Issued July 11, 1916.

U. S. DEPARTMENT OF AGRICULTURE,

BUREAU OF SOILS—MILTON WHITNEY, Chief.

SOIL SURVEY OF ROGER MILLS COUNTY, OKLAHOMA.

BY

J. A. KERR, J. H. AGEE, AND E. C. HALL.

HUGH H. BENNETT, INSPECTOR, SOUTHERN DIVISION.

[Advance Sheets—Field Operations of the Bureau of Soils, 1914.]

WASHINGTON:
GOVERNMENT PRINTING OFFICE.
1916.

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LETTER OF TRANSMITTAL.

U. S. DEPARTMENT OF AGRICULTURE,
BUREAU OF SOILS,
Washington, D. C., December 11, 1915.

SIR: In the extension of the soil survey in the State of Oklahoma a survey was made of Roger Mills County during the field season of 1914.

I have the honor to transmit herewith the manuscript and map covering this work and to recommend their publication as advance sheets of Field Operations of the Bureau of Soils for 1914, as authorized by law.

Respectfully,

MILTON WHITNEY,
Chief of Bureau.

Hon. D. F. HOUSTON,
Secretary of Agriculture.

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SOIL SURVEY OF ROGER MILLS COUNTY, OKLAHOMA.

By J. A. KERR, J. H. AGEE, and E. C. HALL.

DESCRIPTION OF THE AREA.

Roger Mills County, Oklahoma, is a western border county, lying about midway between the northern and southern State lines. The Canadian River forms the northern boundary of the county, separating it from Ellis County. Dewey and Custer Counties adjoin it on the east, Beckham County on the south and on the west by Texas. The county is about 36 miles long from east to west, and averages about 32 miles wide from north to south. It has an area of 1,135 square miles, or 726,400 acres.

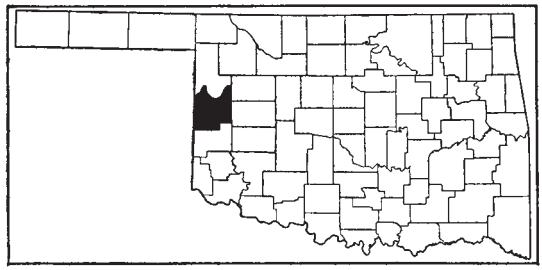

FIG. 1.—Sketch map showing location of the Roger Mills County area, Oklahoma.

Approximately three-fourths of the county is drained by the Washita River, which flows through the central part. The Canadian River drains a strip averaging about 5 or 6 miles wide along the northern boundary. Sweetwater Creek drains a small tract in the southwestern part of the county, and small areas along the southern boundary are drained by other tributaries into the Red River.

Roger Mills County lies within the Great Plains and its topographic features are the result of erosion and grading. Its general slope is toward the east. It includes areas of smooth upland, remnants of a former high plain which covered the entire region, and two areas of lowland, the products of erosion, lying along the two main streams.

In general, the high plain has an undulating to gently rolling topography. The surface is not greatly modified by stream erosion, and is but little altered by wind action. The topography is not nearly so irregular as that of the lowland areas, but the valleys are sufficiently deep to render the surface moderately rolling to somewhat hilly in places. There are a few remnants of what may be regarded as the original uneroded surface. The largest of these, at Durham, in the northwestern part of the county on the Canadian-

Washita divide, is about 10 miles long and 2 miles wide. Farther east, at Crawford and at Roll, are gently rolling areas of 3 or 4 square miles each, and in the northeastern section there are three smaller ones. Areas of similar topography occur on both sides of Rush Creek, near its mouth, and on the divide between Rush Creek and the Washita River, at Bachelor School and at Butlers Store. In the northwestern part of the county, a few miles northwest of Durham, are several small mesas, which rise well above the level of the flat at Durham, and probably are remnants of a higher plain. On the Washita-Sweetwater divide there is an area of about 30 square miles, extending from the western boundary of the county to Dempsey, which shows only traces of former watercourses, and is somewhat modified by wind action. The topography of the area draining into Red River is mainly undulating to rolling, and this area apparently constitutes a slightly modified remnant of the original surface. Considerable rough, broken land has been developed by erosion in the valleys of Buffalo and Starvation Creeks. These streams have cut deep valleys, and the slopes are steep and frequently broken.

The two lowland areas consist of a belt lying along the northern border of the county just south of the Canadian River, and the basin of the Washita River. They are relatively smooth areas, as a whole, but the border belt between them and the high plain is broken, constituting the roughest part of the county. It is a true escarpment, but owing to the small difference in resistance to erosion between the harder bed immediately underlying the high plain and the softer beds on which the lowlands are worn, it is ragged in its details, irregular in its course, and variable in the definiteness or sharpness of its expression.

The lowland area along the Canadian River is about 3 to 4 miles wide, except in the northeastern corner, where it widens to about 10 miles, and in the northwestern part, where the river swings to the north. The topography of this lowland belt along the Canadian River is hilly, with small areas of Rough broken land and occasional high terraces. As a whole the topography is rougher than that of the Washita basin. Where it is widest, in the northeastern corner of the county, there are two streams about 8 miles long which have cut very deep valleys almost to their headwaters and which flow through thoroughly eroded country. On both sides of these valleys high, undulating to gently rolling areas occur. In the northwestern part of the county, where the river makes a loop to the north, its drainage basin includes an area of about 36 square miles which has a hilly and generally broken topography, except in the center, where the surface is undulating to gently rolling. The Permian formations of the

Plains are usually exposed in deep cuts within the drainage basin of the Canadian River, where not covered with colluvial material of Tertiary origin.

The second lowland area comprises the lower drainage basin of the Washita River, and extends far into the central part of the county from the east. In the eastern part of its area the topography is gently rolling to rolling. The river and its tributary streams have established mild gradients, with a quite extensive development of alluvial land. About 8 or 9 miles from the eastern boundary of the county the topography becomes less uniform. Adjoining the alluvial bottoms of the river and its main branches are belts of higher land one-half mile to 2 miles wide, frequently including small, rough hillocks 20 to 50 feet high. The eastern two-thirds of the Washita drainage basin, together with areas draining into the Red River and Sweetwater Creek, are referred to locally as the "red lands."

The escarpment which forms the boundary between the lowland areas and the high plain consists of a belt of broken land, or "breaks," one-half mile to 2 miles wide. The escarpment which borders the lowland belt along the Canadian River roughly parallels the course of the river across the central part of the county, about 3 to 4 miles from the channel, but has a more direct course than the river and in the northeastern and northwestern corners of the county, where the stream swings to the north, the distance from the river to the escarpment is much greater. The small streams which flow into the Canadian River have their headwaters in this escarpment.

The escarpment which borders the Washita basin extends from a point on the eastern boundary of the county about 14 miles north of the Washita due west about 6 miles as a belt of broken land about 2 miles wide. It then swings southwestward, extending as a strip of hilly country 2 to 4 miles wide, with many areas of Rough broken land, to the valley of Dead Indian Creek, about 16 miles from the eastern county boundary. In this section of the escarpment Quartermaster, Ninemile, and Wildhorse Creeks have their headwaters. From Dead Indian Creek the escarpment extends southward about 6 miles to a point within a mile of the Washita just above Cheyenne. Thence it closely follows the river channel to Hamburg. The entire Dead Indian-Washita ridge is very broken. Above Hamburg the escarpment occurs on both sides of the river as small areas of Rough broken land near the river, gradually merging with the river bluff. South of Hamburg the belt is only one-fourth to 1 mile wide, rising abruptly from the alluvial basin of the river to the gently rolling surface of the high plains. At the mouth and in the valley of Croton Creek the escarpment again occurs as extensive areas of rough and broken land. Altogether, at the crossing of the river

basin, the escarpment occupies more or less completely a belt of broken country 4 to 8 miles wide and about 12 miles long.

South of Cheyenne the land about the headwaters of Brokenleg and Sergeant Major Creeks is hilly and ridged, but only occasionally severely eroded. Farther east the land around the headwaters of Beaverdam Creek and the entire upper valleys of Sandstone and Currant Creeks are badly eroded.

The county was opened to homestead settlement in 1892, having been up to that time a part of the reservation of the Cheyenne and Arapaho Indian tribes. The population is almost wholly of native American settlers, mainly from Missouri, Kansas, and Texas. In 1910 the population is reported as 12,861, or 11.3 persons to the square mile, and the entire population is classed as rural. There are no negroes and but few Indians in the county. Cheyenne, the county seat, in the center of the county; Strong City, 7 miles farther down the Washita; and Hammon, on the eastern boundary, each with only a few hundred population, are the chief towns of the county.

The development of Roger Mills County has been hindered somewhat by the lack of good transportation facilities. The Clinton & Oklahoma Western Railway runs from Strong City to Clinton, where it connects with the Rock Island. The Cheyenne Short Line Railway extends from Strong City to Cheyenne. The Wichita Falls & Northwestern Railway crosses the southeastern part of the county. The southern part is served by the Rock Island Railway, which roughly parallels the southern boundary 6 to 10 miles to the south. Some of the products of the northwestern townships are shipped to Canadian, Tex., on the main line of the Santa Fe, and some to points farther east on this line.

The industries of the county are altogether agricultural. The chief products marketed are live stock, broom corn, cotton, and small quantities of wheat. Fuel, lumber, and manufactured products are imported.

CLIMATE.

The mean annual temperature in Roger Mills County, as recorded at the Weather Bureau station at Harrington, in the southwestern part, is 58° F. For the summer months the temperature averages 77° and for the winter months 38°. For the spring and fall months it is given as 59°. During the summer the heat is not debilitating as a rule, as the humidity is low, and the nights are usually cool. Hot, dry winds from the south and southwest sometimes cause considerable crop loss, generally being considered as injurious as lack of rain. In the winter the wind direction alternates between

north and south, causing wide variations in temperature. The winters usually are open. Occasionally severe winds from the north, or "northers," occur, lasting for three to seven days.

Throughout this region the average wind velocity is relatively high. At Oklahoma City, about 150 miles to the east, the average hourly wind movement is reported as 11 miles. The maximum monthly average of 13 miles is reached in March and April, and the minimum of 9 miles in July and August. Breaking land for spring planting ordinarily is deferred on the lighter textured soils, which are subject to drifting, until the winds moderate. Cyclones are rare.

The average annual rainfall is about 25 inches. Ordinarily three-fourths of the precipitation occurs during the growing season. During the planting season, April and May, the rainfall usually is adequate. The general rains continue until late summer, when the showers are rather local. Throughout the fall and winter the precipitation is low, although in some years general rains occur as late as October. The occurrence of snow is only occasional and the snowfall light. The lowest annual rainfall recorded, about 18 inches, was insufficient for successful crop production; the total for the wettest year recorded was nearly 40 inches. Usually the rainfall, owing to its favorable distribution, is adequate for crop growth.

In the four years 1905 to 1908 the annual rainfall averaged 32.54 inches. This was a period of general prosperity, and in these years practically all the available homestead land in the county was taken. For the following six years the precipitation averaged slightly less than 20 inches annually.

The records of the Weather Bureau station at Arapaho, in the adjoining county to the east, show an average annual precipitation of about 27 inches for the period 1894–1903, with no occurrence of very droughty seasons.

The average date of the last killing frost in the spring is April 7, and of the first in the fall October 26. The latest recorded date of killing frost in the spring is May 4, and the earliest in fall September 26. There is an average growing season of 202 days. Planting ordinarily begins about the middle of April. Drought-resistant crops frequently are planted as late as July, following wheat, but these late crops do not mature regularly.

The table on page 10 gives the normal monthly, seasonal, and annual temperature and precipitation for Roger Mills County, as reported by the Weather Bureau.

19718°—16——2

Normal monthly, seasonal, and annual temperature and precipitation, Roger Mills County, Okla.[1]

Month.	Temperature.			Precipitation.			
	Mean.	Absolute maximum.	Absolute minimum.	Mean.	Total amount for the driest year.	Total amount for the wettest year.	Snow, average depth.[2]
	° *F.*	° *F.*	° *F.*	*Inches.*	*Inches.*	*Inches.*	*Inches.*
December	38	74	0	.82	.52	.60	2.4
January	37	87	−13	.73	T.	.30	0.1
February	39	91	−17	1.21	T.	.75	1.2
Winter	38	.....	.....	2.76	.52	1.65	3.7
March	50	102	2	1.14	.23	1.09	3.4
April	62	96	23	2.06	2.18	4.93	0.1
May	66	99	22	3.53	5.87	4.80	0
Spring	59	.....	.....	6.73	8.28	10.82	3.5
June	74	109	45	3.02	3.17	4.98	0
July	78	106	35	3.12	2.66	8.74	0
August	78	108	39	2.22	1.46	4.00	0
Summer	77	.....	.....	8.36	7.29	17.72	0
September	71	103	30	2.97	.64	3.25	0
October	59	97	16	2.01	.90	4.74	0
November	48	86	4	1.96	.22	1.66	.6
Fall	59	.....	.....	6.94	1.76	9.65	.6
Year	58	109	−17	24.79	17.85	39.84	7.8

[1] For 8 years,1904–1912, Weather Bureau station was at Harrington. In March, 1912, it was moved to Rankin.

[2] Snowfall record doubtful.

AGRICULTURE.

The lands of the county originally supported a good growth of grasses, with considerable timber, mainly cottonwood, elm, and walnut in the bottoms. From about 1870 large herds of cattle were ranged over the entire region by more or less regular arrangements with the Indian tribal governments. The cattle were ranged in the open throughout the year, and hay for feeding during the periods of severe winter weather was cut from the luxuriant growth of prairie grasses in the stream bottoms. Often the cattle were in a weakened condition by spring, and occasionally the "northers" caused considerable winter loss.

The agricultural occupation of the county began in 1892 with the opening of the public land to homestead settlement. The nearest railroad point was almost 100 miles to the east.

Early settlement was confined to the valley lands. Corn was the important crop, and live stock the only product marketed to any ex-

tent until about 1900. The 1900 census reports 267,986 acres in the county in farms, of which 44,273 acres are improved. A total of 11,045 acres is reported in corn, 7,006 acres sowed to forage crops, 4,435 acres in wild grasses, 221 acres in millet, and 108 acres in alfalfa. An area of 620 acres was in cotton, 120 acres in wheat, and 310 acres in oats. The total value of domestic animals in 1899 was $1,245,388. The receipt from the sale of live stock during that year was $276,912, and the value of animals slaughtered $25,366.

About 1900 farming was extended to the upland soils. The free homestead act was passed, and in the favorable years from 1905 to 1908, inclusive, the homesteading of the county was practically completed. Considerable land better suited to grazing was put under cultivation. A law was passed in 1902 requiring cattlemen to fence their lands.

According to the Thirteenth Census, in 1910, 77.5 per cent of the area of the county was in farms, of an average size of 217 acres. Half the farm land was improved. The year 1909, to which the census crop statistics apply, was one of favorable moisture conditions in the fall, but exceptionally light spring rainfall. The following table gives the acreage and production of the principal crops in that year:

Crops.	Acreage.	Production.
Grains:		
Corn	77,863	618,290 bushels.
Kafir and milo	13,888	122,453 bushels.
Wheat	6,056	48,058 bushels.
Oats	4,857	68,848 bushels.
Barley	474	5,734 bushels.
Rye	109	1,138 bushels.
Hay and forage:		
Coarse forage	11,210	12,203 tons.
Alfalfa	4,987	5,948 tons.
Wild grasses	4,305	4,262 tons.
Millet or Hungarian grass	3,398	2,579 tons.
Grains cut green	524	293 tons.
Special crops:		
Broom corn	19,348	3,719,842 pounds.
Cotton	15,743	2,338 bales.
Sorghum	258	472 tons.
Potatoes	211	9,106 bushels.
Dry peas	131	748 bushels.

The 1910 census reports 140,336 fruit trees in Roger Mills County, of which 108,036 were peach. Plum and apple trees number about 12,000 and 13,000, respectively. Besides these there were 3,621 cherry trees and 20,298 grapevines. Blackberries and dewberries were the most important small fruits.

Practically every farm in the county reported ownership of live stock in 1910. In round numbers there were 19,000 cattle, 14,000 horses and mules, and 27,000 hogs. There are also a few sheep. Dairy cows form about one-third of the total number of cattle. The sale or slaughter of cattle in 1909 amounted to 17,000 head, and of hogs to 45,000 head.

Of the income from all sources in 1909 live-stock products contributed $1,085,686 and crops of all kinds $1,227,095. Cereals and special crops contributed the bulk of the income from crops, and animals sold four-fifths of the receipts from the live-stock industries.

The agriculture of Roger Mills County has changed considerably since the 1910 census was taken. The year 1909, to which the census figures apply, was the first of a period of exceptionally dry seasons. Crops were planted and cultivated under methods successful in the preceding years of exceptionally good moisture conditions, and the statistics of yield are not representative of normal crop production. Since 1910 much of the rougher and more sandy land has been abandoned or thrown into pastures. The acreage in cotton has been considerably reduced, and a larger proportion of the upland area is planted in drought-resistant crops.

While the possibilities and limitations of the soils are beginning to be more fully understood, agriculture has not yet reached a settled basis. There has always been lack of capital among the homesteaders, who are seldom properly supplied with provisions and equipment for efficient operations. Probably 80 to 90 per cent of the homesteads are mortgaged as soon as title is secured and the proceeds used in paying debts and erecting houses. Most of the original homesteaders have had too little capital to carry them through successive years of crop failure and many have surrendered their land to the mortgage companies. Very little of the land remains in the hands of the original settlers.

Most of the farmers on the better lands are turning from the production of a single cash crop to a more diversified form of agriculture, and are acquiring small herds of cattle. The county is capable of supporting a considerably larger number of cattle than is kept at present. The advantage of using as ensilage the large quantities of forage produced in growing corn, kafir, milo, and broom corn, both as an economical winter feed and as insurance against famine from drought, is gaining recognition. Extensive farming, with the use of 4-horse implements, is becoming quite common on the lighter soils.

The agriculture practiced on the bottom lands is very different from that on the uplands. A large and increasing proportion of the bottom-land soils is used for alfalfa, and corn, alfalfa, and wheat are

the most important crops. The greater productiveness of these soils is due apparently to the good supply of water in the substratum.

The live-stock industry is increasing in importance. Almost all the cattle in the county are of beef or dual-purpose breeds. Dairying is not of great relative importance, but increasing interest is being taken in this industry, and there are some prosperous dairy farms on the valley lands. The grain crops grown in the uplands are used for fattening cattle, which are wintered at little cost, pasturing on the dried grasses and stubble of wheat and forage-crop fields. The crops grown on the valley lands, including especially alfalfa, adapt the farms lying in those sections to some form of animal husbandry.

Hog raising is important throughout the county, much of the grain produced being used for feeding. The hogs on the valley farms are pastured on alfalfa fields. On the upland farms they are grazed on wheat and rye pasture through the fall and winter, but get little nitrogenous and succulent feed through the summer.

The raising of horses and mules for eastern markets is of some importance. In general a fairly good type of mule is produced.

The production of poultry and eggs is in the aggregate quite important. Very little trouble is caused by disease and the grain crops produced make good poultry feed. Perhaps the greatest source of loss is from the coyotes.

A large acreage of broom corn is grown. The standard dwarf type is grown almost exclusively. The plant is drought resistant and the product is of good quality. Broom corn is grown as a money crop, but the profits are very uncertain. Usually the farmers are unable to hold the crop for higher prices, and the market is sometimes oversupplied. Normal prices range from $50 to $150 a ton. In some cases in the last seven or eight years farmers who have been able to hold the crop through a season have received an average price of over $100. The cost of producing this crop is relatively large.

Much of the cotton produced in the county is grown on shallow soils. In general, the yield is low and uncertain. No commercial fertilizer is used, as the soils are naturally productive. Cultivation is on an extensive system, and the cost of production is comparatively small.

There is some difference of opinion among the farmers as to the relative value of corn and the sorghum cereals. While the sorghum crops receive the greatest attention, considerable corn is grown on the fine sandy loams, sandy loams, and loamy sands.

A considerable acreage is sowed to wheat in seasons in which the fall precipitation is favorable. The crop endures the dry winter well,

and is regularly pastured in winter. As the spring rains set in before its maturity, it produces good yields. In the year covered by the 1910 census the average yield was 8 bushels per acre. The spring rains were exceptionally late that year, and the yield was below the average. The crop is valued as much for the pasture it affords as for grain. In 1913 the summer crops were comparative failures, but heavy rains occurred in September and a large acreage was sowed to wheat. The stock was carried through the winter in good condition on the wheat pastures.

With the exception of wheat, the staple upland crops are all intertilled, and no effective rotation of crops is practiced. No need of the addition of organic matter in larger quantities than are now supplied by plowing under stalks and stubble has so far been felt. It is claimed that the physical condition of the soils, especially the lighter types, has improved with continuous crop production. These sandy soils are on first breaking quite loose, and subject to drifting. After they have been used for some time they become more coherent.

On account of the dry atmosphere in this general region, the maintenance of a soil mulch is very necessary. The maintenance of such a mulch in this region is easier than in more humid climates, and where careful attention is given to this matter crops are grown with a rainfall that would not be sufficient for successful crop production in more Eastern States. The light soils, however, apparently need compacting rather than loosening.

Little variation in crop adaptation is apparent on the various upland soils, although cotton is grown almost exclusively on the Vernon soils.

All the upland soils support a fair to good growth of bunch grass. The grass growth on the sands and the lighter sandy loam soils is somewhat tufted or scattered; the best growth is on the loams and silt loams, where there is a large proportion of the short but more valuable buffalo grass. There is some broom sedge in old fields, the grass apparently having established itself firmly in place of a former growth of the better buffalo grass.

There was originally no tree growth on the upland, except dwarf oak on the lightest sands and sandy loams. The settlers have quite commonly planted peach, black locust, cottonwood, catalpa, and box elder. These trees thrive where cultivated for 2 or 3 years.

SOILS.

The upland soils of the county are classed with two general groups on the basis of their origin from Permian or Tertiary material. The Permian or Red Beds formation gives rise to the soils locally called "red lands." The Permian Red Beds comprise calcareous clays and

shales chiefly, much of the shale being weakly consolidated with and containing a relatively large proportion of fine sand. Wells often are dug in this material to depths of over 100 feet. The material apparently indurates near the surface or in exposures, and the process of surface weathering into soil is slow, as compared with that of erosion by running water, the streams having cut their channels rapidly, many of them heading in gorges or small canyons.

In gently rolling areas, such as occur in the lower, more completely eroded or graded country in the east-central part of the county, and in areas in the south-central part which retain more of the original plain configuration but slightly modified, and in situations near larger streams which have long had established grades, the shale usually is completely weathered or nearly so throughout the 3-foot section. On the other hand, on slopes and narrow ridges shale is encountered in many places at shallow depths, or is exposed in patches, and occasional low hillocks capped with shale or stone are interspersed with patches and belts of deep colluvial material. These lands are commonly called "red hills."

The soils derived from the Permian formation are chocolate red in color, calcareous, and productive. The crop yields depend to a considerable degree upon the moisture conditions, which vary with the rainfall, topography, and soil texture. These soils are classed with the Vernon series.

The Tertiary formations give rise to the sands and sandy loams of the "sand hills." Not all the soils are sandy, but the general section in which the sandy soils occur is known locally by this name. Loam soils occur in areas of undulating topography. These are sometimes referred to as "flats," as, e. g., the "Durham Flats." The soils are subject to drifting, which limits cultural operations. Sand or loamy sand soils can not be loosened and smoothed in preparation for seeding until after the severe winds of the spring. Crops are listed, and in east and west rows, to prevent blowing. The soils derived from the Tertiary rocks are grouped with two series, the Amarillo and Richfield. The sandy soils have been modified by wind action, at least on the surface, and there are small sand dunes on some of the types. The substratum of the Amarillo soils, at least in some places, consists of very sandy material.

The brown terrace soil along the Canadian River was mapped as the Canadian loam. The terrace soils along streams carrying Permian material chiefly are classed with the Bastrop series. These soils are chocolate brown to chocolate red at the surface, and have chocolate-red subsoils. The corresponding first-bottom soils are classed with the Lincoln and Miller series. The Yahola is a first-bottom soil consisting largely of material washed from the Vernon soils.

The following table gives the name and the actual and relative extent of each soil type mapped in this county:

Areas of different soils.

Soil.	Acres.	Per cent.	Soil.	Acres.	Per cent.
Vernon clay loam	138,304	19.0	Richfield sandy loam	17,728	2.4
Rough broken land	85,376	11.8	Richfield loamy fine sand	14,272	1.9
Richfield fine sandy loam	57,600	10.1	Dunesand	13,376	1.8
Rolling phase	15,936		Miller very fine sandy loam	10,048	1.4
Vernon very fine sandy loam	66,944	9.2	Vernon loamy sand	8,384	1.2
Amarillo fine sandy loam	54,848	7.5	Canadian loam	8,128	1.1
Richfield loam	38,912	5.4	Bastrop clay loam	7,040	1.0
Richfield sand	34,624	4.8	Lincoln loamy fine sand	5,760	1.0
Amarillo sandy loam	32,576	4.5	Heavy phase	1,280	
Vernon silt loam	30,400	4.2	Bastrop loam	5,888	.8
Richfield fine sand	27,264	3.8	Yahola clay loam	2,368	.3
Vernon fine sandy loam	25,152	3.5			
Miller clay loam	24,192	3.3	Total	726,400	

VEGNON SERIES.

The Vernon soils are extensively developed in the prairie region of northern Texas, Oklahoma, and southern Kansas. The surface soils are reddish brown to chocolate red and the subsoils are chocolate red. The topography varies from gently rolling to broken. In Roger Mills County five members of the series are recognized—the loamy sand, fine sandy loam, very fine sandy loam, silt loam, and clay loam.

VERNON LOAMY SAND.

The Vernon loamy sand in its typical development consists of a brown sand to dark-brown or chocolate-brown loamy sand, underlain at an average depth of about 8 inches by reddish brown loamy sand. This extends to a depth of 36 inches without much change, except that the lower subsoil and the substratum in some places consist of chocolate-red sand. In places the surface soil varies to light brown or even browish gray, when dry. There are some included patches of fine sandy loam, and also occasional sandy hummocks. Water-rounded gravel of quartz and other rocks occur in places in small quantities throughout the soil section. The surface is subject to drifting where the material consists of loose sand, as it does in those areas in which the material is grayish or light brown.

The type occurs near the Washita River, the largest area lying between Cheyenne and Strong City. It occupies ridges and hills and their slopes, and some comparatively low, smooth areas, such as that 3 miles south of Strong City.

The type conserves moisture well, and the loamier areas are considered good farming land. The lighter areas drift considerably

under cultivation. The native growth consists of bunch grass, with some sage in the areas of lighter soil.

Kafir and milo yield normally about 15 to 20 bushels per acre, and broom corn one-fifth to one-eighth ton per acre. Cotton is not grown extensively. It is hard to get a good stand of cotton as the soil is "cold" at planting time, and the drifting sand injures the small plants. The land is easily cultivated, requiring only light implements.

VERNON FINE SANDY LOAM.

The soil of the Vernon fine sandy loam is a reddish-brown, friable fine sandy loam about 8 to 16 inches deep. The subsoil is a chocolate-red sandy clay loam to clay, usually lighter in color in the lower depths, sometimes grading into whitish, calcareous material. Bedrock is encountered within the 3-foot section in places, but not at such shallow depths as to interfere with cultivation or affect moisture conditions. A variation of this type, in which the surface section apparently consists in part of Tertiary material, occurs on gentle to moderate slopes in the southwestern part of the county near the contact with the Tertiary formations.

This soil is typically developed in the vicinity of Berlin in the southern part of the county, and about 12 miles farther west, in an area extending northeastward from Cotton Store. The topography is undulating to moderately rolling. The stream channels as a rule are but little below the general plain level of the type. Occasional areas about stream heads have a high content of silt, mainly in the subsoil.

The type is considered a good agricultural soil. It is absorptive and retentive of moisture and productive. The type is easily cultivated, requiring only light implements and teams for efficient preparation of the seed bed. Corn is more extensively grown than the sorghums, yielding normally 15 to 30 bushels per acre. This apparently is the most productive cotton soil in the county, yielding one-third to one-half bale with normal rainfall. A small acreage of broom corn is grown. Land values average about $30 an acre.

VERNON VERY FINE SANDY LOAM.

The surface soil of the Vernon very fine sandy loam is typically a reddish-brown to light chocolate red very fine sandy loam. This grades at 6 to 15 inches into lighter colored clay, occasionally containing some white, powdery material. On the whole, there is a fairly deep accumulation of weathered material, but bedrock frequently is encountered in the 3-foot section.

This is an extensive type, being widely distributed through the "red-lands" country. The topography is variable. In the east-central and southeastern parts of the county it is, on the whole, gently to moderately rolling, the type occurring mainly on the ridges, in association with the clay loam of the same series on the slopes. Where the type occurs in belts along the watercourses, in association with soils from Tertiary formations, the topography is irregular, and the slope is usually so great that some washing occurs in cultivated fields. The type includes small spots of clay loam, small areas eroded so as to expose the shale, and small hillocks.

The type is locally referred to as "tight land," owing to the tendency of the material to become compact upon drying. It is friable, however, and has a good structure under cultivation. It does not absorb rainfall so rapidly as the fine sandy loam type, but is a strong soil, producing fairly well in seasons of normal rainfall. In years of good rainfall it is one of the most productive soils of the county. Almost all the ridge areas and perhaps one-half of the larger areas on the valley slopes are used for the production of cultivated crops. Where it occurs in belts along watercourses it is used, in connection with ridge areas of other soils, for pasture. Land values range from $5 to $30 an acre.

VERNON SILT LOAM.

The Vernon silt loam is typically a dark chocolate red silt loam, underlain at 6 to 8 inches either by chocolate-red silty clay loam, which has a powdery structure when dry, or by chocolate-red clay. The surface soil, in places, apparently contains considerable material of Tertiary derivation. The type as mapped northeast of Strong City is a light silt loam, showing indistinctly the characteristic reddish color of the Vernon in the surface soil, and the subsoil to a depth of 12 to 20 inches is a yellowish-brown, powdery silt loam. The lower subsoil is a chocolate-red silty clay loam, frequently containing particles of shale. The surface soil of the type as mapped in the southwestern part of the county is in part apparently of reworked and mixed material.

This type occurs in scattered areas on the elevations throughout the "red-lands" part of the county, and is sufficiently extensive in the aggregate to constitute an important soil. The topography is undulating to gently rolling.

The type is preferred to the clay loam of the series, with which it is associated, and is extensively cultivated. While yields are quite variable, according to the rainfall, crops are matured in dry seasons with careful frequent cultivation, and the type is considered a valuable agricultural soil. The various drought-resistant grain crops

succeed, and cotton is grown quite extensively. In good seasons yields of 15 to 25 bushels of grain per acre, and one-third to one-half bale of cotton are obtained. Land values range from $12 to $30 an acre.

VERNON CLAY LOAM.

The Vernon clay loam consists typically of a chocolate-red clay loam containing considerable very fine sand, and underlain at 6 to 12 inches by chocolate-red clay or sandy clay. The material is derived from interbedded clay shales and fine sandy shales. Shale is frequently reached in the lower part of the 3-foot section, and there are occasional patches in which the surface material is shaly.

With good moisture conditions the soil is friable. It generally contains sufficient very fine sand to scour the plow, and often it approaches a heavy very fine sandy loam in texture. When dry, however, it becomes very compact and hard, and is difficult to break.

This soil occurs quite extensively in the central and east-central parts of the county. Typically it occupies sloping positions, with occasional patches of Rough broken land occurring as small hillocks. The type suffers somewhat from washing, for, on account of the compact structure, there is considerable surface run-off during heavy rains. In places shale is found at shallow depths.

In normal seasons the type produces good crops. At the time of the survey many farms on this type had been abandoned, owing to the exceptional preceding period of dry seasons. Possibly one-third of the settlers on this soil type are now farming their claims. The type is generally recognized as a strong soil, but in droughty years it is not productive. It is used considerably for grazing. Cotton is the principal money crop, and milo and kafir are grown for grain. This land is valued at $5 to $15 an acre.

AMARILLO SERIES.

The surface soils of the Amarillo series are light brown to chocolate brown and the subsoils are reddish brown or chocolate brown. Frequently the lower subsoil is yellowish brown and friable, and contains whitish, calcareous material. The lighter textured types are lighter in color; the depressions include darker colored soils. The topography varies from nearly level or undulating to rolling, and in some places broken. The soils are derived from unconsolidated or only faintly consolidated Tertiary and Quaternary deposits of the Great Plains region. The material probably was derived from sandstone, shale, limestone, and crystalline rocks and distributed by the aggrading action of former streams as mountain footslopes and

alluvial fans or outwash plains. The sandy types are subject to surface modification by wind action. In this survey the sandy loam, loamy sand, and fine sandy loam types are mapped.

AMARILLO SANDY LOAM.

The Amarillo sandy loam is typically a grayish-brown to brown loamy sand to sandy loam, underlain at 10 to 18 inches by reddish-brown sandy clay loam. This quickly passes into reddish-brown, stiff sandy clay, which grades at a depth of 24 to 36 inches into reddish-yellow, friable loamy sand, sandy loam or sandy clay. White, powdery, calcareous material is frequently present in the lower subsoil. Some rounded gravel of quartz and other rocks occur on the surface and throughout the soil section over small areas.

In places, usually where this type is associated with the Richfield soils, the color of the surface soil is reddish brown to chocolate brown, and the texture a sandy loam to loamy sand. In the more continuous areas, however, the surface soil is rather incoherent and grayish brown in color, with a brownish-red or yellowish-red to red subsoil, containing barely enough clay to constitute a sandy clay. This clay, however, is very sticky and produces a very compact subsoil. A variation of this type, the largest area of which contains about 2 square miles and occurs 6 miles northeast of Rankin, at McCaskill School, does not carry sufficient clay to cement the sand material. It is, however, sufficient to render the lower subsoil so compact that the variation is of practically the same agricultural value as the typical soil. While the surface soil of this type is somewhat incoherent and subject to drifting when barren of vegetation, practically no change by wind action occurs under natural conditions. The sandy clay stratum is found usually at a depth not exceeding 24 inches on the slopes, and on the brows and shoulders of elevations the sandy loam surface soil is invariably at least 6 inches deep.

The type occurs extensively in the west-central part of the county, chiefly in the valley of Rush Creek. The topography is undulating to rolling. While the valleys are quite deep the slopes are moderate and the ridges flat or rounded.

This type absorbs and conserves moisture much better than the heavier soils, owing undoubtedly to the porous character of the soil and the shifting of the loose surface soil by the wind, producing an effective mulch. In dry seasons crops produce fairly well when properly tilled, and there is little danger of complete crop failure. The type is not so productive in wet years as the heavier soils of the county, but is on the whole a safer soil for farming. In wet seasons the planting and early growth may be delayed by the excessive moisture content, but not for a longer period than 7 to 10 days.

This soil is well adapted to the general farm crops of the region. Broom corn is the money crop, as on all the lighter soils of the county. Kafir and milo normally yield 15 to 18 bushels per acre. Corn does well in good years. When the moisture conditions at seeding time are favorable wheat is grown. This grain yields quite well. The range of value of land of this type is from $5 to $15 an acre.

AMARILLO LOAMY SAND.

With inclusion symbol on areas of the sandy loam several rather small areas of Amarillo loamy sand are shown. This is a light-brown to dark-brown loamy sand, overlying pinkish loamy sand. This soil apparently is of lower agricultural value than the Amarillo sandy loam.

AMARILLO FINE SANDY LOAM.

The Amarillo fine sandy loam typically consists of 15 to 24 inches of gray to grayish-brown fine sand underlain by reddish-brown or brownish-red clay loam or sandy clay, which occasionally grades into calcareous material. The soil is incoherent and subject to drifting. Small sand dunes are numerous. The surface soil generally is of quite uniform depth, being protected in its natural condition by a fair growth of bunch grass.

This type is extensively developed in the southwestern part of the county, in association with the areas of deeper sand mapped as Richfield fine sand. The topography is undulating to gently rolling.

Much of the type was homesteaded and subsequently abandoned. However, there is a strip 1 to 2 miles wide around the headwaters of Croton and Sergeant Major Creeks, with an extension to the south in the vicinity of Dempsey, another area east of Grimes, and other small areas scattered through the main body of the type, which are somewhat loamier than typical and of a grayish-brown color, and these are farmed with some success. The main body of the type, however, has proved droughty and unproductive of the crops commonly grown, and is uncultivated.

The following table gives the results of mechanical analyses of samples of the soil and subsoil of the Amarillo fine sandy loam:

Mechanical analyses of Amarillo fine sandy loam.

Number.	Description.	Fine gravel.	Coarse sand.	Medium sand.	Fine sand.	Very fine sand.	Silt.	Clay.
		Per cent.	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*
450501	Soil	1.0	9.6	11.2	57.2	14.4	4.1	2.6
450502	Subsoil	1.2	10.8	11.5	39.0	10.2	7.9	19.5

Richfield Series.

The Richfield series includes brown to dark-brown soils, with brown to yellowish-brown subsoils. The coarser textured soils are lighter in color than the heavier types. In the depressions the color is darker. Whitish, calcareous material is common in the lower subsoil. These soils are derived from unconsolidated or faintly consolidated material of Tertiary and Quaternary deposits of the Great Plains region. This material is probably derived mainly from sandstone, shale, limestone, and crystalline rocks, and has been distributed by the aggrading action of former streams as mountain footslopes and alluvial fans or outwash plains. The topography varies from level to rolling. The soils are well drained. They differ from the Amarillo soils in having darker colored surface soils and in the absence of reddish color; they differ from the Pratt soils in the absence of the red color. Of this series the sand, fine sand, loamy fine sand, sandy loam, fine sandy loam, and loam types are mapped in Roger Mills County.

RICHFIELD SAND.

The Richfield sand consists of a light brownish gray, loose sand, underlain at about 6 inches by brownish-gray sand. This passes below into a brownish-gray sand which is somewhat compact in places, owing to a small content of clay and silt.

The type occurs quite extensively in the upper valley of the Washita River, chiefly on slopes to the river and its main branches. Some small, hummocky dunes occur, but the slopes are quite regular and moderate. The type produces a fair growth of bunch grass, with a scattered, but occasionally dense, growth of a low-growing variety of oak, 1 or 2 feet in height. On the hummocks this oak reaches a height of 6 or 8 feet. The area of this type mapped in the extreme northeastern part of the county has a prevailingly dunelike topography, but shows no tendency to drift and is in part cultivated.

The type is not extensively farmed. Nevertheless it is of agricultural value, being fairly productive even in dry seasons. It is very suitable for broom corn, as the loose sand naturally forms an effective mulch. The sorghums also produce profitably where not planted too thickly. Crops are listed in this soil and there is very little drifting. It is found that with continued cultivation and the plowing under of broom-corn stalks and other vegetation the soil becomes considerably more coherent and loamier.

RICHFIELD FINE SAND.

The Richfield fine sand consists of a gray, loose fine sand throughout the 3-foot section. It is developed extensively in the south-

western part of the county, occupying, for the most part, undulating to rolling country, with occasional areas on slopes within areas of other types. The grass growth is quite scant. There is a scattering to heavy growth of a low-growing species of oak. Sand dunes are quite numerous. On these the oak grows densely and reaches a height of 6 to 10 feet and apparently assists in the development of the dunes by holding the wind-blown sand. A few of the dunes on this type are over 50 feet high. The type is not used for agriculture.

RICHFIELD LOAMY FINE SAND.

The Richfield loamy fine sand is a light-brown to brown loamy fine sand grading into yellowish-brown loamy fine sand, which is fairly compact in the lower part of the soil section owing to the presence of some silt and clay.

The type is developed on the Canadian-Washita divide, the largest area occurring near Roll. The topography is sloping to gently rolling.

The type is productive and quite easily tilled. There is little evidence of serious shifting by the wind, but the usual precautions in cultivation are necessary to prevent wind erosion. Kafir and milo yield 10 to 20 bushels, wheat 8 to 16 bushels, and broom corn one-fifth to one-eighth ton per acre. This land is valued at $10 to $15 an acre.

RICHFIELD SANDY LOAM

The typical Richfield sandy loam is a brown to chocolate-brown loamy sand to sandy loam, underlain at 12 to 20 inches by a yellowish-brown, compact clay or sandy clay. This passes below into yellowish-brown, tough clay, which is underlain by yellowish-brown loamy sand. Frequently some whitish, calcareous material is present. On the lower slopes and in depressions the soil is deeper and darker.

The largest area of this type occurs in the vicinity of Roll, in the north-central part of the county. Other areas occur near Crawford and south of Durham, in the northwestern part of the county, and near Rankin, in the central-western part. The topography is undulating to gently rolling. The type is but little subject to modification by wind, as compared with the less loamy, sandy types. After several years of cultivation there may be some drifting of the soil, but only ordinary precaution in early breaking is necessary to check this.

Kafir and milo yield about 12 to 20 bushels per acre, and corn 8 to 16 bushels. Broom corn yields about one-fifth to one-eighth ton per acre. Wheat is grown in favorable seasons, the crop being pastured and later harvested, yielding 8 to 20 bushels.

RICHFIELD FINE SANDY LOAM.

The Richfield fine sandy loam is typically a brown to dark-brown light fine sandy loam, underlain at about 8 to 15 inches by a somewhat lighter colored fine sandy loam or loam, which grades into yellowish-brown fine sandy loam or sandy clay, containing considerable whitish, calcareous material. In places the upper subsoil is quite dark.

The type is extensively developed on the upper slopes of the Canadian watershed. The topography is quite rolling. The more regular slopes and ridges are cultivated, and produce good yields. The higher areas, as those east of Roll, near Crawford, east of Durham, and on the county line between the Washita River and Rush Creek, have an undulating to moderately rolling topography. The area at the head of Rush Creek occupies moderate, regular slopes, and the area at the head of Skipout Creek, near Rankin, is gently rolling on the south and moderately to steeply rolling on the northwest. The areas at the head of Croton Creek include moderate to rather steeply rolling slopes. The areas in the southwestern part of the county occupy rounded ridges and moderate slopes.

Much of the unevenly sloping land is in pasture. The smoother slopes and ridges are cultivated, and produce good yields. This type is little subject to wind action.

Kafir and milo yield 14 to 20 bushels, corn 8 to 16 bushels, and wheat 10 to 20 bushels per acre. Yields of broom corn range from one-sixth to one-eighth ton per acre.

The type ranges in value from $5 to $15 an acre.

Richfield fine sandy loam, rolling phase.—The rolling phase differs from the typical Richfield fine sandy loam principally in its rougher topography. It represents areas where erosion has been more active. This land is mainly too broken for profitable cultivation. The greater part of the land is utilized as pasture, which probably is its best use.

Mechanical analyses of samples of the soil and subsoil of the rolling phase gave the following results:

Mechanical analyses of Richfield fine sandy loam, rolling phase.

Number.	Description.	Fine gravel.	Coarse sand.	Medium sand.	Fine sand.	Very fine sand.	Silt.	Clay
		Per cent.	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*
450525	Soil	0.0	2.7	4.3	29.2	36.2	21.5	5.8
550526	Subsoil	.6	4.0	4.8	34.2	25.2	21.8	9.2

RICHFIELD LOAM.

The Richfield loam consists of a dark-brown to brown, mellow loam, underlain at about 8 to 12 inches by yellowish-brown, compact

loam, which grades below into grayish-yellow or pale yellowish brown, friable silty clay loam containing considerable whitish, calcareous material. In places the surface soil has a chocolate cast. In depressions the soil is darker than typical.

The topography is uniformly gently undulating to almost flat. The type is extensively developed on the Canadian-Washita divide in the western part of the county. Another development is in the center of the western loop of the Canadian River. In the northeastern part of the county the land is dissected by rather deep stream channels, Permian material appearing at shallow depths, although this is seldom encountered within the 3-foot section.

The type is considered a good agricultural soil. While the effects of severe drought are more serious than on the lighter types, it compares favorably with the light soils in years of normal, or even less than normal, rainfall where properly farmed. The yields in more favorable seasons exceed those on the sandy types. It is an earlier soil, becoming warm enough for planting one to two weeks before the sandy soils. Kafir and milo yield 15 to 25 bushels, wheat 10 to 20 bushels, and broom corn one-fifth to one-eighth ton per acre. This land sells for about $20 to $30 an acre.

Canadian Series.

The Canadian series includes brown to dark-brown soils, underlain by lighter brown subsoils. These types occur along streams of the Great Plains region which reach into the Rocky Mountains or into Tertiary outwash plains. They occupy well-drained terraces and are productive soils. The series represents the terrace equivalent of the Lincoln series. Only the loam type is identified in Roger Mills County.

CANADIAN LOAM.

The Canadian loam is a dark-brown, mellow loam to heavy, very fine sandy loam 6 to 12 inches deep, underlain by a dark-brown to yellowish-brown silt loam, loam or heavy very fine sandy loam. The small areas on the lowest terrace on "Pie Flat," north of Roll, included with this type, consist of a yellowish-brown very fine sand, underlain at about 12 inches by a yellowish-brown fine sandy loam. The type occurs on high terraces of the Canadian River. The topography is uniformly level to gently undulating.

This type is regarded as one of the best in the county. It is almost entirely under cultivation. It is productive and easily tilled. Kafir and milo in favorable years yield 20 to 30 bushels, wheat 14 to 20 bushels, and broom corn one-fourth to one-eighth ton per acre. Cotton was grown quite extensively at one time, but at present receives little attention. This land is valued at $20 to $35 an acre.

Bastrop Series.

The Bastrop soils are composed of old alluvial deposits containing enough material washed from the Vernon soils of the Permian Red Beds to impart a characteristic chocolate-reddish color. These soils occur on stream terraces (second bottoms). They are chocolate brown to chocolate reddish in the surface section and characteristically chocolate red in the subsoil, and are calcareous. In this survey the Bastrop loam, loamy sand, and clay loam were mapped.

BASTROP LOAM.

The Bastrop loam is typically a reddish-brown or dark chocolate red to chocolate-brown loam, underlain at 8 to 12 inches by chocolate-red to chocolate-brown clay or crumbly silty clay loam, which grades below into clay. In places there is not much change through the 3-foot section, but usually the subsoil is lighter in color and heavier in texture. In swales and level to slightly depressed areas the surface soil is a dark-brown silty loam, and the subsoil is darker and more silty than that in the better drained situations. There also are included areas of very fine sandy loam.

The type occupies level to gently sloping benches along streams, which appear to be true stream terraces or second bottoms. Some areas have a gradual slope, and doubtless carry some colluvial material. The principal areas occur along the Washita River and its tributaries.

This is a good agricultural type. Alfalfa, corn, and wheat are the principal crops. Alfalfa yields 1 to 2 tons per acre, corn about 10 to 30 bushels, and wheat 10 to 20 bushels. This soil is easier to handle than the Bastrop clay loam.

Land values on the Bastrop loam average between $20 and $25 an acre.

Results of mechanical analyses of samples of the soil and subsoil follow:

Mechanical analyses of Bastrop loam.

Number.	Description.	Fine gravel.	Coarse sand.	Medium sand.	Fine sand.	Very fine sand.	Silt.	Clay.
		Per cent.	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*
450535	Soil	0.1	1.4	2.4	13.6	19.9	49.8	12.6
450536	Subsoil	.2	.9	1.0	6.0	12.2	60.4	19.2

BASTROP LOAMY SAND.

The Bastrop loam includes small areas of the Bastrop loamy sand, which are indicated on the soil map by inclusion symbols. The Bas-

trop loamy sand is typically a reddish-brown loamy sand underlain at 8 to 10 inches by a chocolate-red loamy sand which has a very compact structure on drying. The subsoil is, in places, a yellowish-brown sand. In some places a loamy fine sand occurs, but this does not differ in agricultural value from the soil of medium texture. The Bastrop loamy sand occurs on low terraces along the Washita River. It varies in agricultural value, but is for the most part rather droughty, owing to the occurrence of underlying beds of loose sand.

BASTROP CLAY LOAM.

The Bastrop clay loam is a chocolate-red to reddish-brown clay loam, underlain at 5 to 8 inches by a somewhat lighter chocolate red, rather stiff clay.

The type occupies nearly level to faintly sloping benches (second bottoms). The surface usually is nearly level, but often there is a very gradual descent toward the first bottom. Probably much of the material of the sloping areas is colluvial. There are some small included areas of residual soil near the contact with the upland.

This is a valuable soil, and most of it is under cultivation. The type is more productive than somewhat similar soils on the uplands, and apparently holds moisture better, as crops withstand droughts much longer. Corn, alfalfa, and wheat are the main crops. Corn yields 10 to 30 bushels, alfalfa 1 to 2 tons, and wheat 10 to 20 bushels per acre. Heavy teams and implements are necessary for the proper preparation of the seed bed. This land is valued at $20 to $25 an acre.

Below are given the results of mechanical analyses of samples of the soil and subsoil of this type:

Machanical analyses of Bastrop clay loam.

Number.	Description.	Fine gravel.	Coarse sand.	Medium sand.	Fine sand.	Very fine sand.	Silt.	Clay.
		Per cent.	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*
450551	Soil	0.1	0.6	1.2	8.6	16.2	46.1	27.3
450552	Subsoil	.1	.3	.8	7.0	14.7	49.2	27.8

MILLER SERIES.

The Miller series includes alluvial soils of the first, or overflow, bottoms of streams, containing sufficient material from the Vernon, or Permian Red Bed, soils to impart a characteristic chocolate-reddish color. Considerable areas are only rarely overflowed. The series includes soils of chocolate-brown to chocolate-red color, with choc-

olate-red subsoils. Both soil and subsoil are calcareous. These soils occur along the Washita, in the central and eastern parts of the county, along its tributaries, and along Sweetwater Creek. They are the best alfalfa and corn soils of the county. Water rises by capillary action from the moist substratum, and crops suffer comparatively little from drought. Two Miller types are identified in this survey, the very fine sandy loam and clay loam.

MILLER VERY FINE SANDY LOAM.

The Miller very fine sandy loam is a chocolate-red or reddish-brown very fine sandy loam, which in places continues through the 3-foot section without much change. In other places it passes into chocolate-reddish, compact, friable to stiff fine sandy clay to clay. In the western areas in the Washita bottoms there are some included low hummocks of Dunesand, Miller fine sand, and Miller very fine sand, and, in low places, Miller clay loam. Along the tributaries of the Washita the type is quite uniform, consisting of a very fine sandy loam throughout the soil section, or having a subsoil of very fine sandy clay loam. Along the upper courses of the streams, however, included areas of very fine sand or fine sand occur.

In its typical development the type is of equal value to the clay loam of the series. The deeper sandy areas are not so productive, being more droughty. There are few areas of good prairie grass on this type, as the native grasses do best on the heavier soils.

The following table gives the average results of mechanical analyses of samples of the soil and subsoil of this type:

Mechanical analyses of Miller very fine sandy loam.

Number.	Description.	Fine gravel.	Coarse sand.	Medium sand.	Fine sand.	Very fine sand.	Silt.	Clay.
		Per cent.	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*
450521, 450531.....	Soil.....	0.1	0.2	0.9	8 7	46.1	38.7	5.3
450522, 450532.....	Subsoil.....	.0	.1	.3	1.4	13.2	64.7	20.2

MILLER CLAY LOAM.

The Miller clay loam is a chocolate-red to dark chocolate red or reddish-brown clay loam or silty clay loam, underlain at 5 to 10 inches by dark chocolate red clay, which is usually very compact when dry. The type either consists wholly of wash from the Vernon soils or contains enough of such material to give the characteristic chocolate-reddish color.

The surface is generally flat, but there is sometimes a gradual slope, the boundary between this and the terrace soils being indis-

tinct. In places there is a slight slope from the stream, and slightly depressed areas occur, in which the color is often dark chocolate red or chocolate brown, owing apparently to poorer drainage and higher organic content.

This is the best soil in the county for corn and alfalfa, and these are the principal crops grown. Some of the type is devoted to wheat and it is used to considerable extent for prairie hay. Alfalfa yields 2 to 3 tons per acre, corn 15 to 35 bushels, wheat 10 to 25 bushels, and prairie hay 2 to 3 tons. Land values range from about $25 to $50 an acre.

Yahola Series.

The Yahola series includes first-bottom soils, consisting of material derived largely or, at least, in part from the Vernon soils. They differ from the soils of the Miller series in having a subsoil of lighter texture than the surface soil. In this county the clay loam type only is mapped.

YAHOLA CLAY LOAM.

The surface soil of the Yahola clay loam is identical with that of the Miller clay loam. It grades into lighter textured material, usually at 16 to 24 inches. The subsoil ranges to a chocolate-red or lighter red, friable very fine sandy loam, very fine sand or fine sand. The type occurs in the first bottoms of streams and is subject to overflow.

Crops on this soil suffer somewhat during severe droughts. The crop adaptation is the same as that of the Miller clay loam.

Lincoln Series.

The Lincoln series includes first-bottom alluvial soils, occurring along streams rising in the Rocky Mountains or Tertiary outwash plains. The soils are brown, with grayish to brownish subsoils. In Roger Mills County these soils occur principally along the Washita River, with very small areas along the Canadian River and Sweetwater Creek. Formerly there were considerable areas of Lincoln soils along the Canadian, but these have largely been removed by floods in the last few years. Only the loamy fine sand type is mapped in this county.

LINCOLN LOAMY FINE SAND.

The Lincoln loamy fine sand consists of a brown loamy fine sand, underlain at about 10 to 20 inches by a lighter colored fine sand or slightly loamy fine sand of open structure. As mapped along the Washita River, there are included patches of Lincoln sand and fine sand.

This type occurs principally in the bottoms of the Washita and its tributaries in the western part of the county and in small areas along the Canadian River.

The type is very little used for agriculture, as it is leachy, particularly along the Washita, and crops on it are subject to injury by drought. The native growth of cottonwood, elm, and walnut is of some value, and there is a poor to fair growth of bunch grass. As mapped along the tributaries of the Washita, the type apparently represents old stream deposits and is now rarely overflowed. The more loamy areas along these streams are fairly productive.

Some small unimportant areas of Riverwash are included with the Lincoln loamy fine sand. These areas are low, and consist of gravel, sand, and other recently deposited material. They occur along the Canadian River and are of no agricultural value.

Lincoln loamy fine sand, heavy phase.—A few small areas of a heavy phase of the Lincoln loamy fine sand are mapped along the Canadian River. This phase consists predominantly of a silt loam to loamy fine sand of a dark-gray color, usually underlain at 6 to 10 inches by fine to very fine sand or sandy loam. There are included with this phase some patches of very fine sandy loam and some small hummocks of Dunesand. The agricultural value of this phase is somewhat higher than that of the typical loamy fine sand.

Miscellaneous Material.

Rough broken land.

Within the areas of Vernon soils there are considerable areas which are so rough as to be valueless for agricultural purposes. These are classed as Rough broken land. The larger areas form the "breaks" from the red lands to the Tertiary formations. The smaller areas consist of ridges and low hillocks rising abruptly from the graded slopes, and of eroded areas at the heads of streams.

This land is too rough for cultivation, but much of it supports a scanty growth of grass. It is of some use for pasturage.

Dunesand.

Areas of Dunesand occur along the Canadian and Washita Rivers, and to a less extent on the uplands in the western part of the county. The soil is mainly a light-grayish and in places a light reddish brown loose fine sand, underlain by salmon-colored or light chocolate red loose fine sand. It occurs as irregularly distributed hummocks or sand dunes rising 5 to 25 feet above the surrounding land. Between the hummocks in lower areas are patches of reddish-brown to dark-brown loamy fine sand and fine sandy loam. There is an

irregular growth of sage, a scrub variety of oak, dwarf walnut, wild currant, scrubby elm, and sumac. The dunes apparently are composed of material blown up from the stream channels and deposited mainly on the original flood plain of the stream. The Dunesand areas have some value as pasture land.

The small dunes of the western uplands probably represent accumulations about plants. The low-growing variety of oak common to this region thrives on this deep sand, and its growth assists in holding the sand in place after it has blown up about the plants, thus aiding in the encroachment of the dunes.

SUMMARY.

Roger Mills County adjoins the western boundary of Oklahoma, lying about halfway between the northern and southern State lines. It has an area of 1,135 square miles, or 726,400 acres.

The county consists of a high, rolling plain, deeply dissected by easterly flowing streams. The drainage basin of the Washita River extends across the county from east to west and comprises about three-fourths of its area. Another important area of lowland occurs along the Canadian River, which marks the northern boundary of the county. The lowland is separated from the high plains by an escarpment one-half mile to 2 miles wide, consisting of an irregular strip of broken land, or "breaks." The topography of the plain is undulating to gently rolling, while that of the lowland is hilly.

The county was opened to homestead settlement in 1892, and by 1908 settlement was practically completed. The population is reported in the 1910 census as 12,861. It is wholly rural and consists mainly of native Americans. Cheyenne, the county seat, is near the center of the county. The development of the county has been retarded by the lack of transportation facilities.

The mean annual precipitation is reported as 24.79 inches. The rainfall is favorably distributed, about three-fourths of it occurring during the growing season. The mean annual temperature is 58° F. In the summer the heat is not oppressive, as the humidity is low. Crops are sometimes injured by hot, dry winds from the south and southwest. In the winter the winds alternate from north to south, causing wide variations in temperature. There is a normal growing season of 202 days. The winds usually are strong in the spring, and planting is often deferred on account of the drifting of the soil.

The principal products marketed are live stock, broom corn, cotton, and small quantities of wheat. The chief crops grown are corn, kafir, milo, wheat, broom corn, and cotton. The live-stock industry, including hog raising, the fattening of beef cattle, and the raising of horses and mules, is important throughout the country. No systematic

crop rotations are practiced, and commercial fertilizers are not used. A mulch ordinarily is maintained to conserve the soil moisture, and the sandy soils are so cultivated as to prevent drifting. The 1910 census reports a total of 2,592 farms in the county, of an average size of 217 acres. Of the land in farms 50 per cent is reported as improved. Eighty per cent of the farms are operated by the owners and the remainder by tenants. The farm land has an average value of $12.73 an acre.

The upland soils of the county are classed with two general groups on the basis of their derivation from Permian or Tertiary material. The Permian Red Beds formation gives rise to the soils locally referred to as the "red lands." These soils are classed with the Vernon series.

The sands and sandy loams of the "sand hills" sections are derived from the Tertiary formation. These soils are mainly sandy and subject to drifting. They are grouped with the Amarillo and Richfield series. The brown soil of the Canadian River terraces, mapped as the Canadian loam, contains considerable wash from the soils of these series.

The soils of the terraces along streams flowing through the Permian soils are classed with the Bastrop series. The corresponding first-bottom soils are classed with the Lincoln and Miller series. The Yahola is a first-bottom soil consisting largely of material from the Vernon soils.

Aside from the fact that cotton is grown almost exclusively on the Vernon soils, there is little variation from the indiscriminate use of the different soils of the county for any of the general crops. In general, the lowland soils are more extensively used for cultivated crops than the uplands, being considered somewhat more productive, probably because of the good supply of water in the substratum. The upland soils are used mainly for pasture and the production of forage crops.

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[PUBLIC RESOLUTION—No. 9.]

JOINT RESOLUTION Amending public resolution numbered eight, Fifty-sixth Congress, second session, approved February twenty-third, nineteen hundred and one, "providing for the printing annually of the report on field operations of the Division of Soils, Department of Agriculture."

Resolved by the Senate and House of Representatives of the United States of America in Congress assembled, That public resolution numbered eight, Fifty-sixth Congress, second session, approved February twenty-third, nineteen hundred and one, be amended by striking out all after the resolving clause and inserting in lieu thereof the following:

That there shall be printed ten thousand five hundred copies of the report on field operations of the Division of Soils, Department of Agriculture, of which one thousand five hundred copies shall be for the use of the Senate, three thousand copies for the use of the House of Representatives, and six thousand copies for the use of the Department of Agriculture: *Provided,* That in addition to the number of copies above provided for there shall be printed, as soon as the manuscript can be prepared, with the necessary maps and illustrations to accompany it, a report on each area surveyed, in the form of advance sheets, bound in paper covers, of which five hundred copies shall be for the use of each Senator from the State, two thousand copies for the use of each Representative for the congressional district or districts in which the survey is made, and one thousand copies for the use of the Department of Agriculture.

Approved, March 14, 1904.

[On July 1, 1901, the Division of Soils was reorganized as the Bureau of Soils.]

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