Series 1953, No. 3 Issued March 1959

SOIL SURVEY

Lynn County Texas

UNITED STATES DEPARTMENT OF AGRICULTURE
Soil Conservation Service
In cooperation with
TEXAS AGRICUTURAL EXPERIMENT STATION

How to Use THE SOIL SURVEY REPORT

THIS SURVEY of Lynn County will help you plan the kind of farming or ranching that will protect your soils and provide good yields. It describes the soils, shows their location on a map, and tells what they will do under different kinds of management.

Find Your Farm on the Map

In using this survey, start with the soil map, which consists of the 70 sheets bound in the back of this report. These sheets, if laid together, make a large photographic map of the county as it looks from an airplane. You can see towns, roads, large buildings, and many other landmarks on this map.

To find your farm or ranch on the large map, use the index to map sheets. This is a small map of the county on which numbered rectangles have been drawn to show where each sheet of the large map is located.

When you have found the map sheet, you will notice that boundaries of the soils have been outlined on the map, and that there is a symbol for each kind of soil. All areas marked with the same symbol are the same kind of soil, wherever they appear on the map.

Suppose you have found on your farm or ranch an area marked with the symbol Ac. You learn the name of the soil this symbol represents by looking at the map legend. The symbol Ac identifies Amarillo loam, 0 to 1 percent slopes.

Learn About Your Soils

Amarillo loam, 0 to 1 percent slopes, and all the other soils mapped are described in the section, Descriptions of the Soils. Soil scientists walked over the fields and rangeland; dug holes and examined surface soils and subsoils; measured slopes with a hand level; noted differences in growth of crops, grass, weeds, or brush; and, in fact, recorded all the things about the soils that they believed might affect their suitability for farming and ranching.

After they mapped and studied the soils, the scientists talked with farmers, ranchers, and others about the use and management of each soil. They placed each soil in a capability unit. A capability unit is a group of similar soils that need and respond to about the same kind of management.

Amarillo loam, 0 to 1 percent slopes, is in capability unit II-2. Turn to the section, Capability Units, and read what is said about capability unit II-2. You will also want to study table 5, which tells you how much you can expect to harvest from Amarillo loam, 0 to 1 percent slopes, under different levels of management. Some areas of Amarillo loam, 0 to 1 percent slopes, may be used for range instead of for cropland. Management of range is discussed in the section, Range Sites.

Make a Farm or Ranch Plan

For the soils on your farm or ranch, compare your yields and practices with those given in this report. Look at your fields for signs of erosion. Then decide whether or not you need to change your methods. The choice, of course, must be yours. This survey will aid you in planning new methods, but it is not a plan of management for your farm or any other farm or ranch in the county.

If you want help in planning, consult the local representative of the Soil Conservation Service or the county agricultural agent. Members of the staff of your State experiment station and others familiar with farming and ranching in your county will also be glad to help you.

The soil survey of Lynn County was made to provide a basis for the best agricultural uses of the land. Fieldwork was completed in 1953. Unless otherwise specified, all statements in this report refer to conditions in 1953.

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Contents

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Issued March 1959

SOIL SURVEY OF LYNN COUNTY, TEXAS

By IRVIN C. MOWERY, Soil Survey,[1] Soil Conservation Service, in Charge, and GORDON S. McKEE, Texas Agricultural Experiment Station

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United States Department of Agriculture in Cooperation With the Texas Agricultural Experiment Station

General Nature of the Area

LYNN COUNTY is located in northwestern Texas. The total area of the county is 915 square miles, or 585,600 acres. Tahoka, the county seat and largest town, is 30 miles south of Lubbock and 75 miles east of the New Mexico border (fig. 1).

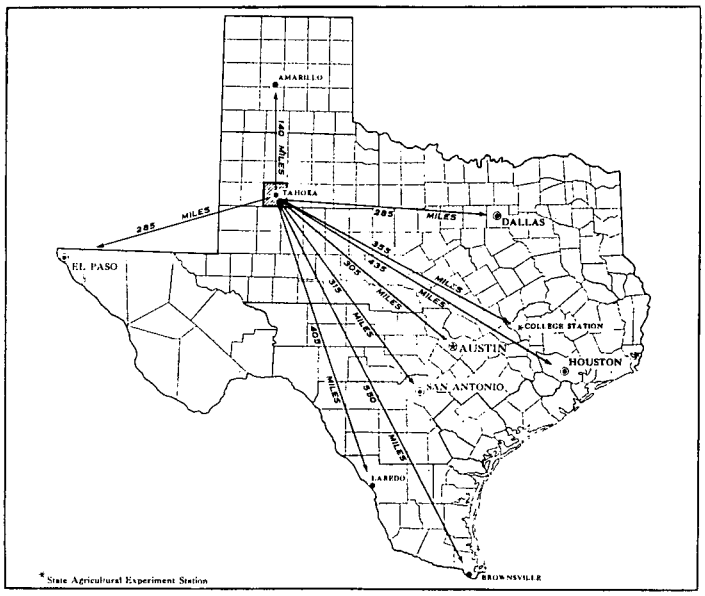

Figure 1.—Location of Lynn County in Texas.

The county was organized in 1903. Most of the settlers came from the southeastern States and eastern Texas between 1910 and 1930. In 1950, the county had a population of 11,030, of which 74.2 percent was classified as rural.

There are four high schools and seven consolidated grade schools. Churches are located throughout the county both in rural areas and in towns. There is a hospital and clinic in Tahoka. A public library is located in the courthouse.

A main line of the Santa Fe railroad crosses the northeastern corner of the county. A branch line extends north and south across the county. Processing plants for agricultural products are located at three shipping points along this branch line. A truck line and a bus line also serve the county. Some farm products are shipped by truck.

Two Federal highways cross the central part of Lynn County — U. S. 87 extends from north to south and U. S. 380 from east to west. About 200 miles of farm-to-market roads are paved. Most of the farms are on, or within 5 miles of, paved roads. The dirt roads are passable except during extremely bad weather.

The economy of Lynn County is based on agriculture. There is no manufacturing or heavy industry. A cotton compress, 32 cotton gins, and 8 grain elevators provide facilities for processing and storing the cotton and sorghum grain that are the principal crops grown in the county. Most of the labor is done by farmers and seasonal workers.

Five small oil wells were in operation at the close of 1953. Small quantities of potash, volcanic ash, sodium sulfate, and magnesium sulfate have been mined.

Physiography, Relief, and Drainage

Lynn County is on that part of the southern High Plains known locally as the South Plains. The South Plains are separated by the valley of the Canadian River from the main part of the High Plains, which form a vast plateau extending north and west of Texas. Elevations range from 3,000 to 3,300 feet.

Relief in the county appears to be nearly level. However, there is a general slope to the southeast of 10 to 15 feet per mile. The smooth surface is pitted with many shallow lakes, or playas, 10 to 30 feet deep and 3 to 40 acres in area and generally surrounded by gentle slopes. The lakes are dry except during wet years or rainy sea-

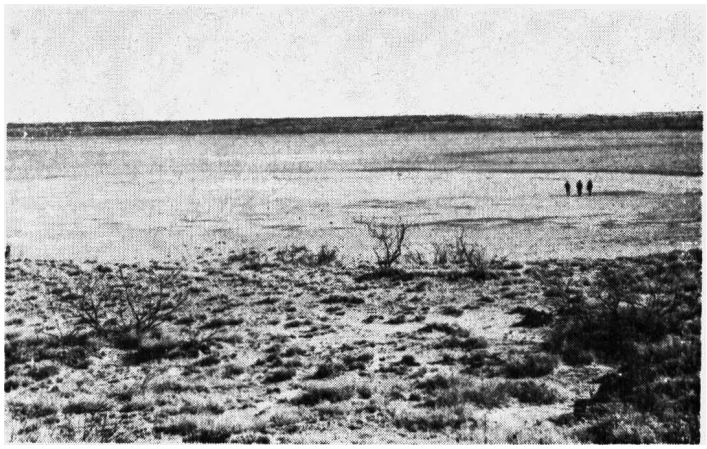

Figure 2.—Guthrie Lake, showing the salty white crust that forms on the surface when the lake is dry.

[1] Part of the fieldwork was done while Soil Survey was part of the Bureau of Plant Industry, Soils, and Agricultural Engineering. Soil Survey was transferred to the Soil Conservation Service on November 15, 1952.

sons. Several intermittent salt lakes, from 15 to 750 acres in area and 20 to 50 feet deep, occur in the county. The floors of these lakes are near the water table;[2] most of the water evaporates, leaving a white salty crust on the surface (fig. 2). The floor of Guthrie Lake, located about 3 miles southwest of Tahoka, consists of a thin bed of Cretaceous limestone.[3]

If conservation practices are followed, most of the rainfall is absorbed by the smooth, deep, crumbly soils. A small amount of runoff water collects in playa lakes and salt lakes. The capacity of the soils to store water and to supply it to plants is good, but there is so little precipitation that the water supply is limited.

Climate

The climate of Lynn County is subhumid. It is characterized by (1) low annual precipitation, (2) a very high rate of evaporation, (3) high average wind velocity, (4) hot summer days followed by cool nights, and (5) moderate winter temperatures punctuated by severe cold spells. The normal monthly, seasonal, and annual temperature and precipitation at the United States Weather Bureau Station at Lubbock, Lubbock County, Texas, are given in table 1. Average annual precipitation recorded at this station from 1918 through 1955 is shown in figure 3. These data are representative of weather conditions in Lynn County.

The annual precipitation fluctuates greatly. Only 8.73 inches of precipitation were recorded in 1917, but 40.55 inches were recorded in 1941. The distribution of precipitation varies widely from year to year, but almost 70 percent of the average annual precipitation falls during the growing season — May through September. If the rainfall for the year is low but well distributed throughout the year, crop yields may be good; but if the total rainfall for the year is high but poorly distributed, yields may be poor.

The average annual snowfall is only 7.4 inches. Snow seldom stays on the ground for more than a week. An occasional summer hailstorm may severely damage or destroy crops, but these storms are never widespread. During heavy rains, some moisture is lost through runoff. Moisture from light showers evaporates quickly. The average annual evaporation from an open-water surface is about 73 inches.

The relative humidity is low. Over a 6-year period, 1946 to 1952, the average relative humidity at the Lubbock Municipal Airport was 76 percent at 6:30 a. m. and 43 percent at 6:30 p. m.[4]

The period from January to May is characterized by strong prevailing winds from the west and the southwest, interspersed with winds from the north. These winds quickly evaporate surface moisture; they damage fields by blowing the soil; they cut and burn crops and cover young plants with sand. Cold masses of air from the north, known as "northers," sweep across the area, especially during the winter. Temperatures frequently go below freezing and occasionally below 0° F. Summer temperatures may exceed 100°, but the nights are generally cool.

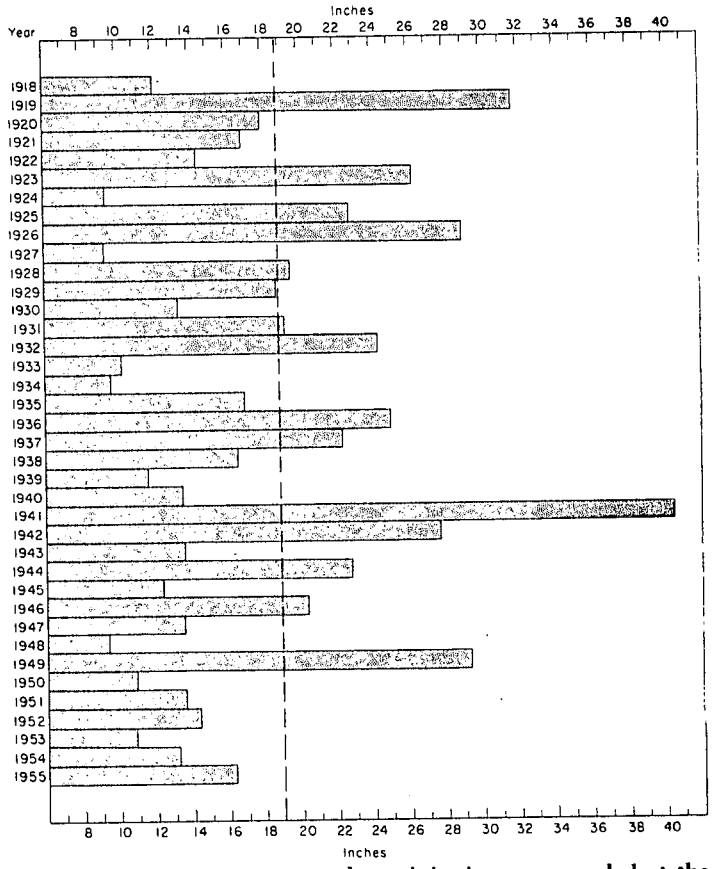

Figure 3.—**Variations in annual precipitation, as recorded at the Weather Bureau Station, Lubbock, Lubbock County, Texas, from 1918 through 1955. Average for the period is shown by vertical broken line.**

The average length of the frost-free season at Lubbock is 201 days. November 1 is the average date of the first killing frost in the fall, and April 14, the average date of the last killing frost in the spring. Records over a 20-year period show that the earliest killing frost occurred on October 19, and the latest on May 7. The growing season is long enough for cotton, which can be planted as late as June 30 and still mature if the first killing frost does not come unusually early. Grain sorghums do not require as long a growing season as cotton.

Agriculture

Lynn County once consisted entirely of rangeland, but as the population increased more and more land was cul-

[2] BARNES, J. R. ELLIS, W. C. LEGGAT, E. R., and others. GEOLOGY AND GROUND WATER IN THE IRRIGATED REGION OF THE SOUTHERN HIGH PLAINS IN TEXAS. Tex. Bd. of Water Engin. Prog. Rpt. No. 7. 1949.

[3] EVANS GLEN L., and MEADE, GRAYSON E. QUATERNARY OF THE TEXAS HIGH PLAINS. Univ. Tex. Pub. No. 4401, pp. 485–507, illus. 1945.

[4] UNITED STATES DEPARTMENT OF COMMERCE. LOCAL CLIMATOLOGICAL DATA WITH COMPARATIVE DATA. Weather Bur. Sta., Lubbock, Tex. 1952.

TABLE 1.—*Normal temperature and precipitation at Lubbock Station, Lubbock County, Texas*
[ELEVATION, 3243 FEET]

Month	Temperature [1]			Precipitation [2]			
	Average	Absolute maximum	Absolute minimum	Average	Driest year (1917)	Wettest year (1941)	Average snowfall
	° F.	° F.	° F.	*Inches*	*Inches*	*Inches*	*Inches*
December	40.6	81	— 2	.66	(3)	0.72	2.0
January	38.8	87	—10	.67	0.35	.55	1.9
February	43.1	89	1	.53	.05	.61	1.0
Winter	40.8	89	—10	1.86	.40	1.88	4.9
March	49.7	91	— 2	.80	.21	3.56	1.9
April	59.5	100	18	1.11	.58	2.23	.1
May	67.8	102	29	3.36	1.07	12.69	(3)
Spring	59.0	102	— 2	5.27	1.86	18.48	2.0
June	76.4	108	39	2.53	.64	4.13	0
July	79.3	106	49	1.89	1.42	3.68	0
August	78.4	103	43	1.79	1.16	1.85	0
Summer	78.0	108	39	6.21	3.22	9.66	0
September	71.2	105	33	2.85	3.03	4.47	0
October	61.2	94	19	2.07	.14	5.89	.2
November	48.6	89	5	.63	.08	.17	.3
Fall	60.3	105	5	5.55	3.25	10.53	.5
Year	59.5	108	—10	18.89	8.73	40.55	7.4

[1] Average temperature based on a 41-year record, through 1955; highest and lowest temperatures on a 17-year record, through 1930.

[2] Average precipitation based on a 43-year record, through 1955; wettest and driest years based on a 44-year record, in the period 1911-1955; snowfall, based on a 20-year record, through 1930.

[3] Trace.

tivated. About three-fourths of the cultivated acreage was broken out of sod between 1905 and 1930. Only a small part of the cultivated acreage — areas of shallow soils on ridges and some of the playa lakes — has reverted to natural vegetation. There is practically no woodland in the county. In 1929 a total of 302,287 acres was in cropland and 161,822 acres was in pasture, according to Federal census figures. By 1954, there was 453,003 acres in cropland and 137,879 in pasture.

Size of Farms

The 1954 census classifies the 1,152 farms in the county according to size as follows:

	Numbers of farms
Less than 3 acres	12
3 to 9 acres	14
10 to 29 acres	23
30 to 49 acres	6
50 to 69 acres	8
70 to 99 acres	13
100 to 139 acres	15
140 to 179 acres	175
180 to 219 acres	62
220 to 259 acres	64
260 to 499 acres	453
500 to 999 acres	234
1,000 or more acres	73

Between 1930 and 1954, the total number of farms and ranches in the county decreased from 2,138 to 1,152, but the average size of farms increased from 221 acres to 509 acres.

Farm Tenure

The early settlers were landowners or managers for nonresident owners. Tenancy increased as more land was converted from range to cropland. According to the 1930 Federal census, nearly 72 percent of the 2,138 farms were operated by tenants. In 1954, more than 52 percent of the 1,152 farms were operated by tenants. In 1954, there were 543 owner-operators, 6 managers, and 603 tenants.

Rental is usually on a yearly share-crop basis. The landowner furnishes the homestead and land and receives one-fourth of the cotton and one-third of the grain sorghum. A few farms are rented for cash.

Farm Equipment and Buildings

The farms of Lynn County are largely mechanized. Tractors have replaced horses and mules as the source of farm power. Most farms are equipped with one or more tractors with attachable listers, planters, cultivators, and knives, and a stalk cutter. Other common items of equipment are sand fighters, rotary tools having curved protruding spikes that pick up the soil. Many farms have small grain combines and mechanical cotton strippers.

Row binders and other equipment are sometimes owned jointly by several farmers. Sprayers and dusters have been used in recent years to control cotton insects. Farmers who feed a few cattle generally have feed grinders. In 1954 there were 2,149 tractors, 1,282 automobiles, and 1,071 trucks on the 1,152 farms in the county.

Only a few farms have buildings to shelter the tractors and other implements, but machinery does not deteriorate rapidly in the open because humidity is low. Most farms have small sheds to protect livestock and poultry and to store small amounts of feed. Bundle feed is stacked in the open. Many farm homes are coated with stucco for protection against blowing sand and cold weather. According to Federal census figures, 1,077 farms had electricity in 1954, and 442 had telephones. Butane gas, introduced in this area in 1944, is used to heat most of the rural homes.

Permanent fences are used mainly in lots near the farmstead. Sudangrass pastures and some cultivated fields are fenced with electrically charged wires when grazed.

Wells supply good water for household use and for livestock in all parts of the county except in areas surrounding and southeast of Tahoka Lake, Guthrie Lake, Three Lakes, and Double Lakes. There are few farmsteads in these areas where good water is not found.

Crops

The number of crops that can be grown in Lynn County under dryland farming is limited by the small amount of annual precipitation. Cotton and sorghums, which resist drought, are the most important crops. In some years they have occupied as much as 97 percent of the harvested acreage. The acreages and yields of principal crops and the number of fruit trees in Lynn County are given for stated years in table 2. Small acreages of wheat, corn, alfalfa, and sudangrass are grown. These crops either are not very productive or are not profitable enough to be grown extensively. Castor beans may be suited to the soils of the county, but as yet they have only been grown experimentally.

On the smooth, nearly level terrain of Lynn County, it is possible to plant crops in long rows and to use multiple-row implements. Tractors and four-row implements have replaced one- and two-row implements pulled by horses and mules.

Sorghums, the first crops grown, were used to feed ranch livestock. Cotton proved successful between 1910 and 1920 and has become the dominant crop. Cotton and sorghums are suited to the same soils, but sorghums provide better protection against wind erosion on sandy soils. Cotton is planted on the best land in order to get the greatest cash returns.

Management practices for cotton and sorghums are about the same until after the crops come up. The land is listed in 40-inch rows late in winter. In the spring the seedbeds are "knifed" with long V-shaped blades to kill the weeds. The blades are drawn just under the surface of the soil. The seedbeds are generally knifed twice before the crops are planted.

A modified rotation of cotton and sorghums is generally followed. Because the proportionate acreage that is planted to cotton and to sorghums varies over the years, no definite rotation has been established.

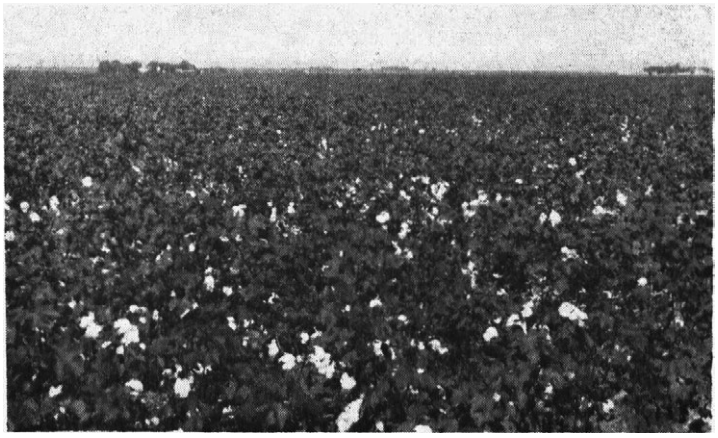

Figure 4.—Cotton on irrigated field of Amarillo loam.

If heavy rainfall occurs just after cotton or sorghum is planted, a crust may form that will prevent the seedlings from emerging. If this happens the crop may have to be replanted unless the crust is broken by stalk cutters and sand fighters. Sorghum, which does not need as long a growing season, may be planted if spring rains delay planting of cotton or if the seedlings fail to come up. Strong winds are also a hazard to the young crop. Wind damage is more severe after the soil crusts. When the crust dries, it should be broken to prevent wind erosion.

COTTON.—The introduction of the mechanical cotton stripper created a demand for cotton that would hang in the burr longer. As a result several stormproof varieties — Stormproof No. 1, Stormaster, and Macha Early[5] — have been developed. These varieties produce well in this area. Cotton growing on an irrigated field of Amarillo loam is shown in figure 4.

Planting of cotton begins about the middle of May, if moisture conditions are favorable, and continues through June. Cotton planted after the end of June seldom matures before the first killing frost.

Harvesting of the crop begins in September and may last into the following year. The early harvesting is done by hand. Mechanical strippers are used after the cotton is thinned out and most of the bolls are open. A few farmers harvest their entire crop by strippers, especially if the yield is low.

The bollworm, leafworm, thrips, fleahopper, pink bollworm, and other insects have damaged the cotton crop in recent years. Insect-control measures must be applied when the crop is young. The boll weevil has never invaded this area, probably because the winters are too long and severe.

Most of the cotton is sold at the local gins, which are scattered throughout the county, or at the one local cotton compress. Few farmers have to haul their cotton more than 7 miles. There are some cooperative gins that are operated by boards of directors, made up mostly of farmers.

[5] RAY, L. L. and JONES, D. L. COTTON VARIETY TESTS AT LUBBOCK. Tex. Agr. Expt. Sta. Prog. Rpt. No. 1564, 4 pp., 1953. (Processed.)

TABLE 2.—*Acreages and yields of crops and number of fruit trees in stated years*

Crop	1929	1939	1949	1954
Cotton:				
Acres	204,005	140,511	247,713	194,304
Bales	27,179	55,308	149,397	89,001
Sorghums (except for sirup):				
Harvested for grain:				
Acres	30,387	64,595	114,456	199,244
Bushels	246,232	777,600	2,534,210	2,101,712
Silage, hay, fodder:				
Acres	46,930	55,537	7,235	7,675
Tons	37,509	58,423	10,096	10,337
Wheat threshed:				
Acres	300	(1)	7,098	4,023
Bushels	1,740	(1)	84,622	29,880
Corn harvested for grain:				
Acres	3,354	2,994	234	28
Bushels	32,712	29,840	3,717	248
	Number [2]	*Number* [2]	*Number* [2]	*Number* [2]
Peach trees	5,040	907	2,254	929
Apple trees	1,016	258	261	119
Plum and prune trees	2,642	465	514	142
Cherry trees	1,358	389	251	73
Pear trees	307	60	166	56

[1] Not reported.

[2] Number in census year, which is 1 year later than crop year given at head of column.

SORGHUMS.—Regular varieties of grain sorghums are grown for fodder, and dwarf combine varieties are grown for grain. The combine varieties (fig. 5) are cut for fodder if they fail as grain crops. Little sweet sorghum is grown. The short, combine varieties, developed about 1940, have completely changed the management practices for grain sorghums. In 1952, important combine varieties grown in Lynn County included Combine Kafir-60, Redbine-60, Redbine-66, Plainsman, Caprock, Martin, Double Dwarf Milo, and Early Hegari.[6]

Planting of sorghums begins about June 10 and may last until the middle of July, but late-planted crops may be killed by frosts in the fall. Sorghum is not planted until June, so that the booting and blooming stages of the plant, which require additional moisture, will occur in September, a month of heavy rainfall.

Most of the sorghum grain is sold at the local grain elevators, then shipped to Fort Worth for resale.

OTHER CROPS. — Crops other than cotton and sorghums occupy less than 3 percent of the cultivated acreage of Lynn County. Wheat is grown both for winter grazing and for grain. A small acreage is planted in the fall, but lack of rain limits yields.

Many farmers, especially those using irrigation, have 1- to 5-acre patches of alfalfa. Alfalfa is not grown more extensively because it requires more water than can be supplied economically by the small irrigation wells. Nearly all farmers plant a small acreage of sudangrass. This crop is important because it furnishes summer grazing for the few cows kept on most farms.

[6] KARPER, R. E., QUINBY, J. R., and KRAMER, N. W. NEW VARIETIES OF SORGHUMS. Tex. Agr. Expt. Sta. Prog. Rpt. 1367, 6 pp., 1951. (Processed.)

Figure 5.—**Combine grain sorghum on an irrigated field of Amarillo loam.**

Livestock and Livestock Products

Livestock raising was the dominant type of agriculture when Lynn County consisted of open range, but as settlement progressed farms were established and by 1910 most of the range had been fenced. Table 3 shows the numbers of livestock and poultry on farms in Lynn County in stated years.

The number of cattle decreased during the mid-twenties because of a sharp decline in cattle prices and because much of the rangeland was being put in cultivation. By 1930, however, the number of cattle had increased and it remained constant until the late forties when another decline took place. This decrease in number was necessary because less acreage was being used for feedstuffs and because droughts had depleted the range.

Only two large areas remain under native grass — the Double U Ranch in the southeastern corner of the county and the T-Bar Ranch in the west-central part. Most of the soil on these ranches is suited to cultivation, but large parts are nonarable. A smaller nonarable area around Tahoka Lake remains in pasture.

Most of the cattle are Herefords. There are also a few Angus. In 1953, there were eight herds of registered Herefords in the county. Most of the registered calves, especially the bulls, are sold for breeding stock, either by contract or through breeders' auctions.

TABLE 3.—*Number of livestock and poultry on farms in stated years*

Livestock	1930	1940	1950	1954
Cattle	16,274	[1]16,334	10,538	8,835
Hogs	6,440	[2]7,830	6,340	3,709
Sheep	1,732	[3]6,511	3,860	382
Chickens	[1]120,159	[2]159,862	[2]83,268	[2]52,524

[1] Over 3 months old. [2] Over 4 months old. [3] Over 6 months old.

Livestock from the two large ranches are shipped to feed-lots outside the county. Cattle raised on farms are conditioned and then either sold and butchered locally or sold at auction in Lubbock.

Cattle on the large ranches are fed cottonseed cake in winter and early in spring, to supplement grazing. Farm cattle are fed home-grown feeds but also receive some cottonseed cake. Most farmers have only a small acreage in range and must depend almost entirely on sudangrass pastures in summer and sorghum fodder during other periods for livestock feed.

Dairy farming has never been extensive in Lynn County. The 1954 Federal census lists only 10 dairy farms in the county.

Hogs have decreased in number in recent years. This decline has resulted from the drought, a decrease in grain acreage, and a drop in hog prices. Common breeds are the Duroc, Chester White, Hampshire, Poland China, and Berkshire.

Sheep raising is declining. In 1940 there were 6,511 sheep, but by 1954 there were only 382. Most farms have small flocks of chickens for home use. None of the farms in the county were classified as poultry farms in 1954.

How the Soil Survey Was Made

The scientist who makes a soil survey examines soils in the field, classifies the soils in accordance with facts that he observes, and maps their boundaries on an aerial photograph or other map.

FIELD STUDY. — The soil surveyor bores or digs many holes to see what the soils are like. The holes are not spaced in a regular pattern, but are located according to the lay of the land. Usually they are not more than a quarter of a mile apart and in some places they are much closer together. In most soils such a boring or hole reveals several distinct layers, called horizons, which collectively are known as the soil profile. Each layer is studied to see how it differs from others in the profile and to learn the things about this soil that influence its capacity to support plant growth.

Color is usually related to the amount of organic matter. The darker the surface soil, as a rule, the more organic matter it contains. Streaks and spots of gray, yellow, and brown in the lower layers generally indicate poor drainage and poor aeration.

Texture, or the content of sand, silt, and clay, is determined by the way the soil feels when rubbed between the fingers and is later checked by laboratory analysis. Texture determines how well the soil retains moisture, plant nutrients, and fertilizer, whether it is easy or difficult to cultivate, and whether it is likely to be damaged by wind erosion.

Structure, which is the way the individual soil particles are arranged in aggregates, and the amount of pore space between aggregates, gives us clues to the ease or difficulty with which the soil is penetrated by plant roots and by moisture.

Consistence, or the tendency of the soil to crumble or to stick together, indicates whether it is easy or difficult to keep the soil open and porous under cultivation.

Other characteristics observed in the course of the field study and considered in classifying the soil include the following: The depth of the soil over bedrock or compact layers; the presence of gravel or stones in amounts that will interfere with cultivation; the steepness and pattern of slopes; the degree of erosion; the nature of the underlying parent material from which the soil has developed; and acidity or alkalinity of the soil as measured by chemical tests.

CLASSIFICATION. — On the basis of the characteristics observed by the survey team or determined by laboratory tests, soils are classified into phases, types, and series. The soil type is the basic classification unit. A soil type may consist of several phases. Types that resemble each other in most of their characteristics are grouped into soil series.

As an example of soil classification, consider the Amarillo series of Lynn County. This series is made up of two soil types, subdivided into phases, as follows:

Series	*Type*	*Phase*
Amarillo	Loam	0 to 1 percent slopes.
		1 to 3 percent slopes.
	Fine sandy loam	0 to 1 percent slopes.
		1 to 3 percent slopes.

Soil type. — Soils similar in kind, thickness, and arrangement of soil layers are classified as one soil type.

Soil phase. — Because of differences other than those of kind, thickness, and arrangement of layers, some soil types are divided into two or more phases. Slope variations, frequency of rock outcrops, degree of erosion, depth of soil over the substratum, or natural drainage are examples of characteristics that suggest dividing a soil type into phases.

The soil phase (or the soil type if it has not been subdivided) is the unit shown on the soil map. It is the unit that has the narrowest range of characteristics. Use and management practices therefore can be specified more easily than for soil series or yet broader groups that contain more variation.

Soil series. — Two or more soil types that differ in surface texture, but are otherwise similar in kind, thickness, and arrangement of soil layers, are normally designated as a soil series. In a given area, however, it frequently happens that a soil series is represented by only one soil type. Each series is named for a place near which it was first mapped.

Miscellaneous land types. — Fresh stream deposits, or rough, stony, and severely gullied land that have little true soil are not classified into types and series, but are identified by descriptive names, such as Alluvial land, or Stony rough land.

Soil complex. — When two or more soils are so intricately associated in small areas that it is not feasible to show them separately on the soil map, they are mapped together and called a soil complex. No soil complexes were mapped in Lynn County.

Soils of Lynn County

The soils of Lynn County developed from thick beds of porous, friable, unconsolidated, loamy materials that are rich in lime and plant nutrients. These materials were

probably transported by water from the higher lying areas to the west, then shifted and reworked by wind. The soils of the county have sandier surface soils and less compact, less blocky, and more permeable subsoils than the soils that comprise the "hardlands" to the north.

The porosity and structure of the soils of Lynn County are favorable for agriculture. The total pore space between soil aggregates is large in nearly all of the soils, but the size of the pores varies greatly. A large amount of pore space increases permeability to air, water, and roots. A favorable soil structure also increases the water-holding capacity and permeability. Nearly all the soils of the county have moderate to strong medium and fine structure, which permits roots to expand and thereby makes good plant growth possible.

The following list shows types of structure for some of the soils of Lynn County:

	Type of structure
Tivoli	Single grain.
Brownfield	Very coarse prismatic to massive.
Amarillo	Compound moderate medium granular, subangular blocky, and medium prismatic.
Zita and Portales	Compound strong medium and fine granular, subangular blocky, and strong medium prismatic.
Randall	Massive.

Key to the Soil Series

The physical characteristics of the soil series of Lynn County and the relationships between the series are outlined in the following key:

I. Soils that have distinct horizons.
  A. Soils not calcareous to the surface.
    1. Soils with brown surface soils and reddish subsoils —
      a. With subangular blocky and granular subsoil underlain by horizons of stonelike caliche at depths between 10 and 36 inches ..... Arvana.
      b. With subangular blocky and granular subsoil underlain by distinct light-colored horizons of soft caliche at depths between 44 and 80 inches ..... Amarillo.
      c. With massive subsoil underlain by indistinct or weak horizons of soft caliche at depths greater than 80 inches. ..... Brownfield.
    2. Soils with grayish-brown surface soils and dark grayish-brown subsoils —
      a. With subangular blocky and granular subsoil underlain by caliche at depths between 22 and 38 inches. ..... Zita.
      b. With subsoil granular in upper part and blocky in lower part; underlain by caliche at depths greater than 36 inches. ..... Lubbock.
  B. Soils calcareous to the surface.
    1. Soils with granular, strongly calcareous, sandy clay loam subsoils —
      a. With caliche at depths between 10 and 20 inches. ..... Mansker.
      b. With caliche at depths greater than 20 inches —
        (1) With pale-brown strongly calcareous surface soils and light brownish-gray subsoils ..... Arch.
        (2) With grayish-brown calcareous surface soils and grayish-brown subsoils .. .. Portales.
    2. Soils with dark-gray calcareous surface soils and calcareous clay subsoils ... Church.
II. Soils without distinct horizons.
  A. Soils that have been deeply developed; clay soils with massive clay subsoils ..... Randall.
  B. Soils that consist of only slightly modified parent material.
    1. Very pale brown fine sand more than 60 inches thick; uppermost few inches slightly darkened by organic matter; no caliche layer. ..... Tivoli.
    2. Light-gray granular, strongly calcareous loams to clay loams more than 20 inches thick; uppermost few inches slightly darkened by organic matter; no caliche layer. ..... Drake.
    3. Light brownish-gray gravelly and strongly calcareous soil material; caliche at depths of less than 10 inches. ..... Potter.

Soil Associations

The map of soil associations (fig. 6) shows the general patterns of the soils in Lynn County. Each association is made up of soils that are arranged in a characteristic pattern. Sometimes we can use this kind of a general soil map to point out areas that are similar in economic value; that are suitable for a certain kind of crop; or that require similar practices to make use of them or to protect them from erosion.

1. Deep moderately permeable fine sandy loams: Amarillo-Arvana-Lubbock

This soil association occurs on nearly level to gently undulating areas in the western part of the county. It occupies about 28 percent of the county. The principal soils are the Amarillo fine sandy loams, the moderately deep phases of Arvana fine sandy loam, and Lubbock fine sandy loam. The Amarillo soils occur in the uplands. The Lubbock soil occurs in shallow depressions, generally within larger areas of Amarillo and Arvana soils. Rather small areas of Arvana soils lie next to areas of Amarillo soils. Their surface layers are so similar that differences among the soils cannot be detected from the surface.

All of the soils in this association have brownish surface layers. The subsoils of the Amarillo and Arvana soils are reddish sandy clay loam, and the subsoil of the Lubbock soil is grayish-brown clay loam. The soils are deep to moderately deep over caliche.

2. Deep moderately permeable loams and clay loams: Amarillo-Lubbock

This extensive soil association is comprised of the most productive soils in the county. It occupies most of the

eastern and northern parts of the county. The total acreage is about 38 percent of the county. About 98 percent of the acreage consists of Amarillo loams. The rest is Lubbock clay loam, which occurs in shallow depressions within larger areas of Amarillo loams. The soils are generally nearly level, but some occur on the slopes next to the many playa lakes.

3. *Deep permeable fine sands: Brownfield-Tivoli*

The principal soils in this association are the Brownfield fine sands and Tivoli fine sand. This association occupies only 7 percent of the county. The soils occupy five areas in the western part of the county and one in the central part. Relief is gently undulating; the areas occupied by Brownfield fine sand, wind-hummocky, and by Tivoli fine sand consist of low stabilized dunes surrounded by areas of Brownfield soils. Some of the areas are nonarable, principally because the soils have been severely eroded by wind. The farms on this association are generally larger than those on more productive soils.

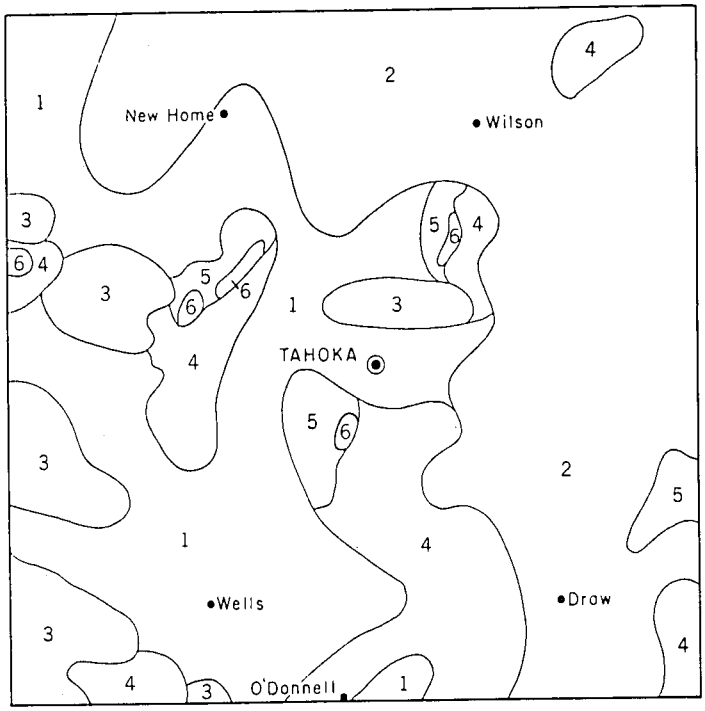

Figure 6.—Soil associations.

1. Deep moderately permeable fine sandy loams: Amarillo-Arvana-Lubbock.
2. Deep moderately permeable loams and clay loams: Amarillo-Lubbock.
3. Deep permeable fine sands: Brownfield-Tivoli.
4. Shallow and moderately deep fine sandy loams and loams: Portales-Zita.
5. Rough and stony lands.
6. Intermittent lakes.

4. *Shallow and moderately deep fine sandy loams and loams: Portales-Zita*

This soil association occurs in various parts of the county. One large area is south and one is west of Tahoka. Other areas are in the southeastern, northeastern, and southwestern parts of the county. The total acreage comprises 21 percent of the county. The relief is nearly level to gently sloping. The shallower soils occupy ridges and the crests of gentle slopes.

The principal soils in the association are the Portales and Zita fine sandy loams and the Portales and Zita loams. Minor soils are Arch fine sandy loam; Arvana fine sandy loam, shallow phase; the Mansker loams; and the Drake soils. In most of these soils, caliche occurs at depths of 10 to 36 inches, but there is no definite caliche horizon in the Drake soils. Most of the soils are calcareous to the surface, but in some the upper layers are noncalcereous.

The risk of wind erosion is moderate to great in most of the soils. The more strongly sloping areas are subject to water erosion, especially if the soils are cultivated.

5. *Rough and stony lands*

This soil association occupies only 3 percent of the county. Most of the areas that border the large intermittent lakes are composed of shallow, gravelly Potter soils. The areas in the southeastern part of the county have a larger proportion of Rough broken land than the other areas.

None of this association is suitable for crops, but it has a thin cover of grass. All of the areas are within ranches.

6. *Intermittent lakes*

This association occupies the bottoms of depressions that are 30 to 50 feet deep. Though dry most of the time, these areas are actually the floors of lakes. The areas are 15 to 750 acres in size. When the soils are dry, the water table is near the surface and the soils are covered by a whitish salty crust. This salty crust, which is toxic to plants, was left when the lake waters evaporated.

These soils have no agricultural value. Tests show that they contain potassium and magnesium, but not enough of either to make processing economically feasible.

Descriptions of the Soils

In the following pages the soil series and mapping units in Lynn County are described in detail. The approximate acreage and proportionate extent of each mapping unit and the numbers of acres under cultivation, in pasture, and in miscellaneous uses are shown in table 4. The location and distribution of the soils are shown on the soil map at the back of this report.

Amarillo series

The Amarillo soils occupy about 65 percent of the county. They occur throughout the county except for one

TABLE 4.—*Approximate acreage and proportionate extent of soils and number of acres under cultivation, in pasture, and in miscellaneous uses*

Map symbol	Soil	Approximate area	Proportionate extent	Cultivated	Pasture	Miscellaneous use
		Acres	*Percent*	*Acres*	*Acres*	*Acres*
Aa	Amarillo fine sandy loam, 0 to 1 percent slopes	88,200	15.1	130,100	23,400	3,700
Ab	Amarillo fine sandy loam, 1 to 3 percent slopes	69,000	11.8			
Ac	Amarillo loam, 0 to 1 percent slopes	177,700	30.3	186,900	25,400	5,900
Ad	Amarillo loam, 1 to 3 percent slopes	40,500	7.0			
Ag	Arch fine sandy loam	2,500	.4	2,100	300	100
Ae	Arch clay loam	2,900	.5	0	2,900	0
Ah	Arvana fine sandy loam, 0 to 3 percent slopes, shallow	4,200	.7	2,600	1,500	100
Ak	Arvana fine sandy loam, 0 to 1 percent slopes, moderately deep	2,000	.3	2,800	1,600	100
Am	Arvana fine sandy loam, 1 to 3 percent slopes, moderately deep	2,500	.4			
Ba	Brownfield fine sand, thin surface	35,300	6.0	26,700	7,800	800
Bb	Brownfield fine sand, thick surface	3,600	.6	100	4,000	100
Bc	Brownfield fine sand, wind-hummocky	600	.1			
Ca	Church clay loam	2,600	.4	1,000	1,500	100
Da	Drake soils, 1 to 3 percent slopes	7,400	1.3	4,100	3,000	300
Db	Drake soils, 3 to 5 percent slopes	4,400	.8	1,100	3,200	100
La	Loamy colluvial land	2,300	.4	100	2,100	100
Lc	Lubbock fine sandy loam	1,400	.2	1,200	200	0
Lb	Lubbock clay loam	3,400	.6	3,000	400	0
Ma	Mansker loam, 1 to 3 percent slopes	3,800	.6	2,300	1,400	100
Mb	Mansker loam, 3 to 5 percent slopes	900	.2	500	400	0
Pa	Portales fine sandy loam, 0 to 1 percent slopes	14,000	2.4	24,400	7,300	800
Pb	Portales fine sandy loam, 1 to 3 percent slopes	18,500	3.2			
Pc	Portales loam, 0 to 1 percent slopes	18,100	3.1	23,000	6,400	800
Pd	Portales loam, 1 to 3 percent slopes	12,100	2.1			
Pe	Potter soils	12,100	2.1	500	11,300	300
Rb	Randall loamy fine sand	300	(1)	200	100	0
Ra	Randall clay	9,700	1.7	5,800	3,600	300
Rc	Rough broken land	3,700	.6	0	3,600	100
Ta	Tivoli fine sand	1,200	.2	0	1,200	0
Za	Zita fine sandy loam, 0 to 1 percent slopes	19,900	3.4	20,100	2,300	600
Zb	Zita fine sandy loam, 1 to 3 percent slopes	3,100	.5			
Zc	Zita loam, 0 to 1 percent slopes	14,000	2.4	12,200	1,400	400
	Intermittent salt lakes	3,700	.6	0	0	0
	Total	585,600	100.0	450,800	116,300	14,800

[1] Less than 0.1 percent.

area in the west-central part. Relief is generally nearly level to gently undulating, but a few small areas around some of the playa lakes have stronger slopes. The soils developed from calcareous crumbly sandy clay loams, under a cover of bunchgrasses.

The Amarillo soils resemble the Arvana except that the Arvana soils are underlain by stonelike caliche at a depth of about 36 inches. Unlike the Amarillo soils, the Lubbock, Portales, Zita, and Mansker soils are brown or grayish brown. The Brownfield soils have a sandier and thicker A horizon than the Amarillo.

The Amarillo soils are moderate to high in fertility. They may have good water-holding and water-supplying capacity. Surface drainage is slow, and internal drainage is medium.

About 85 percent of the acreage is cultivated. Some water erosion has occurred on cultivated areas on the stronger slopes around playa lakes. The cultivated areas of Amarillo fine sandy loams require careful management to protect them against wind erosion.

Amarillo fine sandy loam, 0 to 1 percent slopes (Aa). — This soil is in capability unit III-1. A typical profile follows:

0 to 10 inches, brown to reddish-brown alkaline fine sandy loam; crumbly and friable; gradual transition to layer below.
10 to 30 inches, alkaline sandy clay loam; reddish brown in upper part and yellowish red in lower part; crumbly and friable when moist; very hard when dry; clear transition to layer below.
30 to 56 inches, yellowish-red sandy clay loam, the aggregates coated with films of lime; crumbly and friable; clear transition to layer below.
56 to 80 inches, pink sandy clay loam, 40 to 60 percent soft to hard lumps of calcium carbonate; gradual transition to parent material below.
80 to 120 inches +, pink crumbly calcareous sandy clay loam.

A typical profile is illustrated in figure 7.

Range in characteristics. — The surface soil ranges from 6 to 12 inches in thickness; depth to the accumulation of calcium carbonate ranges from 46 to 66 inches.

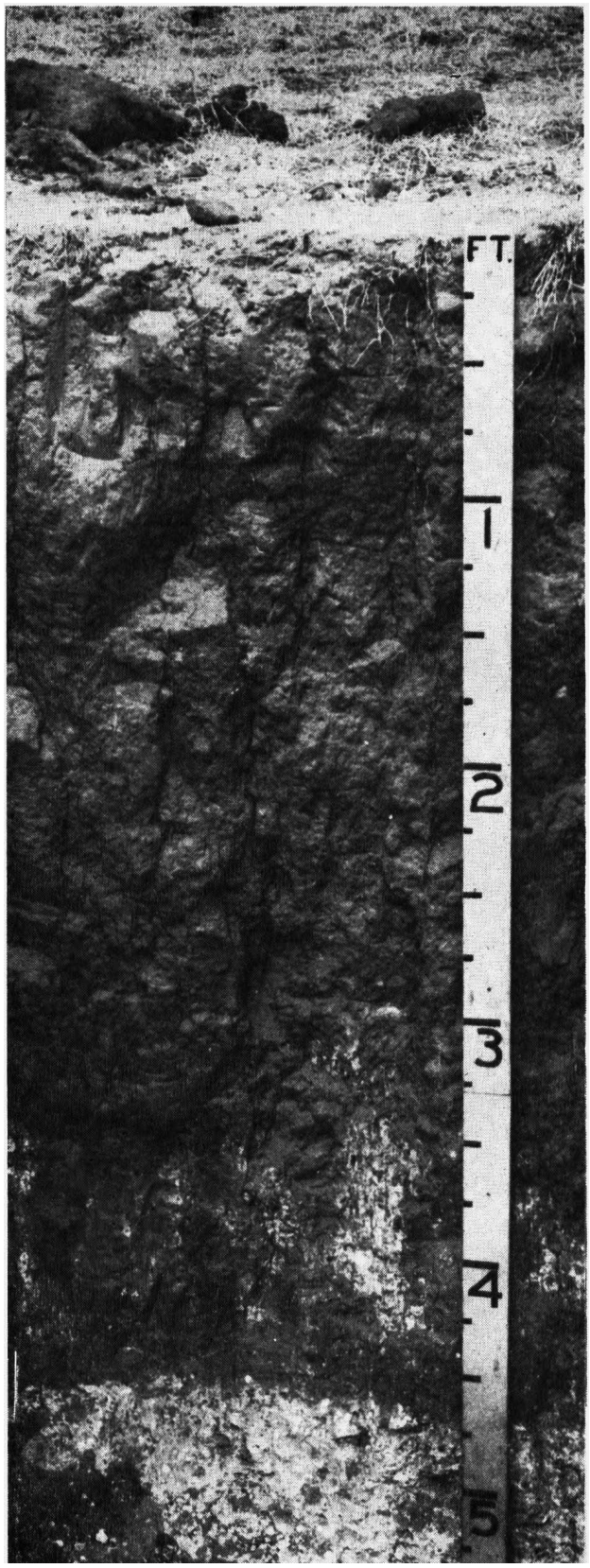

Figure 7.—**Profile of Amarillo fine sandy loam; films of calcium below 3 feet; accumulation of calcium carbonate at about 5 feet.**

Inclusions.—Small areas of Brownfield fine sand, and small knolls and narrow gentle slopes occupied by the Portales and Mansker soils are included in this mapping unit. None of these included areas exceeds 5 acres.

Amarillo fine sandy loam, 1 to 3 percent slopes (Ab). — Except that it occurs on stronger slopes, this soil is similar to Amarillo fine sandy loam, 0 to 1 percent slopes. It occurs on low ridges, knolls, and gentle slopes around playa lakes.

Water erosion has removed part of the surface layer in most of the areas that have been cultivated. Many of the more strongly sloping areas under cultivation are cut by shallow gullies. This soil is in capability unit III-1.

Amarillo loam, 0 to 1 percent slopes (Ac). — This soil is in capability unit II-2. A typical profile follows:

0 to 7 inches, grayish-brown to brown, crumbly noncalcareous loam; gradual transition to layer below.
7 to 22 inches, reddish-brown, crumbly, noncalcareous sandy clay loam; friable when moist, hard when dry; clear transition to layer below.
22 to 44 inches, reddish-brown to yellowish-red, crumbly, calcareous sandy clay loam; soil aggregates coated with films of calcium carbonate; less friable than layer immediately above; abrupt transition to layer below.
44 to 64 inches, pink clay loam, about 40 percent soft impure calcium carbonate that contains a few hard concretions; gradual transition to parent material below.
64 to 80 inches +, pink crumbly calcareous sandy clay loam.

A typical profile is illustrated in figure 8.

Range in characteristics. — The surface soil ranges from loam to sandy clay loam in texture and from 5 to 10 inches in thickness. The depth to the layer of calcium carbonate ranges from 32 to 54 inches.

Inclusions. — Small knolls of Amarillo fine sandy loams are included in this mapping unit but occupy no more than 1 percent of any area. In some areas small spots of Portales and Mansker soils are included.

Amarillo loam, 1 to 3 percent slopes (Ad). — Except that it occurs on stronger slopes and in most places the caliche occurs at shallower depths, this soil is similar to Amarillo loam, 0 to 1 percent slopes. Most of it is on gentle slopes around playa lakes. In cultivated fields water erosion has thinned the surface layer slightly and some areas are cut by shallow gullies. This soil is in capability unit III-2.

Arch series

The soils of the Arch series occur principally in two areas. One area, in the southeastern corner of the county, is entirely in native pasture; the other, in the southwestern corner, is mostly under cultivation. The total acreage is small. These soils have developed from strongly calcareous sandy loams and sandy clays under a cover of medium bunchgrasses. They are moderately deep over the accumulation of calcium carbonate and are strongly calcareous.

In some characteristics the Arch soils resemble the Mansker, Portales, and Zita soils, but they are not so dark colored. They are deeper over caliche than the Potter soils. Unlike the Church soil, they do not occur in playa lakes.

These soils are moderately fertile. Water erosion is not a hazard, but the soils are likely to be severely damaged

by wind if not protected. Surface drainage is very slow, and internal drainage is medium.

Arch fine sandy loam (Ag). — This soil is in capability unit IV-1. A typical profile follows:

0 to 5 inches, pale-brown very friable strongly calcareous fine sandy loam; distinct transition to horizon below.
5 to 16 inches, grayish-brown friable strongly calcareous loam containing fine particles of calcium carbonate; indistinct transition to layer below.
16 to 26 inches, light brownish-gray, friable, strongly calcareous sandy clay loam containing fine particles of calcium carbonate; distinct transition to layer below.
26 to 58 inches, white clay loam containing thin strata of fine blocky clay; about 25 percent calcium carbonate; underlain by fine sand containing thin strata of clay.

Range in characteristics. — The surface soil ranges from pale brown to light brownish gray in color, from fine sandy loam to loamy fine sand in texture, and from 8 to 20 inches in thickness. The depth to the underlying white sand ranges from 40 to 72 inches.

Arch clay loam (Ae). — This soil is in capability unit IV-1. A typical profile follows:

0 to 10 inches, grayish-brown strongly calcareous clay loam; friable; porous; aggregates hard when dry; indistinct transition to layer below.
10 to 30 inches, light-gray strongly calcareous clay; firm when moist, sticky when wet.
30 to 51 inches, essentially the same as layer above but contains a few soft to hard lumps of calcium carbonate in the uppermost 2 to 4 inches.
51 to 84 inches +, white strongly calcareous sandy clay.

Range in characteristics. — The surface soil ranges from grayish brown to light brownish gray in color and from clay loam to silty clay loam in texture.

Arvana series

The Arvana soils occur in small areas throughout the county. They developed in calcareous crumbly sandy clay loam. The soils resemble the Amarillo soils, with which they are associated, but are underlain by hard stonelike caliche that occurs within 36 inches of the surface. The total acreage is small.

The Portales, Zita, Potter, and Mansker soils somewhat resemble the Arvana soils, but they have brown or grayish-brown profiles, whereas the Arvana soils have reddish soil material below the surface layer.

Arvana soils are fertile and productive. Surface drainage is slow. Internal drainage is medium. About 60 percent of the acreage is cultivated. Water erosion is not a hazard, but the soils in cultivated fields are likely to be damaged by wind if they are not carefully managed.

Arvana fine sandy loam, 0 to 3 percent slopes, shallow (Ah). — This soil is in capability unit IV-3. A typical profile follows:

0 to 8 inches, brown, friable, noncalcareous fine sandy loam; gradual transition to horizon below.
8 to 17 inches, reddish-brown, friable, noncalcareous sandy clay loam; abrupt transition to horizon below.
17 to 20 inches +, stonelike caliche.

Range in characteristics. — The surface soil ranges from fine sandy loam to loam in texture and from 6 to 10 inches in thickness. The depth to caliche ranges from 6 to 20 inches.

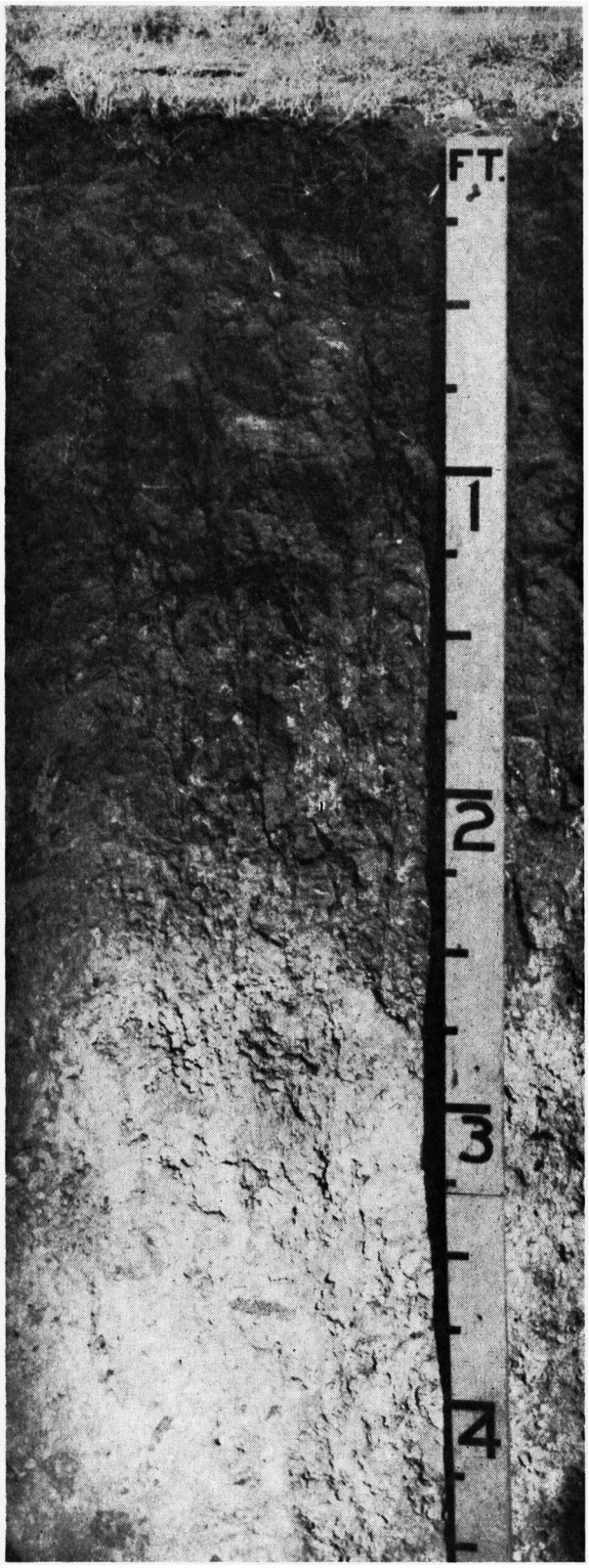

***Figure 8.*—Profile of Amarillo loam; films of calcium carbonate below 18 inches; accumulation of calcium carbonate below 30 inches.**

Inclusions. — Small areas of Kimbrough soils, not mapped elsewhere in the county, are included in this mapping unit. These soils have no subsoil; hard caliche begins at depths of less than 8 inches. Also included are small areas in which hard caliche begins at depths of more than 20 inches.

Arvana fine sandy loam, 0 to 1 percent slopes, moderately deep (Ak). — This soil is in capability unit III-1. A typical profile follows:

0 to 6 inches, brown, friable, noncalcareous fine sandy loam; gradual transition to layer below.
6 to 30 inches, friable, crumbly, noncalcareous sandy clay loam, reddish brown in upper part, yellowish red in lower part; soil aggregates very hard when dry; in some places aggregates in lower 10 to 12 inches coated with films of calcium carbonate; abrupt change to layer below.
30 to 34 inches +, stonelike caliche.

Range in characteristics. — In texture the surface soil ranges from loam to loamy fine sand. The areas that have a loamy fine sand surface layer occur next to areas of Brownfield soils. In thickness the surface soil ranges from 4 to 8 inches. Depth to the stonelike caliche ranges from 20 to 36 inches.

Inclusions. — Small spots in which the hard caliche occurs at depths of less than 20 inches occur in nearly all the areas, but they occupy less than 5 percent of any single area. Small areas of Amarillo fine sandy loams are also included in this mapping unit.

Arvana fine sandy loam, 1 to 3 percent slopes, moderately deep (Am). — This soil is similar to Arvana fine sandy loam, 0 to 1 percent slopes, moderately deep, but it is on stronger slopes and the hard caliche occurs at shallower depths. In places the caliche is at depths of less than 20 inches. Water erosion has damaged the soil in most areas that have been cultivated. The soil is in capability unit III-1.

Brownfield series

The Brownfield soils occupy very gently sloping to undulating areas, mainly in the west-central part of the county. They have developed in calcareous sandy clay loam and sandy loam under a cover of coarse bunchgrasses and shin oak. These soils differ from the Amarillo, which are less sandy and have thinner A horizons. They differ from the associated Tivoli soil, which occurs as stabilized dunes several feet high.

The Brownfield soils are moderately productive, but there is risk of severe damage from wind erosion if they are cultivated (fig. 9). Water erosion is not a problem. Surface drainage is slow, and internal drainage is medium. More than 70 percent of Brownfield fine sand, thin surface, is cultivated. More than 90 percent of Brownfield fine sand, thick surface, is pastured.

Brownfield fine sand, thin surface (Ba). — This soil is in capability unit IV-2. A typical profile follows:

0 to 17 inches, brown, loose, alkaline fine sand, darkened in the uppermost 3 or 4 inches by organic matter; clear transition to layer below.
17 to 92 inches, sandy clay loam, yellowish red in upper part, red in lower part; porous, crumbly, and friable when moist, very hard when dry; upper part is noncalcareous, but below depths of about 80 inches material is calcareous and soil aggregates are coated with films of calcium carbonate.
92 to 120 inches +, light-brown loam about 50 percent calcium carbonate.

***Figure 9.*—Brownfield fine sand, drifted by wind.**

Range in characteristics. — In texture the surface soil ranges from fine sand to loamy fine sand. It ranges from 10 to 20 inches in thickness, except for small dunes in which the surface soil is as much as 36 inches thick. The layer in which calcium carbonate has accumulated is lacking in many places, but in some places it is within 40 inches of the surface. In one area of about 300 acres, 3 miles north of Tahoka, the layer of accumulated calcium carbonate occurs at depths between 26 and 42 inches.

Inclusions. — Small areas of Amarillo fine sandy loams are included in this mapping unit. About 4½ miles north and one-half mile east of the West Point cotton gin, an area of about 200 acres has been included in which the subsoil is brown loam underlain at a depth of about 40 inches by pale-brown loamy sand.

Brownfield fine sand, thick surface (Bb). — This soil is in capability class VI. A typical profile follows:

0 to 30 inches, very pale brown, loose, noncalcareous fine sand, darkened in upper part by organic matter; clear transition to layer below.
30 to 86 inches, noncalcareous sandy clay loam, yellowish red in upper part, red in lower part; porous, crumbly, and friable when moist, and very hard when dry; gradual transition to layer below.
86 to 96 inches +, reddish-yellow noncalcareous heavy fine sandy loam.

Range in characteristics. — The surface layer ranges from 20 to 34 inches in thickness; it is thickest on the small stabilized dunes. Depth to the layer of fine sandy loam ranges from 70 to 96 inches.

Inclusions. — Included in this mapping unit are areas less than 5 acres in size occupied by dunes of Tivoli soil. Also included are small areas in which the soils have been eroded by wind. In these eroded areas the surface layer is less than 18 inches thick.

Brownfield fine sand, wind-hummocky (Bc). — Originally, this soil was like Brownfield fine sand, thick surface, but cultivation has destroyed the native vegetation. Severe wind erosion has taken place. The loose sandy surface soil has been blown into hummocks 36 to 72 inches or more high. Some areas are stabilized by vege-

tation, but sand blowouts are common. It is difficult to establish a stand of grass. This soil is in capability Class VII.

Church series

Church clay loam is the only soil of the Church series mapped in Lynn County. This crumbly calcareous soil occupies many small areas throughout the county. It occurs on the floors of playa lakes. It developed in calcareous clays under a cover of short grasses. Although it is more crumbly than the Randall soils, it resembles them in some characteristics.

The Church soil is fertile and productive but is likely to be flooded. It occurs in depressions, so there is no surface runoff. Internal drainage is slow. Water erosion is not a hazard, but areas not covered by vegetation are subject to wind erosion after freezing. About 50 percent of the acreage is cultivated.

Church clay loam (Ca). — This soil has not been placed in a capability unit because the areas may be flooded for long periods. Reclamation might be practical for some areas. A typical profile follows:

0 to 14 inches, dark-gray, crumbly, calcareous clay loam; friable when moist, very hard when dry; gradual transition to layer below.
14 to 26 inches, gray, crumbly, strongly calcareous clay; firm when moist, very hard when dry; clear transition to layer below.
26 to 38 inches, light-gray clay; about 30 percent soft lumps of calcium carbonate; gradual transition to layer below.
38 to 60 inches +, white strongly calcareous clay.

Range in characteristics. — In texture the surface layer ranges from clay loam to loam, and in thickness from 10 to 14 inches. Depth to the accumulation of calcium carbonate ranges from 26 to 38 inches.

Drake series

The loamy strongly calcareous Drake soils occupy low stabilized dunes on the leeward (east) side of some of the playa lakes. They occur in many small areas throughout the county, but the total acreage is small. The soils were derived from materials blown from the lakes many years ago. They developed under a cover of short grasses. These soils do not have the distinct horizon of accumulated calcium carbonate that is typical of the Arch, Portales, and Mansker soils; nevertheless they resemble those soils in some characteristics. Relief ranges from gently sloping to sloping. Both surface drainage and internal drainage are medium.

Although about 40 percent of the areas that are on slopes of less than 3 percent are cultivated, only about 10 percent of the areas that are on slopes of more than 3 percent are under cultivation. Water erosion is a slight to moderate hazard. The soils may be damaged severely by wind erosion if they are not protected.

Drake soils, 1 to 3 percent slopes (Da).—This mapping unit is in capability unit IV-1. A typical profile follows:

0 to 10 inches, light brownish-gray strongly calcareous loam; friable and crumbly when moist; breaks to fine round aggregates; gradual transition to layer below.
10 to 64 inches +, light-gray strongly calcareous sandy clay loam; friable and crumbly when moist, slightly hard when dry; lower part slightly sandier and in places contains a few soft lumps of calcium carbonate.

Range in characteristics. — The surface layer ranges from loam to fine sandy loam in texture and from 8 to 18 inches in thickness.

Inclusions. — Small areas of Portales soils are included in this mapping unit.

Drake soils, 3 to 5 percent slopes (Db). — Except that it is on stronger slopes and its surface layer is generally thinner, this mapping unit is similar to Drake soils, 1 to 3 percent slopes. It is subject to water and wind erosion. It is in capability class VI.

Loamy colluvial land

Loamy colluvial land (La). — This land type occurs on foot slopes below areas of Potter soils. It consists of materials that have washed or worked downward from the slopes above. Most of the areas have strongly sloping relief and are subject to severe damage from water erosion if they are cultivated. Vegetation consists of buffalograss, blue grama, hairy grama, and lovegrasses, and scrubby mesquite trees and allthorn bushes. Some areas have a thick cover of saltgrass (*Distichlis spicata*). This land type is in capability class VI. The profile varies from place to place, but the following profile is typical:

0 to 27 inches, light brownish-gray strongly calcareous clay loam; uppermost 10 inches darkened by organic matter; friable and crumbly when moist, hard when dry; a few to many small and large fragments of caliche scattered throughout the layer and on the surface.
27 to 50 inches +, white clay loam, 10 to 40 percent calcium carbonate.

Inclusions. — Small areas of Potter, Mansker, and Portales soils are included in this mapping unit.

Lubbock series

The Lubbock soils occur in small, shallow depressions throughout the county. Because of their position they receive some water from surrounding areas and have no surface runoff. Internal drainage is slow. These soils developed in calcareous clay loams and sandy clay loams under a vegetative cover of short grasses.

In some characteristics these soils resemble the Amarillo, Church, Randall, and Zita soils. The Amarillo soils have reddish subsoils, however, instead of grayish brown or dark grayish brown; the Church soil is calcareous; the Randall soils are less crumbly and more clayey; and the Zita soils have accumulations of calcium carbonate within 36 inches of the surface.

The Lubbock soils are fertile and productive. More than 85 percent of the total acreage is cultivated. Water erosion is not a hazard, but wind erosion may cause slight damage on areas of Lubbock fine sandy loam.

Lubbock fine sandy loam (Lc). — This soil is in capability unit II-1. A typical profile follows:

0 to 8 inches, grayish-brown noncalcareous fine sandy loam; friable when moist, hard when dry; clear transition to layer below.

8 to 16 inches, dark grayish-brown noncalcareous clay loam; crumbly but somewhat firm when moist, hard when dry; gradual transition to layer below.
16 to 40 inches, dark grayish-brown noncalcareous blocky clay; firm when moist, very hard when dry.
40 to 60 inches +, light brownish-gray calcareous clay containing a few small soft concretions of calcium carbonate; not so hard as layer above.

Range in characteristics. — The surface soil ranges from fine sandy loam to loam in texture and from 5 to 10 inches in thickness.

Inclusions. — Small areas of Zita fine sandy loams are included in this mapping unit.

Lubbock clay loam (Lb). — This soil is in capability unit II-1. A typical profile follows:

0 to 16 inches, grayish-brown noncalcareous clay loam; plow layer contains some sand; friable and crumbly when moist, moderately hard when dry; gradual transition to layer below.
16 to 44 inches, dark grayish-brown noncalcareous clay; crumbly and friable in upper part; very gradual transition to lighter colored, less crumbly, firmer, calcareous material in lower part; distinct transition to layer below.
44 to 54 inches +, white clay, about 20 percent soft lumps of calcium carbonate.

Range in characteristics. — The surface layer ranges from grayish brown to dark grayish brown in color and from 12 to 24 inches in thickness. The depth to the accumulation of calcium carbonate ranges from 36 to 60 inches.

Inclusions. — Small areas of Lofton clay loam, which is not mapped separately in this county, and of Randall clay and Amarillo soils are included in this mapping unit.

Mansker series

The Mansker soils occupy small areas throughout the county. They occur on low ridges and on the crests of gentle slopes. Slopes range from 1 to 6 percent. Surface drainage is slow to rapid, and internal drainage is medium. The soils have developed in strongly calcareous sandy clay loam under a cover of short grasses. They are associated with the Potter, Portales, Zita, and Arch soils. The soils are similar in some characteristics to the associated soils but are deeper than the Potter soils; they are not so deep over the accumulation of calcium carbonate as the Portales and Zita soils, and they are darker colored than the Arch soils.

These soils are moderately fertile but are low in productivity. Though not well suited to cultivation, about 60 percent of the less strongly sloping acreage is cultivated. The cultivated soils are subject to slight to moderate erosion by wind and water.

Mansker loam, 1 to 3 percent slopes (Ma). — This soil is in capability unit IV-3. A typical profile follows:

0 to 16 inches, strongly calcareous friable loam; grayish brown in upper part and light brownish gray in lower part; very crumbly and porous; small fragments of caliche throughout the horizon and on the surface; abrupt transition to layer below.
16 to 40 inches, pinkish clay loam; about 40 percent soft lumps and hard fragments of calcium carbonate; gradual transition to parent material below.
40 to 84 inches +, pink crumbly strongly calcareous clay loam.

Range in characteristics. — The upper part of the surface layer ranges from brown to grayish brown in color. The plowed surface layer ranges from fine sandy loam to clay loam in texture. Depth to the accumulation of calcium carbonate ranges from about 10 to 20 inches.

Inclusions. — Areas of Potter and Arvana soils, 1 acre or less in size, occur in many places and are included in this mapping unit. These are especially noticeable where caliche has been plowed up. Also included are small areas of Portales and Zita soils.

Mansker loam, 3 to 5 percent slopes (Mb). — Except that it occurs on stronger slopes and its surface layer is thinner and lighter in color, this soil is similar to Mansker loam, 1 to 3 percent slopes. Its surface drainage is more rapid, and the risk of water erosion is moderate to high in cultivated areas. Many small areas not well suited to cultivation are cultivated because they occur within larger, nearly level areas of other soils. This soil is in capability class VI.

Inclusions. — Small areas of Potter, Arvana, Portales, and Arch soils are mapped with this soil. None of these areas exceeds 3 acres in size.

Portales series

The Portales soils are calcareous, moderately deep soils that occupy nearly level to gently sloping areas throughout the county. They developed in strongly calcareous, crumbly sandy clay loams under a vegetative cover of short and medium grasses. Their surface drainage is very slow, and internal drainage is medium.

These soils are associated with the Zita, Mansker, Potter, and Arch soils. They resemble the associated soils in some characteristics, but the Zita soils are noncalcareous; the Mansker and Potter are shallower over caliche; and the Arch are lighter in color.

The Portales soils are fertile and are moderate to high in productivity. About 75 percent of the total acreage is cultivated. Water erosion is a slight hazard on the gently sloping areas. Wind erosion is a hazard on the fine sandy loams.

Portales fine sandy loam, 0 to 1 percent slopes (Pa). — This soil is in capability until III-1. A typical profile follows:

0 to 7 inches, dark grayish-brown strongly calcareous fine sandy loam; plowed layer in fields lighter in color; friable and crumbly when moist; clear transition to layer below.
7 to 32 inches, pale-brown, porous, strongly calcareous clay loam, slightly darker and sandier in upper few inches; friable and crumbly when moist, slightly hard when dry; films of calcium carbonate coat the soil aggregates in lower part of layer; abrupt transition to layer below.
32 to 54 inches, pale-brown clay loam; about 30 percent large soft lumps of calcium carbonate; gradual transition to layer below.
54 to 72 inches +, pink, friable, calcareous sandy clay loam.

Range in characteristics. — The surface soil ranges from dark grayish brown to grayish brown in color and from 4 to 10 inches in thickness. The depth to the accumulation of calcium carbonate ranges from 20 to 36 inches.

Inclusions. — Mapped with this soil are small areas of Mansker and Zita soils.

Portales fine sandy loam, 1 to 3 percent slopes (Pb). — Except that it is more strongly sloping and in most places the horizons above the caliche are thinner, this soil is similar to Portales fine sandy loam, 0 to 1 percent slopes. It occurs in association with the Amarillo soils on the crests of slopes around playa lakes, on knolls, and on low ridges. A few to many fragments of caliche are on the surface. The surface soil is more strongly calcareous than that of Portales fine sandy loam, 0 to 1 percent slopes. The depth to the layer of caliche in most places is about 26 inches.

Water erosion is a hazard. Erosion has damaged many of the cultivated areas, and shallow gullies are common.

Inclusions. — Mapped with this soil are small areas of Mansker soils, which are similar in some characteristics but are less than 20 inches deep over the layer of caliche. Not more than 10 percent of any area consists of Mansker soils. This soil is in capability unit III-1.

Portales loam, 0 to 1 percent slopes (Pc). — This soil is in capability unit II-2. A typical profile follows:

0 to 10 inches, grayish-brown calcareous loam; friable and crumbly when moist, slightly hard when dry; gradual transition to layer below.

10 to 34 inches, light-brown strongly calcareous clay loam; friable and very crumbly in upper part, less crumbly in lower part; films of calcium carbonate coat the soil aggregates; small concretions of calcium carbonate occur throughout but are more numerous in lower part; abrupt transition to layer below.

34 to 46 inches, pinkish sandy clay loam; about 50 percent soft lumps and hard fragments of calcium carbonate; gradual transition to layer below.

46 to 84 inches +, light reddish-brown crumbly calcareous sandy clay loam.

Range in characteristics. — The surface layer ranges from dark grayish brown to brown in color, from loam to sandy clay loam in texture, and from 4 to 12 inches in thickness. The subsoil ranges from clay loam to sandy clay loam in texture. The depth to the accumulation of calcium carbonate ranges from 20 to 36 inches. Many areas have numerous small hard concretions and fragments of calcium carbonate on the surface.

Inclusions. — Many small spots of Zita soils occur in the more nearly level areas and are included in this mapping unit; not more than 5 percent of any single area consists of Zita soils. Also included are small areas of Mansker and Drake soils.

Portales loam, 1 to 3 percent slopes (Pd). — This soil resembles Portales loam, 0 to 1 percent slopes, except that it occurs on stronger slopes, has thinner horizons, and has a more strongly calcareous surface soil. Many small hard fragments of caliche are on the surface. In most places the depth to the layer of caliche is about 26 inches.

Most of this soil occurs on mild slopes around playa lakes. Water erosion is a hazard. Many cultivated areas have been damaged by erosion. This soil is in capability unit III-2.

Inclusions. — Small spots of Mansker soils are included in this mapping unit. They occupy less than 10 percent of any single area.

Potter series

The Potter soils are very shallow over hard caliche. They developed from caliche under a thin cover of short grasses.

These soils are widely distributed in the county. A few of the areas are large, but most are small. They occur on slopes around the large alkali lakes. Some areas lie next to areas of Rough broken land in the southeastern part of the county. Slopes range from 3 to 15 percent. Surface drainage is slow to rapid, and drainage through the caliche is slow. The soils are similar to the Mansker and Portales soils but are shallower over caliche.

The Potter soils are too shallow for cultivation and support only a thin cover of grass. All of the areas are used for pasture.

Potter soils (Pe). — This soil is in capability class VI. A typical profile follows:

0 to 4 inches, light brownish-gray strongly calcareous loam containing many fragments of caliche; abrupt transition to thick bed of caliche.

Range in characteristics. — The mantle of soil ranges from light brownish gray to brown in color and from 2 to 10 inches in thickness.

Inclusions. — Spots of Mansker and Arvana soils, within smooth, gently sloping areas of Potter soils, are included in this mapping unit.

Randall series

The Randall soils originated from clayey materials. They developed under a cover of short grasses and water sedges. Some of the parent materials were calcareous, and some were not calcareous. The soils occur throughout the county on the floors of playa lakes, 2 to 30 feet below the level of the surrounding plains. Areas that are within larger areas of Brownfield soils are covered by deposits of windblown sand.

Because these soils occur in depressions, there is no surface runoff. Water moves downward through the soil very slowly or not at all. Runoff from higher areas collects in the playa lakes and stands for periods of a few days to several months after heavy rains or after prolonged rainy spells.

These soils are associated with the Church, Lubbock, and Zita soils. They resemble the associated soils in some characteristics but are less crumbly; the Church soil is calcareous, and the Zita soils have an accumulation of calcium carbonate at depths between 20 and 36 inches.

About 60 percent of the acreage is cultivated. Water erosion is not a hazard, but areas not covered by vegetation are likely to be eroded by wind after freezing.

Randall loamy fine sand (Rb). — This soil is in capability unit IV-2. A typical profile follows:

0 to 18 inches, brown, loose, noncalcareous loamy fine sand; abrupt transition to layer below.

18 to 56 inches, very firm or hard noncalcareous clay; grayish brown in upper part, light brownish gray in lower part.

56 to 84 inches +, light yellowish-brown calcareous clay; not so firm or hard as layer immediately above.

Range in characteristics. — The surface layer ranges from 8 to 30 inches in thickness.

Randall clay (Ra). — This soil has not been placed in a capability unit because it is likely to be flooded for long periods. The areas are from 2 to 40 acres in size. A typical profile follows:

0 to 40 inches, dark-gray, very dense, hard, noncalcareous clay that is very sticky when wet; breaks to large massive clods; gradual transition to layer below.
40 to 84 inches +, light brownish-gray noncalcareous clay; not so firm or hard as layer above.

Range in characteristics. — The surface layer ranges from dark gray to gray in color and from 22 to 48 inches in thickness. In places the entire profile is calcareous, but in other places it is noncalcareous. In some small playa lakes this soil is under an overwash of loam or sandy clay loam, 6 to 8 inches thick.

Rough broken land

Rough broken land (Rc). — This mapping unit occurs on strongly sloping, severely eroded and gullied areas. The largest area is in the southeastern part of the county, about 4 miles southeast of Grassland. Here, a branch of the headwaters of the Brazos River has cut a deep rough canyon into the High Plains. This canyon penetrates through the mantle of Plains soil material and into the Permian "Red Beds." In other areas of Rough broken land, gullies do not reach below the Plains soil material. Some areas on the eastern sides of alkali lakes are cut by many short gullies that lead from the upper slopes to the floors of the lakes.

Surface runoff is extremely rapid, and little rainfall is absorbed. Geologic erosion is so rapid that soils cannot develop. About 40 percent of the mapping unit consists of Plains soil materials, 30 percent of materials from the redbeds, 25 percent of Drake soil materials, and 5 percent of other soil materials.

The vegetation is sparse. It consists of a few scrubby mesquite trees and bushes; some short grasses, mainly needlegrass; and some grama grasses and grasses of the *Andropogon* species. Small areas that are more nearly stabilized support a denser stand of grasses.

This land is unsuitable for crops and produces little forage. It is suitable for use as game refuges. It is in capability class VII.

Tivoli series

The only soil of the Tivoli series mapped in Lynn County is Tivoli fine sand. This soil consists of stabilized dunes that occur in a few areas in the west-central part of the county. It developed in windblown sands under a cover of shin oak and coarse bunchgrasses. The surface is billowy.

The loose fine sand of which the Tivoli soil consists readily absorbs rainfall. Internal drainage is very rapid. The soil is low in fertility. It is unsuitable for crops but is used for grazing. Areas not covered by vegetation are likely to be severely damaged by wind erosion.

Tivoli fine sand (Ta). — This soil is in capability class VII. A typical profile follows:

0 to 54 inches, very pale brown, loose, noncalcareous fine sand; uppermost 4 to 8 inches somewhat darkened by organic matter.

Range in characteristics. — The color of this soil ranges from very pale brown to yellow. The dunes range from 5 to 15 feet in height.

Inclusions. — Small areas of Brownfield soils that occur between dunes are included in this mapping unit.

Zita series

These moderately deep fertile soils occupy nearly level areas throughout most of the county. They developed in calcareous sandy clay loams under a cover of short and medium grasses. Surface drainage is very slow. Internal drainage is medium to slow.

The Zita soils are associated with the Portales, Lubbock, Amarillo, and Church soils. They are similar to the Portales and Mansker soils but are noncalcareous. The Lubbock and Amarillo soils are deeper over the accumulation of calcium carbonate, and the Amarillo soils have a reddish subsoil.

About 90 percent of the total acreage of these soils is cultivated. Water erosion is not a hazard. Some wind erosion and drifting occur in unprotected fields.

Zita fine sandy loam, 0 to 1 percent slopes (Za). — This soil is in capability unit III-1. A typical profile follows:

0 to 6 inches, brown friable and crumbly noncalcareous fine sandy loam; clear transition to layer below.
6 to 26 inches, crumbly friable sandy clay loam; dark grayish brown and noncalcareous in upper part; grayish brown and calcareous in lower part, with films of calcium carbonate coating the soil aggregates; abrupt transition to layer below.
26 to 40 inches, pale-brown friable clay loam, about 25 percent calcium carbonate; gradual transition to layer below.
40 to 64 inches +, pink, crumbly, calcareous clay loam.

Range in characteristics. — The surface layer ranges from brown to grayish brown in color, from fine sandy loam to loam in texture, and from 4 to 10 inches in thickness. The 6- to 26-inch layer ranges from dark grayish brown to brown in color and from sandy clay loam to clay loam in texture. The depth to the accumulation of calcium carbonate ranges from 24 to 38 inches.

Zita fine sandy loam, 1 to 3 percent slopes (Zb). — Except that it occurs on gentle slopes, this soil is similar to Zita fine sandy loam, 0 to 1 percent slopes. Also it is calcareous nearer the surface, and in a few small areas it is calcareous at the surface. In most places the depth to caliche is about 26 inches.

Water erosion is a hazard on this soil, but few cultivated areas are eroded. This soil is in capability unit III-1.

Zita loam, 0 to 1 percent slopes (Zc). — This soil is in capability unit II-2. A typical profile follows:

0 to 8 inches, grayish-brown friable noncalcareous loam; clear transition to layer below.
8 to 26 inches, dark grayish-brown crumbly friable clay loam; noncalcareous and a little sandier in upper part;

lighter colored and calcareous in lower part, and films of calcium carbonate coat soil aggregates; abrupt transition to layer below.

26 to 46 inches, pale-brown clay loam, about 40 percent large soft lumps of calcium carbonate; gradual transition to layer below.

46 to 84 inches +, pink, crumbly, calcareous clay loam.

A typical profile is illustrated in figure 10.

Range in characteristics. — The surface layer ranges from grayish brown to dark grayish brown in color, from loam to clay loam in texture, and from 6 to 12 inches in thickness. The 8- to 26-inch layer ranges from clay loam to sandy clay loam in texture. The depth to the accumulation of calcium carbonate ranges from 22 to 36 inches.

Inclusions. — Included in this mapping unit are small areas of Mansker soils that occupy low knolls. Also included are areas of Lubbock soils that occur in small shallow depressions.

Capability Classification

Capability classification is useful in choosing good uses for each soil and good combinations of practices for it, and in estimating the responses of cultivated crops or other plants grown on it. In grouping soils according to their capability, each soil is placed in one of eight general classes according to the degree of its natural limitations—that is, its suitability for cultivated crops, grazing, or other uses, the risk of erosion or other damage when it is used, and the management that it needs. Classes are designated by Roman numerals. Within each class, except for class I, there may be as many as four subclasses based on the chief kind of limitation: Risk of erosion (e), excess water (w), low-moisture capacity or other unfavorable soil characteristics (s), or adverse climate (c). Capability units are groups of similar soils within each class and subclass. Capability units are practical management groups of soils.

Capability Classes of Soils Suitable for Cultivation

The soils of Lynn County that are suitable for dryland farming as well as other uses have been placed in the following capability classes and units. No capability subclasses have been designated for the soils. No class I soils occur in the county.

Class II. — Soils suitable for cultivation with moderate limitations, or with moderate risks of damage if not protected.

- II-1. Nearly level, deep, slowly permeable soils.
- II-2. Nearly level, deep, moderately permeable soils.

Class III. — Soils suitable for cultivation with severe limitations, or severe risk of damage if not protected.

- III-1. Deep moderately permeable or rapidly permeable soils.
- III-2. Gently sloping, deep, moderately permeable soils.

***Figure 10.*—Profile of Zita loam; strongly calcareous material between 15 and 24 inches; accumulation of calcium carbonate below 24 inches.**

Class IV. — Soils suitable for limited cultivation with extreme care.

IV-1. Deep soils high in lime.
IV-2. Deep soils that have thin fine sandy surface soils over moderately permeable subsoils.
IV-3. Shallow moderately permeable soils over caliche.

Playa lakebeds are not classified, but some are suitable for cultivation.

Dryland Management

The most important management requirements of the soils of Lynn County are concerned with conserving moisture in the soil and controlling wind erosion.

Most farmers now apply water conservation practices. Terrace systems had been constructed on about 50 percent of the cropland by 1951. Most of these are level closed terraces that have been designed to hold all the rainwater on the land until it soaks in. Almost all the terraced acreage and a small part of the unterraced acreage are cultivated on the contour to conserve moisture. Nearly all farmers keep all weeds and grass out of their fields. This practice saves moisture for crops but reduces the vegetative residues that help control wind erosion. If every third crop row is left unseeded, more moisture will be available for the crops; however, the increase in yields is seldom great enough to make this system profitable.

Wind erosion in cultivated fields can be curtailed by keeping the surface rough and cloddy. Soils that are most susceptible to erosion are generally tilled first. In the spring, when strong winds are prevalent, relisting or some other form of emergency tillage may be necessary.

Because sorghum leaves more residue on the land after the harvest, it provides better protection than cotton against erosion. If cattle graze on the sorghum residue, however, the fields are likely to be more severely damaged. After the harvest, most farmers chisel their sorghum fields. This practice leaves the residue on the surface, where it lessens the effect of erosion and helps to conserve moisture.

Wind erosion is more severe in cotton fields because less crop residue is left. Heavy equipment is used in harvesting cotton; consequently, the surface soil becomes pulverized, increasing the likelihood of erosion damage. Most farmers chisel or list their fields as soon as possible after the harvest, even though the soil may be dry and hard.

Another management practice is concerned with eliminating the plowsole, a compacted soil layer that occurs in most of the sandy soils. The plowsole develops in places where heavy tractors, used too soon after rains, compact the soil. It is difficult for plant roots and water to penetrate this layer. Chiseling, the practice generally employed, will temporarily break the plowsole. Deep plowing is a more effective method of eliminating the plowsole. A moldboard or diskplow, plowing at a depth of about 10 inches, is used to turn the plowsole up on the surface.

The soils of Lynn County appear to be well supplied with the major and minor elements needed for good crop production under dryland farming. The deep sandy soils and the soils that are rich in lime are probably somewhat low in nitrogen. Applications of fertilizer have not resulted in significant increases in yields under dryland farming, but additions of nitrogen and phosphorus to sandy soils have resulted in greater yields.

Irrigation

Before 1944, there were only a few small irrigation wells in Lynn County, but following some extremely dry years—1948, 1951, and 1952—irrigation increased rapidly. By the end of 1952, more than 700 irrigation wells had been drilled and more than 50,000 acres was under irrigation. Most of the wells are 80 to 130 feet deep; a few are only 40 feet deep, but others are more than 200 feet deep.

The Ogallala formation, in the Pliocene series of the Tertiary Age,[7] is the important water-bearing stratum. It underlies all of Lynn County, but water is not available in all places. The principal irrigated regions are in the northeastern and north-central parts of the county.

Irrigation systems are designed according to the kind of soil, the topography, the quantity and quality of available water, and the water requirements of crops to be grown.

The ditch-furrow system is the method commonly used to apply irrigation water in Lynn County. In the ditch-furrow system the water is carried by ditch to the field and then siphoned into furrows between the rows. Most farmers apply water in every furrow; a few apply it in every other furrow. From 10 to 20 percent of the water is lost by seepage or evaporation as it flows through the ditch; the percentage of water lost depends on the distance from the well to the field. Many farmers have installed underground tile to prevent loss of water.

Irrigation systems which require less labor and make more efficient use of the water have been installed on some farms. Level-furrow irrigation or border irrigation is used on the more clayey, smoother soils. Sprinkler systems are more efficient for application of water on the sandy, undulating soils but the loss by evaporation is likely to be high.

Fields used for cotton generally receive two or three applications of water. The first, a preplanting application, is put on late in winter or early in spring, after the land has been listed. The second is applied during the bloom stage of the plant. If rainfall is light, a third is applied late in summer.

Capability Units

The soils suitable for cultivation, as well as for range and other uses, are grouped in seven capability units, each unit consisting of soils that need about the same

[7] BARNES, J. R., ELLIS, W. C., LEGGAT, E. R., and others. GEOLOGY AND GROUND WATER IN THE IRRIGATED REGION OF THE SOUTHERN HIGH PLAINS IN TEXAS. Tex. Bd. of Water Engin. Prog. Rpt. No. 7. 1949.

kind of management. Management requirements and use suitability for these groups of soils, under dryland management and under irrigation, are discussed in the following pages.

Capability unit II-1

This unit consists of the following soils, which are nearly level, deep, fine textured and medium textured, and slowly permeable.

Lubbock clay loam.
Lubbock fine sandy loam.

Use suitability. — These soils are suited to all the crops that can be grown in the area. They are productive if there is sufficient rainfall. Cotton and sorghums are the principal crops. Sudangrass and, under irrigation, alfalfa are grown on small acreages.

Management requirements. — The principal management requirements are to hold the rainwater on the soil until all of it is absorbed and to prevent wind erosion.

Since the soils are nearly level, most of the water will be retained if the fields are tilled on the contour. If, in addition, well-engineered closed terraces are constructed, all of the rainwater can be saved, except during periods of unusually heavy rainfall. Plowing the soil to a depth of about 10 inches every 4 or 5 years will keep the plowsole broken up so that water will infiltrate more rapidly and plant roots will penetrate more easily. The organic-matter content can be increased and permeability and moisture-holding capacity can be improved by growing crops that leave large amounts of residue and by practicing stubble-mulch farming. Stubble-mulching also helps to prevent crusting.

There is only a slight hazard of wind erosion, but some soil is blown away if fields are stripped of all crop residues. Damage by wind erosion can be prevented by keeping the soil covered with a growing crop or with crop residues or by keeping the surface rough or cloddy when there is no vegetative cover.

Irrigation. — Under irrigation, these soils produce high yields of all crops commonly grown in the area. Castor beans, which have been grown experimentally, also do well under irrigation. Because of the slow to moderate permeability of the subsoils, irrigation runs can be longer than on any other soils in the county.

Capability unit II-2

This unit consists of the following soils, which are nearly level, deep, fine textured, and moderately permeable.

Amarillo loam, 0 to 1 percent slopes.
Portales loam, 0 to 1 percent slopes.
Zita loam, 0 to 1 percent slopes.

Use suitability and management requirements are essentially the same as for capability unit II-1. The hazard of wind erosion is slight to moderate, and there is a slight risk of water erosion.

Capability unit III-1

This unit consists of the following soils, which are deep, moderately coarse textured, and moderately or rapidly permeable.

Amarillo fine sandy loam, 0 to 1 percent slopes.
Amarillo fine sandy loam, 1 to 3 percent slopes.
Arvana fine sandy loam, 0 to 1 percent slopes, moderately deep.
Arvana fine sandy loam, 1 to 3 percent slopes, moderately deep.
Portales fine sandy loam, 0 to 1 percent slopes.
Portales fine sandy loam, 1 to 3 percent slopes.
Zita fine sandy loam, 0 to 1 percent slopes.
Zita fine sandy loam, 1 to 3 percent slopes.

Use suitability. — Cotton and sorghums, the two principal crops, grow equally well on these soils. Small acreages of sudangrass are grown in the dryland farming areas. Under irrigation, orchard fruits, truck crops, sugar beets, and alfalfa can be grown. Average yields are not so high as on the finer textured soils of the county, but fair yields can be obtained year after year.

Management requirements. — The principal management problems are loss of water by runoff and moderate susceptibility to wind erosion.

On areas that are nearly level, runoff can be almost entirely prevented by tilling on the contour. If, in addition, closed terraces are constructed, all of the rainwater can be retained. On slopes of more than 1 percent, closed terraces will prevent runoff and water erosion. Plowing the soil to a depth of 10 inches every 3 to 5 years will break up the plowsole so that water will infiltrate more rapidly and plant roots penetrate more easily. To build up the organic-matter content and improve permeability and water-holding capacity, legumes that have been fertilized with phosphate can be grown and plowed under every 3 years.

For protection against wind erosion, crops that leave heavy residues should be grown, and the residues should be left on or near the surface after the crop is harvested. Fields from which sorghum has been harvested should not be plowed or listed until it is time to prepare for the next crop. Fields on which there is not sufficient residue to prevent wind erosion should be plowed or listed immediately after the harvest. Late in the summer, weeds and grass can be permitted to grow with clean-tilled crops, to provide cover for the soil. In spring, if strong winds begin to blow and drift the soil, it may be necessary to chisel or list so as to roughen and clod the surface.[8]

Irrigation. — These permeable soils absorb irrigation water readily, and consequently irrigation runs should be shorter than on the soils of capability units II-1 and II-2.

Capability unit III-2

This unit consists of the following soils, which are gently sloping, deep, fine textured, and moderately permeable.

[8] CHEPIL, W. S., WOODRUFF, N. P., and ZINGG, A. W. FIELD STUDY OF WIND EROSION IN WESTERN TEXAS. Soil Conserv. Serv. SCS–TP–125, 60 pp., illus. 1955.

Amarillo loam, 1 to 3 percent slopes.
Portales loam, 1 to 3 percent slopes.

Use suitability and management requirements are essentially the same as for capability unit II-1. The hazard of wind erosion is slight to moderate, and the risk of water erosion is moderate.

Capability unit IV-1

This unit consists of the following soils, which are nearly level to gently sloping, have moderate to moderately rapid permeability, are moderately deep to deep, and are strongly calcareous.

Arch fine sandy loam.
Arch clay loam.
Drake soils, 1 to 3 percent slopes.

Use suitability. — Cotton, sorghums, wheat, and sudangrass are grown on these soils. Young sorghum plants are damaged by chlorosis, a disease that blanches the green parts of the plants. The sorghums recover, however, especially after rains, and produce fair yields. Wheat can be grown if there has been enough precipitation in the fall. Growing cotton will increase the risk of wind erosion.

Management requirements. — The principal management requirements are to prevent runoff and to control water and wind erosion. These soils absorb rainwater rapidly, but the more strongly sloping areas are subject to moderate water erosion. If fields are tilled on the contour and well-engineered terrace systems are constructed, water erosion can be controlled and more rainwater will be retained. The water-holding capacity is moderate.

The hazard of wind erosion is moderate to severe. Soils high in lime pulverize easily and can be severely damaged by blowing. Fields can be protected by a growing crop, preferably sorghums or grasses, or by crop residues. It is best to harvest sorghums with a combine so that a large amount of residue will be left on the soil. The fields should not be plowed until time to plant the next crop. Stubble left on or near the surface protects the young crop from the wind. When the stubble is incorporated into the soil, it increases the organic-matter content. Sudangrass protects the soil best if it is left at least 15 inches tall after grazing. Strongly sloping areas of Drake soils, if cultivated, need very careful management to control wind erosion.

Irrigation. — Under irrigation these soils are suited to some fruits, vegetables, and alfalfa, in addition to the crops grown under dryland farming.

Capability unit IV-2

This unit consists of the following soils, which are moderately permeable.

Brownfield fine sand, thin surface.
Randall loamy fine sand.

The Brownfield soil occupies gently undulating slopes surrounding depressional areas of Randall soil.

Use suitability. — Cotton and sorghums are the main crops. A small acreage is in sudangrass. These soils have good water-supplying capacity, but water-holding capacity of the surface soil is low. Crop yields are not high because of the effects of wind erosion. The soils are best planted to grasses.

Management requirements. — The hazard of wind erosion is moderate to severe. Water erosion is not a serious problem because the soils absorb rainwater readily and there is little runoff. The water-holding capacity of the surface soil, however, is low. Fertility is quickly depleted.

Deep plowing—deep enough to turn up 4 to 6 inches of sandy clay loam subsoil—reduces the risk of wind erosion. This practice increases the percentage of clay in the surface soil and makes the surface cloddy. It may increase yields as much as 40 percent.

Growing sorghums or sudangrass helps protect the soil against wind erosion. The varieties of sorghums suitable for combine harvesting are especially effective because they leave a large amount of crop residue and a tall stubble after harvest. When sorghum fields are plowed, the stubble should be kept on or near the surface.

Because of the severe hazard of wind erosion, the growing of cotton is not advisable. If cotton is grown, erosion can be reduced by omitting late cultivations and letting the grass and weeds grow, so as to leave a residue after harvest. Tilling on the contour or in crooked rows helps prevent the wind from sweeping down between the rows.

Areas on the stronger slopes that are deep plowed are subject to water erosion until farming operations break down the plowed-up subsoil and incorporate organic matter into it. After deep plowing, it may be difficult to establish a good crop for 2 years; the plow layer may crust and keep seedlings from coming up, especially if rains come immediately after planting.

Irrigation. — These soils can be irrigated, but water for irrigation is not available in all the areas. Sprinkling is the best method because the soils have deep sandy surface layers that absorb water readily.

Capability unit IV-3

This unit consists of the following soils, which are shallow and moderately permeable.

Arvana fine sandy loam, shallow, 0 to 3 percent slopes.
Mansker loam, 1 to 3 percent slopes.

Use suitability. — Small spots of these soils occur within fields of deeper soils and for convenience are generally farmed in the same way. Yields are poor. Areas near farmstands can be used for feed lots.

Management requirements. — These soils are shallow and have only moderate water-holding capacity. They are best suited to drought-resistant crops. It is difficult to terrace these soils, but if the associated deeper soils are terraced, more water will be retained on the land and the moderate hazard of water erosion can be reduced.

Wind erosion is a moderate hazard. It can best be controlled on the larger areas by growing sorghums and sudangrass. The soil should be kept cloddy when it is bare of vegetation. Crop residues and grasses incorporated into the soil will help maintain the organic-matter content.

Unclassified soils

This grouping consists of two unclassified soils — Randall clay and Church clay loam. These soils occur in playa lakebeds and are under water during periods of heavy rainfall. Consequently, they have not been placed in a capability unit, even though some areas are cultivated.

Cotton and sorghums are the principal crops. Some sudangrass is grown. Crops are difficult to establish because good seedbeds cannot be prepared and because the soil usually dries out before the seeds germinate. Most of the lakebeds have a good cover of buffalograss and in some of the wetter areas there is a dense growth of water sedges. If the lakebeds remain under water for extended periods, the better grasses are drowned out. After the lakebeds dry out, it takes from 2 to 5 years to reestablish the grasses.

For flood prevention, diversion terraces can be constructed to control runoff water from the surrounding areas. Terracing may be economically practical for some areas and not for others. Areas that are not flooded can be managed in about the same way as the soils in capability unit II-1.

Soils and Land Types Not Suited to Cultivation

Each of the mapping units in this group has one or more limitations that make it unsuitable for cultivation. All of them will furnish limited grazing, if carefully managed. A permanent cover of native vegetation should be maintained.

Soils in class VI are too sandy, shallow, or steep to be cultivated. They can be used for grazing and are moderately limited for such use. The following soils of Lynn County are in class VI:

Brownfield fine sand, thick surface.
Drake soils, 3 to 5 percent slopes.
Loamy colluvial land.
Mansker loam, 3 to 5 percent slopes.
Potter soils.

Loamy colluvial land and the shallow Drake and Mansker soils are unsuited to cultivation because of low water-holding capacity, moderate hazard of water erosion, and moderate to severe hazard of wind erosion. The vegetation consists of a thin to moderate cover of short grasses—principally blue grama, hairy grama, and sand dropseed—scrubby mesquite trees, and allthorn bushes. The density of grass can be increased by eradicating bushes and shrubs and by conserving moisture. Contour lister furrows or pits that are spaced about 4 feet apart will reduce runoff.

The Brownfield fine sand is deep, coarse textured, and moderately permeable to rapidly permeable. It is low in fertility, has low water-holding capacity, and is likely to be damaged severely by wind erosion, especially if the native vegetation is removed. The native cover, which includes shin oak and a thin cover of little bluestem and sand dropseed, furnishes limited browse and grazing. Sand sagebrush and yucca also occur but are of little or no value for grazing. Grazing should be halted periodically.

Potter soils are too shallow and too strongly sloping to be cultivated. They are likely to be very severely damaged by water erosion. The vegetation consists of a very thin cover of short grasses, small lote bushes, and mesquite trees.

Soils in class VII are more subject to wind and water erosion and less productive of forage than those in class VI. The following soils of Lynn County are in class VII:

Brownfield fine sand, wind-hummocky.
Rough broken land.
Tivoli fine sand.

The Tivoli and Brownfield soils are deep, coarse textured, and moderately to rapidly permeable. They are likely to be severely damaged by wind erosion. They are low in fertility and have low water-holding capacity. The native vegetation, consisting of shin oak and a thin cover of little bluestem and sand dropseed, furnishes little forage. Sand sagebrush and yucca also grow on these soils, but are of little or no value for grazing. Grazing should be halted periodically.

Rough broken land is too steep and too severely damaged by water erosion to be arable. Much of this mapping unit is devoid of vegetation, but small uneroded areas have a thin cover of short grasses and a few scrubby mesquite trees. Because these areas provide little forage, grazing should be restricted. Areas of this land type can be used as a refuge for wildlife.

Estimated Yields

Table 5 shows, for each soil in the county, the estimated average acre yields for the principal crops, under three levels of management, and the estimated carrying capacity of pastures in good condition and fair condition. The estimates are based on information furnished by farmers and ranchers, observations and comparisons made by those familiar with the soils, and results of experiments at the Lubbock (Lubbock County) and Big Spring (Howard County) Experiment Stations. In columns A are yields of cotton and sorghums that are likely to be obtained under ordinary management; in columns B are yields under improved management, including practices suggested in the section, Management of Cultivated Soils; and in columns C are yields obtained under ordinary management on irrigated soils.

Range Sites

The soils of Lynn County are grouped into six range sites. Each of the soils in a range site will support about the same kinds and amounts of native plants.

Native Vegetation of Range Sites

The combination of plants that grew on each range site before it was disturbed by grazing is called the climax vegetation. As a rule, the climax vegetation is the most productive combination of plants that will grow on a given site. It also gives the best protection against erosion.

TABLE 5.—*Estimated average acre yields of principal crops to be expected over a period of years*

[Yields of cotton and sorghum in columns A are those likely to be obtained under ordinary dryland management; yields in columns B are those obtained under improved dryland management; yields in columns C are those obtained on irrigated soils under ordinary management. Absence of a yield figure indicates crop is not grown on the soil at the level of management specified]

Soil	Cotton (lint)			Sorghum for grain			Sorghum for forage			Pasture	
	A	B	C	A	B	C	A	B	C	In fair condition	In good condition
	Lb.	*Lb.*	*Lb.*	*Lb.*	*Lb.*	*Lb.*	*Tons*	*Tons*	*Tons*	*Acres* [1]	*Acres* [1]
Amarillo fine sandy loam, 0 to 1 percent slopes	190	220	450	700	875	3,200	1.75	2.00	10	30	18
Amarillo fine sandy loam, 1 to 3 percent slopes	160	190		600	800		1.50	1.75		30	18
Amarillo loam, 0 to 1 percent slopes	190	235	475	850	950	3,500	1.75	2.00	10	28	20
Amarillo loam, 1 to 3 percent slopes	150	190		600	800					28	20
Arch fine sandy loam	125			400	450		.75	1.00		30	18
Arch clay loam					460			1.00		28	20
Arvana fine sandy loam, 0 to 3 percent slopes, shallow	80			350	400		.75	1.00		35	25
Arvana fine sandy loam, 0 to 1 percent slopes, moderately deep	190	215	450	700	875	3,000	1.75	2.00	7	30	18
Arvana fine sandy loam, 1 to 3 percent slopes, moderately deep	160	190		600	800		1.50	1.75		30	18
Brownfield fine sand, thin surface	95			550	850		1.00	1.50		25	18
Brownfield fine sand, thick surface	75			300						25	18
Brownfield fine sand, wind-hummocky										25	12
Church clay loam	190	250	450	700	1,000	3,800	1.75	3.00	12	20	16
Drake soils, 1 to 3 percent slopes	85			300	350		.75	1.00		35	25
Drake soils, 3 to 5 percent slopes	75			200						40	30
Loamy colluvial land										30	18
Lubbock fine sandy loam	220	240	450	1,000	1,100	3,500	1.75	2.00	10	28	20
Lubbock clay loam	230	250	500	1,000	1,100	3,500	2.00	2.50	10	20	16
Mansker loam, 1 to 3 percent slopes	80			300	375		.75	1.00		35	25
Mansker loam, 3 to 5 percent slopes	60									35	25
Portales fine sandy loam, 0 to 1 percent slopes	180	210	400	600	650	3,000	1.25	1.50	6	30	18
Portales fine sandy loam, 1 to 3 percent slopes	150	180		500	600		1.00	1.25		30	18
Portales loam, 0 to 1 percent slopes	195	235	425	700	750	3,200	1.50	1.75	8	28	20
Portales loam, 1 to 3 percent slopes	150	190		600	700		1.25	1.50		30	18
Potter soils										55	40
Randall loamy fine sand	140			700	800		1.25	1.50		25	18
Randall clay	175	230	400	600	800	3,600	1.00	2.50	8	20	16
Rough broken land										55	40
Tivoli fine sand										25	18
Zita fine sandy loam, 0 to 1 percent slopes	190	220	450	750	850	3,200	1.50	1.75	8	30	18
Zita fine sandy loam, 1 to 3 percent slopes	160	200		600	800		1.25	1.50		30	18
Zita loam, 0 to 1 percent slopes	190	235	475	850	950	3,500	1.50	1.75	10	28	20

[1] Approximate number of acres of rangeland required to support one cow, based on a 12-month grazing season.

The native vegetation on each site consists of three classes of plants: decreasers, increasers, and invaders. Decreasers and increasers are climax plants. Decreasers are the most heavily grazed and are consequently the first to be destroyed by overgrazing. Increasers withstand grazing better or are less palatable to the livestock; they increase under grazing and replace the decreasers. Invaders are plants that become established after the climax vegetation has been reduced by grazing. At present, the vegetation in some parts of the rangelands consists almost entirely of increasers and invaders.

Short grasses are the dominant type of native vegetation in Lynn County. The vegetation also has some characteristics of the desert grasses of the nearby arid regions.

The two most important grasses of the short-grass zone, blue grama (*Bouteloua gracilis*) and side-oats grama (*B. curtipendula*), occurred on all soils of the county in the original, or climax, condition. They were climax dominants on all sites except the Sandy land and Valley and bottom-land sites.

Buffalograss (*Buchloe dactyloides*) and tobosagrass (*Hilari mutica*) are short grasses that occurred on all sites except the Sandy land site. They predominated on many extensive areas of the sites composed of clayey and deeper soils.

Other grasses that were distributed throughout most of the county in varying amounts, depending on the water-supplying capacity of the soils, were Arizona cottontop (*Trichachne californica*), little bluestem (*An-*

TABLE 6.—*Climax plants and invaders, by range sites*

[*O* indicates plant is not native to the specified range site. *C–I* indicates a climax plant that increases when site is grazed. *C–D* indicates a climax plant that decreases when site is grazed. *I* indicates a plant that invades the site when the climax vegetation is reduced by grazing]

Native plants	Deep hardland site	Shallow hardland site	Valley and bottom-land site	Sandy land site	Mixed land site	Rough breaks site
Giant dropseed	O	O	O	C–D	O	O
Hooded windmillgrass	O	O	O	[1]C–I	[1]C–I	O
Sand paspalum	I	I	I	[2]C–I	I	I
Fall witchgrass	I	I	I	[2]C–I	[2]C–I	[2]C–I
Blue grama	C–D	C–D	[1]C–I	[1]C–I	C–D	C–D
Side-oats grama	C–D	C–D	C–D	C–D	C–D	C–D
Little bluestem	O	O	C–D	C–D	C–D	C–D
Indiangrass	O	O	C–D	C–D	C–D	C–D
Sand bluestem	O	O	C–D	C–D	C–D	O
New Mexico feathergrass	C–D	C–D	C–D	C–D	C–D	C–D
Arizona cottontop	C–D	C–D	C–D	C–D	C–D	C–D
Sand dropseed	I	[2]C–I	I	[3]C–I	[2]C–I	[2]C–I
Hairy grama	O	[3]C–I	O	[3]C–I	[2]C–I	[1]C–I
Western wheatgrass	O	O	C–D	O	O	O
Buffalograss	[4]C–I	[4]C–I	[3]C–I	O	[1]C–I	[2]C–I
Switchgrass	O	O	C–D	O	O	C–D
Canada wildrye	O	O	C–D	C–D	C–D	C–D
Alkali sacaton	O	O	[3]C–I	O	O	[2]C–I
Black grama	O	[3]C–I	O	[3]C–I	[2]C–I	[4]C–I
Silver bluestem	C–D	C–D	[2]C–I	[1]C–I	C–D	C–D
Cane bluestem	C–D	C–D	C–D	C–D	C–D	C–D
Tobosagrass	[3]C–I	[2]C–I	[2]C–I	O	O	O
Vine-mesquite	C–D	C–D	C–D	O	C–D	C–D
Plains bristlegrass	C–D	C–D	C–D	C–D	C–D	C–D
Forbs	C–D	C–D	C–D	C–D	C–D	C–D
Woody plants, except mesquite	O	O	O	[3]C–I	O	[2]C–I

[1] Normally constituted 15 percent of the climax vegetation on the specified range site.
[2] Normally constituted 5 percent of the climax vegetation on the specified range site.
[3] Normally constituted 10 percent of the climax vegetation on the specified range site.
[4] Normally constituted 25 percent of the climax vegetation on the specified range site.

dropogon scoparius) (except on the Deep hardland site), needle-and-thread (*Stipa comata*), silver bluestem (*Andropogon saccharoides*), cane bluestem (*A. barbinodis*), perennial threeawn (*Aristida* sp.), and sand dropseed (*Sporobolus cryptandrus*).

Descriptions of the climax vegetation on the soils of the six range sites follow. This information is summarized in table 6.

Deep hardland site

This range site is made up of the following soils:

Amarillo loam, 0 to 1 percent slopes.
Amarillo loam, 1 to 3 percent slopes.
Arch clay loam.
Portales loam, 0 to 1 percent slopes.
Portales loam, 1 to 3 percent slopes.
Zita loam, 0 to 1 percent slopes.

The original vegetation consisted mainly of blue grama, side-oats grama, and buffalograss. Of a lesser extent were needle-and-thread, silver bluestem, cane bluestem, cottontop, tobosagrass, vine-mesquite (*Panicum obtusum*), and legumes and forbs. This site still retains most of the original plants, but buffalograss, tobosagrass, and certain invading plants, including mesquite, are now predominant. On the other sites there has been more change in the vegetative cover.

Shallow hardland site

The following soils occur on this range site:

Arvana fine sandy loam, 0 to 3 percent slopes, shallow.
Drake soils, 1 to 3 percent slopes.
Drake soils, 3 to 5 percent slopes.
Mansker loam, 1 to 3 percent slopes.
Mansker loam, 3 to 5 percent slopes.

The vegetation on this site is composed of the following plants, in addition to those that occur on the Deep hardland site: Little bluestem, hairy grama (*Bouteloua hirsuta*), hooded windmillgrass (*Chloris cucullata*), black grama (*Bouteloua eripoda*), bristle panicum (*Panicum ramisetum*), bush muhly (*Muhlenbergia porteri*), and rough tridens (*Tridens elongata*).

Valley and bottom-land site

This site consists of deep soils that receive runoff water from higher lying areas. As a result it is the most productive site in the county. Vegetation, however, is likely to drown out if an area is under water for an extended period. The following soils are in this range site:

Church clay loam.
Lubbock clay loam.
Lubbock fine sandy loam.
Randall clay.

Originally, this site supported vegetation common to areas having more rainfall. The predominant species were tall grasses, including little bluestem, yellow Indiangrass (*Sorghastrum nutans*), sand buestem (*Andropogon halli*), needle-and-thread, Canada wildrye (*Elymus canadensis*), and plains bristlegrass (*Setaria macrostachya*). The short grasses common to the Deep hardland and Shallow hardland sites made up a minor part of the vegetation on the bottom-land areas. They have increased while the taller grasses have been eliminated by grazing and drought.

The soils in some areas may be saline. In these places alkali sacaton (*Sporobolus airoides*) becomes an important plant. As the degree of salinity increases, this species spreads and displaces other tall grasses. Eventually it may replace practically all other species. Inland saltgrass (*Distichlis stricta*) will then invade the areas.

Mixed land site

The following soils occur on this range site:

Amarillo fine sandy loam, 0 to 1 percent slopes.
Amarillo fine sandy loam, 1 to 3 percent slopes.
Arch fine sandy loam.
Arvana fine sandy loam, 0 to 1 percent slopes, moderately deep.
Arvana fine sandy loam, 1 to 3 percent slopes, moderately deep.
Loamy colluvial land.
Portales fine sandy loam, 0 to 1 percent slopes.
Portales fine sandy loam, 1 to 3 percent slopes.
Zita fine sandy loam, 0 to 1 percent slopes.
Zita fine sandy loam, 1 to 3 percent slopes.

The native vegetation on this site included the plants native to the Deep hardland, Shallow hardland, and Sandy land sites. Most of this site, particularly the areas of fine-textured soils, has now reverted to short grasses. Areas of sandier soils support the taller species.

Sandy land site

This range site is composed of the following soils:

Brownfield fine sand, thin surface.
Brownfield fine sand, thick surface.
Brownfield fine sand, wind-hummocky.
Randall loamy fine sand.
Tivoli fine sand.

The vegetation on this site is about the same as that on the Valley and bottom-land site, except that the taller grasses, which are predominant, are less abundant than on the bottom-land site. The most prevalent species are hairy grama, hooded windmillgrass, black grama, fall witchgrass (*Leptoloma cognatum*) and vine-mesquite. All of these are increasers.

Rough breaks site

This range site includes the following two mapping units:

Potter soils.
Rough broken land.

Because this site is made up of a mixture of soil materials, the vegetation has characteristics of the vegetation on all other sites in the country. Tall grasses are predominant, but most stands are sparse and low in productivity. In areas that are accessible for heavy grazing, the forage will usually deteriorate to a very sparse stand of low-quality grasses and invading forbs.

Changes in Range Vegetation

Under climax conditions, the relative proportion of decreasers and increasers varied by sites. Generally, in Lynn County, the more favorable sites — the Valley and bottom lands or the Sandy loams — had more decreasers than sites having less favorable moisture conditions.

Grazing and droughts change the composition of range vegetation. The palatable decreasers, because they are most heavily grazed, are replaced by increasers, which withstand grazing better. If heavy grazing continues, the decreasers are gradually eliminated. Livestock are then forced to eat the less palatable increasers, and those too are reduced and may, in turn, be almost eliminated.

As the decreasers and increasers are reduced, the invaders move in. Invaders are plants that grow around animal burrows or in other disturbed areas, or plants that have been brought into the county. Short-lived annuals are invaders that afford some grazing for short periods. Other invaders are worthless brush, and some are poisonous plants such as bitterweed or locoweed.

Common invading plants. — In addition to the plants that are listed in table 6 as invaders in specific range sites, certain other plants are likely to invade any of the rangelands in the county when the climax vegetation is damaged by heavy grazing. Some of the species that invade from the drier areas to the west and southwest are burrograss (*Schleropogon brevifolius*), red grama (*Bouteloua trifida*), ear muhly (*Muhlenbergia arenacea*), cactus (*Opuntia* sp.), and hairy tridens (*Tridens pilosus*). Invaders common to all sites are threeawns (*Aristida* sp.), sandhill muhly (*Muhlenbergia pugens*), broom snakeweed (*Gutierrezia sarothrea*), western ragweed (*Ambrosia psilostachya*), groundsel (*Senicio longilobus*), tumble lovegrass (*Eragrostis sessilispica*), windmillgrass (*Chloris verticillata*), gummy lovegrass (*Eragrostis curtipendicellata*), and croton (*Croton* sp.).

A shrub, mesquite (*Prosopis juliflora*), is the most common and conspicuous invader in this area. This species has invaded all the range sites to some extent; it is possibly the most detrimental of the invading plants. Shin oak (*Quercus havardii*), catclaw (*Acacia* sp.), sand sagebrush (*Artemesia filifolia*), and yucca (*Yucca glauca*) are other shrub invaders; they are especially conspicuous on the Mixed land and Sandy land sites. These shrubs, along with many species of annual forbs, make up much of the vegetation on these two sites.

Range Condition

The present condition of a range is judged by comparing it with the original, or climax, condition. If 75 to 100 percent of the present vegetation is the same as the climax vegetation, the range is in excellent condition. If 50 to 75 percent is the same, the range is in good condition. If 25 to 50 percent is the same, the condition is fair. If less than 25 percent is the same as the climax vegetation, the range is in poor condition.

Assistance in determining the condition of a range can be obtained from the local representative of the Soil Conservation Service.

Management Requirements

Management practices should be aimed at getting native grasslands in good or excellent condition. The principal requirements are to conserve moisture and prevent overgrazing. Moisture supply is the factor that most commonly limits grass growth. Overgrazing destroys the better forage and enables poisonous plants or worthless weeds or brush to invade rangeland.

Regulation of grazing. — Regulation of grazing may be sufficient to maintain or improve range that is in fair or better condition. No more than half the annual growth should be grazed off. This will leave enough top growth to feed the roots and protect the soil. If the range has a cover of good forage grasses but its condition is declining, grazing should be halted to allow the grasses to reseed. Practical means of regulating grazing are fencing, properly locating watering places, and salting to attract the stock to areas that are inaccessible or that produce the least palatable forage.

Brush control, pitting, and seeding. — These are emergency measures that are needed for grasslands that are in poor or fair condition.

If practical, mesquite and other brush invaders should be eradicated. Pitting the soil is a means of retaining rainwater. Pits that are about 36 inches long, 10 inches wide, and 5 inches deep are plowed on the contour. The rows are spaced about 4 feet apart, and the pits 3 to 4 feet apart. Seeding may be profitable if few or no desirable grasses remain. Seeding is usually done at the time pitting or brush-control methods are being applied.

Assistance in planning range management can be obtained from the local representative of the Soil Conservation Service.

Formation and Classification of Soils

Soil is the product of soil-forming processes acting on parent materials deposited or accumulated by geologic agencies. The characteristics of the soil at any given point depend on (1) the physical and mineralogical composition of the parent material; (2) the climate under which the soil material has accumulated and has existed since accumulation; (3) the plant and animal life in and on 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 material.

PARENT MATERIAL. — The parent material of nearly all the soils of Lynn County consisted of calcareous unconsolidated outwash materials derived from the Rocky Mountains.[9] Tivoli and Drake soils have developed in wind-deposited materials of more recent origin. Some of the sandier parent materials were reworked by the wind; some areas where Zita, Portales, and Arch soils developed were probably recalcified as a result of a high water table; and in the zonal soils, free lime has been leached from the A and upper B horizons and has accumulated in the lower horizons.

CLIMATE. — The climate of Lynn County is subhumid; temperatures are moderate. The average annual rainfall is about 18 inches. Strong winds late in winter and in spring cause wind erosion, especially on sandy soils.

External climate, although important in its effect on soil development, is less important than internal soil climate. Internal soil climate depends not only on temperature, rainfall, and humidity, but also on the physical characteristics of the soil or soil material, and on the relief, which, in turn, strongly influences drainage, aeration, runoff, erosion, and exposure to sun and wind.

The amount of moisture affects the rate of weathering. In Lynn County, minerals weather most rapidly in the playa lakes, where surface runoff collects. In other parts of the county weathering is slower because there is little rainfall.

VEGETATION. — Vegetation contributes organic matter to the soils. In Lynn County, the soils developed under grass. The county is in the short-grass zone, but because it is near the more arid Trans-Pecos region, the vegetation has some characteristics common to that of the desert grasslands.

RELIEF. — The relief in Lynn County is smooth and nearly level, except where small playa lakes, 10 to 30 feet deep, occur. Most of the time, these lakes are dry.

TIME. — The soils of the county vary in age. Their apparent age is indicated by the degree of profile development. Reddish Chestnut soils such as the Amarillo and Arvana have well developed profiles, but Regosols such as the Drake and Tivoli have relatively undeveloped profiles.

Processes of Soil Formation

Certain processes of soil formation have produced specific characteristics typical of the soils of the county.

Formation of caliche layer. — While the soils were developing, free lime, dissolved in water, was carried downward from the upper layers. When the water reached a level below which it could not infiltrate, the lime was redeposited, and zones of lime accumulation commonly called "caliche" were built up. Many soils eventually became noncalcareous in the surface layer because of this process of leaching. Soils that are still calcareous to the surface are those that developed from materials rich in lime, or those through which less water percolated, or those that were eroding at a rate about equal to the downward movement of lime.

The thickness of the soil over the caliche greatly affects the suitability of the soil to agriculture. If caliche is near the surface, the root zone is restricted and the water-holding capacity is limited.

Except for the Drake, Randall, and Tivoli soils, all

[9] EVANS, GLEN L. and MEADE, GRAYSON E. QUATERNARY OF THE TEXAS HIGH PLAINS. Univ. of Tex. Pub. No. 4401, pp. 485–507., illus. 1945.

the soils in Lynn County have a layer of caliche. The range in depth to caliche is shown in the following list:

Potter	0–10
Arvana (shallow phase)	10–20
Mansker	10–20
Arvana (moderately deep phases)	20–36
Portales	20–36
Church	20–40
Zita	22–38
Arch	24–40
Lubbock	36–60
Amarillo	32–80
Brownfield	72+

Leaching of clay. — The gradual movement of the finer particles of clay from the surface to the subsoil is a process that has affected the agricultural potential of the soils in Lynn County. Varying quantities of clay particles, in suspension, are carried downward by water. As the movement of water slows down the clay particles are redeposited, and they form a layer that contains more clay than the one above. This process reduces the proportion of clay in the surface soil and increases it in the lower part of the profile. Parent materials that have proportionately larger amounts of sand than clay are affected most by this process. Sandy soils from which most of the clay has been removed by leaching are subject to severe damage by wind erosion.

Classification of Soils

Lynn County is located in the part of the High Plains, south of the Canadian River, known locally as the South Plains. It is within the zone of Reddish Chestnut soils; about 80 percent of the total acreage consists of these soils.

The soil series of Lynn County are described on the following pages. On the basis of their characteristics, they have been placed in orders and great soil groups as follows:

	Series
Zonal order	
Reddish Chestnut	Amarillo. Arvana. Brownfield. Lubbock. Zita.
Intrazonal order	
Calcisol[1]	Arch. Church. Mansker. Portales.
Grumusol	Randall.
Azonal order	
Lithosol	Potter.
Regosol	Drake. Tivoli.

[1] Tentative name for a great soil group consisting of soils developed from highly calcareous parent materials under a sparse stand of short grass and shrubs. (See HARPER, W. G. MORPHOLOGY AND GENESIS OF CALCISOLS. Soil Sci. 21: 420–424, illus. 1957).

Amarillo series

The Amarillo soils, members of the Reddish Chestnut great soil group, developed under bunchgrasses. Their parent materials were calcareous sandy clay loams. They have a brownish loamy A horizon and a reddish sandy clay loam B horizon that overlies a C_{ca} horizon.

The associated soils differ from the Amarillo soils as follows: The Arvana is underlain by hard stonelike caliche within 36 inches; the Lubbock is dark grayish brown; the Portales is calcareous to the surface and underlain by a C_{ca} horizon generally within 36 inches of the surface; the Zita is grayish brown and underlain by a C_{ca} horizon, generally within 36 inches of the surface; the Mansker is underlain by a C_{ca} horizon within 20 inches of the surface; and the Brownfield has a sandier and thicker A horizon.

Amarillo fine sandy loams and Amarillo loams are mapped in Lynn County. The following profile of Amarillo fine sandy loam was taken in an area of native pasture having a weak convex surface and a slope of 0.5 percent, at a point 12.8 miles west of Tahoka, 0.8 miles south of U. S. Highway 380, and 200 feet west of a field road.

A_{11} 0 to 3 inches, brown (7.5YR 4/3;[10] 7.5YR 3/3 when moist) fine sandy loam; very friable (moist), soft (dry); upper inch weak platy, lower 2 inches weak fine granular; noncalcareous; many roots; 0.79 percent organic carbon;[11] a few wormholes; permeable to roots and water; clear transition to horizon below.

A_{12} 3 to 11 inches, reddish-brown (5YR 4/3; 5YR 3/3 when moist) fine sandy loam; friable (moist), moderately hard (dry); compound weak granular and weak very coarse prismatic; porous; noncalcareous; fewer roots than A_{11} horizon; 0.62 percent organic carbon; more wormholes and wormcasts than in horizon above; permeable to roots and water; gradual transition to horizon below.

B_1 11 to 15 inches, reddish-brown (5YR 4/4; 5YR 3/4 when moist) heavy fine sandy loam; friable, very hard; compound weak medium granular, fine subangular blocky, and weak very coarse prismatic; porous; noncalcareous; a few roots concentrated along cleavage planes; 0.78 percent organic carbon; many wormcasts; wormholes larger and more numerous than in horizon above; gradual transition to B_{21} horizon below.

B_{21} 15 to 26 inches, reddish-brown (5YR 4/4; 5YR 3/4 when moist) sandy clay loam; friable, very hard; compound weak medium granular, subangular blocky, and coarse prismatic; not so porous as B_1 horizon; noncalcareous; roots and rootholes less numerous; wormholes and wormcasts; permeable to roots and water; moderate water-storing capacity; diffuse transition to B_{22} horizon.

B_{22} 26 to 36 inches, yellowish-red (5YR 4.5/6; 5YR 4/8 when moist) sandy clay loam; consistence, porosity, and structure same as in B_{21} horizon above; noncalcareous; a few roots and rootholes; wormholes and wormcasts are slightly larger; moderate water-storing capacity; clear transition to B_3 horizon.

B_3 36 to 56 inches, yellowish-red (5YR 5/6; 5YR 4/6 when moist) sandy clay loam; friable, very hard; weak coarse prismatic; noncalcareous but cleavage planes and old root channels coated with weak to strong films of $CaCO_3$; a few roots, rootholes, and wormcasts; moderate water-holding capacity; abrupt transition to C_{ca} horizon.

C_{ca} 56 to 80 inches, pink (5YR 7/4; 5YR 6/4 when moist) sandy clay loam; friable, hard; massive; some hard $CaCO_3$ that is weakly porous; diffuse transition to C horizon.

[10] The verbal description of color refers to dry soil. Unless otherwise indicated the Munsell color notations also refer to dry soil.

[11] Analyses made in laboratory of Division of Soil Survey, U. S. Department of Agriculture, Beltsville, Md.

C 80 to 120 inches +, pink (5YR 7/4; 5YR 6/4 when moist) sandy clay loam; friable, hard; massive; porous; calcareous, with a few hard concretions of $CaCO_3$.

Range in characteristics. — The A horizon of the Amarillo fine sandy loam ranges from 6 to 12 inches in thickness and from light brown to brown in color. The A horizon of the Amarillo loams ranges from brown to dark grayish brown in color and from 4 to 8 inches in thickness. The subsoil ranges from heavy fine sandy loam to clay loam in texture. Depth to the C_{ca} horizon ranges from 46 to 66 inches in the fine sandy loams and from 32 to 54 inches in the loams.

Drainage. — Surface drainage is slow, and internal drainage is medium.

Topography and erosion. — The topography, in general, is nearly level to very gently undulating. Small areas that are more strongly sloping occur around some of the playa lakes. In these places, cultivated fields have been damaged by erosion. The fine sandy loams are moderately susceptible to wind erosion; cultivated fields require very careful management.

Distribution and use. — The Amarillo soils occupy about 65 percent of the county. They occur throughout the county, except in an area in the west-central part. About 85 percent of the acreage is cultivated.

Arch series

The Arch soils developed from calcareous sandy loams, under a cover of medium bunchgrasses. They have a strongly calcareous, loamy, pale-brown A horizon, and a strongly calcareous sandy clay loam B horizon that overlies a C_{ca} horizon. These soils are in the great soil group tentatively named Calcisols.

The associated soils differ from the Arch soils as follows: The Drake has no C_{ca} horizon; the Portales is darker and less strongly calcareous; and the Mansker is shallower over the C_{ca} horizon.

Arch fine sandy loam and Arch clay loam are mapped in Lynn County. The following profile of Arch fine sandy loam was taken from a nearly level cultivated field located about 18 miles southwest of Tahoka and 4 miles south and 2.7 miles east of Newmore.

A_p 0 to 5 inches, pale-brown (10YR 6/3; 10YR 5/3 when moist) fine sandy loam; friable (moist), slightly hard (dry); massive; strongly calcareous; clear transition to A_1 horizon.

A_1 5 to 16 inches, grayish-brown (10YR 6/2; 10YR 5/2 when moist) loam; friable (moist), slightly hard (dry); weak fine granular; porous; strongly calcareous; fine particles of $CaCO_3$ scattered through horizon; diffuse transition to AC horizon.

AC 16 to 26 inches, light brownish-gray (10YR 6/2; 10YR 5/2 when moist) sandy clay loam; friable, slightly hard; porous; massive; strongly calcareous; fine particles of $CaCO_3$ scattered through horizon; abrupt transition to C_{ca} horizon.

C_{ca} 26 to 58 inches, white (10YR 8/2; 10YR 7/2 when moist) clay loam containing lenses of fine blocky clay; friable; strongly calcareous; about 25 percent is soft $CaCO_3$; clear transition to C horizon below.

C or D_u 58 to 84 inches +, white (10YR 8/2; 10YR 7/2 when moist) fine sand containing laminae of clay about 2 inches thick.

Range in characteristics. — The surface soil of Arch fine sandy loam ranges from loamy fine sand to fine sandy loam in texture, from light brownish gray to very pale brown in color, and from 8 to 20 inches in thickness. The C_{ca} horizon is lacking in some areas. Depth to the C horizon ranges from 40 to 72 inches. The clay strata in the substrata are up to 24 inches in thickness.

Drainage. — Surface drainage is very slow, and internal drainage is medium.

Topography and erosion. — These soils occur in nearly level areas. They are not subject to water erosion but are very susceptible to wind erosion.

Distribution and use. — Arch soils are inextensive in Lynn County. Of the two principal areas, one, in the southeastern corner of the county, is entirely in native pasture, and the other, in the southwestern corner, is about 75 percent under cultivation.

Arvana series

The Arvana soils, members of the Reddish Chestnut great soil group, developed from calcareous sandy clay loam under coarse bunchgrasses. They have a brownish loamy A horizon that grades to a reddish sandy clay loam B horizon. Hard stonelike caliche occurs within 36 inches of the surface.

The associated soils differ from the Arvana soils as follows: The Amarillo has no layer of hard caliche; the Mansker is calcareous and has a layer of softer calcium carbonate within 20 inches of the surface.

The profile of Arvana fine sandy loam that is described below was observed in a cultivated field that has a plane surface and a slope of 0.5 percent. This area is located 1 mile north of O'Donnell, 1.4 miles west of U. S. Highway 87, and 100 feet south of a paved road.

A_p 0 to 5 inches, brown (7.5YR 4/4; 7.5YR 2/4 when moist) fine sandy loam; friable (moist), slightly hard (dry); weak fine granular; noncalcareous; clear transition to B_1 horizon.

B_1 5 to 14 inches, reddish-brown (5YR 4/4; 5YR 3/4 when moist) sandy clay loam; friable (moist), very hard (dry); porous; compound moderate medium granular, fine subangular blocky, and moderate medium prismatic structure; noncalcareous; gradual transition to B_{21} horizon.

B_{21} 14 to 20 inches, yellowish-red (5YR 4/6; 5YR 3/6 when moist) sandy clay loam; friable, very hard; compound weak coarse granular, fine subangular blocky, and moderate medium prismatic structure; noncalcareous; diffuse transition to B_{22} horizon.

B_{22} 20 to 30 inches, yellowish-red (5YR 4/6; 5YR 3/6 when moist) clay loam; friable, hard; weak coarse prismatic structure; noncalcareous; abrupt transition to D_r horizon.

D_r 30 to 32 inches +, stonelike caliche.

Range in characteristics. — The A horizon ranges from 4 to 8 inches in thickness and from loam to fine sandy loam in texture. In small areas the B horizon becomes calcareous at a depth of about 16 inches. The depth to stonelike caliche ranges from 20 to 36 inches in the moderately deep phases and from 10 to 20 inches in Arvana fine sandy loam, 0 to 3 percent slopes, shallow.

Drainage. — Surface drainage is slow, and internal drainage is medium.

Topography and erosion. — These soils are nearly level to gently undulating. Water erosion is slight to moder-

ate; wind erosion is likely to damage fields that are not carefully managed.

Distribution and use. — Arvana soils are inextensive. They occur in small areas throughout the country, about 60 percent of the acreage is cultivated.

Brownfield series

The Brownfield soils developed in calcareous sandy clay loam and sandy loam under a cover of coarse bunchgrass and shin oak. They have a brownish sandy A horizon and a reddish sandy clay loam B horizon. A horizon of C_{ca} accumulation occurs 90 or more inches below the surface. The Brownfield soils are members of the Reddish Chestnut great soil group.

The profile of Brownfield fine sand, thin surface, that is described below was taken from a virgin area having a convex surface and a gradient of 1 percent. This area is located 10.9 miles west of Tahoka, 1.8 miles north of U. S. Highway 380, and 100 feet west of a county road.

- A_{11} 0 to 3 inches, brown (7.5YR 4.5/4; 7.5YR 3.5/4 when moist) fine sand; very friable (moist), soft (dry); single grain when dry, but slightly coherent when moist; neutral; plant roots moderately numerous; 0.76 percent of organic carbon; water moves freely; clear transition to A_{12} horizon.
- A_{12} 3 to 17 inches, brown (7.5YR 5/4; 7.5YR 4/4 when moist) fine sand; very friable (moist), soft (dry); single grain when dry, but slightly coherent when moist; neutral; not so many roots as in A_{11} horizon; 0.18 percent organic carbon; water moves freely; clear transition to B_{21} horizon.
- B_{21} 17 to 40 inches, yellowish-red (5YR 4/6; 5YR 3/6 when moist) sandy clay loam; friable, very hard; massive to weak coarse blocky; porous; very few roots and root channels; 0.30 percent of organic carbon; permeable to roots and water; moderate water-holding capacity; neutral; gradual transition to B_{22} horizon.
- B_{22} 40 to 80 inches, red (2.5YR 5/6; 2.5YR 4/6 when moist) sandy clay loam; friable, hard; porous; massive; noncalcareous; very few roots, but more root channels; permeable; moderate water-holding capacity; clear transition to B_{23} horizon below.
- B_{23} 80 to 92 inches yellowish-red (5YR 5/8; 5YR 4/8 when moist) sandy clay loam; friable, hard; porous; massive; weakly calcareous; cleavage faces coated with weak films of $CaCO_3$; a few root channels; permeable; moderate water-holding capacity; gradual transition to B_3 horizon.
- B_3 92 to 120 inches, yellowish-red (5YR 5/6; 5YR 4/6 when moist) sandy clay loam; friable, hard; massive; porous; a very few root channels; calcareous, with films of $CaCO_3$; about 10 percent consists of lumps of hard caliche; abrupt transition to C_{ca} horizon.
- C_{ca} 120 to 156 inches +, light-brown (7.5YR 6/4; 7.5YR 5/4 when moist) loam; friable; massive; about 50 percent consists of lumps of soft $CaCO_3$.

Range in characteristics. — The A horizon generally ranges from loamy fine sand to fine sand in texture. In fields that have been deep-plowed the A horizon may be a sandy clay loam, 10 to 18 inches thick in the thin-surface phase, and 18 to 36 inches thick in the thick-surface phase. The C_{ca} horizon occurs in some profiles but is lacking in others. In some areas it is within 40 inches of the surface.

Drainage. — Surface drainage is slow, and internal drainage is medium.

Topography and erosion. — Most of the area is very gently sloping to undulating. The thick-surface phase is undulating to billowy. Water erosion is not a problem, but cultivated areas are susceptible to severe wind erosion and therefore require careful management.

Distribution and use. — The soil occurs mainly in the west-central part of the county. More than 70 percent of the thin-surface phase is cultivated; more than 90 percent of the thick-surface phase is in pasture.

Church series

The Church soil developed in calcareous clays under a cover of short grasses. It occurs in playa lakes. The Church soils are in the great soil group tentatively named Calcisols.

The Church soil occurs in association with the Randall soils, most of which are noncalcareous and less crumbly, and with the Lubbock soils, which are noncalcareous and less clayey in the subsoil.

The profile of Church clay loam that is described below was taken from the floor of a playa lake, located 14.2 miles east of O'Donnell and 3.8 miles south of the headquarters of the Double U Ranch.

- A_{11} 0 to 2 inches, grayish-brown (10YR 5/2; 10YR 3/2 when moist) clay loam; friable (moist), slightly hard (dry); weak platy; calcareous; clear transition to A_{12} horizon.
- A_{12} 2 to 14 inches, dark-gray (10YR 4/1; 10YR 2/1.5 when moist) clay loam; moderately firm; aggregates very hard; slowly permeable; roots penetrate without much difficulty; moderate to strong fine granular and subangular blocky; many roots; calcareous; gradual transition to AC horizon.
- AC 14 to 26 inches, gray (10YR 6/1; 10YR 4/1 when moist) clay; firm, very hard; strong fine blocky; many roots, but not so many as in A_{12} horizon; strongly calcareous; a few soft lumps of $CaCO_3$; clear transition to C_{ca} horizon.
- C_{ca} 26 to 38 inches, light-gray (10YR 7/2; 10YR 6/2 when moist) clay; moderately firm; porous; strongly calcareous; about 30 percent consists of small lumps of $CaCO_3$; clear transition to C horizon.
- C 38 to 60 inches +, white (10YR 8/1; 10YR 7/1 when moist), very porous, calcareous clayey material containing many small shells.

Range in characteristics. — The clay loam A horizon ranges from 10 to 14 inches in thickness and from gray to dark gray in color. In a few of the playa lakes, the soil ranges from clay loam to clay in texture. Depth to the C_{ca} horizon ranges from 20 to 40 inches.

Drainage. — Surface drainage is lacking, and internal drainage is slow.

Topography and erosion. — This soil occurs in depressions and on the floors of playa lakes. There are no hazards of water erosion, but bare areas are likely to be damaged by wind erosion after freezing.

Distribution and use. — This soil is not extensive, but it occurs in many small areas throughout the county. About 50 percent of the acreage is cultivated.

Drake series

The Drake series consists of strongly calcareous, loamy soils that occupy low stabilized dunes on the lee side of some of the playa lakes. These soils developed in windblown materials under a cover of short grasses. They are members of the Regosol great soil group.

The associated soils differ from the Drake as follows: The Portales is less strongly calcareous and has a distinct C_{ca} horizon; the Mansker has a distinct C_{ca} horizon within 20 inches of the surface; and the Zita is darker and noncalcareous in the surface soil and has a distinct C_{ca} horizon.

The profile of Drake soils that is described below was observed in a virgin area having a convex surface and a gradient of 4 percent. This area is located 12.5 miles east of Tahoka, 1.5 miles north of U. S. Highway 380, and 0.25 miles west of a county road.

A_1 0 to 10 inches, light brownish-gray (10YR 6/2; 10YR 5/2 when moist) loam; friable (moist); aggregates slightly hard (dry); compound strong fine granular, fine subangular blocky, and weak prismatic; freely permeable; easily penetrated by roots; many grass roots; a few wormholes and wormcasts; strongly calcareous; gradual transition to C_1 horizon.

C_1 10 to 22 inches, light-gray (10YR 7/2; 10YR 5/2 when moist) sandy clay loam; friable (moist), slightly hard (dry); compound strong fine granular, fine subangular blocky, and weak prismatic; freely permeable; easily penetrated by roots; not so many roots as in A_1 horizon; a few wormcasts; strongly calcareous; diffuse transition to C_2 horizon.

C_2 22 to 64 inches +, light-gray (10YR 7/2; 10YR 6/2 when moist) sandy clay loam; friable; compound strong medium granular and fine subangular blocky; strongly calcareous; weak carbonate zone in lower 8 inches indicated by a few soft lumps of $CaCO_3$.

Range in characteristics. — The A horizon ranges from 8 to 18 inches in thickness, from loam to fine sandy loam in texture, and from grayish brown to light brownish gray in color. The C_{ca} horizon is indistinct or lacking.

Drainage. — Surface drainage and internal drainage are medium.

Topography and erosion. — Surface gradients range from 1 to 5 percent. Cultivated areas are subject to moderate water erosion and severe wind erosion.

Distribution and use. — Drake soils are not extensive, but they occur in small areas in most parts of the county. About 40 percent of the areas having surface gradients of less than 3 percent are cultivated, but only about 10 percent of the areas having surface gradients of more than 3 percent are cultivated.

Lubbock series

The Lubbock series consists of dark, grayish soils that occur in slight depressions. These soils developed in calcareous sandy clay loams and clay loams under a cover of short grasses. They are members of the Reddish Chestnut great soil group.

The associated soils differ from the Lubbock soils as follows: The Amarillo is reddish in color; the Church is calcareous and less blocky in the subsoil; the Randall is more compact and less crumbly; and the Zita has a C_{ca} horizon that occurs within 20 to 36 inches of the surface.

The profile of cultivated Lubbock clay loam that is described below was taken from a slight depression having a concave surface. This area is located 10 miles south of Tahoka, 5.75 miles east of U. S. Highway 87, and just north of a paved farm-to-market road.

A_{1p} 0 to 6 inches, grayish-brown (10YR 5/2; 10YR 3/1.5 when moist) clay loam; friable (moist), slightly hard (dry); moderate fine granular; noncalcareous; less clayey than A_{12} horizon; clear transition to A_{12} horizon.

A_{12} 6 to 16 inches, grayish-brown (10YR 5/1.5; 10YR 3/1.5 when moist) clay loam; friable (moist), hard (dry); moderate to strong medium and fine granular and fine subangular blocky; noncalcareous; gradual transition to B_1 horizon.

B_1 16 to 24 inches, grayish-brown (10YR 5/2; 10YR 4/1.5 when moist) sandy clay; firm, very hard; moderate medium granular, fine subangular blocky, and weak medium blocky; noncalcareous; gradual transition to B_2 horizon.

B_2 24 to 34 inches, brown (10YR 5/2.5; 10YR 4/2.5 when moist) clay; very firm, very hard; moderate medium blocky; noncalcareous; gradual transition to B_3 horizon below.

B_3 34 to 44 inches, light brownish-gray (10YR 6/2; 10YR 5/2 when moist) clay; very firm, very hard; weak coarse blocky; calcareous; clear transition to C_{ca} horizon.

C_{ca} 44 to 66 inches, white (10YR 8/2; 10YR 7/2 when moist) clay; about 20 percent consists of soft lumps of $CaCO_3$, ¼ to ½ inch in diameter; gradual transition to C horizon.

C 66 to 80 inches +, very pale brown (10YR 7/4; 10YR 6/4 when moist) clay loam; friable and crumbly; a few soft lumps of $CaCO_3$ in upper part.

Range in characteristics. — The A horizon ranges from 10 to 20 inches in thickness, from dark gray to dark grayish brown in color, and from loam to clay loam in texture. Depth to the C_{ca} horizon ranges from 36 to 60 inches.

Drainage. — There is no surface runoff; internal drainage is slow.

Topography and erosion. — These soils occur in slight depressions that have concave surfaces. Water erosion is not a hazard, but slight to moderate wind erosion may occur on Lubbock fine sandy loam.

Distribution and use. — Lubbock soils are not extensive. They occur in small areas throughout the county. More than 85 percent of the acreage is cultivated.

Mansker series

The Mansker series consists of strongly calcareous, light-colored soils. They developed in calcareous sandy clay loams under a cover of short grasses. A C_{ca} horizon occurs within 20 inches of the surface. Mansker soils are in the great soil group tentatively named Calcisols.

The associated soils differ from the Mansker soils as follows: The Potter has a C_{ca} horizon within 10 inches of the surface; the Portales is deeper, having a C_{ca} horizon at depths of 20 to 36 inches; the Zita is darker and noncalcareous; and the Drake has no C_{ca} horizon.

The profile of Mansker loam that is described below was taken from a virgin area having a concave surface and a gradient of 2 percent. This area is 7 miles south of Tahoka, 0.6 miles west of U. S. Highway 87, and just south of a county road.

A_{11} 0 to 5 inches, grayish-brown (10YR 5/2.5; 10YR 3/2.5 when moist) loam; friable (moist), soft (dry); porous; moderate fine granular; strongly calcareous; scattered, small, hard concretions of $CaCO_3$; gradual transition to A_{12} horizon.

A_{12} 5 to 16 inches, light brownish-gray (10YR 6/2.5; 10YR 4/2.5 when moist) sandy clay loam; friable, slightly hard; compound weak medium prismatic

and moderate fine granular; strongly calcareous; more small, hard concretions of $CaCO_3$ than in A_{11} horizon; abrupt transition to C_{ca} horizon.

C_{ca} 16 to 30 inches, pinkish-white (7.5YR 8/2; 7.5YR 7/2 when moist) extremely calcareous clay loam; about 75 percent consists of soft lumps and a few hard concretions of $CaCO_3$; diffuse transition to C horizon.

C 30 to 84 inches +, pink (7.5YR 7/4; 7.5YR 6/4 when moist) sandy clay loam; friable; porous; massive; strongly calcareous; small lumps and concretions of $CaCO_3$ in upper part.

Range in characteristics. — The A horizon ranges from fine sandy loam to sandy clay loam in texture and from brown to grayish brown in color. Depth to the C_{ca} horizon ranges from 10 to 20 inches.

Drainage. — Surface drainage is slow to rapid, and internal drainage is medium.

Topography and erosion. — These soils occur on low ridges and at the crests of slopes. Gradients range from 1 to 6 percent. Cultivated fields are subject to moderate erosion by water and moderate to severe erosion by wind.

Distribution and use. — Mansker soils occur in small areas throughout the county. They are not well suited to cultivation, but about 60 percent of the less strongly sloping acreage is cultivated.

Portales series

The Portales series consists of brownish, moderately deep, calcareous soils. They developed in calcareous, friable sandy clay loams under a cover of short and medium grasses. These soils are in the great soil group tentatively named Calcisols.

The associated soils differ from the Portales soils as follows: The Mansker is shallower over caliche; the Zita is noncalcareous to the surface; and the Amarillo is reddish in color.

The profile of Portales loam that is described below was taken from a large, nearly level cultivated area having a plane surface. This area is 10.1 miles south of Tahoka and 2.9 miles east of U. S. Highway 87, along the north side of Farm Highway 213.

A_{1p} 0 to 4 inches, grayish-brown (10YR 5/2.5; 10YR 3/3 when moist) loam; friable (moist), slightly hard (dry); weak fine granular; calcareous; clear transition to A_{11} horizon.

A_{11} 4 to 10 inches, grayish-brown (10YR 5/2.5; 10YR 3/3 when moist) loam; friable (moist), hard (dry); compound weak medium prismatic, fine subangular blocky; and moderate medium granular; porous; calcareous; a few weak films of $CaCO_3$ and a few small hard concretions of $CaCO_3$; a few roots and root channels; a moderate number of wormholes and wormcasts; permeable to roots and water; moderate water-holding capacity; diffuse transition to A_{12} horizon.

A_{12} 10 to 26 inches, light-brown (7.5YR 6/3; 7.5YR 4/3 when moist) sandy clay loam; moderately friable or hard; compound weak medium prismatic, moderate medium granular, and fine subangular blocky; strongly calcareous; soil aggregates and old root channels coated with films of $CaCO_3$; fewer wormholes and wormcasts than in horizon above; permeable to roots and water; moderate water-holding capacity; diffuse transition to AC horizon.

AC 26 to 34 inches, this horizon is same as A_{12} horizon except that its structure is weaker and coarser and there is more $CaCO_3$, which occurs as a few coarse soft lumps; abrupt transition to C_{ca} horizon.

C_{ca} 34 to 46 inches, pinkish-white (7.5YR 8/2; 7.5YR 7/2 when moist) sandy clay loam; friable; massive; 30 to 50 percent consists of soft lumps of $CaCO_3$; gradual transition to C horizon.

C 46 to 84 inches +, light-brown (7.5YR 6/4; 7.5YR 5/4 when moist) sandy clay loam; friable, slightly hard; porous; massive; calcareous; 10 to 20 percent consists of small soft lumps of $CaCO_3$.

Range in characteristics. — The A horizon ranges from 4 to 12 inches in thickness, from brown to dark grayish brown in color, and from loam to clay loam in texture. The A_{12} horizon ranges from pale brown to grayish brown in color and from sandy clay loam to clay loam in texture. Depth to the C_{ca} horizon ranges from 20 to 36 inches.

Drainage. — Surface drainage is very slow, and internal drainage is medium.

Topography and erosion. — The soils are nearly level to gently sloping. The gently sloping areas are subject to slight water erosion. Areas of Portales fine sandy loams are subject to wind erosion.

Distribution and use. — These soils occur throughout the county in both small and large areas. About 75 percent of the acreage is cultivated.

Potter series

The Potter series consists of very shallow, light-colored soils that overlie semi-indurated calcium carbonate ($CaCO_3$). The thin layer of soil developed from calcium carbonate under a thin cover of short grasses. These soils are members of the Lithosol great soil group.

The associated soils differ from the Potter soils as follows: The Mansker is deeper to the C_{ca} horizon, or from 10 to 20 inches deep; the Portales is 20 to 38 inches deep over a C_{ca} horizon; and the Arvana is reddish in color and noncalcareous to the surface.

The profile of Potter soils that is described below was taken from a virgin area having a convex surface and a gradient of about 6 percent. This area is located 5.5 miles north-northeast of Tahoka on a gravelly slope that grades to Tahoka Lake.

A_1 0 to 4 inches, grayish-brown (10YR 5/2; 10YR 3/2 when moist) gravelly loam; friable (moist), soft (dry); weak fine granular; strongly calcareous; many fragments of caliche (¼ to 2 inches in diameter) on and below the surface; abrupt transition to the C_{ca} horizon.

C_{ca} 4 inches +, white semi-indurated $CaCO_3$; grades to pink calcareous sandy clay loam at depths of a few feet to several feet.

Range in characteristics. — The thin mantle of soil ranges up to 10 inches in thickness and from brown to light brownish gray in color.

Drainage. — Surface drainage is slow to rapid; drainage through the semi-indurated caliche is slow.

Topography and erosion.—Potter soils occur on slopes ranging from 3 to 15 percent, most of which grade from the high smooth plain down to the salt lakes and to some of the playa lakes. Geologic erosion is active.

Distribution and use. — The soil occurs throughout most of the county in a few large areas and many small areas. All of it is in pasture.

Randall series

The Randall series consists of gray, compact, massive soils that occupy the floors of many of the playa lakes. The soils developed in calcareous and noncalcareous clays under a cover of short grasses and water sedges. They are members of the Grumusol great soil group.

The associated soils differ from the Randall soils as follows: The Church is calcareous, less massive, and more crumbly; the Lubbock is less massive and more crumbly; and the Zita is more crumbly and has a C_{ca} horizon at depths of 20 to 36 inches.

Randall clay and Randall loamy fine sand are the only soil types of this series that are mapped in Lynn County. Randall loamy fine sand consists of a wind-deposited layer of loamy fine sand, 8 to 30 inches thick, that overlies clay. The profile of Randall clay that is described below was taken from the floor of a playa lake, located 6.6 miles north-northeast of Tahoka and about 300 feet west of Farm Road 400. This area is cultivated.

A_{1p} 0 to 4 inches, dark grayish-brown (10YR 4/1.5; 10YR 3/2 when moist) clay; very firm (moist), very sticky (wet), and very hard (dry); massive; absorbs water very slowly; pH 6.8; abrupt transition to A_{12} horizon.

A_{12} 4 to 40 inches, dark-gray (10YR 4/1; 10YR 3/1 when moist) clay; dense; very firm (moist), extremely hard (dry), very sticky (wet); massive; almost impervious to water when wet; cracks ½ inch to 4 inches wide occur when dry; noncalcareous; very few plant roots; diffuse transition to C horizon below.

C 40 to 84 inches +, light brownish-gray (10YR 6/2; 10YR 4/2 when moist) clay; sand grains evident; firm to very firm, very hard; massive; noncalcareous; not so dense as A_{12} horizon; very slowly permeable.

Range in characteristics. — The A horizon ranges from gray to dark gray in color and from 22 to 48 inches in thickness. The entire profile may or may not be calcareous. The calcareous spots occur on the ridges of the microrelief.

Drainage. — There is no surface runoff; internal drainage is very slow or nonexistent. Runoff water from surrounding areas collects in playa lakes. After heavy rains or prolonged rainy weather, water stands in the lakes for periods of a few days to several months.

Topography and erosion. — These soils occur in depressions having concave surfaces. The surface of virgin areas has a microrelief of parallel ridges separated by microdepressions. These depressions are 2 to 6 feet wide, 10 to 100 feet long, and 4 to 16 inches deep. Water erosion is not a hazard, but bare fields are subject to wind erosion after freezing.

Distribution and use. — Randall clay occurs in all parts of the county, in playa lakes ranging from 2 to 40 acres in size. There are fewer playa lakes in areas in which Brownfield soils occur. About 60 percent of the acreage is cultivated.

Tivoli series

The Tivoli soil occurs as stabilized sand dunes. It developed in eolian sands under a cover of shin oak and coarse bunchgrasses. The Tivoli series is a member of the Regosol great soil group.

This soil occurs principally in association with the Brownfield, which is darker colored and has a B horizon within 36 inches of the surface. The profile of Tivoli fine sand that is described below was observed on a stabilized dune, 10 to 12 feet high, surrounded by gently undulating upland. The location is 10 miles west of Tahoka and 4 miles north of U. S. Highway 380.

A 0 to 6 inches, pale-brown (10YR 6/3; 10YR 4/3 when moist) fine sand; very friable, weakly coherent when moist; single grain and loose when dry; few roots; neutral; clear transition to C horizon below.

C 6 to 54 inches +, very pale brown (10YR 7/3; 10YR 6/3 when moist) fine sand; very friable and weakly coherent when moist; single grain when dry; a few small roots; neutral.

Range in characteristics. — The A horizon ranges from 4 to 8 inches in thickness and from light brownish gray to pale brown in color. The C horizon ranges from very pale brown to yellow.

Drainage. — The loose sand readily absorbs rainfall. Internal drainage is very rapid.

Topography and erosion. — The surface is distinctly billowy; the dunes range from 6 to 15 feet in height. Areas devoid of vegetation are subject to very severe wind erosion.

Distribution and use. — This soil is small in extent and is confined to a few areas in the west-central part of the county. It is nonarable and is entirely in pasture.

Zita series

The Zita series consists of dark, noncalcareous loamy soils that are moderately deep over a C_{ca} horizon. These soils developed in calcareous, crumbly sandy clay loam under a cover of short and medium grasses. They are members of the Reddish Chestnut great soil group.

The associated soils differ from the Zita soils as follows: The Portales is calcareous to the surface; the Lubbock has a blocky structure in the B horizon and is more than 36 inches deep to the C_{ca} horizon; the Amarillo is reddish and more than 36 inches deep over the C_{ca} horizon; and the Church occurs in distinct depressions and is calcareous to the surface.

The profile of Zita loam, 0 to 1 percent slopes, that is described below was observed in a nearly level cultivated field, located 11.8 miles south of Tahoka, 2.9 miles east of U. S. Highway 87, and 0.25 mile south of a county road.

A_{1p} 0 to 4 inches, grayish-brown (10YR 5/2; 10YR 3/2 when moist) loam; friable (moist), soft (dry); moderate fine granular; noncalcareous; abrupt transition to A_{12} horizon.

A_{12} 4 to 11 inches, dark grayish brown (10YR 4/2; 10YR 2/2 when moist) sandy clay loam; friable (moist), hard (dry); permeable to water and easily penetrated by roots; compound weak medium granular, fine subangular blocky, and moderate medium prismatic; porous; a few wormholes and wormcasts; noncalcareous; gradual transition to B_{21} horizon.

B_{21} 11 to 18 inches, grayish-brown (10YR 5/2; 10YR 3.5/2 when moist) clay loam; moderately firm, very hard; compound weak medium prismatic, moderate medium granular, and fine subangular blocky; permeable and easily penetrated by roots; more worm-

holes and wormcasts than in horizon above; calcareous; a few threads of $CaCO_3$ on soil aggregates; clear transition to B_{22} horizon below.

B_{22} 18 to 26 inches, light-gray (10YR 7/1; 10YR 6/1 when moist) clay loam; same structure and consistence as B_{21} horizon; strongly calcareous; a few soft lumps and hard concretions of $CaCO_3$; permeable and easily penetrated by roots; aggregates coated with films of $CaCO_3$; very few wormcasts; clear transition to C_{ca} horizon.

C_{ca} 26 to 46 inches, pale-brown (10YR 7/4; 10YR 6/4 when moist) clay loam; friable, slightly sticky; weakly prismatic; strongly calcareous; large amount of $CaCO_3$ occurs in large soft lumps; diffuse transition to C horizon below.

C 46 to 84 inches +, pink (7.5YR 7/4; 7.5YR 6/4 when moist) silty clay loam; moderately firm, sticky; massive; calcareous; a few soft lumps of $CaCO_3$ in upper part.

Range in characteristics. — The A horizon ranges from loam to clay loam in texture, grayish brown to dark grayish brown in color, and 6 to 12 inches in thickness. The B horizon ranges from sandy clay loam to clay loam in texture and from a grayish brown to brown in color. Depth to the C_{ca} horizon ranges from 22 to 36 inches.

Drainage. — Surface drainage is very slow, and internal drainage is medium to slow.

Topography and erosion. — Nearly all of the acreage occurs on slopes of less than 1 percent. The water erosion hazard is slight. Some wind erosion and soil drifting occur in unprotected fields.

Distribution and use. — These soils occur in small and large areas in most parts of the county. Nearly 90 percent of the acreage is cultivated.

Laboratory Determinations

The results of the mechanical analyses of five soils in Lynn County are shown on table 7. These analyses were made in the laboratory of the Division of Soil Survey, U. S. Department of Agriculture, Beltsville, Md.

TABLE 7.—*Mechanical analysis of five soils*

Soil name and sample number	Horizon	Depth	pH	Organic carbon	Sand (0.05 mm.)	Silt (0.05-0.002 mm.)	Clay (0.002 mm.)
Amarillo fine sandy loam:		*Inches*		*Percent*	*Percent*	*Percent*	*Percent*
52Tex–153–31–1	A_{11}	0– 3	6.6	0.79	67.0	19.8	13.2
52Tex–153–31–2	A_{12}	3– 11	6.8	.62	73.3	14.9	11.4
52Tex–153–31–3	B_1	11– 15	7.0	.78	67.0	14.6	18.4
52Tex–153–31–4	B_{21}	15– 26	7.2	.51	64.3	14.2	21.5
52Tex–153–31–5	B_{22}	26– 36	7.7	.30	61.3	15.7	23.0
52Tex–153–31–6	B_3	36– 56	7.8	.17	64.0	13.0	23.0
52Tex–153–31–7	C_{ca} and C	56–120	8.1	.12	55.5	22.3	22.2
Amarillo loam:							
52Tex–153–34–1	A_{11}	0– 2	7.6	1.26	56.8	24.5	18.7
52Tex–153–34–2	A_{12}	2– 9	7.5	1.17	56.5	20.0	23.5
52Tex–153–34–3	A_3	9– 12	7.8	1.11	53.1	18.9	28.0
52Tex–153–34–4	B_{21}	12– 21	7.8	.77	46.7	22.6	30.7
52Tex–153–34–5	B_{22}	21– 30	8.0	.57	41.6	26.2	32.2
52Tex–153–34–6	C_{ca}	30– 60	8.2	.29	38.2	30.2	31.6
52Tex–153–34–7	C	60– 80	8.0	.09	48.9	22.4	28.7
Brownfield fine sand:							
51Tex–153–8–1	A_1	0– 3	7.2	.76	90.0	6.3	3.7
51Tex–153–8–2	A_{12}	3– 17	7.4	.18	93.2	3.8	3.0
51Tex–153–8–3	B_{21}	17– 40	6.8	.30	66.6	9.9	23.5
51Tex–153–8–4	B_{22}	40– 80	7.0	.11	68.3	7.4	24.3
51Tex–153–8–5	B_{31}	80– 92	7.8	.05	69.7	10.5	19.8
51Tex–153–8–6	B_{32}	92–120	8.0	.04	57.9	20.6	21.5
51Tex–153–8–7	C_{ca}	120–156	8.2	.02	46.7	29.2	24.1
Portales loam:							
52Tex–153–3–1	A_{1p}	0– 3	7.8	.95	50.4	24.9	24.7
52Tex–153–3–2	A_{12}	3– 8	7.6	.87	53.2	22.2	24.6
52Tex–153–3–3	A_{13}	8– 15	7.7	.59	45.0	22.4	32.6
52Tex–153–3–4	A_{14}	15– 22	7.8	.44	44.0	23.0	33.0
52Tex–153–3–5	C_{ca}	22– 30	7.9	.25	35.9	29.4	34.7
Drake soils:							
51Tex–153–5–1	A_1	0– 10	7.9	1.21	61.3	22.2	16.5
51Tex–153–5–2	A_2	10– 22	8.0	.66	47.6	16.7	35.7
51Tex–153–5–3	AC	22– 64	8.7	.28	49.0	17.5	33.5
51Tex–153–5–4	C_u	64–108	8.7	.11	47.3	19.9	32.8
51Tex–153–5–5	C_u	108–120	8.8	.08	36.2	24.4	39.3

Summary of important characteristics of the soils of Lynn County, Texas

Map symbol	Soil	Surface soil	Subsoil	Depth to and kind of caliche	Substratum	Wind-erosion hazard	Water-erosion hazard	Water-holding and water-supplying capacity	Permeability	Dominant slope range
										Percent
Aa	Amarillo fine sandy loam, 0 to 1 percent slopes.	Brown, friable, noncalcareous fine sandy loam; 6 to 12 inches thick.	Reddish-brown to yellowish-red, friable, crumbly, granular and subangular blocky sandy clay loam; calcareous below about 40 inches.	46 to 66 inches to soft caliche.	Calcareous, friable sandy clay loam.	Moderate	Moderate on slopes of more than 2 percent.	Very good	Moderate	0–2
Ab	Amarillo fine sandy loam, 1 to 3 percent slopes.									
Ac	Amarillo loam, 0 to 1 percent slopes.	Grayish-brown, friable, granular, noncalcareous loam; 4 to 8 inches thick.	Reddish-brown, friable, crumbly, granular, subangular blocky, and prismatic sandy clay loam; calcareous below 16 to 24 inches.	32 to 54 inches to soft caliche.	Calcareous, friable sandy clay loam and clay loam.	Slight to moderate.	Slight; moderate on slopes of more than 1 percent.	Good to very good.	Moderate	0–1
Ad	Amarillo loam, 1 to 3 percent slopes.									
Ag	Arch fine sandy loam.	Pale-brown, friable, strongly calcareous fine sandy loam; 8 to 20 inches thick.	Light brownish-gray, friable, porous, granular, strongly calcareous sandy clay loam.	24 to 40 inches to soft caliche.	Strongly calcareous sandy loams and clay loams.	Severe	None	Good	Moderately rapid.	0–1
Ae	Arch clay loam	Light brownish-gray, granular, strongly calcareous clay loam.	Light-gray, granular, strongly calcareous clay loam.	24 to 40 inches to soft caliche.	Strongly calcareous clay loam.	Moderate to severe.	Moderate	Good	Moderate	0–2
Ah	Arvana fine sandy loam, 0 to 3 percent slopes, shallow.	Brown, friable, granular, noncalcareous fine sandy loam; 5 to 10 inches thick.	Reddish-brown, friable, granular, subangular blocky, and prismatic, noncalcareous sandy clay loam.	10 to 20 inches to stonelike caliche.	Calcareous, friable sandy clay loam.	Moderate	Moderate on slopes of more than 2 percent.	Fair	Moderate	0–2
Ak	Arvana fine sandy loam, 0 to 1 percent slopes, moderately deep.	Brown, friable, granular noncalcareous fine sandy loam; 5 to 10 inches thick.	Reddish-brown to yellowish-red, friable, granular, subangular blocky, and prismatic, noncalcareous sandy clay loam.	20 to 36 inches to stonelike caliche.	Calcareous, friable sandy clay loam.	Moderate	Moderate on slopes of more than 2 percent.	Good	Moderate	0–2
Am	Arvana fine sandy loam, 1 to 3 percent slopes, moderately deep.									
Ba	Brownfield fine sand, thin surface.	Brown, very friable, loose, noncalcareous fine sand; 10 to 18 inches thick.	Yellowish-red, friable, porous, prismatic, noncalcareous sandy clay loam.	More than 120 inches to soft caliche.	Calcareous sandy loam.	Severe	None	Very good	Moderate	0–3

Bb	Brownfield fine sand, thick surface.	Brown, very friable, loose, noncalcareous fine sand; 18 to 36 inches thick.	Yellowish-red, friable, porous, prismatic, noncalcareous sandy clay loam.	More than 120 inches to soft caliche.	Calcareous sandy loam.	Very severe.	None	Very good	Moderate	0–3
Bc	Brownfield fine sand, windhummocky.									
Ca	Church clay loam.	Dark-gray, friable, granular and subangular blocky, calcareous clay loam; 10 to 14 inches thick.	Gray, very firm, granular and subangular blocky calcareous clay.	20 to 40 inches to soft caliche.	Calcareous clay loam.	Moderate to severe.	None	Fair	Slow	0
Da	Drake soils, 1 to 3 percent slopes.	Light brownish-gray, friable, granular and subangular blocky, strongly calcareous loams and clay loams; 8 to 18 inches thick.	Light-gray, friable, granular and subangular blocky, strongly calcareous loams and clay loams.	No caliche.	Strongly calcareous loams and clay loams.	Severe	Moderate	Good	Moderate	1–3
Db	Drake soils, 3 to 5 percent slopes.	Light brownish-gray, friable, granular and subangular blocky, strongly calcareous loams and clay loams; 8 to 18 inches thick.	Light-gray, friable, granular and subangular blocky, strongly calcareous loams and clay loams.	No caliche.	Strongly calcareous loams and clay loams.	Severe	Moderate to severe.	Fair to good.	Moderate	3–5
La	Loamy colluvial land.	Grayish-brown, friable, granular, strongly calcareous loams and clay loams; 8 to 12 inches thick.	Light brownish-gray, friable, granular, strongly calcareous loams and clay loams.	30 to 60 inches to soft caliche.	Calcareous loams and clay loams.	Moderate to severe.	Moderate to severe.	Fair to good.	Moderate	3–8
Lc	Lubbock fine sandy loam.	Grayish-brown, friable, granular, noncalcareous fine sandy loam; 5 to 10 inches thick.	Grayish-brown granular loam over dark grayish-brown blocky clay; moderately firm; noncalcareous.	36 to 60 inches to soft caliche.	Calcareous clay loams.	Slight to moderate.	None	Good	Moderately slow.	0
Lb	Lubbock clay loam.	Grayish-brown, moderately friable, granular and subangular blocky, noncalcareous clay loam; 8 to 12 inches thick.	Dark grayish-brown, firm, noncalcareous clay; granular and subangular blocky in upper part; blocky in lower part.	36 to 60 inches to soft caliche.	Calcareous clay loams.	Slight	None	Good	Slow	0

Summary of important characteristics of the soils of Lynn County, Texas—Continued

Map symbol	Soil	Surface soil	Subsoil	Depth to and kind of caliche	Substratum	Wind-erosion hazard	Water-erosion hazard	Water-holding and water-supplying capacity	Permeability	Dominant slope range
										Percent
Ma	Mansker loam, 1 to 3 percent slopes.	Grayish-brown, friable, granular, strongly calcareous loam; 4 to 6 inches thick.	Light brownish-gray, friable, granular, strongly calcareous sandy clay loam.	10 to 20 inches to semi-indurated caliche.	Calcareous sandy clay loam.	Moderate to severe.	Moderate	Fair	Moderate	1–5
Mb	Mansker loam, 3 to 5 percent slopes.									
Pa	Portales fine sandy loam, 0 to 1 percent slopes.	Grayish-brown, friable, calcareous fine sandy loam; 4 to 12 inches thick.	Grayish-brown, friable, calcareous sandy clay loam; granular, subangular blocky, and prismatic.	20 to 36 inches to soft caliche.	Calcareous sandy clay loams.	Moderate	Moderate on slopes of more than 2 percent.	Very good	Moderate	0–3
Pb	Portales fine sandy loam, 1 to 3 percent slopes.									
Pc	Portales loam, 0 to 1 percent slopes.	Grayish-brown, friable, granular and subangular, blocky calcareous loam; 4 to 12 inches thick.	Pale-brown, friable, granular and subangular blocky, strongly calcareous sandy clay loam.	20 to 36 inches to soft caliche.	Calcareous sandy clay loams.	Slight to moderate.	Moderate on slopes of more than 2 percent.	Very good	Moderate	0–3
Pd	Portales loam, 1 to 3 percent slopes.									
Pe	Potter soils	Light brownish-gray, friable, granular, strongly calcareous loam; 0 to 10 inches thick.	No subsoil	0 to 10 inches to semi-hard caliche.	Caliche	Slight	Slight	Fair	Moderate	3–8
Rb	Randall loamy fine sand.	Brown, very friable, loose, noncalcareous loamy fine sand; 8 to 30 inches thick.	Grayish-brown, very firm, blocky, noncalcareous clay.	More than 60 inches; caliche soft or lacking.	Clayey material.	Severe	None	Good	Very slow	0
Ra	Randall clay	Gray, very firm, massive, noncalcareous clay; 20 to 40 inches thick.	Gray, firm to very firm, massive, noncalcareous clay.	More than 60 inches; caliche soft or lacking.	Clayey material.	Slight	None	Poor	Very slow	0
Ta	Tivoli fine sand	Pale-brown, loose, noncalcareous fine sand; 4 to 8 inches thick.	Very pale brown, loose, noncalcareous fine sand.	No caliche.	Windblown sands.	Very severe.	None	Poor	Very rapid.	3–8

Za Zb	Zita fine sandy loam, 0 to 1 percent slopes. Zita fine sandy loam, 1 to 3 percent slopes.	Grayish-brown, friable, granular, noncalcareous fine sandy loam; 4 to 10 inches thick.	Dark grayish-brown, friable, granular and subangular blocky sandy clay loam; calcareous at depths of 16 to 26 inches.	22 to 36 inches to soft caliche.	Calcareous sandy clay loams.	Moderate	Slight	Good	Moderate	0–1
Zc	Zita loam, 0 to 1 percent slopes.	Grayish-brown to dark grayish-brown, friable, granular, noncalcareous loam; 4 to 8 inches thick.	Dark grayish-brown, friable, granular and subangular blocky sandy clay loam; calcareous at depths of 16 to 26 inches.	24 to 38 inches to soft caliche.	Calcareous sandy clay loams.	Slight to moderate.	Slight	Good	Moderate	0–1

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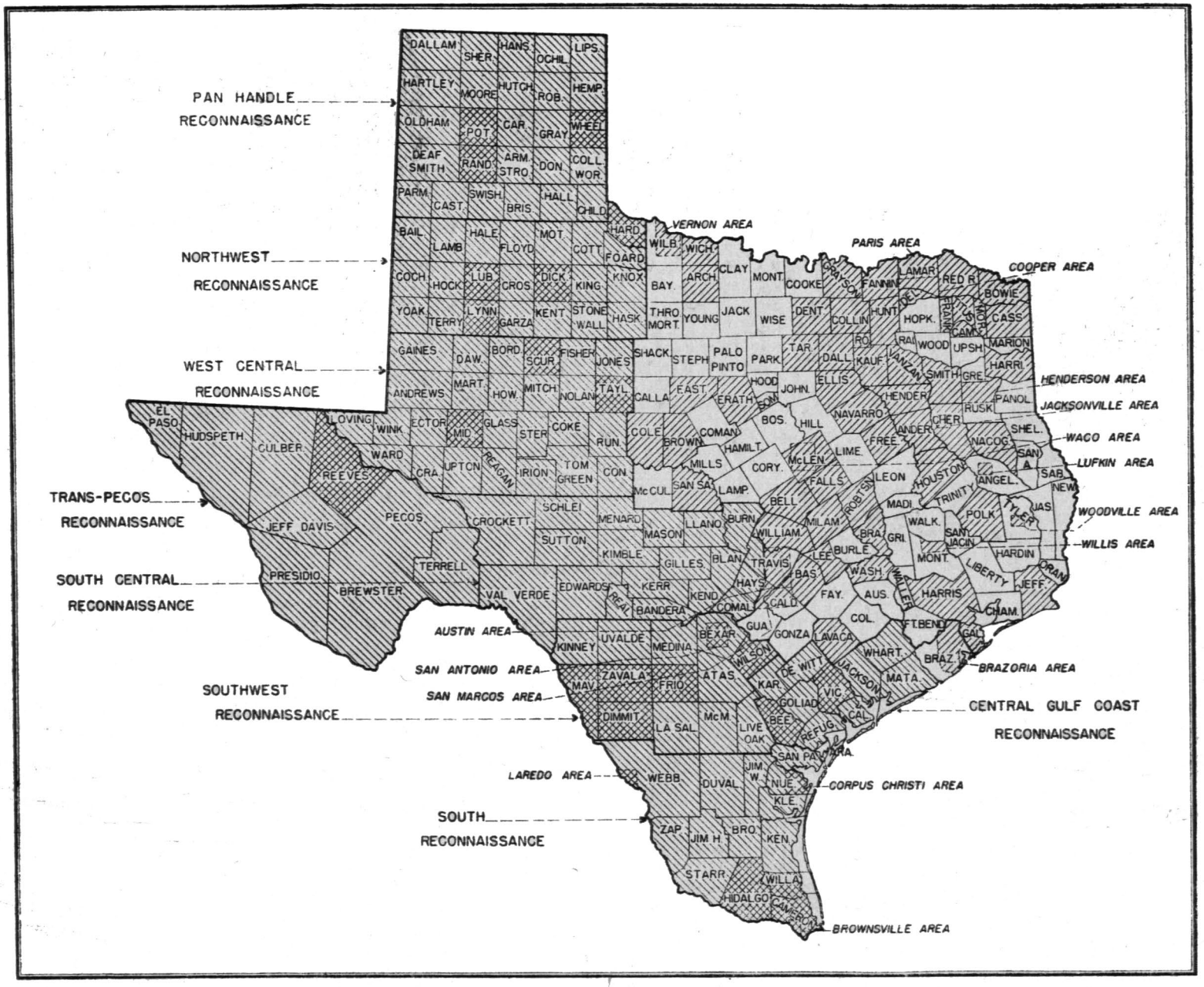

Areas surveyed in Texas shown by shading. Detailed surveys shown by northeast-southwest hatching; reconnaissance surveys by northwest-southeast hatching; crosshatching indicates areas surveyed by both methods.

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