair: fair traffic-supporting capacity.	Moderate: fair traffic-supporting capacity.	Slight	Slight
Mixed alluvial land, saline: Mm. Properties too variable to rate.					
Mobeetie: MoB	Good	Fair: fair traffic-supporting capacity.	Moderate: fair traffic-supporting capacity.	Slight	Slight
Olton: OlA	Fair: 7 to 10 inches of loam.	Fair: moderate shrink-swell potential; fair traffic supporting capacity.	Moderate: moderate shrink-swell potential; fair traffic-supporting capacity.	Moderate: moderate shrink-swell potential.	Severe: moderately slow permeability.
*Patricia: PaB, PbC—For Brownfield part of PbC, see Brownfield series.	Poor: fine sand texture.	Fair: fair traffic-supporting capacity.	Moderate: fair traffic-supporting capacity.	Slight	Slight
Portales: PoA, PoB	Fair: 8 to 15 inches of loam.	Fair: fair traffic-supporting capacity.	Moderate: fair traffic-supporting capacity.	Slight	Slight

interpretations—Continued

Degree of limitations and soil features affecting—Con.			Soil features affecting—			Corrosivity class and contributing soil features for uncoated steel
Sewage lagoons	Farm ponds		Irrigation	Terraces and diversions	Waterways	
	Reservoir area	Embankments				
Severe: indurated caliche at depth of 7 to 12 inches.	Severe: indurated caliche at depth of 7 to 12 inches.	Severe: indurated caliche at depth of 7 to 12 inches.	Indurated caliche at depth of 7 to 12 inches.	Indurated caliche at depth of 7 to 12 inches.	Indurated caliche at depth of 7 to 12 inches.	High: conductivity.
Slight	Slight	Moderate: high compressibility.	Slow intake rate.	Depressional topography.	All features favorable.	High: clay texture.
Moderate: moderate permeability.	Moderate: moderate permeability.	Moderate: fair resistance to piping and erosion.	All features favorable.	All features favorable.	All features favorable.	High: conductivity.
Moderate: moderate permeability.	Moderate: moderate permeability.	Moderate: fair resistance to piping and erosion.	All features favorable.	All features favorable.	All features favorable.	High: conductivity.
Moderate: moderate permeability.	Moderate: moderate permeability.	Moderate: poor resistance to piping and erosion.	Rapid intake rate.	High hazard soil blowing.	High hazard of soil blowing.	Moderate: sandy clay loam texture.
Severe: moderately rapid permeability; slopes over 7 percent.	Severe: moderately rapid permeability.	Moderate: poor resistance to piping and erosion.	Moderately rapid permeability	All features favorable.	All features favorable.	High: conductivity.
Slight	Moderate: moderately slow permeability.	Moderate: medium compressibility.	Slow intake rate.	All features favorable.	All features favorable.	Moderate: clay loam texture.
Moderate: moderate permeability.	Severe: seepage.	Severe: poor stability and resistance to piping and erosion.	High intake rate, erosive.	Highly erosive	Highly erosive	Moderate: sandy clay loam texture.
Moderate: moderate permeability.	Moderate: moderate permeability.	Moderate: medium compressibility.	All features favorable.	All features favorable.	All features favorable.	High: conductivity.

TABLE 4.—*Engineering*

Soil series and map symbols	Suitability as source of—		Degree of limitations and soil features affecting—		
	Topsoil	Road subgrade	Highway location	Foundations for low buildings	Septic tank filter fields
Potter: Ps	Poor where loam layer is 4 to 6 inches thick. Fair where loam layer is 6 to 12 inches thick.	Poor: 4 to 12 inches of suitable material.	Severe: chalky earth and indurated caliche at depth of 4 to 12 inches.	Severe: chalky earth and indurated caliche at depth of 4 to 12 inches.	Severe: chalky earth and indurated caliche at depth of 4 to 12 inches.
Roscoe: Ro	Poor: clay texture.	Poor: high shrink-swell potential; poor traffic-supporting capacity.	Severe: high shrink-swell potential; poor traffic-supporting capacity.	Severe: high shrink-swell potential.	Severe: very slow permeability.
Sharvana: SaB	Fair: 6 to 10 inches of fine sandy loam.	Poor: 12 to 20 inches of suitable material.	Severe: indurated platy caliche at depth of 12 to 20 inches.	Severe: indurated platy caliche at depth of 12 to 20 inches.	Severe: indurated platy caliche at depth of 12 to 20 inches.
Simona: SfB	Fair: 12 to 20 inches of fine sandy loam.	Poor: 12 to 20 inches of suitable material.	Severe: indurated platy caliche at depth of 12 to 20 inches.	Severe: indurated platy caliche at depth of 12 to 20 inches.	Severe: indurated platy caliche at depth of 12 to 20 inches.
Slaughter: SlA	Poor where 4 to 6 inches of material; fair where 6 to 8 inches of material.	Poor: 10 to 12 inches of suitable material.	Severe: indurated caliche at depth of 10 to 20 inches.	Severe: indurated caliche at depth of 10 to 20 inches.	Severe: indurated caliche at depth of 10 to 20 inches.
Springer: SpC	Poor: loamy fine sand texture.	Good	Slight	Slight	Slight
Spur: St	Fair: clay loam texture.	Fair: fair traffic-supporting capacity.	Moderate: fair traffic-supporting capacity; flood hazard.	Severe: subject to flooding.	Severe: flood hazard.
Stamford: SvA	Poor: clay texture.	Poor: high shrink-swell potential; poor traffic supporting capacity.	Severe: high shrink-swell potential; poor traffic-supporting capacity.	Severe: high shrink-swell potential.	Severe: slow permeability.
Stegall: SwA	Fair: clay loam texture.	Fair: moderate shrink-swell potential; fair traffic-supporting capacity.	Severe: indurated platy caliche at depth of 21 to 30 inches.	Moderate: moderate shrink-swell potential.	Severe: indurated platy caliche at depth of 21 to 30 inches.

interpretations—Continued

Degree of limitations and soil features affecting—Con.			Soil features affecting—			Corrosivity class and contributing soil features for uncoated steel
Sewage lagoons	Farm ponds		Irrigation	Terraces and diversions	Waterways	
	Reservoir area	Embankments				
Severe: chalky earth and indurated caliche at depth of 4 to 12 inches.	Severe: chalky earth and indurated caliche at depth of 4 to 12 inches.	Severe: chalky earth and indurated caliche at depth of 4 to 12 inches.	Nonarable	Nonarable	Nonarable	High: conductivity.
Slight	Slight	Moderate: high compressibility; fair stability.	Very slow intake rate.	Depressional topography.	Depressional topography.	High: clay texture; wetness.
Severe: indurated platy caliche at depth of 12 to 20 inches.	Severe: indurated platy caliche at depth of 12 to 20 inches.	Severe: 12 to 20 inches of borrow material.	Indurated platy caliche at depth of 12 to 20 inches.	Indurated platy caliche at depth of 12 to 20 inches.	Indurated platy caliche at depth of 12 to 20 inches.	High: conductivity.
Severe: indurated platy caliche at depth of 12 to 20 inches.	Severe: indurated platy caliche at depth of 12 to 20 inches.	Severe: 12 to 20 inches of borrow material.	Indurated platy caliche at depth of 12 to 20 inches.	Indurated platy caliche at depth of 12 to 20 inches.	Indurated platy caliche at depth of 12 to 20 inches.	High: conductivity.
Severe: indurated caliche at depth of 10 to 20 inches.	Severe: indurated caliche at depth of 10 to 20 inches.	Severe: 10 to 20 inches of borrow material.	Indurated caliche at depth of 10 to 20 inches.	Indurated caliche at depth of 10 to 20 inches.	Indurated caliche at depth of 10 to 20 inches.	High: conductivity.
Severe: moderately rapid permeability.	Severe: moderately rapid permeability.	Moderate: poor resistance to piping and erosion.	Rapid intake rate.	Severe hazard of soil blowing; undulating and hummocky topography.	Severe hazard of soil blowing.	Low.
Moderate: moderate permeability.	Moderate: moderate permeability.	Moderate: medium compressibility.	Flood hazard	Flood hazard	Flood hazard	Moderate: clay loam texture.
Slight	Slight	Moderate: high compressibility; fair stability.	Very slow intake rate.	All features favorable.	Erodible	High: clay texture.
Severe: indurated platy caliche at depth of 21 to 30 inches.	Moderate: moderately slow permeability.	Moderate: medium compressibility.	Indurated caliche at depth of 21 to 30 inches.	All features favorable.	All features favorable.	High: conductivity.

TABLE 4.—*Engineering*

Soil series and map symbols	Suitability as source of—		Degree of limitations and soil features affecting—		
	Topsoil	Road subgrade	Highway location	Foundations for low buildings	Septic tank filter fields
Tivoli: Tf	Poor: fine sand texture.	Good	Slight	Slight	Severe: inadequate filtration.
Upton: UpA	Fair: 5 to 10 inches of loam.	Poor: 12 to 20 inches of suitable material.	Severe: indurated caliche at depth of 12 to 20 inches.	Severe: indurated caliche at depth of 12 to 20 inches.	Severe: indurated caliche at depth of 12 to 20 inches.
Veal: VeB, VeC	Fair: 5 to 10 inches of fine sandy loam.	Fair: fair traffic-supporting capacity.	Moderate: fair traffic-supporting capacity.	Slight	Slight
Vernon: VnB	Poor: clay texture.	Poor: high shrink-swell potential; poor traffic-supporting capacity.	Severe: high shrink-swell potential; poor traffic-supporting capacity.	Severe: high shrink-swell potential.	Severe: slow permeability.
Zita: ZtA	Fair: 8 to 19 inches of loam.	Fair: fair traffic-supporting capacity.	Moderate: fair traffic-supporting capacity.	Slight	Slight

interpretations—Continued

Degree of limitations and soil features affecting—Con.			Soil features affecting—			Corrosivity class and contributing soil features for uncoated steel
Sewage lagoons	Farm ponds		Irrigation	Terraces and diversions	Waterways	
	Reservoir area	Embankments				
Severe: rapid permeability.	Severe: rapid permeability.	Severe: poor resistance to piping and erosion; poor stability.	High intake rate; low available water capacity; dune topography.	Dune topography; severe hazard of soil blowing.	Severe hazard of soil blowing.	Low.
Severe: indurated caliche at depth of 12 to 20 inches.	Severe: indurated caliche at depth of 12 to 20 inches.	Severe: 12 to 20 inches of borrow material.	Indurated caliche at depth of 12 to 20 inches.	Indurated caliche at depth of 12 to 20 inches.	Indurated caliche at depth of 12 to 20 inches.	High: conductivity.
Moderate: moderate permeability.	Moderate: moderate permeability.	Moderate: fair resistance to piping and erosion.	All features favorable.	All features favorable.	All features favorable.	High: conductivity.
Slight	Slight	Moderate: high compressibility; poor stability.	14 to 20 inches to clay and shale; slow intake rate.	14 to 20 inches to clay and shale.	14 to 20 inches to clay and shale.	High: clay texture.
Moderate: moderate permeability.	Moderate: moderate permeability.	Moderate: fair resistance to piping and erosion.	All features favorable.	All features favorable.	All features favorable.	High: conductivity.

TABLE 5.—*Degree of limitation for town and country planning and the chief limiting properties*

[An asterisk in the first column indicates that at least one mapping unit in this series is made up of two or more kinds of soil. The soils in such mapping units may have different properties and limitations, and for this reason the other series should be referred to as explained in this column]

Soil series and map symbol	Campsites	Picnic areas	Intensive play areas	Paths and trails
Acuff: AcA	Slight	Slight	Slight	Slight.
Amarillo: AfA, AfB	Slight	Slight	Slight where slopes are 0 to 2 percent. Moderate where slopes are 3 percent.	Slight.
Arch: ArA	Moderate: dust	Moderate: dust	Moderate: dust	Moderate: dust.
Arvana: AvA, AvB	Slight	Slight	Slight where slopes are 0 to 2 percent. Moderate where slopes are 3 percent.	Slight.
Berda: BeB	Slight	Slight	Slight where slopes are 1 and 2 percent. Moderate where slopes are 3 percent.	Slight.
*Bippus: Bc For Colorado part of Bc, see Colorado series.	Moderate: clay loam texture.	Moderate: clay loam texture.	Moderate: clay loam texture.	Moderate: clay loam texture.
Brownfield: BfB	Severe: fine sand texture.	Severe: fine sand texture.	Severe: fine sand texture.	Severe: fine sand texture.
*Colorado Mapped only in an undifferentiated group with Bippus soils.	Severe: flood hazard.	Moderate: flood hazard.	Severe: flood hazard	Moderate: flood hazard.
Drake: DrB, DrC	Moderate: dust	Moderate: dust	Moderate: dust; slopes of 2 to 5 percent.	Moderate: dust.
Gomez: GoB, GsA, GsB	Severe: dust	Severe: dust	Severe: dust	Severe: dust.
*Kimbrough: KsA, KuA For Slaughter part of KsA, see Slaughter series. For Upton part of KuA, see Upton series.	Moderate: 25 percent coarse fragments on surface.	Slight	Severe: over 20 percent coarse fragments on surface.	Slight.
*Lipan: Lr For Roscoe part of Lr, see Roscoe series.	Severe: clay texture.	Severe: clay texture.	Severe: clay texture	Severe: clay texture.
Mansker: MaB	Moderate: dust	Moderate: dust	Moderate: dust; slopes of up to 3 percent.	Moderate: dust.
Midessa: MdA, MdB	Moderate: dust	Moderate: dust	Moderate: dust	Moderate: dust.
Miles: MlB	Severe: dust	Severe: dust	Severe: dust	Severe: dust.
Mixed alluvial land, saline: Mm. Properties too variable to rate.				
Mobeetie: MoB	Moderate: dust	Moderate: dust	Moderate: dust	Moderate: dust.

TABLE 5.—*Degree of limitation for town and country planning and the chief limiting properties*—Continued

Soil series and map symbol	Campsites	Picnic areas	Intensive play areas	Paths and trails
Olton: OlA	Moderate: moderately slow permeability.	Moderate: clay loam texture below surface layer.	Moderate: moderately slow permeability.	Moderate: moderately slow permeability.
*Patricia: PaB, PbC For Brownfield part of PbC, see Brownfield series.	Severe: fine sand texture.	Severe: fine sand texture.	Severe: fine sand texture.	Severe: fine sand texture.
Portales: PoA, PoB	Moderate: dust	Moderate: dust	Moderate: dust	Moderate: dust.
Potter: Ps	Moderate where slopes are 8 to 15 percent; dust. Severe where slopes are 15 to 20 percent.	Moderate where slopes are 8 to 15 percent; dust. Severe where slopes are 15 to 20 percent.	Severe: indurated caliche at depth of 4 to 12 inches.	Moderate: dust; slopes of 15 to 20 percent.
Roscoe: Ro	Severe: clay texture.	Severe: clay texture.	Severe: clay texture	Severe: clay texture.
Sharvana: SaB	Slight	Slight	Severe: indurated caliche at depth of 12 to 20 inches.	Slight.
Simona SfB	Moderate: dust	Moderate: dust	Severe: indurated platy caliche at depth of 12 to 20 inches.	Moderate: dust.
Slaughter: SlA	Slight	Slight	Severe: indurated caliche at depth of 10 to 20 inches.	Slight.
Springer: SpC	Severe: dust	Severe: dust	Severe: dust	Severe: dust.
Spur: St	Severe: flood hazard.	Moderate: flood hazard; clay loam texture.	Severe: flood hazard	Moderate: flood hazard; clay loam texture.
Stamford: SvA	Severe: clay texture.	Severe: clay texture.	Severe: clay texture	Severe: clay texture.
Stegall: SwA	Slight	Slight	Moderate: indurated caliche at depth of 21 to 30 inches.	Slight.
Tivoli: Tf	Severe: fine sand texture.	Severe: fine sand texture.	Severe: fine sand texture.	Severe: fine sand texture.
Upton: UpA	Moderate: dust	Moderate: dust	Severe: indurated caliche at depth of 12 to 20 inches.	Moderate: dust.
Veal: VeB, VeC	Moderate: dust	Moderate: dust	Moderate: dust; slopes of 1 to 5 percent.	Moderate: dust.
Vernon: VnB	Severe: clay texture.	Severe: clay texture.	Severe: clay texture	Severe: clay texture.
Zita: ZtA	Slight	Slight	Slight	Slight.

TABLE 6.—*Engineering*

[Tests performed by the Texas Highway Department in accordance with standard procedures of the American Association of State Highway Commerce, Bureau of

Soil name	Texas report No.	BPR. report No.	Depth from surface	Mechanical analysis [1]			
				Percentage passing sieve—			
				¾ in.	⅜ in.	No. 4 (4.7 mm.)	No. 10 (2.0 mm.)
			Inches				
Drake fine sandy loam (from an area of Drake soils) (modal).	64–512–R	1–2	6–28	----------	100	99	98
	64–513–R	1–3	28–72	----------	100	99	97
Gomez fine sandy loam (modal)	64–518–R	2–2	12–36	----------	----------	100	99
	64–519–R	2–3	36–54	100	97	94	90
	64–520–R	2–4	54–80	----------	100	97	96
Gomez fine sandy loam (more clayey than modal).	64–521–R	5–2	10–36	----------	100	99	99
	64–522–R	5–3	36–56	----------	100	97	96
	64–523–R	5–4	56–80	100	98	96	93

[1] Mechanical analyses according to the AASHO Designation T 88–57 (*1*). Results obtained by this procedure may differ somewhat from results that would have been 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 coarser than 2 millimeters in diameter. In the SCS soil survey procedure, the fine material is analyzed by the pipette method, and the material coarser than 2 millimeters in diameter is excluded from calculations of grain-size fractions. The mechanical analyses used in this table are not suitable for use in naming textural classes of soils.

The suitability of soils for *reservoir areas* depends primarily upon the seepage rate. The highly plastic soils have a low seepage rate. Coarse-textured soils do not have any binding or sealing characteristics, and they have a high seepage rate.

The factors considered for *farm pond embankments* are stability, compaction characteristics, susceptibility to piping, shrink-swell potential, compacted permeability, compressibility, erodibility, and gypsum content. Both the subsoil and substratum are evaluated where they are contrasting in character and have significant thickness for use as borrow.

Irrigation suitability of soils depends largely on the intake rate, water-holding capacity, depth and slope of soil, susceptibility to water erosion, and susceptibility to flooding.

Terraces and diversions are affected by soil features such as texture, slope, depth to bedrock or other unfavorable material, and stability. Field terraces constructed on erodible, sandy soils are difficult to build and maintain. Factors that hinder layout and construction of these facilities must also be considered.

Waterways are affected by stability of the soil, depth to bedrock, and ease in establishing desired plants.

Corrosivity ratings are given for soils of the county for steel, based on soil conditions at four feet, in table 4. Steel pipe should have a protective coating to retard corrosion when placed in any soil in the county. The corrosivity class for concrete is low for all soils in the county.

Town and country planning

Some of the more common properties affecting the use of the soils for town and country planning are hazards of flooding, slope, permeability, soil texture, depth to bedrock, and stoniness or rockiness. In table 5 the soils of the county are rated for specific recreational uses and the nature of the soil limitations that influenced the ratings is shown.

The ratings used are none to slight, moderate, severe, and very severe. If the rating is *none to slight*, little or no adjustments are needed in use or the limitation is not serious and is easy to overcome. A rating of *moderate* means that some adjustments are needed in use, and *severe*, that extensive adjustments are needed before the soil is suitable for a specific purpose. A rating of *very severe* means that the limitations are so severe that use of the soil for the stated purpose is impractical.

Campsites.—These soil ratings apply to areas suitable for tent and camp trailer sites and the accompanying activities for outdoor living. They are used frequently during the camping season. These areas require little site preparation and should be suitable for unsurfaced parking for cars and camp trailers and heavy foot traffic by humans or horses or vehicular traffic. The soils should be free of coarse fragments and rock outcroppings. Suitability of soil for supporting vegetation is a separate item to be considered in the final evaluation of selecting a site for these uses. Items considered in establishing ratings are wetness hazard, flooding hazard, permeability, slope, surface soil texture, coarse fragments, and stoniness or rockiness.

Picnic areas.—These ratings are based on soil features only and do not include other features as presence of trees or lakes which may affect the desirability of a site. Suitability of soil for supporting vegetation is a separate item to be considered in the final evaluation of selecting sites for these uses. Items considered in establishing

test data

Officials (AASHO). The work by the Highway Department was performed under a cooperative agreement with the U.S. Department of Public Roads (BPR)]

Mechanical analysis [1]—Continued					Specific gravity	Liquid limit	Plasticity index	Classification	
Percentage passing sieve—Continued		Percentage smaller than [2]—							
No. 40 (0.42 mm.)	No. 200 (0.074 mm.)	0.05 mm.	0.005 mm.	0.002 mm.				Unified [3]	AASHO [4]
						Pct.			
96	57	50	26	18	2.65	36	15	CL	A-6(6)
86	56	48	34	29	2.70	38	15	ML-CL	A-6(6)
98	44	39	17	14	2.66	34	16	SC	A-6(4)
86	39	34	17	13	2.66	31	14	SC	A-6(3)
93	39	32	17	13	2.68	27	10	SC	A-4(1)
98	47	37	19	16	2.67	23	10	SC	A-4(3)
92	49	40	25	21	2.69	24	13	SC	A-6(4)
88	37	29	17	14	2.66	25	11	SC	A-6(1)

[2] Used No. 270 sieve and 1-minute hydrometer reading.

[3] Based on the Unified Soil Classification System (*7*) Tech. Memo. No. 3-357, 2 v., Waterways Experiment Station, Corps of Engineers. SCS and BPR have agreed to consider that all soils having plasticity indexes within 2 points of the A-line are to be given a borderline classification. An example of borderline classification obtained by this use is ML-CL.

[4] Based on AASHO Designation M 145-49 (*1*).

ratings are wetness hazard, flooding hazard, slope, surface soil texture, stoniness, and rockiness.

Intensive play areas.—This soil rating applies to areas to be developed for playgrounds and organized games, as baseball, football, badminton and the like. They are subject to intensive foot traffic. Areas selected for this use generally require a nearly level surface, good drainage, and a soil texture and consistence that gives a firm surface. The most desirable soil is free of rock outcrops and coarse fragments. It is assumed that good vegetative cover can be established and maintained on areas where needed. Items affecting this use considered in evaluations are wetness hazard, flooding hazard, permeability, slope, surface soil texture, depth to hard bedrock, stoniness, and coarse fragments.

Paths and trails.—This soil rating applies to areas that are to be used for trails, cross-country hiking, bridle paths, and nonintensive uses which allow for random movement of people. It is assumed that these areas are to be used as they occur in nature and little soil moved (excavated) for the planned recreational use. Ratings are based on soil features only and do not include other items that may be important in the selection of a site for this use. Soils rated as having severe soil limitations may be best from the natural beauty or use standpoint but they do require more preparation or maintenance for such use. Items considered in establishing rating are wetness hazard, flooding hazard, slope, surface soil texture, and surface stoniness or rockiness.

Engineering test data

Table 6 contains the results of engineering tests performed by the Texas State Highway Department on three soil profiles in Martin County, Texas. The table shows the depth to which sampling was done and the results of tests to determine grain-size distribution and other properties significant in soil engineering.

Mechanical analyses show the percentages, by weight, of soil particles that passed sieves of specified sizes. Sand and other coarser materials do not pass through the No. 200 sieve. Silt and clay pass through the No. 200 sieve. Silt is that material larger than 0.002 millimeter in diameter that passes through the No. 200 sieve, and clay is that fraction passing through the No. 200 sieve that is smaller than 0.002 millimeter in diameter. The clay fraction was determined by the hydrometer method, rather than the pipette method most soil scientists use in determining the clay in soil samples.

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 solid to a plastic state. If the moisture content is further increased, the material changes from a plastic to a liquid state. The plastic limit is the moisture content at which the soil material passes from solid to plastic. The liquid limit is the moisture content at which the material 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.

Engineering interpretations by soil associations

The generalized soil map groups the soils into areas having similar characteristics and similar problems. The suitability for engineering use is generally reflected in the various soil patterns of the county. Generalized information will help farmers, ranchers, and agricultural

technicians in understanding problems involved in selecting sites for various engineering structures or practices.

1. Amarillo association.—This association consists of soils that generally are suitable for earthen structures, such as farm ponds, terraces, waterways, and diversions. Moderate seepage can be expected from reservoir areas. In some cases, caliche may be shallow enough to be of concern, but it is not a problem in most places. The dominant soils have slight to moderate limitations to most nonagricultural uses.

2. Miles-Patricia association.—The soils of this association are generally sandy. They are adaptable to sprinkler irrigation on the flatter slopes, but are susceptible to soil blowing when cultivated. The dominant soils have slight to severe limitations to nonagricultural uses.

3. Slaughter-Kimbrough association.—The soils of this association are too shallow for excavated reservoirs. These soils are generally not recommended for cropland. The dominant soils have slight to severe limitations to nonagricultural uses.

4. Portales-Acuff association.—The soils in this association are generally suited to most agricultural uses. Moderate seepage can be expected in reservoir areas. The dominant soils have slight to moderate limitations to most nonagricultural uses.

5. Midessa-Drake-Arch association.—The soils in this association are generally suitable for earthen structures such as farm ponds, terraces, waterways, and diversions. Moderate seepage can be expected in reservoir areas. The Drake and Arch soils tend to be susceptible to soil blowing and have some steeper slopes than the Midessa soils. The dominant soils have slight to moderate limitations to nonagricultural uses.

6. Potter-Mansker association.—The soils of this association are located generally along draws. The dominant soils have moderate to severe limitations for embankment material.

Formation and Classification of Soils

This section presents the outstanding morphologic characteristics, or structural nature, of the soils of Martin County and relates them to the factors of soil formation. Physical and chemical data are limited for these soils and the discussion of soil genesis is correspondingly incomplete. The first part of this section deals with the environment of the soils; the second deals with the classification of the soils.

Factors of Soil Formation

Soil is produced by the action of soil-forming processes on materials deposited or accumulated by geologic agencies. The characteristics of the soil at any given point are determined by (1) the physical and mineralogical composition of the parent materials; (2) the climate under which the soil material has accumulated and existed since accumulation; (3) the plant and animal life on and in the soil; (4) the relief, or lay of the land; and (5) the length of time the forces of soil development have acted on the soil material.

Climate and vegetation are active factors of soil formation. They act on the parent material that has accumulated through the weathering of rocks and slowly change it into a natural body with genetically related horizons. The effects of climate and vegetation are conditioned by relief. The parent material also affects the kind of profile that can be formed and, in extreme cases, determines it almost entirely. Finally, time is needed for the changing of the parent material into a soil profile. It may be much or little, but some time is always required for horizon differentiation. Usually a long time is required for the development of distinct horizons.

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

Parent material

Most of the soils in Martin County were developed from Rocky Mountain outwash materials deposited in the Quaternary and late Tertiary periods. Wind has reworked most of the outwash since the alluvium was originally deposited. The parent materials are mostly calcareous, alkaline, unconsolidated, sandy and silty earths.

The lime content in some areas has been increased by a high water table. Some shallow, enclosed basins have received lime from surrounding slopes.

Other soils that were not developed from Rocky Mountain outwash were developed from clays and sandstone of the Triassic red beds. The soils that developed from the red-bed material have dense, compact, clayey lower layers. Water moves through these soils very slowly. There is little ground water.

Climate

Precipitation, temperature, humidity, and wind have been important in the development of the soils of Martin County. This County is characterized by scanty precipitation in the winter, heavy rains in the spring and early fall, and high winds in the spring. The evaporation is high, and rainwater rarely wets the soil below the area of living roots. Most of the soils have accumulated a horizon of calcium carbonate. The low rainfall has caused many of the soils to have free lime throughout the profile. The variation in temperature has encouraged both the weathering of the underlying rocks and unconsolidated deposits into parent material and soil. The high winds, common in the county, have aided in the breakdown of the parent material, in reworking many deposits, and in shifting material from place to place.

Plants and animals

All the soils of Martin County formed under grass cover. Short and mid grasses were dominant on the moderately fine textured soils, and tall grasses covered the sandy soils. The vegetative cover contributed large amounts of organic matter to the soil. Decaying grasses, leaves, and stems distributed this organic matter on the soil surface. The network of tubes and pores left by these

decaying roots increased the passage of air and water through the soil and provides food for bacteria and fungi.

Earthworms and insects are the most noticeable animal life in the soil. Wormcasts and insect burrows added to the movement of air and water in the soil.

Large prairie dog towns once thrived in the area. The burrowing of these animals did much to effect the leaching of free lime from the soil. This leaching destroyed the soil structure that had formed and increased the lime content on the surface.

The influence of man on the soil has been as great as any living organism. Man has reduced or eliminated the grass cover and allowed soil blowing and water erosion to take place. This has reduced the silt, clay, and organic matter content of the soil. Man has produced compacted areas that reduced infiltration of water and air. He has changed the moisture in some areas by irrigation. He has overgrazed some rangeland and changed the vegetation.

Relief

Relief influences soil development through its effect on drainage and runoff. The degree of profile development depends mainly on the average amount of moisture in the soil if other factors of soil formation are equal. The soils on steep slopes normally have a lesser developed profile than soils on flats and in depressions. Continuous erosion on the steep slopes retards most of the soil-forming processes.

Relief also affects the kind and amount of vegetation on a soil. Slopes facing north receive less direct sunlight than those facing south, and they lose less moisture through evaporation. As a result, soils on north-facing slopes have a more dense vegetative cover. The prevailing westerly winds have deposited soil material on slopes facing east, and have removed soil material from those facing west. As a result, in many areas the soil is deeper on the east-facing slopes.

Most of the dark-colored soils in the county are in slightly depressed or concave positions, or on broad, nearly level plains. The additional moisture that accumulates in such places aids in the growth of more plants, and the biological activity is increased. Consequently, more organic matter is added to the soil.

Time

The characteristics of a soil are determined mainly by the length of time that the soil-forming factors have acted upon a soil. Some materials that have been in place for only a short time have not been influenced enough by climate and living organisms to develop well-defined horizons.

Steep soils are not well developed, and geologic erosion has removed the effects of soil formation. Soils that have been in place for a long time and have approached equilibrium with their environment are mature, well-developed soils. These soils show marked differences in horizons. They are well-drained soils that occupy the nearly level to gently sloping areas.

Classification of Soils

Classification consists of an orderly grouping of soils according to a system designed to make it easier to remember soil characteristics and interrelationships. Classification is useful in organizing and applying the results of experience and research. Soils are placed in narrow classes for discussion in detailed soil surveys and for application of knowledge within farms and fields. The many thousands of narrow classes are then grouped into progressively fewer and broader classes in successively higher categories, so that information can be applied to large geographic areas.

Two systems of classifying soils have been used in the United States in recent years. The older system was adopted in 1938 (*2*) and revised later (*4*). The system currently used by the National Cooperative Soil Survey was developed in the early sixties (*3*) and was adopted in 1956 (*6*). It is under continual study.

The current system of classification has six categories. Beginning with the most inclusive, these categories are the order, the suborder, the great group, the subgroup, the family, and the series. The criteria for classification are soil properties that are observable or measureable, but the properties are selected so that soils of similar genesis are grouped together. The placement of some soil series in the current system of classification, particularly in families, may change as more precise information becomes available.

Table 7 shows the classification of each soil series of Martin County by family, subgroup, and order, according to the current system.

General Nature of the County

The early history, natural resources, and climate of Martin County are discussed in this section.

Martin County was formed from Bexar Territory in 1874 and was organized in 1884. The county was named for Wylie Martin, a member of Stephen F. Austin's colony. The first permanent residents came in the 1870's. The early settlers were mostly of German descent.

Stanton, the county seat, was first established as a railroad section station named Grelton. The name was changed to Stanton in 1888.

Early settlers were first attracted to the Martin County area by advertisement of cheap, fertile land by the Texas and Pacific Railroad.

Soil is one of the most important natural resources in Martin County. Good yields of cotton, grain sorghum, and other crops encouraged the early development of agriculture.

The supply of ground water in the county is contained primarily in the Ogallala formation. Subsurface water for irrigation occurs in most areas of the county, except in the southeastern part where there is little water for irrigation or domestic use. Depth to water ranges from 6 to 250 feet. The quality of ground water in the county is good, although ground water in the eastern part of the county has a higher salt content than the water in other parts of the county.

Oil was first discovered in the county in the early 1920's. In 1960, the average crude oil production was more than 3,800 barrels per day.

TABLE 7.—*Classification of soil series*

Series	Family	Subgroup	Order
Acuff	Fine-loamy, mixed, thermic	Aridic Paleustolls	Mollisols.
Amarillo [1]	Fine-loamy, mixed, thermic	Aridic Paleustalfs	Alfisols.
Arch	Fine-loamy, mixed, thermic	Ustochreptic Calciorthids	Aridisols.
Arvana	Fine-loamy, mixed, thermic	Aridic Petrocalcic Paleustalfs	Alfisols.
Berda	Fine-loamy, mixed, thermic	Typic Ustochrepts	Inceptisols.
Bippus	Fine-loamy, mixed, thermic	Cumulic Haplustolls	Mollisols.
Brownfield	Loamy, mixed, thermic	Arenic Aridic Paleustalfs	Alfisols.
Colorado	Fine-loamy, mixed, calcareous, thermic	Typic Ustifluvents	Entisols.
Drake	Fine-loamy, mixed, calcareous, thermic	Typic Ustorthents	Entisols.
Gomez	Coarse-loamy, mixed, thermic	Typic Ustochrepts	Inceptisols.
Kimbrough	Loamy, mixed, thermic, shallow	Petrocalcic Calciustolls	Mollisols.
Lipan	Fine, montmorillonitic, thermic	Entic Pellusterts	Vertisols.
Mansker	Fine-loamy, mixed, thermic	Aridic Calciustolls	Mollisols.
Midessa	Fine-loamy, mixed, thermic	Typic Ustochrepts	Inceptisols.
Miles	Fine-loamy, mixed, thermic	Udic Paleustalfs	Alfisols.
Mobeetie	Coarse-loamy, mixed, thermic	Typic Ustochrepts	Inceptisols.
Olton [2]	Fine, mixed, thermic	Aridic Paleustolls	Mollisols.
Patricia [3]	Fine-loamy, mixed, thermic	Aridic Paleustalfs	Alfisols.
Portales	Fine-carbonatic, thermic	Typic Calciustolls	Mollisols.
Potter	Loamy-carbonatic, thermic, shallow	Ustollic Calciorthids	Aridisols.
Roscoe	Fine, montmorillonitic, thermic	Typic Pellusterts	Vertisols.
Sharvana	Loamy, mixed, thermic, shallow	Petrocalcic Ustalfic Paleargids	Aridisols.
Simona	Loamy, mixed, thermic, shallow	Typic Paleorthids	Aridisols.
Slaughter	Clayey, mixed, thermic, shallow	Aridic Petrocalcic Paleustolls	Mollisols.
Springer [3]	Coarse-loamy, mixed, thermic	Udic Paleustalfs	Alfisols.
Spur	Fine-loamy, mixed, thermic	Fluventic Haplustolls	Mollisols.
Stamford	Fine, montmorillonitic, thermic	Typic Chromusterts	Vertisols.
Stegall	Fine, mixed, thermic	Aridic Petrocalcic Paleustolls	Mollisols.
Tivoli	Mixed, thermic	Typic Ustipsamments	Entisols.
Upton	Loamy, carbonatic, thermic, shallow	Typic Paleorthids	Aridisols.
Veal	Fine-loamy, mixed, thermic	Typic Ustochrepts	Inceptisols.
Vernon	Fine, mixed, thermic	Typic Ustochrepts	Inceptisols.
Zita	Fine-loamy, mixed, thermic	Aridic Haplustolls	Mollisols.

[1] The soils of Martin County named for this series are outside the range of the series in that they lack free carbonates within 28 inches of the surface and do not fit the Paleustalf classification.

[2] The soils of Martin County named for this series are outside the range of the series in that they lack free carbonates within 28 inches of the surface and have chromas of more than 4 in the Bt horizon.

[3] The soils of Martin County named for this series are outside the range of the series in that they do not fit the Paleustalf classification.

Climate [5]

The climate of Martin County is typical of a semiarid region. Geographically, it is so removed from the moisture source region of the Gulf of Mexico that rainfall is rather sparse. The County receives, on an average, less than 16 inches of rainfall per year as shown in table 8. Most of this falls in the form of thundershowers during the period May through October, when the prevailing southeasterly circulation carries moisture from the Gulf as far inland as West Texas. During November through April, frequent cold fronts keep the Gulf source region cut off rather effectively so that rainfall and snowfall are quite limited. Thunderstorm rainfall is extremely variable so that large differences in amounts will exist from year to year, and from place to place, within the County.

Winter is characterized by frequent cold fronts that are accompanied by strong, gusty, northerly winds. Precipitation, when it occurs, is usually in the form of light rain or drizzle, freezing rain, or snow flurries. Most of the cold fronts are "dry" as they pass through the area. Little benefit is derived from snowfall, as it is usually accompanied by strong winds that pile the light snow in drifts.

Droughts occur frequently. Periods of several weeks or more with little or no rainfall are common. The excess precipitation in some years is misleading because extremely heavy downpours show as large accumulations but the runoff is so great and rapid that little benefit is derived from the rainfall. If rainfall is adequate in spring and summer, cattle ranges are good even though rainfall may be well below normal the remainder of the year. The extreme variability of rainfall is emphasized by the fact that the driest year (1956) was succeeded by the wettest year (1957). Total rainfall in 1957 was four times that received in the former.

The greatest variety of weather occurs during the late winter and early spring. A period of one or two weeks of warm weather late in February or early in March may be followed by a severe cold spell late in March. Strong surface winds are most frequent during this period, and blowing dust occurs with wind velocities of about 30 miles per hour or higher. Severe duststorms, with wind velocities reaching 60 or 70 miles per hour, have occurred on rare occasions.

Daytime temperatures are quite warm in summer. The average daily maximum is about 94° F in both July and August. There is a large daily range in temperature.

[5] By ROBERT B. ORTON, climatologist for Texas, National Weather Service, U.S. Department of Commerce.

TABLE 8.—*Temperature and precipitation*

[Precipation data from Lenorah, Martin County, Elevation 2,850 feet; temperature data from Midland, Midland County, Tex. (nearby station outside of the county.)]

Month	Temperature		Precipitation [1]	
	Average daily maximum	Average daily minimum	Average rainfall	Average snowfall
	° F	° F	Inches	Inches
January	57	31	0. 64	1. 5
February	61	35	. 65	2. 1
March	69	42	. 58	. 7
April	79	51	. 86	(2)
May	86	61	2. 60	0
June	93	69	1. 49	0
July	95	71	2. 45	0
August	94	70	1. 12	0
September	88	63	1. 96	0
October	79	53	1. 72	0
November	66	39	. 69	. 6
December	60	32	. 61	. 6
Year	77	52	15. 37	5. 5

[1] Average precipitation based on a 14-year record.
[2] Trace.

Summer minimum temperatures are usually in the upper 60's. The average daily minimum in January, the coldest month, is about 30° F.

The prevailing wind for most of the year is from the southeast.

The average date of the last 32° temperature in spring is April 5, and the first in fall is November 6. The length of the freeze-free period averages 215 days.

The sun shines on an average of 70 to 75 percent of the possible hours. The relative humidity is between 75 and 80 percent at 6:00 a.m., between 45 and 50 percent at noon, between 35 and 40 percent at 6:00 p.m. and between 60 and 65 percent at midnight.

The annual rate of pan evaporation [6] is between 105 inches and 110 inches, and the annual rate of lake evaporation is between 72 and 74 inches.

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[6] Standard Weather Bureau 4-foot diameter, class A pan.

Glossary

Alkali soil. Generally, a highly alkaline soil. Specifically, an alkali soil has so high a degree of alkalinity (pH 8.5 or higher) or so high a percentage of exchangeable sodium (15 percent or more of the total exchangeable bases), or both, that the growth of most crop plants is low from this cause.

Alluvium. Soil material, such as sand, silt, or clay, that has been deposited on land by streams.

Available water capacity (also termed available moisture capacity). The capacity of soils to hold water available for use by most plants. It is commonly defined as the difference between the amount of soil water at field capacity and the amount at wilting point. It is commonly expressed as inches of water per inch of soil.

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-temperate areas, as in the Southwestern States. The material may consist of soft, thin layers in the soil or of hard, thick beds just beneath the solum, or it may be exposed at the surface by erosion.

Clay. As a soil separate, the mineral soil particles less than 0.002 millimeter in diameter. As a soil textural class, soil material that is 40 percent or more clay, less than 45 percent sand, and less than 40 percent silt.

Clay film. A thin coating of clay on the surface of a soil aggregate. Synonyms: clay coat, clay skin.

Concretions. Grains, pellets, or nodules of various sizes, shapes, and colors consisting of concentrations of compounds, or of soil grains cemented together. The composition of some concretions is unlike that of the surrounding soil. Calcium carbonate and iron oxide are examples of material commonly found in concretions.

Consistence, soil. The feel of the soil and the ease with which a lump can be crushed by the fingers. Terms commonly used to describe consistence are—

Loose.—Noncoherent when dry or moist; does not hold together in a mass.

Friable.—When moist, crushes easily under gentle pressure between thumb and forefinger and can be pressed together into a lump.

Firm.—When moist, crushes under moderate pressure between thumb and forefinger, but resistance is distinctly noticeable.

Plastic.—When wet, readily deformed by moderate pressure but can be pressed into a lump; will form a "wire" when rolled between thumb and forefinger.

Sticky.—When wet, adheres to other material, and tends to stretch somewhat and pull apart, rather than to pull free from other material.

Hard.—When dry, moderately resistant to pressure; can be broken with difficulty between thumb and forefinger.

Soft.—When dry, breaks into powder or individual grains under very slight pressure.

Cemented.—Hard and brittle; little affected by moistening.

Drainage class (natural). Refers to the conditions of frequency and duration of periods of saturation or partial saturation that existed during the development of the soil, as opposed to altered drainage, which is commonly the result of artificial drainage or irrigation but may be caused by the sudden deepening of channels or the blocking of drainage outlets. Seven different classes of natural soil drainage are recognized.

Excessively drained soils are commonly very porous and rapidly permeable and have a low water-holding capacity.

Somewhat excessively drained soils are also very permeable and are free from mottling throughout their profile.

Well-drained soils are nearly free from mottling and are commonly of intermediate texture.

Moderately well drained soils commonly have a slowly permeable layer in or immediately beneath the solum. They have uniform color in the A and upper B horizons and have mottling in the lower B and the C horizons.

Somewhat poorly drained soils are wet for significant periods but not all the time, and commonly have mottlings in the B and C horizons.

Poorly drained soils are wet for long periods and are light gray and generally mottled from the surface downward, although mottling may be absent or nearly so in some soils.

Very poorly drained soils are wet nearly all the time. They have a dark-gray or black surface layer and are gray or light gray, with or without mottling, in the deeper parts of the profile.

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.

Flood plain. Nearly level land, consisting of stream sediment, that borders a stream and is subject to flooding unless protected artificially.

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 is marked by the accumulation of humus. The horizon may have lost one or more of soluble salts, clay, and sesquioxides (iron and aluminum oxides).

B horizon.—The mineral horizon below an A horizon. The B horizon is in part a layer of change from the overlying A to the underlying C horizon. The B horizon also has distinctive characteristics caused (1) by accumulation of clay, sesquioxides, humus, or some combination of these; (2) by prismatic or blocky structure; (3) by redder or stronger colors than the A horizon; or (4) by some combination of these. Combined A and B horizons are usually called the solum, or true soil. If a soil lacks a B horizon, the A horizon alone is the solum.

C horizon.—The weathered rock material immediately beneath the solum. In most soils this material is presumed to be like that from which the overlying horizons were formed. If the material is known to be different from that in the solum, a Roman numeral precedes the letter C.

R layer.—Consolidated rock beneath the soil. The rock usually underlies a C horizon but may be immediately beneath an A or B horizon.

Internal soil drainage. The downward movement of water through the soil profile. The rate of movement is determined by the texture, structure, and other characteristics of the soil profile and underlying layers, and by height of the water table, either permanent or perched. Relative terms for expressing internal drainage are *none, very slow, slow, medium, rapid, and very rapid.*

Munsell notation. A system for designating color by degrees of the three simple variables—hue, value, and chroma. For example, a notation of 10YR 6/4 is a color with a hue of 10YR, a value of 6, and a chroma of 4.

Parent material. Disintegrated and partly weathered rock from which soil has formed.

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.*

Phase, soil. A subdivision of a soil, series, or other unit in the soil classification system made because of differences in the soil that affect its management but do not affect its classification in the natural landscape. A soil type, for example, may be divided into phases because of differences in slope, stoniness, thickness, or some other characteristic that affects its management but not its behavior in the natural landscape.

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

Reaction, soil. The degree of acidity or alkalinity of a soil, expressed in pH values. A soil that tests to pH 7.0 is precisely neutral in reaction because it is neither acid nor alkaline. An acid, or "sour," soil is one that gives an acid reaction; an alkaline soil is one that is alkaline in reaction. In words, the degrees of acidity or alkalinity are expressed thus:

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

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

Sand. Individual rock or mineral fragments in soils having diameters ranging from 0.05 to 2.0 millimeters. Most sand grains consist of quartz, but they may be of any mineral composition. The textural class name of any soil that contains 85 percent or more sand and not more than 10 percent clay.

Series, soil. A group of soils developed from a particular type of parent material and having genetic horizons that, except for texture of the surface layer, are similar in differentiating characteristics and in arrangement in the profile.

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

Soil. A natural, three-dimensional body on the earth's surface that supports plants and that has properties resulting from the integrated effect of climate and living matter acting on earthy parent material, as conditioned by relief over periods of time.

Solum. The upper part of a soil profile, above the parent material, in which the processes of soil formation are active. The solum in mature soil includes the A and B horizons. Generally, the characteristics of the material in these horizons are unlike those of the underlying material. The living roots and other plant and animal life characteristic of the soil are largely confined to the solum.

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).

Subsoil. Technically, the B horizon; roughly, the part of the solum below plow depth.

Substratum. Technically the part of the soil below the solum.

Surface soil. The soil ordinarily moved in tillage, or its equivalent in uncultivated soil, about 5 to 8 inches in thickness. The plowed layer.

Texture, soil. The relative proportions of sand, silt, and clay particles in a mass of soil. The basic textural classes, in order of increasing proportion of fine particles, are *sand, loamy sand, sandy loam, loam, silt loam, silt, sandy clay loam, clay loam, silty clay loam, sandy clay, silty clay, and clay.* The sand, loamy sand, and sandy loam classes may be further divided by specifying "coarse," "fine," or "very fine."

Water table. The highest part of the soil or underlying rock material that is wholly saturated with water. In some places an upper, or perched, water table may be separated from a lower one by a dry zone.

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