

# SOIL SURVEY

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## Creek County Oklahoma

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UNITED STATES DEPARTMENT OF AGRICULTURE  
Soil Conservation Service  
In cooperation with the  
OKLAHOMA AGRICULTURAL EXPERIMENT STATION

# HOW TO USE THE SOIL SURVEY REPORT

**T**HIS SURVEY of Creek County will help you plan the kind of farming 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, you start with the soil map, which consists of the 85 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 woods, fields, roads, streams, and many other landmarks on this map.

To find your farm on the large map, you 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 for your farm, you will notice that boundaries of the soils have been outlined in red, 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 an area marked with the symbol Mb. You learn the name of the soil this symbol represents by looking at the Map Legend. The symbol Mb identifies Mason silt loam.

## Learn About the Soils on Your Farm

Mason silt loam and all the other soils mapped are described in the section Descriptions of Mapping Units. The soil scientists walked over fields and pastures and through the

woodlands. They described and mapped soils; dug holes and examined surface soils and subsoils; measured slopes with a hand level; noted differences in growth of crops, weeds, brush, or trees; and, in fact, recorded all the things about the soils that they believed might affect their suitability for farming.

After they mapped and studied the soils, the scientists placed the soils in groups called capability units. A capability unit consists of soils that are suitable for the same uses and need about the same kind of management. Mason silt loam is in capability unit I-1. Turn to the section, Use and Management of Soils, and read what is said about the soils in capability unit I-1. You will want to study table 6, which tells how much you can expect to harvest from Mason silt loam.

## Make a Farm Plan

For the soils on your farm, compare your yields and farm practices with those given in this report. Look at your fields for signs of runoff, erosion, and overgrazing. 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 in the county.

If you find that you need help in farm planning, consult the local representative of the Soil Conservation Service or the county agricultural agent. Members of the staff of your State agricultural experiment station and others familiar with farming in your county will also be glad to help you. Fieldwork on this survey was completed in 1950. Unless specifically mentioned, statements in this report refer to conditions at the time the survey was completed.

## Oakes, Harvey, 1906-

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# SOIL SURVEY OF CREEK COUNTY, OKLAHOMA

By HARVEY OAKES, Soil Survey; <sup>1</sup> soils surveyed by O. H. BRENSING, in charge, DALE SCRIVEN, and E. C. TALLEY, Oklahoma Agricultural Experiment Station; H. P. MIKLES, Soil Conservation Service; H. M. GALLOWAY, Soil Survey and Oklahoma Agricultural Experiment Station

Correlation by JAMES THORP, Soil Survey, United States Department of Agriculture

United States Department of Agriculture in Cooperation with the Oklahoma Agricultural Experiment Station

## Geography of Creek County

Creek County is in the northeastern quarter of Oklahoma (fig. 1). It is about 72 miles south of the Oklahoma-Kansas boundary and about 96 miles west of the Oklahoma-Arkansas boundary. Sapulpa, the county seat, is in the northeastern corner of the county. It is 15 miles southwest of Tulsa and 87 miles northeast of Oklahoma City.

The county is 36 miles long from north to south and 33 miles across at the central and widest part. It is 24 miles across at the south end. All boundaries of the county are artificial. Most of the county lies between the Cimarron River on the north and the Deep Fork of the North Canadian River on the south. Small parts lie

shales, which erode more rapidly than the sandstones, occupy the shallow valleys. The ridges are capped by the more resistant sandstones.

The western part of the county is underlain mostly by sandstones. Streams have cut narrow V-shaped valleys. Much of this part of the county is rolling or sloping. The eastern and southeastern parts are underlain mostly by shales. The few beds of sandstone outcrop on ridges between the shallow, gently sloping or nearly level, shaly valleys.

The elevation is highest in the western part of the county. The altitude near Drumright, at the western edge, is about 1,100 feet. The altitude is lowest—about 600 feet—where the Deep Fork River leaves the southeastern corner.

The Cimarron River cuts across the north end of Creek County. Polecat Creek lies south of that river. These two streams drain the northern half of the county. Both are tributaries of the Arkansas River, which flows just northeast of Creek County. The Deep Fork of the North Canadian River, locally called the Deep Fork River, flows generally along the southern edge of the county and crosses the boundary a number of times. Together with Little Deep Fork Creek, which rises in the west-central part of the county, this river drains the southern half of the area. These two streams join just outside the county and flow into the North Canadian River about 50 miles to the southeast.

The county is well dissected by small streams, most of which have narrow valleys. The larger streams have rather wide, shallow valleys composed of narrow flood plains and nearly level terraces of old alluvium. All of the uplands and most of the bottom lands and terraces are well enough drained to be suitable for the common crops of the area. Only the flood plain of the Deep Fork River is so frequently flooded and so poorly drained as to prevent cultivation.

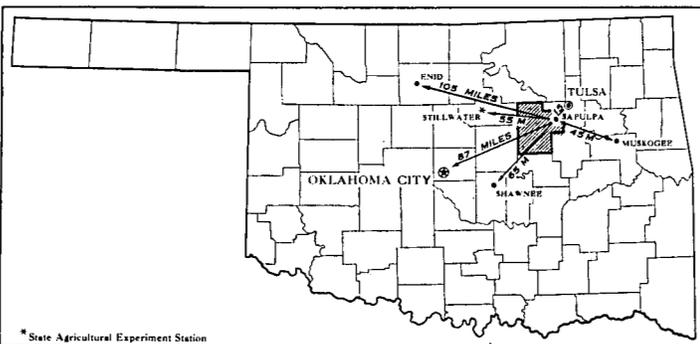


Figure 1.—Location of Creek County in Oklahoma.

north and south of these rivers. The approximate land area of Creek County is 972 square miles, or 622,080 acres.

## Physiography, Relief, and Drainage

Creek County lies in the Osage Plains section of the Central Lowlands physiographic province. The Osage Plains, now a region of well-dissected sandstone hills, was formerly a gently sloping plain. Shallow narrow valleys separated by stony ridges are characteristic. The ridges lie roughly parallel in a northeast-southwest direction. Many of them have rather steep east-facing escarpments.

Creek County is underlain by interbedded sandstones and shales; each layer outcrops at its eastern edge. The

## Climate

The climate of Creek County is continental and has pronounced seasonal changes in temperature and, to a lesser extent, in precipitation. It is generally warm to temperate and humid. There is a difference of about 40° F. between the average summer and the average winter temperatures. The prevailing winds are from the north from December to February and from the south during the rest of the year.

<sup>1</sup> Fieldwork for this survey was done while Soil Survey was part of the former Bureau of Plant Industry, Soils, and Agricultural Engineering. Soil Survey was transferred to the Soil Conservation Service on November 15, 1952.

Summers are long and hot. The highest temperatures are usually accompanied by clear skies, a moderately low humidity, southern breezes, and cooler nights. Winters are short and comparatively mild. They are characterized by periods of warm, pleasant weather followed by frequent but short spells of freezing temperatures accompanied by north winds. The ground sometimes is frozen to a depth of a few inches for several days. A few light snowfalls each winter total about 6 inches, but snow seldom remains more than a few days. Spring and fall are cool and usually windy. Tornadoes and hailstorms are rare.

The average growing season is about 219 days. The average date of the last frost in spring is March 27, but frosts have occurred as late as April 18. The average date of the first frost in the fall is November 1, but frosts have occurred as early as October 9. During normal years the growing season is long enough for all common field crops to mature. Some orchard crops, especially peaches, may be damaged by frosts late in spring. Planting of cotton or cowpeas is delayed in some years by late frosts and wet cool weather.

The average annual precipitation at Bristow, near the center of the county, is 37.19 inches. This amount of moisture is usually adequate for crops. The eastern edge

TABLE 1.—Normal temperature and precipitation at Bristow Station, Creek County, Okla.

[Elevation, 818 feet]

Month	Temperature <sup>1</sup>			Precipitation <sup>2</sup>			
	Average	Absolute maximum	Absolute minimum	Average	Driest year (1936)	Wettest year (1941)	Average snowfall
	° F.	° F.	° F.	Inches	Inches	Inches	Inches
December	41.3	82	1	1.64	1.65	1.74	0.6
January	38.5	81	-13	1.91	.11	1.79	2.6
February	42.5	84	-7	1.43	.51	2.49	1.6
Winter	40.8	84	-13	4.98	2.27	6.02	4.8
March	51.0	94	-11	2.49	.44	.75	1.1
April	61.0	93	18	4.04	.30	8.62	( <sup>3</sup> )
May	69.0	98	33	4.23	3.66	6.15	( <sup>3</sup> )
Spring	60.3	98	-11	10.76	4.40	15.52	1.1
June	77.6	109	47	4.71	.90	8.04	( <sup>3</sup> )
July	82.6	114	54	3.10	.86	2.07	0
August	82.3	115	50	3.11	.25	4.18	0
Summer	80.8	115	47	10.92	2.01	14.29	( <sup>3</sup> )
September	73.9	108	33	3.87	9.62	7.36	( <sup>3</sup> )
October	63.5	98	21	4.09	3.02	16.00	0
November	49.7	88	8	2.57	1.31	2.40	.3
Fall	62.4	108	8	10.53	13.95	25.76	.3
Year	61.1	115	-13	37.19	22.63	61.59	6.2

<sup>1</sup> Average temperature based on a 38-year record, through 1954; highest temperature on a 21-year record, and lowest temperature on a 20-year record, through 1952.

<sup>2</sup> Average precipitation based on a 39-year record, through 1955; wettest and driest years based on a 26-year record, in the period 1916-55; snowfall based on a 21-year record, through 1952.

<sup>3</sup> Trace.

of the county receives about 2 inches more rainfall than the extreme western part. The precipitation is fairly well distributed during the year. About 60 percent of it comes during the planting and growing season, or between March 1 and September 1. April, May, and June have the highest rainfall. Dry spells lasting several weeks, accompanied by drying winds and a high evaporation rate, are common in July and August. These droughts may damage late crops, especially corn. September and October have more rain, but not so much as the spring months.

Fieldwork can go on throughout the winter, except for the short periods when the ground is frozen. Sometimes spring planting is delayed by cool wet weather. Heavy-textured soils, especially, may be too wet for planting early in spring.

The normal temperature and precipitation at Bristow are fairly representative for Creek County. These figures are given in table 1.

## Vegetation

Most of Creek County had a forest-savanna vegetation known as the Cross Timbers.<sup>2</sup> Open stands of post oak, blackjack oak, and hickory grew among tall grasses. Many grassy openings were on the more clayey soils and along the foot slopes above the drainageways. Since this area became settled, the blackjack oak has spread considerably and occupied many areas that were formerly open. Much of this newer growth is small and brushy and nearly crowds out the grass.

Open prairies of bluestems, Indiangrass, and switchgrass occupy the deeper loams and clay loams and many of the shallow stony clay loams on steep slopes over interbedded clay shales and sandstones. The largest prairies occur in the eastern part of the county. The prairies were originally covered with a thick growth of coarse bunchgrasses, buffalograss (*Buchloe dactyloides*), and grama grasses. Scattered oak and sumac shrubs grew on the shallower soils. The bunchgrasses were mainly little bluestem (*Andropogon scoparius*), big bluestem (*A. gerardi*), broomsedge (*A. virginicus*), silver beardgrass (*A. saccharoides*), switchgrass (*Panicum virgatum*), and Indiangrass (*Sorghastrum nutans*). The grama grasses were mostly side-oats grama (*Bouteloua curtipendula*), hairy grama (*B. hirsuta*), and blue grama (*B. gracilis*).

All of the prairies in this county are excellent rangeland, but the deeper gently sloping soils are superior to the shallow or sloping soils. Native prairie meadows that are in excellent condition produce moderate yields of nutritious hay if the grass is cut at the right stage of growth. Many native prairie pastures and meadows have been poorly managed and now contain a high proportion of three-awn grass (*Aristida oligantha*) and weeds. The grazing is poor on such fields and the hay is of inferior quality.

The trees of the Cross Timbers consisted mainly of blackjack oak (*Quercus marilandica*), post oak (*Q. stellata*), elm (*Ulmus* sp.), and hickory (*Hicoria alba*) on the sandy soils of the uplands. On the terraces the forest was red oak (*Q. rubra*), pecan (*Carya pecan*), black oak (*Q. velutina*), elm, hickory, post oak, and blackjack oak. The bottom lands supported a fairly thick cover of elm, hack-

<sup>2</sup> FENNEMAN, N. M. PHYSIOGRAPHY OF EASTERN UNITED STATES. 691 pp., illus. New York and London. 1938.

berry (*Celtis occidentalis*), pecan, white oak or overcup oak (*Q. lyrata*), cottonwood (*Populus deltoides virginiana*), ash (*Fraxinus* sp.), and willow (*Salix* sp.). The uplands and the higher, sandier terraces had a thin ground cover of scattered coarse grasses, mainly broomsedge and little bluestem, and various shrubs. The low stream terraces and bottoms had a thick ground cover of bluestem grasses, shrubs, and vines, especially wild grape (*Vitis* sp.), in open areas or in places where the tree stand was thin.

Most of the bottom lands and terraces have been cleared of forest. Many areas along the stream channels, in narrow bottoms that are frequently flooded, and on the flood plain of the Deep Fork River have not yet been cleared. The better trees of the terraces and bottom lands, such as red oak, black oak, cottonwood, and ash, are used for lumber. Most of the shallow and stony soils of the uplands still have a cover of scrubby forest. These trees are unsuitable for most commercial uses. They are used for fence posts, firewood, and rough lumber.

### Water Supply

In the central and western parts of the county, a few farm ponds and perennial creeks supply water for livestock, but most of the water for livestock and for household use comes from wells. In areas underlain by sandstones or interbedded sandstones and shales, a moderate supply of good water is normally available at depths of 30 to 60 feet. In a few places the depth to water ranges from 60 to 100 feet.

In the eastern part of the county, where the prairie is underlain by shales, the water from shallow wells contains considerable gypsum and sodium and consequently is not well suited to household use. Late in summer and during droughts, the supply is likely to be inadequate. Good water is normally available in sufficient quantity from wells 60 to 150 feet deep. Water for towns and villages comes from deep wells or surface reservoirs.

In the prairie areas, surface reservoirs, commonly called farm ponds or tanks, furnish water for livestock. These reservoirs are made by constructing earth dams across natural drainageways. Most of these reservoirs are between  $\frac{1}{10}$  of an acre and 1 acre in size and have a storage capacity of  $\frac{1}{2}$  to 3 acre-feet of water. They lose very little water by seepage, but the loss by evaporation is high late in summer.

### Settlement and Development

Creek County was part of the Indian Territory, which included most of what is now eastern Oklahoma. The Creek and Cherokee tribes lived in this area. Hunting and fishing were the Indians' chief means of subsistence, but some agriculture was practiced before 1860. After about 1865, a few white squatters began grazing cattle in the area, by agreement with the Indians.

In 1889 the Indian land was divided and allotted to individuals. After 1904 some of this land was purchased by white settlers. By the time Oklahoma was admitted as a State in 1907, Creek County had been organized and was becoming fairly well settled. The early settlers came from the southeastern States and nearby States. The population of the county in 1910 was 26,223. Only 2,914 of these inhabitants lived on farms. Cattle raising was

the principal kind of farming. Corn and cotton were the main crops grown.

### Population

In 1950, the total population of the county was 43,143. Of this, 23,638 or 54.8 percent, was urban; and 19,505 or 45.2 percent, was rural. The population is fairly evenly distributed over the county. The most thickly populated sections are the prairies in the north central and eastern parts of the county. The most sparsely settled sections are the shallow and stony dissected areas in the center of the county.

Sapulpa, the county seat, is located in the northeast corner of the county. It had a population of 13,031 in 1950. Other towns, and their population in 1950, are: Bristow, 5,400; Drumright, 5,028; Oilton, 1,109; Depew, 719; Mounds, 560; Kellyville, 528; Mannford, 426; Kiefer, 275; Shamrock, 263; and Slick, 151.

There was a reduction of 13.4 percent in the total population of the county in the 10 years between 1930 and 1940. A further decline of 22.3 percent occurred between 1940 and 1950. This decline in population has taken place in the rural sections of the county. Urban population has increased slightly.

### Industries

The principal industry in Creek County is the production of crude petroleum and gas. Producing oilfields are near Drumright, Bristow, Slick, and Sapulpa. Isolated wells or small groups of wells are scattered throughout the county.

The first oil well in the county was completed in December 1905. In 1906 the famous Glenn pool in the northeastern corner of the county was discovered. The Cushing field near Drumright was opened in 1912, and the Slick pool in the southeastern corner of the county was developed in 1919 and 1920. The Continental or Bristow pool was opened in 1921 and 1922. In 1945 there were 2,152 producing oil wells in the county.<sup>3</sup> Many new wells are drilled in the county each year, and some old shallow wells are producing again from deeper sands.

Small "cracking plants" or oil refineries are located near Drumright and at Sapulpa. Several natural-gas pumping stations or plants are located in the county. The number employed in the production of crude oil and gas and allied industries has declined steadily during the last 20 years, because the oil production is diminishing.

In Sapulpa are a small food-processing and food-canning plant, a small pottery plant, and a glass works. Creameries, bottling works, monument and tombstone plants, cotton gins, and warehouses are located at Sapulpa and Bristow.

### Transportation and Markets

The St. Louis-San Francisco Railway's main line between Oklahoma City and Tulsa crosses the county through Depew, Bristow, and Sapulpa. A branch line runs southeast from Sapulpa through Kiefer and Mounds. Another branch line runs northwest from Depew through Shamrock to Drumright. The Santa Fe Railroad enters

<sup>3</sup> National Industrial Conference Board. THE PETROLEUM ALMANAC. 420 pp. New York, N. Y. 1946.

the county from the west and connects with the St. Louis-San Francisco line at Drumright.

The Turner Turnpike, which connects Oklahoma City and Tulsa, passes near Depew, Bristow, and Sapulpa. Entrances to the turnpike are located at Bristow and Sapulpa. (The turnpike is not shown on the detailed soil map because mapping of soils was completed before the turnpike was constructed.) United States Highway No. 66 follows the same general route as the turnpike. United States Highway No. 75 crosses the east end of the county from north to south. Numerous hard-surfaced State roads connect the small towns.

The main county roads are surfaced with gravel or oil and gravel. Local county roads are on almost every section line. Two-thirds of the farms are located on dirt roads or unimproved roads. The average distance from a hard-surfaced or gravel road is 2.5 miles. One-third of the farms are located directly on improved roads.

Farm products are sold in the local towns or shipped by rail or truck to Oklahoma City or Tulsa.

### Farm, Home, and Community Improvements

Creek County has grade schools throughout the county and high schools in the larger towns. Most of the schools are consolidated, but a few small rural schools remain in sparsely settled communities. Numerous churches of various denominations are located throughout the county. Hospitals are in Sapulpa and Bristow.

Farm dwellings range from poor to very good. Owner-occupied farm homes are generally in better repair than tenant-occupied farmhouses. Barns and outbuildings are usually in about the same condition as the farmhouse on the same farm.

Of the 1,559 farms in the county, 1,342 had electricity, but only 709 had running water, according to the 1954 census of agriculture. There were 686 telephones on farms in the county. Some farms used natural gas or butane for fuel.

### Agriculture

About 386,925 acres, or 62.2 percent of the total land area of Creek County, was in farms in 1954, according to the census of agriculture. Only about 16 percent of the farmland, or 63,743 acres, was harvested for crops in 1954. Eighty percent of the farmland is used for pasture. Of the 310,988 acres used for pasture, 203,256 acres is pastured woodland, 40,919 acres is pastured cropland, and 66,813 acres is other land pastured. Only 12,311 acres of woodland on farms is not pastured. There were 1,559 farms in Creek County in 1954. The average size was 248.2 acres.

The most common type of farming in the county is the raising of livestock. A few farms receive their chief income from grain, cotton, vegetables, and other crops. Two-thirds of the farms were not classified as to source of income by the 1954 census. Farmers are generally shifting from crop farming to livestock farming. The general shortage of farm labor is hastening this shift. The tendency is to stop cultivating the less productive fields and to use them for native pastures. Only 21 acres of farmland was under irrigation in 1954.

On the light-colored sandy soils in the central and western parts of the county, small farms are being consolidated into larger farms that specialize in livestock. There has also been an increase in the number of very small farms, many of which are owned by persons who are employed part time or full time elsewhere. Two-thirds of the farm operators were employed off their farms during 1954. More than half of all farm operators earned more by working off the farm than they earned from farming during the year.

*Farm tenure.*—The number of tenant-operated farms in Creek County has declined steadily since about 1930. In that year the census showed that 438 farms, or 77.6 percent, were operated by tenants. The census of 1954 reported that only 28.1 percent of the farms in the county were operated by tenants. Full owners operated 740 farms, or 47.4 percent; part owners operated 375 farms, or 24.1 percent; and managers operated just 6 farms, or 0.4 percent of the farms in the county. Tenants operated 438 farms.

Cash tenants pay a rent that depends on the productivity of the land, the improvements, location, and other considerations. Share tenants furnish all equipment, seed, and labor, and pay all expenses of producing and harvesting the crop. They keep two-thirds of the grain and hay and three-fourths of the cotton. The owner furnishes land, buildings, and other improvements and receives one-third of the grain and hay and one-fourth of the cotton. Most of the share tenants are on the prairie farms in the central and eastern parts of the county.

Share-croppers furnish labor and keep half of the crop; the owner furnishes land, buildings, equipment, power, feed or fuel, and seed and gets half of the crop. Some tenants have a share-cash agreement by which the tenant pays part of the rent in cash and part in crops or livestock. Usually the tenants in the forested areas rent on a share-cash basis.

*Farm power and equipment.*—Horses and mules were still important as work animals on many farms in 1954. They were used for farmwork on 745 farms in Creek County that year. On 361 of these farms, tractor power was also used, but on 384 farms, the work animals were the only source of power. These farms were operated with two-horse implements. Most farms had turning plows, cultivators, riding planters, mowing machines, hayrakes, and wagons. On 455 farms, neither work animals nor tractors were used.

Only tractor power was used for farmwork on 347 farms. On the 708 farms where tractors were used for all or part of the work, 945 tractors were reported. Most of the tractors are two-row models, but one-row tractors are common in the sandy areas of the county. Nearly every tractor owner has such attachments as lister plows, planters, and cultivators. Some farmers have gang or moldboard plows, one-way disk plows, disk or section harrows, stalk cutters, mowers, hayrakes, row binders, and fertilizer spreaders.

Only a few farmers own combines, hay balers, and cornpickers; those who do own such equipment do custom work for neighbors. Harvesting is seldom delayed because of lack of power equipment.

Farmers in the county owned 1,103 automobiles and 821 trucks in 1954. Most of the trucks are half-ton pickup trucks. A few farmers or ranchers own heavy trucks and truck trailers.

**Crops**

More than half of the land on which crops were raised in Creek County in 1954 was used for hay, silage, or green fodder. The acreage planted to field crops has declined considerably in the last 30 years, as emphasis has shifted from field crops to livestock on most farms.

In former years, corn was the major crop in the county. In 1954, hay, including sorghum, was the most extensively grown crop, and corn occupied only about a fourth as much land.

Corn, cotton, sorghums, and oats, in the order named, were the principal crops from 1907, when the first white settlers began cultivation in the county, until 1950. In 1954, hay, sorghum, corn, oats, cotton, and peanuts were the principal crops.

Table 2 shows the acreage of the principal crops in the county in stated years between 1929 and 1954.

TABLE 2.—Acreage of principal crops and number of bearing fruit trees and grapevines

Crop	1929	1939	1949	1954
<b>Corn:</b>	<i>Acres</i>	<i>Acres</i>	<i>Acres</i>	<i>Acres</i>
For all purposes.....	50,985	34,637	21,372	6,539
Harvested for grain.....	48,063	34,096	20,684	3,929
<b>Cotton</b> .....	64,366	26,846	11,688	2,287
<b>Oats:</b>				
Threshed or combined.....	2,911	9,385	1,299	5,349
Cut and fed unthreshed.....	978	3,309	704	( <sup>1</sup> )
Barley (threshed or combined).....	25	1,803	( <sup>2</sup> )	526
Wheat (threshed or combined).....	177	1,795	700	1,380
<b>Sorghums (except for sirup):</b>				
For all purposes.....	7,606	12,308	7,600	8,246
Harvested for grain or seed.....	3,688	6,051	4,469	1,502
Cut for silage, hay, or fodder.....	3,918	6,257	3,131	6,744
<b>All hay (except sorghums).....</b>	13,313	13,789	16,470	17,732
Annual legumes cut for hay.....	811 <sup>3</sup>	2,850	3,320	1,537
Alfalfa.....	1,601	1,475	2,087	3,296
Lespedeza.....	74	245	947	421
Small grains cut for hay.....	331	397	937	3,181
Other tame hay.....	1,736	3,140	994	2,190
Wild hay.....	8,760	5,682	8,185	7,107
Potatoes for sale and home use.....	559	448	351	422
Sweetpotatoes for sale and home use.....	352	267	355	418
Other vegetables harvested for sale.....	538	272	133	103
<b>Peanuts:</b>				
All purposes.....	240	1,850	4,062	1,855
Picked or threshed.....	231	690	3,820	1,446
<b>Orchard fruits, vineyards, and planted nut trees.....</b>	668	813	1,337	481
	<i>Number</i> <sup>5</sup>	<i>Number</i> <sup>5</sup>	<i>Number</i> <sup>5</sup>	<i>Number</i> <sup>5</sup>
Apple trees.....	8,409	4,114	5,179	1,122
Cherry trees.....	934	1,339	546	50
Peach trees.....	11,765	9,069	6,861	1,760
Pear trees.....	1,212	1,754	1,489	448
Pecan trees <sup>6</sup> .....	28,118	36,527	24,043	9,724
Plum and prune trees.....	2,456	2,774	2,070	206
Grapevines.....	21,302	22,219	6,795	460

<sup>1</sup> Included under "small grains cut for hay."  
<sup>2</sup> Not reported.  
<sup>3</sup> Does not include acreage for farms with less than 15 bushels harvested.  
<sup>4</sup> Does not include acreage for farms with less than 20 bushels harvested.  
<sup>5</sup> Number in census year, which is 1 year later than the crop year given at the head of the column.  
<sup>6</sup> Includes improved pecans and wild pecans or seedlings.

**Corn**

Until recently, the largest acreage of cropland in the county was planted to corn. Nearly all of the corn was harvested for grain. In 1929, corn was grown on nearly 51,000 acres, but the acreage has declined rapidly. In 1954, only 6,539 acres of corn was planted, and nearly half of that was for silage instead of grain.

Most of the corn produced is fed to livestock on the same farm, but on some of the larger farms corn is a cash crop. The reduction in the acreage of corn has been due to the decrease in the total cropland, the increase in acreage of other feed crops, and a reduction in the number of work animals to which much of the corn was fed.

Most of the corn is grown on the bottom lands, on the dark soils of stream terraces, and on the prairie soils. It is usually grown on land that was in cotton or small grains the preceding year. The field is generally listed or bedded twice in the spring. Corn is planted between March 25 and April 20 in the furrow between the beds. Plants are spaced at intervals of 18 to 36 inches in rows 3½ feet apart. A few farmers use a little starter fertilizer under the corn and sidedress it with ammonium nitrate. Corn is cultivated 2 to 4 times with sweeps on a riding cultivator or tractor, and it is usually hoed once by hand to cut weeds out of the row. Corn is harvested about October 1 by hand or with a cornpicker. It is stored in bins or corncribs on the farm.

**Sorghum**

Sorghum is an important crop in this county. The largest acreage of field crops was in sorghum in 1954. More than four-fifths of this was cut for silage, hay, or fodder. Practically all of the sorghum produced in the county is fed to livestock on the same farm.

Sorghum is grown throughout the county, but the greatest acreage is on the dark prairie soils. Sorghum is more drought resistant than other crops. It also helps to reduce erosion when planted in contour strips.

Growing sorghum requires comparatively little labor. On soils of low productivity, it produces more feed as grain or fodder than other crops, especially in dry years. Under good management, yields of sorghum grain will equal or exceed those of corn on uplands. Eroded and unproductive lands that will not produce profitable yields of other crops are usually planted to sorghum.

Sorghum may follow any crop, but it is most commonly grown after small grains. The sweet varieties are used for hay. The land is plowed with a turning plow or one-way plow and allowed to settle or become firm before being seeded. Sorghum may be planted at any time after frost danger is past. Yields are higher if the crop is planted early, because there is more moisture early in the season. Usually in May, the seed is drilled in or broadcast by hand and harrowed in. Seed is planted thickly, about 60 to 80 pounds per acre, so that the stalks will be small and weeds will be shaded and crowded out. Some fields are harrowed once, but most are not cultivated at all. When the first grain heads are mature, the stalks are mowed by machine, raked, and baled in the field.

When sorghum is to be planted in rows, the land is prepared as for corn. About 10 to 15 pounds of seed per acre is drilled in the furrows between beds. Row sorghums are usually cultivated twice but are not hoed. The heads are cut by hand or with a combine when mature and fairly dry. If the forage is harvested also,

it is cut with a row binder when all the heads are mature. Row sorghums grown for silage are cut when the grain is in the late dough stage.

### **Cotton**

Cotton was at one time the most important field crop in the county. It was fourth in acreage in 1954 but still important as a cash crop. The decrease in acreage was due partly to the national program to reduce the amount of cotton grown, partly to the shortage of labor after 1940, and partly to the general reduction in crop acreage in the county. Most of the cotton now grown is planted on the better soils of the bottom lands, stream terraces, and prairies.

Cotton is one of the most profitable cash crops that can be grown in the county, especially for small farms operated by family labor. It can be produced by simple tillage methods, with inexpensive equipment, and with unskilled labor. Because its growing season is longer, it is more likely to recover from the effects of adverse weather than many other crops. Also, labor requirements are distributed over a longer period.

Cotton usually follows corn or sorghum, but sometimes it follows small grain. The land is bedded or listed twice, and the cotton is planted on the bed between April 15 and May 15. A few farmers use about 150 pounds per acre of mixed fertilizer, but most cotton is not fertilized. The seed is either drilled in rows with a riding planter or hill-dropped with a walking planter. Soon after the seedlings emerge, the cotton is thinned with a hoe. It is cultivated with sweeps 3 to 6 times, up to the time the first bolls are mature. Picking begins about the first of October and continues until all the bolls have opened, which is about the middle of November. The cotton is ginned and baled and sold at local gins.

### **Oats**

Oats is the principal small grain grown in this county. Most of the crop is fed to work stock on the farm where it is grown. Oats cut and fed unthreshed to stock was not listed separately in 1954, but was included under "Small grains cut for hay."

Nearly all the oats is produced in the central and eastern parts of the county on dark soils of stream terraces and prairies. This crop is often planted on sloping, thin, eroded soils that will not produce good yields of corn or cotton. Moderate yields of oats are obtained on such soils, especially if preceded by a crop of sweetclover. Oats usually follows sorghum on the least productive soils, but sometimes it is rotated with cotton and sorghums on better soils.

A few acres are planted to oats in the fall, but winter-killing is common. Generally the seed is planted with a drill late in winter or early in spring, 2 or 3 weeks after the land has been plowed with a one-way disk plow. The crop is harvested about July by combine or binder. Oats for hay is mowed when in the late dough stage. It is raked and baled or stored loose in a barn.

### **Hay**

Hay is an increasingly important crop in Creek County, as the trend away from field crops and toward livestock continues. Although the total acreage of cropland in the county is decreasing, the acreage used for hay is steadily increasing.

Only about a third of the hay cut in 1954 consisted of legumes. A large proportion was wild hay. Native prairie grass is a consistent producer of fairly nutritious hay, and it needs no cultivation. Nearly all of this native hay is grown on the dark-colored soils of the prairies, but a few acres are on stream terraces.

More hay is actually produced in the county than is reported separately in the census. Large acreages of sorghum are cut for hay and silage. Most of the peanut vines are saved for hay or forage. Soybeans and cowpeas are included in the annual legumes cut for hay.

### **Minor crops**

Peanuts have become more important in this county in recent decades. Most of them are picked or threshed for peanuts, but the vines or tops are saved for hay.

Wheat is grown mostly on dark soils of the prairies. Some barley is grown. Potatoes, sweetpotatoes, cowpeas, other vegetables, fruits, and berries are "special crops," grown intensively on small acreages.

Nut trees, especially pecan trees, were once numerous. Most of the pecan trees were wild trees or seedlings, but some trees of improved varieties, which were budded or grafted, were planted. Pecan trees are native to the forests on terraces and bottom lands in this county.

A few fruit trees and grapevines are grown. The number of both has declined considerably. Most of the tree fruits and nuts are grown for home use. The surplus is sold locally. There are a few commercial fruit and vegetable farms in the southern part of the county.

### **Pastures**

In 1954, five times as much of the farm land in Creek County was in pasture as was in crops. Almost all the land retired from cultivation is used for pasture.

The largest acreage of pasture is in the prairies, on shallow, stony, or sloping soils that are unsuitable for crops. Some of the deep, gently sloping soils are also in pasture. A few farms on which no work animals are kept have little or no pasture, but most farms have some.

In the prairies, native bluestem and grama grasses furnish fair to good pasture most of the year, except for about 3 months in the winter. Many pastures are abandoned crop fields that have a thin cover of three-awn grasses and some broomsedge, little bluestem, bermudagrass, and annual lespedeza. These grasses furnish fairly abundant, nutritious grazing in spring and early in summer, but the amount and nutritive value of the forage declines rapidly during the dry weather late in summer.

Before 1940, little was done to improve pastures, but now many farmers apply lime and phosphate to rundown pastures and reseed them with bluestem grasses and legumes.

### **Woodland**

The soils of Creek County are generally unsuitable for forestry. Some areas, however, are even less suitable for pasture or cropland. About 56 percent of the farmland is wooded. Nearly all of this is used for pasture. The principal areas of woodland are in the central and western parts of the county and on the flood plain of the Deep Fork of the North Canadian River. There is no woodland in the prairies along the eastern side and in the north-

western corner of the county. Small areas of woodland are scattered throughout the rest of the county.

Most of the woodland consists of frequently flooded bottom lands and sloping to strongly sloping shallow and stony soils of the upland. Almost all of the original forest land that was well suited to cultivation has now been cleared for cropland or pasture. All of the remaining woodland has been cut over many times. Most of it is burned over every few years. Little effort is made to prevent or to control fires. Only a few trees large enough for sawlogs remain, mostly along the streams.

The principal species of commercial importance on the bottom lands are cottonwood, ash, pecan, walnut, and oak. Some lumber of inferior quality is rough sawed in small portable sawmills, which are set up near the larger creeks and operated until the local supply of timber is gone.

On the uplands there are moderately thick stands of scrubby post oak, blackjack oak, elm, and some hickory. All of the larger post oak and blackjack oak trees have been cut. The remaining trees are good only for firewood or fence posts.

Strongly sloping Eufaula soils, Broken or gullied sandy upland, and Gullied bottom land are useless for pasture or cropland. They should be planted to locust, catalpa, or mulberry trees for fence posts. Red oak, black oak, black walnut, pecan, and white oak trees should do well if planted on Gullied bottom land.

Nearly all of the woodland, except narrow areas along streambanks, is used for pasture. The grazing is usually sparse except in spring and early summer. Most of the upland woodlands will probably give better returns over a long period from grazing than from any other use. They should be continued as woodland pasture without further clearing or burning. Bottom land that is frequently flooded is usually better suited to pasture than to forest, especially if it is already cleared. Bottom lands or terraces that now support fair stands of good trees should be protected from overgrazing. Thinning and culling would increase production of both trees and grass in bottom-land woodlands.

## Livestock

Ranching, or production of livestock, mainly beef cattle, was an extensive enterprise before the county was organized and before other types of farming became im-

portant in the area. It continues to be the chief source of farm income in the county. Table 3 gives the number of livestock on farms from 1930 to 1954.

### Beef cattle

Beef cattle are the principal livestock. Most are grade Shorthorns and Herefords, but there are a few purebred herds in the prairie sections. A few herds of grade Anguses and Brahmans are kept. There are a few cattle on nearly every farm, but the largest herds are on the shallow and stony soils of the prairies. Most of the feed is produced on the farm, but some cottonseed cake or other concentrate is bought to feed during winter. The cattle are sold locally as grass-fed yearlings or trucked to the stockyards at Oklahoma City.

### Dairy cattle

Most commercial dairy farms are near larger towns. The principal dairy breeds in the county are Jersey, Holstein, and Guernsey. A few herds are purebred.

Nearly every farm keeps one or more cows for milk for home use. Most of these family cows are beef or dual-purpose animals or grade cows of dairy breeds. Their milk production is low.

Most feed for commercial dairy herds is purchased, but feed for family cows is usually raised on the farm. Milk is sold locally or in nearby Tulsa.

### Horses and mules

Horses and mules are kept for work stock and for riding animals. Their numbers have decreased rapidly because of the change to tractor power for farm work. Most horses and mules are raised on the farms where they are used, but a few are purchased from outside the county. Nearly all feed for them is raised on the farm.

### Swine

Hogs are raised on most of the farms, usually for home consumption. They are raised commercially in the better farming areas where the highest yields of corn can be produced. The principal breeds are Duroc-Jersey, Poland China, Chester White, Hampshire, or crosses of these breeds. Most of the feed for hogs is raised on the farm, but some is bought to finish hogs for market. Hogs are butchered and sold locally or sold alive at Tulsa or Oklahoma City.

### Chickens

Farm flocks of 50 to 100 chickens are common throughout the county. Commercial flocks are located mainly near the larger towns. The principal breeds are White Leghorn, Rhode Island Red, and Plymouth Rock. Feed for farm flocks is raised at home, but most feed for commercial flocks is bought. Eggs and dressed or live poultry are sold locally or in Tulsa and Oklahoma City.

### Other livestock

A few other kinds of livestock are kept on farms in the county, but they are of only minor importance. They include sheep, goats, ducks, geese, turkeys, and bees. They are raised mainly for home use. The surplus is sold locally.

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

Livestock	1930	1940	1950	1954
	<i>Number</i>	<i>Number</i>	<i>Number</i>	<i>Number</i>
All cattle.....	23, 979	<sup>1</sup> 22, 574	25, 921	31, 265
Milk cows.....	8, 022	8, 290	6, 898	3, 853
Horses.....	6, 909	<sup>1</sup> 6, 008	4, 202	1, 738
Mules.....	4, 666	<sup>1</sup> 2, 499	548	262
Swine.....	18, 074	<sup>2</sup> 12, 943	12, 899	5, 993
Sheep.....	561	<sup>3</sup> 396	279	1, 167
Goats.....	347	<sup>2</sup> 366	( <sup>4</sup> )	169
Chickens.....	<sup>1</sup> 137, 179	<sup>2</sup> 109, 990	<sup>2</sup> 81, 644	<sup>2</sup> 51, 405

<sup>1</sup> Over 3 months old.

<sup>2</sup> Over 4 months old.

<sup>3</sup> Over 6 months old.

<sup>4</sup> Not reported.

## Soil Associations

The soils of Creek County are in three broad, general associations. Each association is dominated by soils that developed from similar or related parent materials, support similar kinds of vegetation, and have some characteristics in common. The associations differ considerably in their suitability for different systems of farming.

Figure 2 shows the general areas occupied by each of the three soil associations of the county. Sandy soils of forested areas occupy more than half the area, dark soils of the prairies about one-fourth, and soils of the bottom lands only one-fifth. These associations are mapped very broadly, and each contains many small areas of soils that belong to one of the other two associations.

### Dark Soils of the Prairies

The soils in this association belong to the Dennis, Okemah, Bates, Collinsville, Woodson, Talihina, Choteau, Teller, Vanoss, and Neosho series. The association occurs mainly in two fairly distinct areas, one along the eastern side of the county and one in the northwestern corner. The area in the northwestern corner is divided by the Cimarron River. In the area on the east side of the county, strips of woodland separate tracts of prairie. Besides these two large areas, several areas too small to be shown on the soil association map are scattered throughout the county.

The pattern of geographic distribution within this association is not well defined. As a rule, the Okemah and Woodson soils occupy the nearly level floors of shallow valleys. The Dennis and Bates soils occur on the gently sloping to moderately sloping sides of valleys above the Okemah and Woodson soils. The shallow and stony Collinsville and Talihina soils are on the ridgetops and on the highest and most strongly sloping parts of the valley walls. The Vanoss, Teller, and Choteau soils occupy high, fairly distinct benches or terraces along the major streams. The Neosho soils lie in small level or slightly depressed areas within large, nearly level areas of Choteau soils.

The areas of this association are among the most important agricultural sections of Creek County. They total about 165,700 acres, or 26.6 percent of the county area. The association consists of both shallow, nonarable soils and deep, arable soils. In some places they are intermixed and in other places they occur in fairly large separate areas. Soils that are well suited to crops comprise 42 percent of the association; soils that are moderately well suited to crops comprise another 16 percent. Marginal land and soils unsuitable for crops make up the remaining 42 percent of the association.

The deep and moderately deep soils of this association have moderate to high natural fertility. Under common management they produce moderate yields of cultivated crops or native pastures. They are well suited to cotton, sorghums, small grains, corn, and native grass for hay or pasture. If properly managed, these soils will also produce moderate to high yields of sweetclover and alfalfa. The shallow soils of the association are unsuitable for crops, but they produce moderate yields of pasture and are well suited to grazing.

The arable soils occur in relatively large areas on nearly level to moderately sloping topography that is favorable for large-scale farming operations and the use of power-

operated equipment. The more strongly sloping areas of these soils are very susceptible to erosion and need careful management to reduce runoff and to prevent erosion.

The system of farming in the prairie sections depends on the proportion of arable and nonarable soils on each farm. Some farms or ranches are composed almost entirely of arable soils and some almost entirely of nonarable soils. Farms consisting of deep, arable soils are used for row crops. On farms that consist of both shallow and deep soils, crop and livestock farming are combined. Cattle ranches are located on the shallow, nonarable soils. The system most common is the combination of row-crop and livestock farming.

### Sandy Soils of Forested Areas

The dominant soil series in this association are the Darnell, Pottsville, Stephenville, Cleburne, Dougherty, Stidham, and Eufaula series. Talihina soils occur in the many small prairie openings and as bands on the steep slopes next to Darnell soils. Some areas of Broken or gullied sandy upland are included.

This association occurs all through the county; the largest single area includes nearly all the uplands of the central part. The pattern of distribution is fairly distinct. The Darnell and Pottsville soils and the areas of Broken or gullied sandy upland occupy sloping valley walls, dissected areas, ridgetops, and rolling to hilly areas. The Cleburne and Stephenville soils, as a rule, are on gently sloping ridgetops and the foot slopes along valley sides. The Dougherty, Stidham, and Eufaula series occur on dissected high terraces, mainly above the Deep Fork and Cimarron Rivers in the southern and northern ends of the county.

This is the most extensive soil association in the county, but the least important for agriculture. It occupies 330,600 acres, or 53.2 percent of the county. Three-fourths of the acreage consists of shallow, sloping, and nonarable soils. The rest consists of moderately deep to deep, arable soils. Most of these are only moderately well suited to crops; less than 4 percent of the association is well suited to crops. In most places the shallow and the deep soils are closely associated, but in some parts of the association the shallow soils and the deep soils occur in separate, fairly distinct areas.

These soils are low in natural fertility, and they deteriorate rapidly under cultivation. Only the Dougherty and Stidham soils, which occur along the south edge of the county, are well suited to crops. The gently sloping Cleburne and Stephenville soils are moderately well suited to crops but they do not occur in areas large enough to be important agriculturally.

These soils are very susceptible to leaching, which further depletes their fertility. The moderately deep soils of this association are easily damaged by sheet and gully erosion when cultivated and rapidly become unsuitable for crops and of low value for pasture.

Most of this soil association is scrubby woodland in which there are small prairie openings. It is used mainly for grazing. Small farms are scattered on the deeper and less strongly sloping soils. Small, irregular, cultivated fields are located among areas of woodland or abandoned fields. Crops occupy less than 6 percent of this soil association; most of the cropped areas are on the Dougherty and Stidham soils.

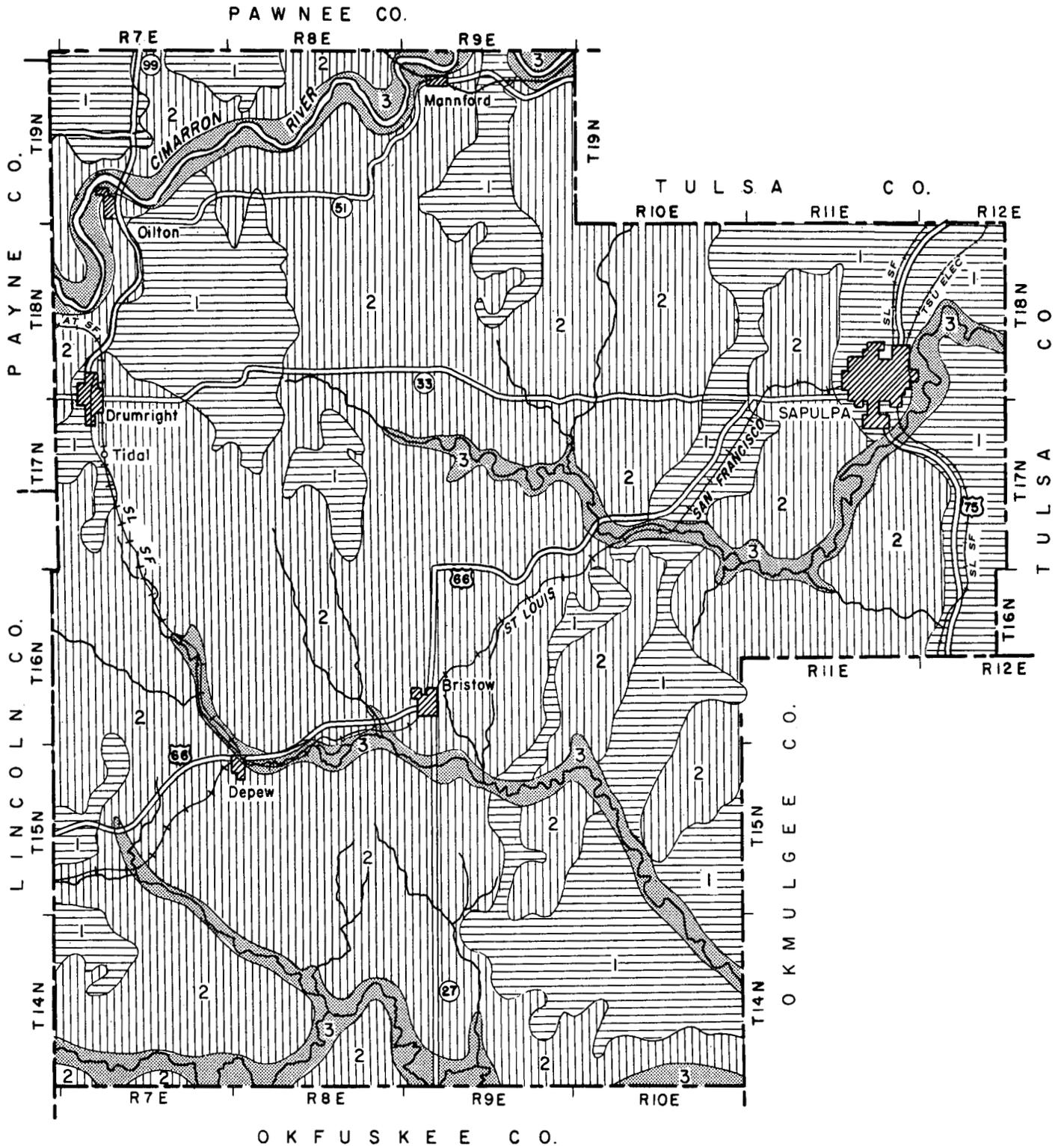


Figure 2.—Soil associations of Creek County, Okla. 1.—Dark soils of the prairies. 2.—Sandy soils of the forested areas. 3.—Soils of the bottom lands.

None of the soils of this association provide good grazing. Pastures support a thin stand of annual weeds and three-awn grasses, which are of low nutritive value. Pastures of moderate carrying capacity can be developed on the moderately deep and deep soils if they are heavily

fertilized. The forest on the shallow and moderately deep soils that overlie sandstone is scrubby blackjack and post oaks. It has little economic value. Under good management, trees for fence posts or other commercial uses can be grown on the deep soils.

Cotton, peanuts, corn, cowpeas, and sorghums are the principal crops. Yields are low to very low. Many of the farms are operated by persons who obtain most of their income from other sources.

### Soils of the Bottom Lands

This association consists of soils of the Port, Yahola, Verdigris, Pulaski, Mason, Roebuck, and Reinach series and of Gullied bottom land. It occurs in the valleys of streams throughout the county. The largest areas are along the Cimarron and Deep Fork Rivers, and along Little Deep Fork and Polecat Creeks. The Mason and Reinach soils lie on low terraces. The other soils are on the flood plains.

This association is made up of the most fertile and productive soils in this county. It is very important agriculturally. It occupies about 121,200 acres, or 19.5 percent of the county. Fifty-four percent of the acreage is well suited to crops, and another 12 percent is moderately well suited to crops. Only about 34 percent, which includes all of the Gullied bottom land, is not suitable for crops. Nearly all the 34 percent that is not suited to crops is well suited to forest or pasture. Gullied bottom land, except for a few small areas, is suitable only for growing trees.

These soils are higher in natural fertility and more productive than the soils of the uplands. The fertility can be maintained or increased easily by using legumes, lime, and phosphate. Crops on these soils withstand droughts much better than crops on the higher lying soils.

Erosion is no problem on these nearly level soils, but runoff and overwash from higher areas may damage crops. Protection from floods is the most serious management problem. Soils on the flood plains of the smaller streams and the Deep Fork River are covered with water so frequently that they are not suitable for crops. Woodland is the best use for these soils. A few areas are well suited to pasture and johnsongrass hay. Other soils of the flood plains and low terraces are flooded, but less frequently, and usually early enough in the spring so that a crop can be planted later.

Few farms are composed entirely of bottom-land soils and, as a rule, these soils are used and managed along with nearby upland soils. Corn, cotton, and sorghums are the principal crops. Soils that are flooded too often to be used for crops are suitable for pastures, pecan orchards, or commercial forests.

### Soil Series and Their Relations

A total of 24 soil series and 3 miscellaneous land types were mapped in Creek County. Each series differs from the others in some characteristic that affects its suitability for agriculture.

The soils of the Bates and Dennis series developed over interbedded sandstones, fine-grained sandy shales, and shales. They occupy gently sloping to moderately sloping relief. They have a dark grayish-brown, friable, acid surface soil and a dark yellowish-brown to brown, friable, slightly acid sandy clay loam to sandy clay subsoil. The Dennis soils are deeper than the Bates soils, and they have more clay in the lower subsoil. Runoff is medium to

rapid, and internal drainage is medium. These are moderately productive, easily worked soils that are well suited to crops, pasture, or native hay.

The Okemah and Woodson soils are the darkest, most clayey soils of the uplands. They developed over neutral to weakly alkaline shales and clays. They are nearly level to gently sloping. They have a very dark grayish-brown, friable, slightly acid surface soil. The Okemah soils have a crumbly clay subsoil, but the Woodson soils have a heavy, compact claypan subsoil; both are slightly acid to neutral in the subsoil. Runoff is slow to medium, and internal drainage is very slow. Drainage is adequate for all of the commonly grown crops, including alfalfa, but planting may be delayed if the weather is very wet in the spring. These are among the most productive soils of the county. They are very good for crops, pasture, or native hay.

The Teller and Vanoss soils developed on moderately high, nearly level to gently sloping stream terraces. Their parent materials were sediments, mainly from the prairies and plains to the west. The Teller soils have a brown friable surface soil and a reddish-brown friable clay loam subsoil over reddish silty and sandy parent materials. They have some characteristics of the light-colored soils of the area, but they more nearly resemble the dark-colored soils. The Vanoss soils have a very dark grayish-brown friable surface soil. Their subsoil is grayish-brown sandy clay loam to friable sandy clay. It overlies dark loamy to clayey parent materials. Soils of these two series are very productive. They are friable, well drained, and easily worked. The reaction ranges from slightly acid to neutral. They are well suited to all crops commonly grown in the county, including alfalfa.

The Choteau and Neosho soils are somewhat lighter colored, less well drained, and less productive than the Teller and Vanoss soils. The Choteau soils are nearly level to gently sloping. The Neosho soils occupy level to slightly depressed spots within areas of Choteau soils. The parent materials are sandy and clayey acid sediments from both dark-colored and light-colored soils. Both series have grayish-brown, friable, acid surface soils. The Choteau soils have a mottled sandy clay subsoil that is moderately friable and permeable. The Neosho soils have a heavy, compact, mottled claypan subsoil. The Choteau soils are moderately well drained and are well suited to crops. The Neosho soils have very slow internal drainage and are not so well suited to crops.

The Collinsville and Talihina soils are shallow and stony nonarable soils of the prairies. They developed from sandstone or interbedded sandstone and shale. These areas are gently sloping to strongly sloping. They have a dark grayish-brown, friable, thin surface soil. Bedrock is about 5 to 18 inches below the surface. In most areas the soils range from slightly acid to neutral, but some spots are alkaline because of underlying limestone or calcareous shales and clays. Runoff is medium to rapid.

The soils of these two series are unsuitable for crops because they are shallow, stony, and sloping. Outcrops of bedrock and loose stones on the surface are common. These soils are well suited to grazing. They produce moderate amounts of nutritious grasses.

A few small areas of Bates soils within the mapping units are the only soils suitable for crops. Small grains and sorghums can be grown on them. However, they

are generally surrounded by nonarable soils and might as well be used for pasture.

The Stephenville, Cleburne, Dougherty, Stidham, and Eufaula series are the moderately deep and deep soils of the forested uplands. These are all light-colored acid soils. They have low natural fertility, but they are very responsive to management and are easily worked.

The Stephenville and Cleburne soils developed over sandstones. They are of medium depth. Slopes are gentle to moderate. Both series have pale-brown sandy surface soils. The friable sandy clay loam subsoil is reddish in the Stephenville series and yellowish in the Cleburne series. Drainage is moderate to rapid. These soils are somewhat droughty. When they are well managed, they are moderately well suited to special crops and some field crops. Small areas of Darnell fine sandy loam are closely associated with Stephenville soils and are mapped in the same units.

The Dougherty and Stidham soils are deep soils that developed in old sandy alluvial sediments. They are nearly level to gently sloping. They have a pale-brown to light-brown sandy surface soil and a friable sandy clay loam subsoil. The subsoil is red in the Dougherty soils and yellowish in the Stidham soils. Both soils absorb rainfall readily and have fairly good moisture-holding capacity. They are moderately well drained to well drained. If well managed, they are well suited to special and vegetable crops, fruits, and general field crops.

The Eufaula soils are pale-brown deep sands that have no loamy material within 3 feet of the surface. These soils are too sandy and loose for most field crops. They produce fair yields of special crops if heavily fertilized.

The Darnell and Pottsville soils, along with strongly sloping or eroded nonarable soils of other series, are the shallow and stony sandy soils of forested areas. They occur in large and small areas among the deeper forested soils. They have a pale-brown, very friable, acid, sandy surface soil only a few inches thick over sandstone or interbedded sandstones and shales. Many loose stones occur on the surface. Bedrock outcrops are common on the sloping areas. These soils are too shallow, stony, or sloping for crops. They have little value for grazing; nevertheless, nearly all areas are used for woodland pasture. They support thin to moderately thick native forests of scrubby post oak and blackjack oak.

The bottom-land soils in Creek County are the Port, Pulaski, Roebuck, Verdigris, and Yahola soils of the flood plains and the Mason and Reinach soils of the low terraces.

The Port soils occur mainly on the flood plains of the Cimarron River. They developed in alluvial sediments that originated west of Creek County from grasslands overlying redbeds. They are alkaline to calcareous soils, reddish brown in color. They are deep, well drained, and highly productive.

The Pulaski soils developed from alluvial sediments washed from prairies and forested areas, both underlain by reddish sandstones. They are brown or reddish brown, slightly acid, well drained, and more or less sandy. Areas that are not flooded too often to be suitable for crops are moderately productive.

The Roebuck soil occurs mostly on the flood plain of the Deep Fork River. Soils of this series developed from reddish-brown, clayey, alluvial sediments. Most of these sediments were washed from grasslands that developed

over the clays and shales of the redbeds west of Creek County. Roebuck soils are poorly drained and most areas are flooded too frequently to be suitable for crops.

Verdigris soils occur on the flood plains of streams that drain the dark-colored soils of the prairies. They have a dark grayish-brown surface layer over a slightly lighter colored silty and clayey subsoil. They are moderately well drained. Areas that are not flooded too frequently are very productive.

The Yahola soils are similar to the Port soils in surface appearance, but they have a sandier subsoil, and they are less productive. They have moderate natural fertility, but some areas are flooded too often to be used successfully for crops.

The Mason and Reinach soils occupy low terraces next to the wider flood plains. Ordinary floods do not cover these soils. During exceptionally high floods some areas are under water. The Mason soils are similar to Verdigris soils in profile characteristics, but they are better drained and are very productive. Mason soils are about the most productive soils in the county.

The Reinach soils occur mainly in the valley of the Cimarron River. They resemble the Yahola soils, with which they are usually associated. They are very productive and are easily worked. Most of their area is cultivated.

## *Descriptions of Mapping Units*

In this section are descriptions of the soils and land types mapped in Creek County. The exact location of each area of each mapping unit is shown on the detailed soil map at the back of this report. The approximate acreage and proportionate extent of each mapping unit are listed in table 4. Table 4 also shows what percentage of each mapping unit was used for stated purposes at the time of this survey.

### *Bates series*

Soils of the Bates series developed over noncalcareous sandstone or sandstone interbedded with sandy and silty shale. The native vegetation was grass. These soils are medium acid to slightly acid. The surface soil is dark grayish brown and friable. The subsoil is friable yellowish-brown sandy clay loam, slightly mottled with reddish brown and yellow in the lower part. The soils are of medium depth.

Bates soils are more sandy and friable in the lower subsoil than soils of the Dennis series, and they are deeper than soils of the Collinsville series. In Creek County, Bates soils are associated with Dennis soils and Collinsville soils. A shallow soil of the Bates series is mapped in a unit with Collinsville soils, and is described under the Collinsville series.

**Bates fine sandy loam, gently sloping** (2 to 4 percent slopes) (Ba).—This is a dark grayish-brown, friable, slightly acid soil of medium depth, developed over sandstone and sandy shale in small prairie areas. These areas are scattered through the county; most of them are in transition zones between forests and prairies. Prairie grasses were the native vegetation, but areas next to woodlands have been invaded by scrubby post oak, mesquite, and elm trees. Internal drainage is moderate,

TABLE 4.—Approximate acreage and proportionate extent of the soils and percentage in stated uses

Soils	Area		Percentage in stated uses			Soils	Area		Percentage in stated uses		
	Acres	Per cent	Crops	Pas-ture and native hay	Wood-land		Acres	Per cent	Crops	Pas-ture and native hay	Wood-land
Bates fine sandy loam:						Eufaula loamy fine sand:					
Gently sloping-----	18,000	2.9	43	57	0	Gently sloping-----	1,500	0.2	33	20	47
Sloping-----	12,000	1.9	26	74	0	Strongly sloping-----	3,500	.6	3	9	88
Sloping, severely eroded-----	800	.1	25	75	0	Gullied bottom land-----	17,000	2.7	0	2	98
Broken or gullied sandy upland-----	16,000	2.6	6	14	80	Mason clay loam-----	3,500	.6	60	34	6
Choteau very fine sandy loam:						Mason silt loam-----	24,000	3.9	71	25	4
Gently sloping-----	5,000	.8	54	36	10	Neosho silt loam-----	1,700	.3	35	65	0
Nearly level-----	3,100	.5	61	36	3	Oil-waste land-----	4,500	.7	0	49	51
Cleburne fine sandy loam-----	5,000	.8	26	44	30	Okemah and Woodson clay loams-----	4,500	.7	51	49	0
Collinsville and Bates soils, gently sloping-----	1,600	.3	25	75	0	Port clay loam-----	400	.1	75	0	25
Collinsville and Talihina soils:						Pulaski fine sandy loam-----	17,000	2.7	20	35	45
Sloping-----	24,000	3.9	2	98	0	Reinach very fine sandy loam-----	17,000	2.7	75	19	6
Strongly sloping-----	25,000	4.0	0	100	0	Roebuck clay-----	5,000	.8	0	0	100
Darnell and Pottsville soils:						Stephenville and Darnell fine sandy loams:					
Sloping-----	115,000	18.5	1	4	95	Gently sloping-----	38,000	6.1	8	47	45
Strongly sloping-----	75,000	12.1	0	2	98	Sloping-----	44,000	7.1	8	37	55
Dennis and Okemah loams:						Sloping, severely eroded-----	12,500	2.0	8	92	0
Gently sloping-----	40,000	6.4	35	65	0	Teller silt loam:					
Sloping-----	14,000	2.3	25	75	0	Gently sloping-----	2,500	.4	60	28	12
Sloping, severely eroded-----	1,500	.2	20	80	0	Nearly level-----	1,200	.2	67	16	17
Dougherty and Stidham fine sandy loams:						Sloping-----	4,500	.7	20	47	33
Gently sloping-----	7,000	1.1	43	47	10	Vanoss silt loam:					
Nearly level-----	2,700	.4	59	26	15	Gently sloping-----	4,000	.6	60	40	0
Sloping-----	9,000	1.4	33	42	25	Nearly level-----	2,300	.4	74	26	0
Dougherty and Stidham loamy fine sands:						Verdigris clay loam-----	1,800	.3	33	45	22
Gently sloping-----	1,000	.2	50	30	20	Verdigris fine sandy loam-----	9,000	1.4	34	32	34
Nearly level-----	400	.1	75	0	25	Verdigris silt loam-----	23,000	3.7	35	39	26
						Yahola clay loam-----	1,000	.2	30	20	50
						Yahola very fine sandy loam-----	2,500	.4	40	24	36
						Total land area-----	622,000	100.0	18	35	47

and runoff is slow to moderate. This soil is usually associated with soils of the Dennis and Collinsville series.

Profile in a cultivated field 4½ miles south of Bristow in NW¼NE¼ sec. 19, T. 15 N., R. 9 E.:

- 0 to 10 inches, dark grayish-brown fine sandy loam; friable when moist, hard when dry; the 6-inch plow layer is slightly lighter colored and more sandy than the subsurface layer; slightly acid; grades to layer below.
- 10 to 20 inches, yellowish-brown sandy clay loam; crumbly and friable when moist, slightly plastic when wet; medium acid; grades to layer below.
- 20 to 34 inches, yellowish-brown sandy clay loam, splotted or mottled with reddish brown and yellow; crumbly and friable when moist, hard when dry; contains a few small fragments of rotten sandstone in lower part; medium to slightly acid.
- 34 to 46 inches +, interbedded yellowish-brown and pale-yellow rotten sandstone and sandy shale; neutral.

The depth to rotten sandstone ranges from 24 to 46 inches. A few acres included in this unit have a reddish-brown surface soil and a reddish-brown friable sandy clay loam subsoil over partly weathered soft reddish sandstone. These areas are Fitzhugh fine sandy loam, but there is not enough Fitzhugh soil in Creek County to make a separate mapping unit.

*Use and management* (Capability unit IIe-2).—This is a moderately productive and easily worked soil. It absorbs water readily and has moderate water-holding capacity. It is very responsive to management. It is slightly to moderately susceptible to erosion if cultivated. About 60 percent shows no effects of erosion. About 40 percent is slightly eroded and has a few shallow gullies and rills. The erosion interferes very little with cultivation. Productivity has been lowered a little, but it can be restored in 2 or 3 years by good management.

About half of this soil is cultivated, and about half is in pasture. Cotton, corn, oats, and sorghums are the principal crops. This soil is well suited to crops, pasture, or native hay. It is in the Loamy prairie range site.

**Bates fine sandy loam, sloping** (4 to 6 percent slopes) (Bb).—This friable soil is similar to Bates fine sandy loam, gently sloping, but the soil layers are slightly thinner. It is associated with Collinsville soils and with other soils of the Bates series.

*Use and management* (Capability unit IIIe-1).—This soil is moderately well suited to crops. It is more droughty and slightly less productive than the gently sloping soil, and it is more likely to erode if cultivated. It requires

more intensive management to reduce runoff and to maintain productivity.

About three-fourths of this soil is now covered by native grass. It is in the Loamy prairie range site. A few acres support a fairly thick cover of scrubby post oak, mesquite, and elm trees. About one-fourth of this soil is cropland, used mostly for corn, cotton, oats, and sorghums. Yields are lower than on Bates fine sandy loam, gently sloping.

**Bates fine sandy loam, sloping, severely eroded** (4 to 6 percent slopes) (Bc).—This mapping unit has been damaged by both sheet erosion and gully erosion. Very little of the original surface soil remains. Tillage operations expose the subsoil over much of the area. Shallow and deep gullies are numerous, and gullying is active in most of the areas.

*Use and management* (Capability unit VIIe-1).—This soil is unsuitable for crops because the gullies practically prevent cultivation. Most of the soil is idle or in pasture. A few areas are associated with less severely eroded Bates soils and are used along with them. Crop yields are very low; usually they do not pay the cost of planting. Idle areas and abandoned fields used for pasture support a thin cover of three-awn grasses and weeds between the gullies. All of this soil should be seeded or sodded to permanent grass. A good cover could not be established easily because of low fertility and gullying.

This soil is in the Loamy prairie range site.

#### **Broken or gullied sandy upland**

**Broken or gullied sandy upland** (5 to 25 percent slopes) (Bd).—This mapping unit is unsuitable for crops because the areas are strongly sloping or are so eroded that cultivation is almost impossible. The parent materials were sandy and silty old alluvial sediments. Most of the original soils consisted of 8 to 14 inches of pale-brown or light-brown fine sandy loam over a subsoil of reddish-brown or reddish-yellow friable sandy clay loam. The most severely gullied areas are those that were formerly cultivated; they generally have slopes of less than 10 percent. Areas once cultivated have lost most of the original sandy surface soil through erosion, and they are cut by numerous deep and shallow gullies. Areas that have never been cultivated have a thin sandy surface soil, but they are so dissected by entrenched natural drains that they are also unsuitable for crops.

*Use and management* (Capability unit VIIe-2).—Most of this land type is under cutover forest. The most practical use for it is to plant catalpa, locust, and mulberry trees to be cut for fence posts. Some areas once cultivated are idle, others are in pasture that supports a thin cover of three-awn grass and weeds. The carrying capacity varies widely according to the severity of erosion. This land is in the Eroded savanna range site.

#### **Choteau series**

These soils developed from old, acid, somewhat silty alluvium, possibly overlain by loess, on high terraces of streams. They are acid soils that are only moderately fertile but respond to management. Internal drainage is slow, and the water-holding capacity is good. The soils are not susceptible to severe leaching or erosion. Under good management, Choteau soils are well suited to common field crops.

Choteau soils have a grayish-brown friable surface layer and a lighter colored subsurface layer over a mottled sandy

clay or clay subsoil that begins at depths of 16 to 28 inches. They have a more clayey subsoil than the well-drained Vanoss soils, but they lack the distinct claypan subsoil and very slow internal drainage of the Neosho soils. The Choteau soils are usually associated with the Neosho soils.

**Choteau very fine sandy loam, nearly level** (0 to 1 percent slopes) (Cb).—This soil developed from slightly acid to neutral silty and clayey alluvium washed from non-calcareous soils, which were probably overlain by slightly sandier loess. It occurs in a few fairly large areas, mostly near Slick, in the southeastern part of the county. It occupies high terraces or benches that lie 25 to 50 feet above the flood plains along the larger creeks. Prairie grass was the native vegetation; a few scattered elm, post oak, and hackberry trees grew next to streams. Internal drainage is slow, and runoff is very slow.

Profile about 3 miles southeast of Slick in SE $\frac{1}{4}$ SE $\frac{1}{4}$  sec. 27, T. 15 N., R. 10 E.:

- 0 to 16 inches, dark grayish-brown very fine sandy loam; plow layer to a depth of 6 inches is grayish brown; moderate medium granular and friable but forms a thin surface crust on drying if not cultivated soon after rains; medium acid.
- 16 to 28 inches, light-gray heavy very fine sandy loam or loam, slightly mottled with brown; moderate medium granular structure; friable when moist, hard when dry; medium acid.
- 28 to 32 inches, light-gray sandy clay or clay, coarsely mottled with brownish yellow and light yellowish brown; firm when moist, moderately sticky and plastic when wet; moderately permeable; slightly acid.
- 32 to 48 inches, mottled light-gray, light brownish-gray, and yellowish-brown clay; very compact; very sticky and stiff when wet; very slowly permeable; neutral.
- 48 to 58 inches +, mottled light yellowish-brown, light-gray, and light olive-brown clay; very sticky and stiff when wet, extremely hard when dry; very slowly permeable; neutral to weakly alkaline.

The texture ranges from fine sandy loam to silt loam, and the depth to the clay subsoil ranges from about 16 to 30 inches. The clay layers in the profile contain a few to numerous small shotlike concretions of iron oxide.

Included in the mapping unit are a few small areas, totaling less than 10 percent of the unit, that have friable clay loam subsoils. These areas are Vanoss or Teller soils and are too small to be separated on the map.

*Use and management* (Capability unit I-3).—This soil is moderately productive. It is very responsive to good management and can be made highly productive. It is moderately fertile, but because of slow internal drainage it stays rather cold and wet until late in spring. In wet years, planting may be delayed. Drainage is adequate for most crops. The moisture-holding capacity is good, and crops are seldom damaged by drought except during unusually long periods of dry weather. The soil is only moderately susceptible to leaching or erosion.

This soil is well suited to crops. About two-thirds of it is cultivated, mostly to corn, cotton, small grains, and sorghums. Yields are moderate. About one-third is used for pasture. This soil is in the Loamy prairie range site.

**Choteau very fine sandy loam, gently sloping** (1 to 4 percent slopes) (Ca).—This grayish-brown, friable, deep, acid soil closely resembles Choteau very fine sandy loam, nearly level. It occurs in small areas associated with the nearly level soil.

*Use and management* (Capability unit IIe-1).—This soil is less productive than Choteau very fine sandy loam, nearly level, because more water is lost through runoff. About one-third of the cropland is slightly or moderately

eroded. The productivity has been lowered about 25 percent by erosion, but it could be restored in 2 or 3 years by good management.

About half of this soil is cultivated. The principal crops are corn, cotton, sorghums, and oats. Yields average a little lower than on the nearly level soil. About one-third of this soil is used for pasture. The remainder is in woodland, which is pastured also.

This soil needs the same management as Choteau very fine sandy loam, nearly level. It also needs control of runoff and erosion. Areas already damaged by erosion need extra fertilization. This soil is in the Loamy prairie range site.

#### **Cleburne series**

The soils in this series developed over yellowish noncalcareous sandstones under a scrubby deciduous forest. They are acid, well drained, moderately deep, and friable. They are low in natural fertility but are very responsive to management and are well suited to special and vegetable crops and field crops if well managed.

These soils have a sandy surface soil and a yellowish sandy clay loam subsoil. They are associated with soils of the Darnell, Pottsville, and Stephenville series. The Darnell and Pottsville soils are more shallow over sandstone and shale. The Stephenville soils are deep or of medium depth, and they have browner surface soils and redder subsoils than the Cleburne soils.

Only one soil of the Cleburne series was mapped in Creek County.

**Cleburne fine sandy loam** (1 to 4 percent slopes) (Cc).—This soil occurs in many small areas on gently sloping divides and ridgetops. The parent material is yellowish to reddish-brown sandstone that is slightly acid to neutral. The native vegetation was a scrubby hardwood forest, consisting mostly of blackjack and post oaks. Surface drainage is slow to moderate, and internal drainage is moderate.

Profile about 2 miles southwest of Kiefer in the NW¼ NW¼ sec. 25, T. 17 N., R. 11 E.:

- 0 to 10 inches, pale-brown light fine sandy loam; nearly loose when dry, very friable when moist; slightly acid.
- 10 to 26 inches, brownish-yellow sandy clay loam; crumbly and friable when moist, hard when dry, moderately sticky when wet; permeable; medium acid.
- 26 to 38 inches, brownish-yellow friable sandy clay loam, mottled with pale yellow and strong brown; contains small fragments of partly weathered sandstone in the lower part; medium acid.
- 38 to 45 inches+, yellowish partly weathered sandstone; contains seams of reddish sandstone and sandy clay loam; slightly acid.

The color of the surface soil ranges from grayish brown in forested areas to light brownish gray in cultivated areas. The surface layer may be from 8 to 14 inches thick. The color of the subsoil ranges from yellow to yellowish brown and the texture from sandy clay loam to friable sandy clay.

*Use and management* (Capability unit IIIe-3).—This soil is low in natural fertility, but it is easily worked and is very responsive to good management. It is slightly susceptible to erosion. A few acres have lost part of the original surface soil, but the damage is not yet serious. The original level of productivity could be restored by 2 or 3 years of good management.

About one-fourth of this soil is used for crops, mostly

corn, cotton, sorghums, and special crops like peanuts, melons, or cowpeas. About half is abandoned fields now used for pasture. The rest is covered by native forest. The carrying capacity of the pastures varies widely, depending on the thickness of the brush cover. The range site is the Sandy savanna type.

#### **Collinsville series**

The soils of the Collinsville series are very shallow over noncalcareous sandstone and sandy shale. They are slightly acid. The native vegetation is grass. These soils are not suited to crops but are well suited to grazing.

In Creek County, the Collinsville soils are mapped only with the Bates or Talihina soils. Most areas of these mapping units are on the narrow, gently sloping to rolling crests of ridges or divides, where a sandstone cap overlies the more strongly sloping layers of interbedded shales and sandy or silty shales that underlie the Talihina soils.

**Collinsville and Bates soils, gently sloping** (2 to 4 percent slopes) (Cd).—This mapping unit consists of dark grayish-brown shallow or stony soils over sandstone or sandstone interbedded with sandy and silty shale. About 60 percent of the acreage is Collinsville fine sandy loam or stony loam. About 30 percent is a shallow phase of Bates fine sandy loam or very fine sandy loam. Small and large areas of these soils occur intermixed on narrow ridgetops and divides or on gentle slopes. Less than 10 percent of the mapping unit consists of Talihina soils, which are very shallow and overlie shale and shaly clay. The native vegetation, which still covers most of this unit, is a moderately thick cover of prairie grasses and scattered post oak trees. Both runoff and internal drainage are moderately rapid.

Profile of Collinsville stony loam about 3 miles west of Kiefer:

- 0 to 10 inches, dark grayish-brown loam; weak granular structure; friable; contains numerous small and large fragments of sandstone in the soil and on the surface; slightly acid.
- 10 inches+, yellowish-brown sandstone bedrock; slightly acid.

Profile of Bates fine sandy loam, shallow phase, near the Collinsville profile just described, but slightly higher:

- 0 to 7 inches, dark grayish-brown fine sandy loam; weak granular structure; friable; slightly acid.
- 7 to 18 inches, yellowish-brown sandy clay loam; medium granular structure; crumbly and friable; contains a few small fragments of sandstone and reddish-brown spots or mottles in the lower part; medium acid.
- 18 inches+, partly weathered yellowish-brown sandstone, in some places interbedded with rotten sandy shale; medium acid.

The surface soil of both the Bates and the Collinsville soils in this unit ranges from dark brown to dark grayish brown in color, and the texture ranges from fine sandy loam to loam or light clay loam. The Collinsville soils are 6 to 15 inches deep over sandstone; sandstone outcrops are very numerous. The Bates soils are 16 to 25 inches deep over sandstone and have fewer outcrops. The small areas of Talihina clay loam have a thin subsoil of yellowish-brown clay that overlies shale at depths of 10 to 15 inches.

*Use and management* (Capability unit VI-1).—This unit is not suitable for cropland, and only about one-fourth is used for crops. Most of it is used for grazing, for which it is moderately well suited. It is in the Shallow prairie range site. These soils do not erode if protected

by a good cover of native grass, but they may erode slightly if overgrazed.

**Collinsville and Talihina soils, sloping** (4 to 12 percent slopes) (Ce).—The soils in this mapping unit are shallow and stony. About 60 percent of the acreage is Collinsville loam, which occupies the crests of ridges or low hills that are capped with sandstone. About 40 percent is Talihina clay loam, which occurs on the slopes below the Collinsville soils, where shale and interbedded sandstone and shale outcrop. The two soils usually occur in narrow bands that are too small to separate on the map. Tall grasses, mainly little bluestem and side-oats grama, are dominant, but some short grasses, mainly buffalograss and hairy grama, grow on the Talihina soils. Some areas are thinly covered with scrubby post oak, elm, and mesquite.

Profile of Talihina clay loam, about 3 miles west of Kiefer:

- 0 to 8 inches, olive-gray or dark grayish-brown clay loam; strong granular structure; crumbly and friable when moist, very hard when dry; has numerous sandstone fragments on the surface; slightly acid.
- 8 to 30 inches+, pale-olive or olive slightly weathered shale that contains thin layers of light-gray or brown clay and silty shale; neutral.

The Collinsville soil is described under Collinsville and Bates soils, gently sloping.

On slopes below areas of Collinsville stony loam, the Talihina soil has numerous sandstone fragments ranging up to 2 feet in diameter on the surface.

*Use and management* (Capability unit VIs-1).—The soils of this unit should not be cultivated, because they are very low in productivity. Most of the area is used for grazing. These soils are in the Shallow prairie range site. They produce moderate amounts of fairly nutritious grasses, but they are commonly overgrazed late in the summer or in long dry periods. The soils are droughty because they are so shallow. Runoff is moderate to rapid.

**Collinsville and Talihina soils, strongly sloping** (12 to 20 percent slopes) (Cf).—This mapping unit occurs in narrow valleys, on escarpments, and on hills dissected by natural stream channels. The soils are shallower than those in the sloping phase of Collinsville and Talihina soils, and the surface is stonier.

These soils are less than 8 inches deep over bedrock. The vegetation is a thin stand of grasses, mainly little bluestem, grama, and buffalograss. Mesquite and post oak trees are scattered over the area and form a fairly thick cover along stream channels and next to sandy forested areas.

In some places, limestone underlies the thin soil profile. Included in the mapping unit are areas of Sogn and Vernon soils, which are reddish brown and overlie red clay and shale. These areas are so small and so intermixed with the other soils that they cannot be mapped separately, and the soils are not described separately in this report.

*Use and management* (Capability unit VIs-1).—This unit is unfit for any use except grazing. It is in the Shallow prairie range site. It has a low carrying capacity. Grazing should be controlled carefully because these soils erode easily.

### **Darnell series**

These very shallow acid soils developed over reddish sandstones under forest. They are too shallow for cropland and are used mainly for woodland pasture.

Darnell soils have a thin grayish-brown sandy surface soil a few inches thick. A thin light-brown or light-yellow sandy subsurface layer overlies sandstone at depths of 5 to 20 inches. Sandstone outcrops are common. Most areas have a few to numerous loose sandstone fragments on the surface.

In Creek County, Darnell soils are mapped only in mixed mapping units with either Pottsville or Stephenville soils.

**Darnell and Pottsville soils, sloping** (4 to 12 percent slopes) (Da).—This is an extensive mapping unit that occupies the greater part of the sloping, forested areas of the county. It consists of very shallow, more or less sandy and stony, acid soils that overlie slightly acid to neutral reddish or yellowish interbedded sandstone, silty or sandy shale, and shale. About 55 percent of the acreage is Darnell stony fine sandy loam, and about 35 percent is Pottsville stony loam. Small areas of Stephenville fine sandy loam and spots of Talihina soils are scattered through this mapping unit.

The native vegetation was a scrub forest of blackjack and post oaks. Some elm and hickory trees and scattered coarse grasses, mainly bluestems, also grew in these places. Surface drainage is rapid. Internal drainage is moderate in the Darnell soils, but it is very slow in the Pottsville soils.

Profile of Darnell stony fine sandy loam under native scrubby forest on a slope of about 7 percent, about 5 miles west of Bristow in the SW $\frac{1}{4}$ SW $\frac{1}{4}$  sec. 33, T. 16 N., R. 8 E.:

- 0 to 4 inches, dark grayish-brown fine sandy loam; very friable when moist, nearly loose when dry; numerous small and large sandstone fragments in the soil and on the surface; slightly acid.
- 4 to 8 inches, light-brown fine sandy loam; nearly loose when dry; contains fragments of partly weathered sandstone; medium to slightly acid.
- 8 inches+, red or reddish-yellow sandstone bedrock; slightly acid.

The combined thickness of the two layers of fine sandy loam ranges from 5 to 20 inches within a distance of a few feet. In some places a 3- to 5-inch subsoil of reddish sandy clay loam overlies the bedrock.

Profile of Pottsville stony loam about 5 miles west of Bristow in the NW $\frac{1}{4}$ SW $\frac{1}{4}$  sec. 33, T. 16 N., R. 8 E.:

- 0 to 3 inches, dark grayish-brown loam; weak granular structure; friable; numerous fragments of sandstone, up to 18 inches in diameter, on the surface; slightly acid.
- 3 to 8 inches, yellowish-red clay loam; crumbly when moist, sticky and plastic when wet; medium acid.
- 8 to 30 inches+, mottled olive-brown and yellow or red and olive-yellow shaly clay; contains interbedded layers of brown sandstone; medium acid.

The thickness of the upper two horizons combined ranges from about 3 to 15 inches, and the texture ranges from fine sandy loam to clay. The bedrock that underlies this soil is sandstone in some places, and in other places, sometimes only a few feet away, it is slightly weathered shale.

*Use and management* (Capability unit VIs-2).—This unit is entirely unsuitable for cropland and of low value for woodland or woodland pasture. It is in the Shallow savanna range site. Most of this unit is still under a cover of native scrubby blackjack oak, post oak, elm, and hickory trees. It erodes very easily even under its natural cover of forest. The shallowness of the profile is the result of normal erosion.

**Darnell and Pottsville soils, strongly sloping** (12 to 20 percent slopes) (Db).—This mapping unit is similar to Darnell and Pottsville soils, sloping, except that the slopes are stronger and more irregular. Many fragments of sandstone, ranging up to 2 or 3 feet in diameter, lie on the surface, and there are many outcrops of sandstone bedrock. The profile is less than 8 inches thick, except in scattered pockets between stone fragments or outcrops, where it may be as much as 12 or 15 inches thick (fig. 3). The vegetation is a moderately thick stand of scrubby blackjack and post oaks. Some elm and hickory trees and scattered bunchgrass grow in the area.



Figure 3.—Profile of Darnell and Pottsville soils, strongly sloping.



Figure 4.—Landscape of Darnell and Pottsville soils, strongly sloping.

The unit consists mostly of Darnell and Pottsville soils, but includes small areas of Stephenville fine sandy loam and Talihina soils. The Stephenville soil has a thin subsoil of reddish-brown clay loam over sandstone bedrock at depths of 10 to 15 inches.

*Use and management* (Capability unit VIs-2).—This land is unsuitable for any agricultural use except woodland or woodland pasture (fig. 4). It is in the Shallow savanna range site. A few acres were cropped for a short time and abandoned; nearly all is now used for woodland pasture. The carrying capacity is very low.

#### Dennis series

Soils of the Dennis series are dark-colored, deep, friable, well-drained, slightly acid soils that developed over interbedded sandy shale, sandstone, and thinly bedded clays under grass. They are moderately fertile and are among the most productive upland soils in Creek County.

These soils have a dark grayish-brown friable surface soil, a yellowish-brown friable clay loam upper subsoil, and a mottled friable to firm sandy or silty clay lower

subsoil. Dennis soils have somewhat darker colored and more loamy upper horizons and more clayey lower horizons than Bates soils. They are lighter colored than the Okemah soils, and have a less clayey and more permeable lower subsoil. In Creek County, the Dennis soils are mapped only with the Okemah soils.

**Dennis and Okemah loams, gently sloping** (1 to 4 percent slopes) (Dc).—The principal soils in this mapping unit are Dennis silt loam and Okemah silt loam and loam. About 55 percent of the unit is Dennis silt loam and about 35 percent is Okemah silt loam and loam. Other types of Dennis and Okemah soils comprise the remaining 10 percent. These soils occur both in separate areas and in areas where the two soils are closely associated and merge with little difference in surface appearance. In the areas where the two soils are associated, the Okemah soils occupy the bottoms of shallow valleys and the Dennis soils occupy gentle slopes next to the Okemah soils.

The Okemah soils developed over olive-colored, weakly alkaline clay and shaly clay, and the Dennis soils over thin-bedded sandy clay and sandstone or sandy shale. The native vegetation on both was prairie grasses, mainly bluestems and grama grasses. Runoff is slow to moderate. Internal drainage is moderate in the Dennis soils and slow in the Okemah soils.

Profile of Dennis silt loam, gently sloping, under native grass cover now used for meadow, about 5 miles north of Oilton in the NE $\frac{1}{4}$  sec. 4, T. 19 N., R. 7 E.:

- 0 to 10 inches, dark grayish-brown silt loam; medium granular structure; friable when moist, slightly hard when dry; slightly acid.
- 10 to 20 inches, dark yellowish-brown clay loam; medium granular structure; friable when moist, slightly sticky when wet, hard when dry; medium acid.
- 20 to 32 inches, mottled pale-yellow and strong-brown fine sandy clay; some reddish-brown mottling in lower part; moderately crumbly and friable when moist, sticky and plastic when wet, very hard when dry; slowly permeable; slightly acid.
- 32 to 42 inches, mottled pale-yellow, light-gray, and light-red fine sandy clay; firm; crumbly when moist, moderately sticky and plastic when wet; slowly permeable; slightly acid.
- 42 to 56 inches +, thin-bedded mottled light-gray, pale-yellow, and light-red sandy clay and yellowish-brown fine-grained sandstone or sandy shale; slightly acid to neutral.

The color of the Dennis surface soil ranges from very dark grayish brown in undisturbed areas to grayish brown in cultivated areas. The texture may be very fine sandy loam, loam, or silt loam. The second layer ranges from dark yellowish brown to pale brown; it may or may not be slightly mottled with brown. The third layer ranges from fine sandy clay to friable light clay, and the amount of red or reddish-brown mottling in this layer varies. In areas next to the Okemah soils the two lower layers are firm clay. A few shotlike concretions of iron oxide may occur in any layer beneath the surface layer.

Profile of Okemah silt loam in cultivated area of less than 2 percent slope, near Mounds, in the SW $\frac{1}{4}$ SW $\frac{1}{4}$  sec. 17, T. 16 N., R. 12 E.:

- 0 to 15 inches, very dark grayish-brown silt loam; strong medium granular structure; friable when moist, hard when dry; has a thin surface crust when dry; slightly acid.
- 15 to 22 inches, dark grayish-brown loam or clay loam, slightly mottled with brown and strong brown; granular structure; crumbly when moist, moderately sticky and plastic when wet, very hard when dry; permeable; slightly acid.
- 22 to 38 inches, mottled grayish-brown and light olive-brown heavy clay; compact; very sticky and stiff when wet;

contains numerous small concretions of iron; very slowly permeable; slightly acid to neutral.

38 to 50 inches +, mottled light-gray, olive-yellow, and pale-yellow clay that grades into pale-olive and yellow shale in the lower part; neutral to weakly alkaline.

The surface soil of the Okemah series ranges in color from very dark gray in undisturbed areas under native grass to grayish brown in cultivated areas. The texture may be silt loam, loam, or clay loam. Depth to the third horizon, which is the heavy clay layer, ranges from 16 to 28 inches.

*Use and management* (Capability unit IIe-2).—The soils in this unit are among the most fertile and productive upland soils in the county. More than half of the acreage is used for native pasture. The unit is in the Loamy prairie range site. These soils are well suited for growing all common field crops. They are very good for pasture, but it is usually better to use these productive soils for cropland. These soils are slightly to moderately susceptible to erosion if cultivated. Only one-fourth of the acreage now shows signs of erosion.

**Dennis and Okemah loams, sloping** (4 to 6 percent slopes) (Dd).—This mapping unit is like Dennis and Okemah loams, gently sloping, except that the slopes are stronger and the surface layers are thinner. The surface soil of the Dennis silt loam is from about 6 to 10 inches thick, and that of the Okemah is about 8 to 12 inches thick.

*Use and management* (Capability unit IIIe-1).—These soils are not as well suited to row crops as the gently sloping soils. They are more droughty and consequently less productive. Runoff is moderate to rapid, and the soils are very susceptible to erosion if row crops are grown. Erosion is now active on all cultivated areas, and shallow gullies and rills are common on cropland and on abandoned fields now used for pasture. The productivity of the moderately eroded areas has been reduced, and careful management will be required to prevent further damage.

Large areas of this mapping unit are used for native grass pastures and hay (fig. 5). Yields are about three-



Figure 5.—Native grass meadow on Dennis and Okemah loams, sloping, after hay has been harvested.

fourths as much as on the gently sloping soils. This unit is in the Loamy prairie range site.

**Dennis and Okemah loams, sloping, severely eroded** (4 to 6 percent slopes) (De).—These dark prairie soils have been so severely damaged by sheet and gully erosion that they are nearly worthless for crops. Originally they were moderately productive of crops and very productive of native pasture. Between gullies and rills, the friable

surface soil may be as much as 4 to 6 inches deep; in the most severely eroded spots, there is no surface soil.

*Use and management* (Capability unit VIIe-1).—All of this mapping unit has been cultivated, but 80 percent of it is now idle or in pasture. The pastures are poor. They support a thin cover of annual weeds and three-awn grass. The areas still cultivated produce low yields in years of favorable weather and almost nothing in years when the weather is dry or otherwise unfavorable. This unit is in the Loamy prairie range site.

### **Dougherty series**

The Dougherty soils developed under a mixed hardwood forest from slightly acid, moderately sandy old alluvium. They occur on stream terraces. They are low to moderate in productivity, but they are very responsive to management, are easily worked, and have good water-holding capacity. They are very good soils for growing fruits, special crops, and field crops.

Soils of the Dougherty series have a grayish-brown acid surface soil and a reddish-brown to red friable sandy clay loam subsoil. They are associated with Stidham soils, which have a yellowish-brown subsoil that is slightly more clayey in the lower part, and with Eufaula soils, which have a deep, nearly loose, sandy surface soil. Dougherty soils are so similar to Stidham soils in profile characteristics, crop suitability, and productivity, and the two series are so closely associated in this county, that they are mapped in the same units and described together in this report.

**Dougherty and Stidham fine sandy loams, nearly level** (0 to 2 percent slopes) (Dg).—Some areas of this mapping unit consist of Dougherty fine sandy loam, some of Stidham fine sandy loam, and some of the two soils closely associated and intergrading. The two soils are so similar in appearance that it is difficult to tell them apart in the field, and they are used and managed in the same way. They developed on high terraces bordering the valley of the Deep Fork, on reddish or yellowish sandy alluvium that is more or less stratified with finer material. This alluvial material ranges from slightly acid to weakly alkaline. The original vegetation was a hardwood forest of post oak, blackjack oak, red oak, and some hickory and elm. Coarse grasses grew in clearings. Drainage is favorable for crops; runoff is slow but internal drainage is moderate. Some areas receive water that drains from higher lying soils, and they may consequently be too wet and cold for planting early in the spring.

Profile of Dougherty fine sandy loam about 3 miles southeast of Newby in the SW $\frac{1}{4}$ NE $\frac{1}{4}$  sec. 34, T. 14 N., R. 10 E.:

- 0 to 6 inches, grayish-brown fine sandy loam; structureless; very friable; slightly acid; grades to horizon below.
- 6 to 12 inches, light yellowish-brown fine sandy loam; very friable when moist, nearly loose when dry; medium acid; grades through a 2- to 3-inch transition layer of reddish-yellow heavy sandy loam to horizon below.
- 12 to 34 inches, red sandy clay loam; crumbly and friable when moist, moderately plastic when wet; permeable; medium acid.
- 34 to 50 inches +, reddish-yellow or yellowish-red sandy clay loam; friable when moist, hard when dry; permeable; slightly to medium acid. This is underlain by moderately sandy, somewhat stratified old alluvium at depths of about 5 to 8 feet.

The color of the upper layer may be grayish brown, light brownish gray, or brown. The layer below varies

from pale brown to light yellowish brown. The total thickness of fine sandy loam ranges from 10 to 16 inches. The sandy clay loam subsoil ranges in color from reddish yellow or reddish brown to red. Areas that are transitional between the Dougherty and the Stidham soils have a reddish-yellow subsoil that is mottled with pale yellow in the lower part. Some slightly elevated areas, 2 to 4 feet above the nearly level Dougherty and Stidham soils, are loamy fine sand soils of the same series. These small areas have sandy surface soils 18 to 26 inches thick.

Profile of Stidham fine sandy loam about 3 miles southeast of Newby in the SE $\frac{1}{4}$ NW $\frac{1}{4}$  sec. 25, T. 14 N., R. 9 E.:

- 0 to 8 inches, light brownish-gray fine sandy loam; structureless; very friable when moist, nearly loose when dry; slightly acid.
- 8 to 14 inches, very pale brown fine sandy loam in upper part, light yellowish-brown heavy fine sandy loam in lower part; nearly loose when dry; medium acid.
- 14 to 36 inches, yellowish-brown sandy clay loam; crumbly and friable when moist, moderately plastic when wet; permeable; medium acid.
- 36 to 50 inches +, brownish-yellow sandy clay, mottled or splotted with strong brown and some pale yellow; slightly more sandy in the lower part; plastic and sticky when wet; moderately permeable; medium acid.

The surface soil ranges from 12 to 18 inches in thickness and from grayish brown to very pale brown in color. The color of the subsoil ranges from yellowish brown to yellow. The lower part is mottled in places. The texture of the lower subsoil ranges from sandy clay loam to sandy clay. Small areas of Stidham loamy fine sand occupy slight elevations within this mapping unit. The loamy fine sand surface layer of these areas is 18 to 30 inches thick.

*Use and management* (Capability unit IIe-3).—These soils are permeable and easily worked, and they have good water-holding capacity. They are low in natural fertility but respond well to management. They are not likely to erode.

The soils are suitable for a wide range of crops. Nearly 60 percent of the acreage is used for corn, cotton, sorghums, and other row crops. The rest is idle or in native woodland pasture. This mapping unit is in the Sandy savanna range site.

**Dougherty and Stidham fine sandy loams, gently sloping** (2 to 5 percent slopes) (Df).—These light-colored, moderately sandy, deep, friable soils developed under forest on gently sloping stream terraces. The parent material was slightly acid to weakly alkaline sandy earth washed mainly from noncalcareous forested areas. The soils in this mapping unit are like those in Dougherty and Stidham fine sandy loams, nearly level, except that the subsoils are dominantly reddish and somewhat better drained.

*Use and management* (Capability unit IIIe-3).—Nearly all areas of these soils are suitable for crops. Both runoff and internal drainage are moderate. The soils absorb rainfall readily and have a moderately high water-holding capacity. They are slightly more droughty than the nearly level soils, but under good management they should give about the same yields. Under ordinary management, yields average slightly lower.

The soils in this unit are easily worked and are very responsive to good management. The stronger slopes may erode if planted to row crops.

About half of the acreage is idle land or abandoned fields now used for pasture. Most of the rest is used for crops. Corn, cotton, sorghums, and peanuts are com-

monly grown. A small acreage is in cutover woodland. This unit is in the Sandy savanna range site.

**Dougherty and Stidham fine sandy loams, sloping** (5 to 8 percent slopes) (Dh).—These light-colored, moderately sandy soils are similar to the gently sloping Dougherty and Stidham fine sandy loams, but they have slightly thinner soil layers. The surface soil in undisturbed areas is 8 to 12 inches thick. Internal drainage is moderate. Runoff is moderate to rapid; consequently much of the rainfall is lost.

*Use and management* (Capability unit IVe-1).—These soils are marginal for cropland under common management. They are friable, easily worked, and very responsive to management, but they are also droughty and very susceptible to erosion if cultivated. More than half of the acreage is already moderately eroded. One-third to one-half of the original surface soil has been lost, and shallow gullies and rills are common. Productivity has declined 30 to 50 percent in the eroded areas.

About one-third of the acreage is used for crops. Under very good management, yields are moderate. About one-fourth is under a cutover oak forest. The rest is idle land or abandoned fields used for pasture. These soils are suitable for orchards if properly terraced and well managed. The unit is in the Sandy savanna range site.

**Dougherty and Stidham loamy fine sands, nearly level** (0 to 2 percent slopes) (Dl).—These soils developed on nearly level, old, high stream terraces. The parent material consisted of sandy, slightly acid to weakly alkaline old alluvial sediments washed from forested areas of light-colored soils. Dougherty loamy fine sand and Stidham loamy fine sand are similar in profile characteristics, crop suitability, and appearance, and they occur in close association in this county.

The native vegetation was a hardwood forest, mainly blackjack oak, post oak, red oak, hickory, and elm. Runoff is very slow, because the deep permeable soils absorb most of the rainfall. These soils resemble the Dougherty and Stidham fine sandy loams in appearance, but they have thicker, more sandy, and more strongly leached surface soils.

Profile of Dougherty loamy fine sand south of Bristow in the SW $\frac{1}{4}$ SW $\frac{1}{4}$  sec. 29, T. 14 N., R. 9 E.:

- 0 to 12 inches, pale-brown loamy fine sand; structureless; very friable when moist, nearly loose when dry; slightly acid.
- 12 to 26 inches, very pale brown loamy fine sand in upper part, reddish-yellow fine sandy loam in lower 2 to 4 inches; very friable when moist, nearly loose when dry; medium acid.
- 26 to 44 inches, light-red sandy clay loam; crumbly and friable when moist, slightly plastic and sticky when wet; permeable; medium acid.
- 44 to 56 inches +, light-red or reddish-yellow sandy clay loam that is more sandy and friable than layer above; slightly acid.

The combined thickness of the uppermost two layers ranges from 16 to 36 inches. The color ranges from light reddish brown to light brown or pale brown. The colors are lightest where the loamy sand layers are thickest. The third layer, the subsoil, ranges from reddish yellow to red in color and from light sandy clay loam to friable sandy clay in texture.

Profile of Stidham loamy fine sand about 4 miles southeast of Newby in SW $\frac{1}{4}$ SE $\frac{1}{4}$  sec. 25, T. 14 N., R. 9 E.:

- 0 to 10 inches, pale-brown loamy fine sand; structureless; nearly loose when dry; slightly acid.

- 10 to 26 inches, very pale brown loamy fine sand, slightly more loamy in lower part and faintly mottled with pale yellow; nearly loose when dry; medium acid.
- 26 to 34 inches, brownish-yellow sandy clay loam, faintly mottled with pale yellow; crumbly and friable when moist, moderately sticky and plastic when wet; medium acid.
- 34 to 46 inches+, brownish-yellow light sandy clay mottled with light gray and reddish brown; crumbly and friable when moist, plastic when wet; moderately to slowly permeable; medium acid.

The combined thickness of the two upper layers ranges from about 16 to 36 inches, and the color ranges from very pale brown to light brownish gray. The third layer ranges from sandy clay loam to sandy clay in texture. Its color ranges from yellowish brown to yellow; in places it is mottled with pale yellow.

*Use and management* (Capability unit IIIs-1).—These loamy fine sands are low in natural fertility, but they are easily worked and very responsive to management. They are not susceptible to erosion by water, but the wind may blow away surface soil that is not protected by vegetation.

These soils are well suited to most of the vegetables and special crops grown in the county. Peanuts, cowpeas, sorghums, sweetpotatoes, melons, cotton, and corn are the most common crops. Yields are low to moderate, depending on management.

About 75 percent of this unit is used for crops, and the rest is in woodland. This unit is in the Deep sand savanna range site, but it is not generally used for pasture.

**Dougherty and Stidham loamy fine sands, gently sloping** (2 to 5 percent slopes) (Dk).—These soils occur in association with the other soils of the Dougherty and Stidham series. They lose more water through runoff, and they are more susceptible to erosion than the nearly level Dougherty and Stidham loamy fine sands. Otherwise the two mapping units are similar.

*Use and management* (Capability unit IVe-2).—About half of this unit is now used for crops. About a third is idle or in pasture, and the remainder is woodland. If these soils are well managed, they are well suited to special crops and tree fruits and moderately well suited to field crops. In the areas where this unit is mapped, there is a shortage of good cropland; consequently some areas of this unit are, of necessity, used for field crops. Management needs are the same as for the nearly level phase, but yields are slightly lower. These soils are in the Deep sand savanna range site.

#### **Eufaula series**

These are light-colored, leached, acid, nearly loose, deep sandy soils developed in thick beds of sandy alluvial or eolian deposits on old high stream terraces. The original vegetation was forest. Drainage is rapid. Productivity is low. The Dougherty and Stidham soils are associated with this series, but the Eufaula soils are slightly lighter in color and have much thicker and sandier upper layers.

**Eufaula loamy fine sand, gently sloping** (2 to 7 percent slopes) (Ea).—This soil developed in acid sandy old alluvium on old high terraces of the Deep Fork and Cimarron Rivers. The native vegetation was a forest of post oak, blackjack oak, and hickory, with a thin ground cover of coarse grasses and nettles. Drainage is rapid; most of the water drains downward through the permeable soil and substratum.

Profile of Eufaula loamy fine sand, gently sloping, about 4 miles southeast of Newby in the NE $\frac{1}{4}$ NE $\frac{1}{4}$  sec. 35, T. 14 N., R. 9 E.:

- 0 to 10 inches, very pale brown loamy fine sand; nearly loose when dry; slightly acid.
- 10 to 42 inches, very pale brown to pale-yellow loamy fine sand; nearly loose when dry; freely permeable; slightly acid.
- 42 to 60 inches+, brownish-yellow fine sandy loam, slightly mottled with light gray; friable; permeable; slightly acid.

The upper 3 or 4 inches of this soil is grayish brown in undisturbed areas, but it ranges to light brownish gray where it is cultivated. The depth to the layer of fine sandy loam ranges from 40 inches to several feet.

*Use and management* (Capability unit IVe-2).—This soil has very low natural fertility, but it is moderately responsive to management. It is not likely to be eroded by water, but when it is not covered by vegetation it is very susceptible to wind erosion.

Half of this soil is still in native woodland. About a fifth of it is idle. Peanuts, watermelons, and cowpeas are the principal crops on the remainder. Some corn, cotton, and sorghums are also grown. Yields are low. This soil is moderately well suited to woodland. It is moderately well suited to special crops if organic matter and fertilizer are added. It is not well suited to common field crops or pasture. This soil is in the Deep sand savanna range site.

**Eufaula loamy fine sand, strongly sloping** (7 to 20 percent slopes) (Eb).—This soil is similar in profile to Eufaula loamy fine sand, gently sloping. Many areas consist of alternating low narrow ridges or dunes and nearly level narrow valleys a few yards wide. Other areas consist of strong slopes between the low and high terrace levels. The largest areas are along the Cimarron River.

*Use and management* (Capability unit VIIs-1).—This soil is entirely unsuitable for crops and of very low value for pasture. Most of it is still in native woodland. It is in the Deep sand savanna range site.

Water is absorbed so quickly in this sandy soil that water erosion is not a problem. The surface soil, unless it is protected by vegetation, is very likely to be blown by the wind. A few acres have been cleared, farmed, and abandoned. All of this soil should be returned to woodland. Locust or catalpa trees will probably produce the best income from this land.

#### **Gullied bottom land**

**Gullied bottom land** (Ga).—This miscellaneous land type is made up of alluvial deposits that are cut by abandoned or active stream channels and are unsuitable for crops. Some areas contain entrenched, meandering stream channels and banks, some are the dissected and gullied areas where small streams converge with larger streams, and some are along the channels of small intermittent streams that have not yet reached their grade level and are still cutting laterally and vertically. A few small cultivated areas of Mason and Verdigris soils, less than an acre in size, are also included.

*Use and management* (Capability unit Vw-2).—This land is completely unsuited to crops, but it is suited to woodland or pasture. It is in the Loamy bottom-land range site. Cleared areas furnish good grazing except during the winter. About 98 percent of this land type is in native hardwood forest consisting mainly of oak, elm, cottonwood, pecan, walnut, and hackberry. These areas should remain in woodland because the trees help to

control cutting along streambanks. Light grazing to reduce the underbrush, protection from burning, and selective cutting of timber are good management practices for this land type.

### **Mason series**

Soils of this series developed in slightly acid to neutral silty and clayey alluvium, slightly stratified with fine sandy loams, on low terraces along the larger streams of the county. These are dark, friable, slightly acid soils. They are moderately well drained. They are very productive and easily worked.

The profile characteristics of the Mason soils are about midway between those of the Verdigris series and those of the Vanoss series. The Verdigris soils are more frequently flooded, and they show less profile development. The Vanoss soils lie on higher terraces than the Mason soils; they are better drained and better developed and have less mottling in the lower subsoil.

**Mason silt loam** (0 to 2 percent slopes) (Mb).—This soil developed from silty alluvium, somewhat stratified with fine sandy loams and clays, ranging from slightly acid to weakly alkaline in reaction. It lies on nearly level low terraces along the larger creeks, about 3 to 10 feet above the present flood plains. Runoff is slow, but internal drainage is moderate. The native vegetation was a thin stand of hardwood trees and a ground cover of bluestem, Indiangrass, and switchgrass. A few small areas of Verdigris silt loam are included in this unit; these are flooded almost every year.

Profile of Mason silt loam about 2 miles southwest of Kellyville in the SE $\frac{1}{4}$ NE $\frac{1}{4}$  sec. 27, T. 17 N., R. 10 E.:

- 0 to 15 inches, dark grayish-brown silt loam; the plow layer is grayish brown; moderate medium granular structure; crumbly and friable; slightly acid.
- 15 to 35 inches, dark grayish-brown clay loam; medium granular structure; crumbly and friable when moist, slightly sticky when wet; porous and permeable; slightly acid.
- 35 to 45 inches +, grayish-brown silty clay loam, coarsely mottled with strong brown and yellowish brown; sticky and plastic when wet, very hard when dry; moderately permeable; slightly acid.

Small areas have a very fine sandy loam or loam plow layer that ranges from grayish brown to pale brown in color. A few narrow areas of Verdigris silt loam comprise about 5 percent of this unit. The Verdigris soil is similar to the Mason soils, but it is on high flood plains that are flooded almost every year.

*Use and management* (Capability unit I-1).—This is a very productive soil, excellent for either crops or pasture. It is easy to work and is not susceptible to erosion.

About three-fourths of this soil is used for crops, mainly corn, cotton, oats, sorghums, and alfalfa. Most of the rest is in pasture but some is woodland. It is in the Loamy bottom-land range site.

**Mason clay loam** (0 to 2 percent slopes) (Ma).—This soil developed on nearly level, low terraces from silty to clayey old alluvium that was somewhat stratified in places with fine sandy loams. It ranged from slightly acid to weakly alkaline. The native vegetation was a thin stand of hardwood trees and a thick ground cover of bluestem grasses. Runoff is slow, and internal drainage is moderate. This soil is associated with Mason silt loam and with the lower lying soils of the Verdigris series. Mason clay loam is similar to Mason silt loam, but it is

slightly darker colored throughout and has somewhat slower internal drainage.

Profile of Mason clay loam on a low terrace of Polecat Creek about 2 $\frac{1}{2}$  miles southwest of Kellyville in the SE $\frac{1}{4}$  sec. 28, T. 17 N., R. 10 E.:

- 0 to 14 inches, dark grayish-brown clay loam; strong medium granular structure; crumbly and friable when moist, hard when dry; slightly acid.
- 14 to 30 inches, dark grayish-brown silty clay loam; crumbly and friable when moist, hard when dry; moderately permeable and porous; slightly acid.
- 30 to 45 inches +, dark grayish-brown silty clay loam, mottled with strong brown and yellowish brown; contains a few thin lenses of silt loam or very fine sandy loam in the lower part; sticky and plastic when wet; moderately permeable; slightly acid.

The plow layer ranges in texture from clay loam to loam and in color from grayish brown to very dark grayish brown. The subsoil below about 30 inches is weakly alkaline to slightly acid in reaction. The texture ranges from clay loam to sandy clay. A few small areas of Brewer clay loam are included in this unit along Polecat Creek. These inclusions have a dark-gray surface soil and a subsoil of dark-gray to black crumbly clay.

*Use and management* (Capability unit I-1).—This is excellent soil for crops or pasture. It is not susceptible to erosion. It is moderately heavy but friable. More than half of this soil is used for crops, chiefly corn, cotton, oats, sorghums, and alfalfa. Most of the remainder is in pasture. A few acres are still in native woodland that is used for pasture. It is in the Loamy bottom-land range site.

### **Neosho series**

The soils of this series developed on nearly level or depressed areas on old stream terraces. The parent materials were clayey old alluvial sediments, somewhat stratified with silts and sands. Most of these sediments were washed from soils developed over shales and fine-grained sandstones, and some were from soils developed over limestone.

These soils have a light brownish-gray acid surface soil and a mottled claypan subsoil. Drainage is poor and natural fertility is low. Neosho soils are associated with soils of the Choteau series and the Vanoss series. The Choteau soils are somewhat darker colored and better drained than the Neosho soils, and they do not have a claypan subsoil. The Vanoss soils are much darker than the Neosho soils, and they have a thick, friable, permeable surface soil and subsoil.

Only one soil of the Neosho series is mapped in Creek County.

**Neosho silt loam** (0 to 1 percent slopes) (Na).—This soil developed from slightly acid to weakly alkaline stratified sandy and clayey old alluvial sediments, on level to slightly depressed parts of old high terraces. The principal areas are along Little Deep Fork Creek. The native vegetation was coarse grasses and scattered post oak and elm trees. Runoff is slow or nonexistent, and internal drainage is very slow. This soil is associated with the better drained, somewhat darker colored Choteau soils.

Profile of Neosho silt loam about 3 miles southeast of Slick in the SW $\frac{1}{4}$ SE $\frac{1}{4}$  sec. 27, T. 15 N., R. 10 E.:

- 0 to 15 inches, light brownish-gray silt loam, slightly mottled with brown; surface crusts on drying in cultivated fields;

massive to weakly granular structure; friable when moist, very hard and compact when dry; slightly acid.

- 15 to 24 inches, grayish-brown heavy clay, mottled with yellowish red and yellowish brown; weak blocky structure; very compact and very sticky when moist, extremely hard when dry; very slowly permeable; medium acid.
- 24 to 42 inches+, mottled gray and light olive-brown heavy clay; very sticky and stiff when wet; very slowly permeable; slightly acid in upper part, neutral in lower part.

The thickness of the surface soil ranges from about 10 to 18 inches, and the texture ranges from very fine sandy loam to loam. On a few low sandy mounds the surface soil is fine sandy loam 18 to 30 inches thick. The third layer ranges from dense clay to compact, slowly permeable sandy clay; in places it contains pockets and lenses of sandy loam.

*Use and management* (Capability unit IIs-1).—This soil is not susceptible to erosion. Fertility is low to moderate. The soil remains wet and cold late in the spring, and when it dries the surface soil crusts and bakes. If the soil is not worked at exactly the right moisture content, large clods form that make it very difficult to maintain a good seedbed.

This soil is not well suited to most common field crops, but it is moderately well suited to native hay or pasture. Most of it is now used for pasture. About one-third of the soil is used for crops, mostly cotton, corn, and sorghums. This soil is in the Claypan prairie range site.

#### **Oil-waste land**

**Oil-waste land** (Oa).—The areas mapped in this miscellaneous land type have been practically ruined for agricultural use by oil and salt-water waste from oil wells. They are more or less gullied and eroded and are almost bare of vegetation. They range in size from about one acre to several acres.

*Use and management* (Capability unit VIII).—This land is of no value for crops or pasture in its present condition. Some of the less strongly sloping and less severely gullied areas may eventually be revegetated by natural means if no more oil or salt-water waste is dumped on them.

#### **Okemah series**

These soils have developed from weakly alkaline shales and clays under a cover of grass in nearly level to gently sloping shallow valleys. They are moderately well drained, dark colored, and slightly acid. They have a dark-colored, crumbly and granular surface soil and upper subsoil. Their lower subsoil is mottled olive-yellow and gray compact clay.

Okemah soils are not mapped separately in Creek County. They are closely associated with soils of the Dennis series in some places and with soils of the Woodson series in others, and are mapped in units with soils of one or the other of these series. The Woodson soils differ from the Okemah soils in being dark gray and having a claypan. The Dennis soils, where they are associated with the Okemah soils, lie in slightly higher positions and have developed from less clayey materials. The Dennis soils are browner than the Okemah soils, and they have more rapid runoff and internal drainage.

A profile of an Okemah soil as mapped with the Woodson soils is described under Okemah and Woodson clay loams, and a profile of an Okemah soil as mapped with

Dennis soils is described under Dennis and Okemah loams, gently sloping.

**Okemah and Woodson clay loams** (0 to 1 percent slopes) (Ob).—These two soils occur intermixed in small areas or separately in areas of several acres. Woodson clay loam occupies the nearly level, usually lower-lying parts of shallow valleys, and Okemah clay loam the gently sloping, slightly higher surrounding areas, but the two soils are so closely associated that it is not practical to map them separately. They merge with little or no difference in surface appearance. The parent materials of both soils are olive or olive and yellow weakly alkaline clays and shales. The mapping unit occurs mostly in shallow valleys near Kiefer, Mounds, and Edna. Runoff is slow to moderate, and internal drainage is very slow. The native vegetation was tall grasses, mainly big bluestem, little bluestem, side-oats grama, and Indiangrass.

Profile of Okemah clay loam near Mounds in the SW $\frac{1}{4}$ SW $\frac{1}{4}$  sec. 17, T. 16 N., R. 12 E.:

- 0 to 15 inches, dark-gray clay loam, lower part slightly mottled with brown; granular and friable when moist, very hard when dry; surface crusts in cultivated fields on drying; slightly acid.
- 15 to 20 inches, dark grayish-brown silty clay loam, slightly mottled with brownish yellow and strong brown; crumbly and friable when moist, sticky and plastic when wet; moderately permeable; slightly acid.
- 20 to 35 inches, mottled grayish-brown and light olive-brown heavy clay; very sticky and stiff when wet, extremely hard when dry; compact and very slowly permeable; neutral.
- 35 to 48 inches+, mottled light-gray and olive-yellow clay; very compact; very slowly permeable; weakly alkaline.

The texture of Okemah clay loam ranges from loam to clay loam. The depth to the heavy clay layer ranges from 18 to 25 inches. A few shotlike concretions of iron oxide occur in the two clay layers.

Profile of Woodson clay loam about 1 mile south of Kiefer in the SW $\frac{1}{4}$ SW $\frac{1}{4}$  sec. 28, T. 17 N., R. 12 E.:

- 0 to 12 inches, dark-gray clay loam; the 6-inch plow layer is slightly lighter in color; crumbly and friable when moist, very hard when dry; surface crusts on drying; slightly acid.
- 12 to 22 inches, dark-gray heavy clay, faintly mottled with brown; very compact claypan; very sticky and stiff when wet; very slowly permeable; slightly acid to neutral.
- 22 to 38 inches, dark grayish-brown clay, mottled with yellowish brown; very compact; extremely hard when dry; very slowly permeable; weakly alkaline.
- 38 to 46 inches+, mottled gray, olive-brown, and yellowish-brown clay or shaly clay; contains a few crystals of gypsum and small shotlike concretions of iron oxide; alkaline but not calcareous.

The thickness of the surface soil ranges from 10 to 14 inches. Considerable mottling occurs in the upper subsoil in the areas that grade toward the Okemah soil.

Some small areas of Parsons silt loam near Kiefer are included in this mapping unit. These areas have a dark grayish-brown silt loam surface soil 12 inches thick, which rests on a mottled grayish-brown, strong-brown, and pale-yellow claypan subsoil. The Parsons soils are not extensive enough in Creek County to be mapped separately and are not described in this report.

*Use and management* (Capability unit I-4).—The two soils in this mapping unit are the darkest colored and finest textured soils of the prairies. They are the most fertile and productive soils for common field crops that occur in the uplands of this county. Okemah clay loam is slightly more productive than Woodson clay loam. Both soils have a moderately high water-holding capacity

and are easily cultivated. They are only slightly susceptible to erosion. About 10 percent of the acreage is slightly eroded and has lost about 15 to 25 percent of the surface soil through erosion.

These soils are well suited to crops, pasture, or native hay. About half of the acreage is cropland. Cotton, corn, oats, sorghums, and wheat are the principal crops. The other half is in native grass and used for hay or pasture (fig. 6). These soils are in the Claypan prairie range site.



Figure 6.—Native pasture on Okemah and Woodson clay loams.

### Port series

This series consists of reddish-brown, noncalcareous, friable alluvial soils. They occur on high flood plains that are rarely flooded. They are well drained and fertile. They are probably the most productive and valuable soils in the county for growing corn, cotton, and alfalfa.

There is almost no difference between the surface soil and subsoil in this series. The Port soils resemble the Yahola soils in surface appearance, but they have a more loamy subsoil, better water-holding capacity, and higher natural fertility. They are not flooded as frequently as the Yahola soils.

Port clay loam is the only soil of the Port series that is mapped in Creek County.

**Port clay loam** (0 to 1 percent slopes) (Pa).—This is a reddish-brown, friable alluvial soil that occurs mainly on the high flood plains in the valley of the Cimarron River. The parent material is neutral to alkaline silty alluvium washed from grassland soils that developed over redbeds. A deciduous forest of elm, oak, pecan, cottonwood, and ash grew on this soil. This soil is well drained, but it is flooded for a short time about once in 5 to 10 years.

Profile of Port clay loam about 3½ miles north of Drumright on the high flood plains of the Cimarron River:

- 0 to 20 inches, reddish-brown clay loam; the 6-inch plow layer is slightly lighter colored; strong granular structure; crumbly and friable; neutral.
- 20 to 50 inches +, reddish-brown clay loam; crumbly and friable; permeable; alkaline but not calcareous.

The color of the surface soil ranges from dark reddish brown to light reddish brown. The reaction ranges from neutral to alkaline. In some places the second layer is weakly stratified with silt loam or fine sandy loam in the lower part.

*Use and management* (Capability unit I-2).—This soil is excellent for crops or pasture. It is probably the best

soil in the county for common field crops, including alfalfa. It is not susceptible to erosion. Three-fourths of the area is used for crops, principally corn, cotton, and alfalfa. The rest is in cutover native forest. It is in the Loamy bottom-land range site.

### Pottsville series

This series comprises very shallow acid soils over interbedded shales, sandy shales, and sandstones. The native vegetation is scrubby forest of blackjack and other oaks, and a thin ground cover of coarse grasses and shrubs. These soils are too shallow and too strongly sloping for any use except woodland. Sparse grazing or browse is furnished by the thin cover of grasses and shrubs.

Pottsville soils have a grayish-brown surface layer of loam or sandy clay loam and a yellowish-brown or reddish-brown subsurface layer that ranges from loam to clay. Interbedded reddish or olive shales, sandy shales, and sandstones underlie the soil at a depth of about 6 to 15 inches. Sandstone and shale outcrops are common, and some loose stones are on the surface in most places.

In this area, Pottsville soils are mapped only in units with the Darnell soils. They differ from Darnell soils in having loamier surface layers over more shaly parent materials. A profile of a Pottsville soil is described under Darnell and Pottsville soils, sloping.

### Pulaski series

Soils of the Pulaski series are light brown to reddish brown, friable, and slightly acid. They developed on the flood plains of small streams. The parent material is alluvium washed from forested soils that developed over noncalcareous sandstones. The Pulaski soils are well drained, but they are flooded so frequently that they are not good for crops.

These soils are associated with the Verdigris soils. They are lighter in color than the Verdigris soils and are underlain by sandier alluvial sediments. Only one type of Pulaski soil is mapped in Creek County.

**Pulaski fine sandy loam** (0 to 1 percent slopes) (Pb).—This soil occurs mainly on narrow flood plains of small streams in the western part of the county. The parent material is light-brown to reddish-brown somewhat sandy alluvium. Most of the sediments came from forested soils underlain by reddish sandstones, but some of them came from grasslands underlain by redbeds. The native vegetation on this mapping unit was a forest of oak, elm, willow, cottonwood, and hackberry.

Runoff is slow. Internal drainage is moderate. These areas are occasionally to frequently flooded for short periods.

Profile of Pulaski fine sandy loam about 3 miles east of Dewey in sec. 11, T. 15 N., R. 8 E.:

- 0 to 14 inches, brown fine sandy loam; the 6-inch plow layer is light brown; very friable; slightly acid.
- 14 to 42 inches +, brown fine sandy loam, weakly stratified in the lower part with reddish-brown clay loam and loamy fine sand; slightly acid.

The surface soil ranges from pale brown to reddish brown in color and from loamy fine sand to heavy fine sandy loam in texture. Small areas have a recent overwash of very pale brown or light yellowish-brown loamy fine sand, 4 to 6 inches thick.

Some small areas of Verdigris soils that occur on the flood plains of the larger streams are included in this unit.

These inclusions consist of 10 to 18 inches of light-brown fine sandy loam over dark grayish-brown silt loam or clay loam, overlain by recent deposits of lighter colored, sandier soil materials.

*Use and management* (Capability unit IIIw-1).—This soil is moderately productive. It is easily worked and fairly resistant to drought. It is not susceptible to erosion, but some material may be deposited on the surface by flood waters. Cropping is hazardous because most areas are flooded several times a year.

This soil is moderately well suited to crops and, in spite of the flood hazard, about one-fifth of the area is cropped. Cotton, corn, and sorghums are the chief crops. This soil is well suited to pasture, and about one-third is used for this purpose. Nearly half has been left in native forest. The soil is in the Loamy bottom-land range site.

### **Reinach series**

Soils of the Reinach series developed from alkaline to calcareous, reddish, silty to moderately sandy alluvium on low, nearly level stream terraces. They are moderately productive soils and easily worked. They are well suited to all general crops of this area, including alfalfa.

The Reinach soils have a brown to reddish-brown friable surface soil and a silty to moderately sandy subsoil. They are similar to the Yahola soils that occur on the present flood plains, but the Reinach soils lie a little higher and are above ordinary overflow. Their surface soil is darker than the Yahola surface soil, and is alkaline, though usually noncalcareous. Only one Reinach soil is mapped in Creek County.

**Reinach very fine sandy loam** (0 to 1 percent slopes) (Ra).—This soil occurs on low terraces or benches a few feet higher than the flood plains of the Cimarron River. It developed from reddish, silty to moderately sandy, alkaline, calcareous alluvial sediments. Prairie grasses and scattered elm, hackberry, pecan, and oak trees were the native vegetation. Runoff is slow, and internal drainage is moderate to rapid.

Profile of Reinach very fine sandy loam about 3½ miles north of Drumright on a low terrace of the Cimarron River:

- 0 to 14 inches, reddish-brown very fine sandy loam; the 6-inch plow layer is light reddish brown; weak granular structure; very friable; neutral.
- 14 to 46 inches+, light reddish-brown very fine sandy loam that contains thin strata of reddish-brown and brown silt loam in lower part; friable; very permeable; neutral.

The surface soil ranges from brown to light reddish brown in color and from fine sandy loam to silt loam in texture. Some small areas next to more strongly sloping Teller soils have an overwash of light-brown, slightly acid fine sandy loam, 4 to 10 inches thick.

*Use and management* (Capability unit I-1).—This soil is well suited to crops and pasture. Most of it is cultivated. Corn, cotton, sorghums, and alfalfa are the principal crops. This soil is easily worked and is not susceptible to erosion. It is in the Loamy bottom-land range site.

### **Roebuck series**

Soils of this series consist of only slightly modified clayey alluvium washed from prairie soils that developed over redbeds. The alluvial deposits are alkaline to weakly calcareous. The native vegetation was forest. Both

runoff and internal drainage are slow to very slow. Most areas are too poorly drained or too frequently flooded to be suitable for cropping unless artificially drained and protected from floods.

The surface soil is reddish brown. The subsoil is reddish clay, slightly mottled with brown and grayish brown. Roebuck clay is the only soil of this series that is mapped in Creek County.

**Roebuck clay** (0 to 1 percent slopes) (Rb).—This soil occupies parts of the flood plain of the Deep Fork River, where the channel is choked or partly filled by silting. It developed from clayey and silty, alkaline or calcareous, reddish alluvium. A native forest of elm, hackberry, oak, willow, pecan, and cottonwood covers these areas.

This is a poorly drained soil. Both runoff and internal drainage are very slow. The level flood plains are subject to frequent floods. This soil is not susceptible to erosion, but most areas are rapidly being covered with silt.

Profile of Roebuck clay:

- 0 to 20 inches, reddish-brown clay; moderately crumbly when moist, very sticky and plastic when wet; weakly alkaline.
- 20 to 45 inches+, reddish-brown heavy clay, slightly mottled with other shades of brown and some grayish brown; very sticky and stiff when wet, very hard when dry; slowly permeable; weakly calcareous.

Small areas have recent deposits of reddish-brown or brown, alkaline or calcareous, somewhat stratified clay loam and clay, 5 to 15 inches thick. In some places the subsoil below about 30 inches is stratified with brown clay loam and dark-gray calcareous clay.

*Use and management* (Capability unit Vw-1).—Nearly all of this soil is still in woodland. It is very fertile and would be highly productive if it were drained and protected from flooding, but drainage and flood protection are so difficult as to be almost impossible. Clearing underbrush and culling trees to allow native pecan orchards and bermudagrass pastures to develop may be practical. This soil is in the Heavy bottom-land range site.

### **Stephenville series**

Soils of this series are of medium depth over the parent materials of soft reddish sandstone or interbedded sandstone and sandy shale. They developed under a scrubby forest of mixed blackjack oak and post oak. Scattered coarse grasses grew in open areas.

These soils are slightly acid. They have a light-colored friable sandy surface layer and a yellowish-red or red friable sandy clay loam subsoil. The subsoil grades into the parent material, usually at a depth of less than 3 feet.

The Stephenville soils occupy nearly level to moderately sloping areas and are closely associated with the very shallow Darnell soils. The two soils are similar in surface appearance, but the Stephenville soils are 20 to 36 inches deep and the Darnell soils are 5 to 20 inches deep over sandstone. Sandstone outcrops are common in both.

In this county, the Stephenville soils are mapped only in units with the Darnell soils. The two series have similar uses and are about equal in productivity.

**Stephenville and Darnell fine sandy loams, gently sloping** (2 to 4 percent slopes) (Sa).—Stephenville fine sandy loam occupies about 70 percent of this mapping unit. Small areas of Darnell fine sandy loam make up the other 30 percent. This unit is very extensive in the central, southern, and western parts of the county.

These shallow to moderately deep upland soils developed over reddish-yellow to red sandstone or interbedded sandstone and sandy shale. The parent materials were slightly acid to neutral. The native vegetation was a thin to moderately thick forest of scrubby blackjack oak and post oak, and a thin ground cover of bluestem grasses. Both soils are well drained. Runoff is slow to moderate, but internal drainage is moderate to rapid.

Profile of Stephenville fine sandy loam, gently sloping, under a moderately thick cover of scrubby post oak and blackjack oak and bluestem grasses, about 2 miles east of Dewey in the SW $\frac{1}{4}$ SW $\frac{1}{4}$  sec. 9, T. 15 N., R. 8 E.:

- 0 to 4 inches, grayish-brown fine sandy loam; in plowed fields this layer is pale brown; weak granular structure; very friable; slightly acid.
- 4 to 12 inches, pale-brown light fine sandy loam; very friable when moist, nearly loose when dry; slightly acid.
- 12 to 28 inches, yellowish-red sandy clay loam; massive structure; crumbly and friable when moist, slightly sticky when wet; porous and permeable; medium acid.
- 28 to 35 inches, yellowish-red sandy clay loam, mottled with red; friable; permeable; contains small soft fragments of partly weathered sandstone; medium to slightly acid.
- 35 inches +, yellowish-red sandstone bedrock; slightly acid to neutral.

The depth to bedrock ranges from about 20 to 40 inches; normally it is less than 30 inches. A few small outcrops of the sandstone bedrock occur.

Profile of Darnell fine sandy loam in a cultivated field of about 2 percent slope, in the NW $\frac{1}{4}$ NW $\frac{1}{4}$  sec. 16, T. 15 N., R. 8 E.:

- 0 to 10 inches, pale-brown light fine sandy loam; structureless; very friable when moist, nearly loose when dry; slightly acid.
- 10 to 16 inches, reddish-yellow fine sandy loam, slightly heavier in lower part; structureless; friable; lower part contains small fragments of partly weathered sandstone; medium acid.
- 16 inches +, reddish-yellow sandstone bedrock; neutral.

The depth of the Darnell soil ranges from about 5 to 20 inches. Most areas are between 8 and 15 inches deep. Small outcrops of sandstone bedrock occur here and there. The transition between the deeper Stephenville soil and the shallower Darnell soil is hardly noticeable; there is no change in slope or in color of the surface soil. Another profile of Darnell soil, as it typically occurs when associated with soils of the Pottsville series, is described under Darnell and Pottsville soils, sloping.

*Use and management* (Capability unit IIIe-2).—These soils are droughty and low in fertility. They are slightly to moderately susceptible to erosion if cultivated. Most of the cleared acreage has lost up to 20 percent of its surface soil through erosion. Some shallow gullies occur on the more strongly sloping cleared areas.

These soils are moderately well suited to crops and pasture. Yields are moderate under good management. Intensive management is needed to maintain or increase productivity.

About half of this mapping unit is cleared. Most of the cleared acreage has been abandoned for cropping, and it is now used for pasture. Cotton, peanuts, sorghums, corn, cowpeas, and sweetpotatoes are the principal crops. The pastures have a thin cover of three-awn grasses, bluestem grasses, and weeds. This unit is in the Sandy savanna range site. Nearly half of it is native woodland.

**Stephenville and Darnell fine sandy loams, sloping** (4 to 7 percent slopes) (Sb).—These soils are like Stephenville

and Darnell fine sandy loams, gently sloping, except that the surface soil is somewhat thinner, the bedrock is nearer the surface, and outcrops of sandstone are more common. About 60 percent of the acreage consists of Stephenville soils and about 40 percent of Darnell soils.

*Use and management* (Capability unit VIe-1).—This land is not well suited to crops. It is droughty, low in natural productivity, and highly erodible if cultivated. Moderate yields of common field crops are produced when the soils are first cultivated, but yields decline rapidly.

More than half of this mapping unit is still in woodland. The remainder has been cleared, but little is still used for crops. Cotton, corn, sorghums, peanuts, and cowpeas are grown. Yields are about three-fourths as much as on the gently sloping soils. Most of the acreage that was cleared, cultivated, and abandoned is now in pasture. The vegetation is three-awn grass and weeds. This unit is in the Sandy savanna range site.

If these soils are cultivated, very careful management is needed. They should be terraced, stripcropped, and contour-cultivated, and erosion-resistant crops should be planted. Areas where the soils are too shallow to be terraced should be used for pasture.

**Stephenville and Darnell fine sandy loams, sloping, severely eroded** (4 to 7 percent slopes) (Sc).—The soils in this mapping unit have been so severely eroded that they are worthless for crops. Originally, they were like Stephenville and Darnell fine sandy loams, sloping, but erosion has removed much of the surface soil. Numerous gullies are now active; some cannot be crossed with tillage implements.

*Use and management* (Capability unit VIIe-2).—These soils were never well suited to crops, and now they are of no value for crops. All of the acreage has been cultivated, but most of it is now idle or in pasture. A thin stand of annual grasses and weeds furnishes poor grazing. It would take careful management to establish even moderately good pastures. Cotton, corn, sorghums, cowpeas, and peanuts are still grown on a few acres, but yields are low. This mapping unit is in the Eroded savanna range site.

#### **Stidham series**

The Stidham soils developed from acid sandy old alluvium on stream terraces under a mixed hardwood forest. They are low in natural fertility, but they are very responsive to management. They are well suited to fruits, special crops, and field crops.

Soils of this series have a light brownish-gray to pale-brown, friable, acid surface soil. The subsoil is yellowish-brown friable sandy clay loam, mottled with light gray and strong brown in the lower part.

Stidham soils are closely associated with Dougherty soils, which have a reddish subsoil, and with Eufaula soils, which have no loamy subsoil within 4 feet of the surface. In Creek County, the Stidham soils are not mapped separately. They are mapped in units with soils of the Dougherty series. A profile of a Stidham soil is described under Dougherty and Stidham fine sandy loams, nearly level.

#### **Talihina series**

The Talihina soils developed from beds of slightly acid to neutral, gray, brown, and olive shale that included a little sandstone. They are very shallow, slightly acid

clay loams. The surface is generally stony. The only suitable use for these soils is grazing.

Talihina soils occur principally on steep slopes along drainageways and on the thick beds of shale at the foot of hard rock escarpments. Collinsville soils generally occupy the sandstone caps at the crests of the ridges. Okemah and Dennis soils occur on the gentle foot slopes below the Talihina soils. In Creek County, the Collinsville and Talihina soils are so closely associated that it is not practical to separate them. The Talihina soils are mapped in two units with the Collinsville soils, and a profile of a Talihina soil is described under Collinsville and Talihina soils, sloping.

### **Teller series**

These soils developed from material that was deposited on old stream terraces by both water and wind. The soil material was originally washed or blown from grasslands, underlain by redbeds, in the central and western parts of the State. Teller soils have a brownish, neutral to slightly acid, friable surface soil and a reddish-brown, friable clay loam subsoil.

These soils have moderate natural fertility. They are easy to cultivate, and they absorb and hold moisture well. They are well suited to nearly all field crops commonly grown in the area. Teller soils are associated principally with Vanoss soils, which are darker colored, less reddish, and usually more alkaline. They are also associated to some extent with Choteau soils, which have a less reddish, darker colored, and thicker surface layer and a mottled and more clayey lower subsoil.

**Teller silt loam, nearly level** (0 to 2 percent slopes) (Tb).—This soil occurs on high terraces along the Cimarron River. It developed from yellowish-red, alkaline or neutral material, which was washed or blown from grassland soils overlying redbeds. The native vegetation was a thin hardwood forest of post oak, blackjack oak, red oak, elm, and hickory and a moderately thick ground cover of coarse grasses. Runoff is slow, but internal drainage is moderate. Teller soils are associated with soils of the Vanoss series.

Profile of Teller silt loam, nearly level, in a cultivated field about ¼ mile east of Oilton in the NE¼SW¼ sec. 33, T. 19 N., R. 7 E.:

- 0 to 12 inches, brown silt loam; the 6-inch plow layer is slightly lighter in color; weak granular structure; friable; slightly acid.
- 12 to 34 inches, reddish-brown clay loam; medium granular structure; crumbly and friable when moist, moderately sticky and plastic when wet; slightly acid to neutral.
- 34 to 46 inches+, red friable clay loam that is noticeably more sandy and friable in the lower part; neutral.

The surface soil ranges from 8 to 14 inches in thickness and from very fine sandy loam to loam in texture. The Teller soils that lie next to Vanoss soils have a dark-brown surface soil and a dark reddish-brown subsoil, and the subsoil texture ranges from friable silty clay loam to fine sandy clay.

*Use and management* (Capability unit I-3).—This is one of the most productive soils in the county. It is moderately fertile and very responsive to management. It is well drained, friable, and easy to cultivate. It has good capacity for absorbing and holding moisture. It is not susceptible to erosion.

Two-thirds of this soil is used for crops, mainly corn, cotton, sorghums, and alfalfa. Some oats, fruits, and

vegetables are grown also. Of the rest, half is cleared pasture and half is natural woodland pasture. This soil is in the Loamy prairie range site.

**Teller silt loam, gently sloping** (2 to 5 percent slopes) (Ta).—This soil is like Teller silt loam, nearly level, except that its stronger slopes cause moderate runoff, which makes this soil susceptible to erosion. This mapping unit generally occupies the gentle slopes next to small streams or between different levels of other Teller soils or Vanoss soils.

*Use and management* (Capability unit IIe-1).—This soil is moderately productive, friable, and easily worked. It is used for the same crops as Teller silt loam, nearly level, but yields are slightly lower, especially in dry years. More than half of this soil is cultivated. The rest is in cleared pasture and woodland pasture. It is in the Loamy prairie range site.

Erosion has removed up to one-fourth of the surface soil from part of the cropland. A few deep gullies have developed. The productivity of these areas has been lowered somewhat, but it could be restored in a few years by good soil management. This soil will produce moderate to high yields of cultivated crops for a long time if properly managed.

**Teller silt loam, sloping** (5 to 7 percent slopes) (Tc).—This soil has thinner layers than Teller silt loam, gently sloping. The surface soil is 6 to 10 inches thick. The color in plowed fields is noticeably more reddish than that in undisturbed areas, because some of the reddish-brown subsoil has been mixed with the brown surface soil. The neutral to weakly alkaline, silty, reddish parent material occurs at depths of about 35 to 45 inches. This soil is associated with other less strongly sloping Teller soils.

*Use and management* (Capability unit IVe-1).—Except where it is eroded, this soil is moderately productive. It is suitable for crops if carefully managed, but it is likely to erode unless special care is taken to reduce runoff.

About one-fifth of this soil is cultivated. The same crops are grown as on the less strongly sloping Teller soils, but yields are lower. Half of this soil was once cultivated, but it is now used for pasture. The rest is in native woodland pasture. This soil is in the Loamy prairie range site.

### **Vanoss series**

Soils of the Vanoss series are moderately fertile, dark, friable, and deep. Their reaction is about neutral. They lie on old high stream terraces. They developed from alkaline silty and sandy material that was washed or blown from grassland soils that overlie redbeds. They have a dark grayish-brown surface soil and a brown, friable clay loam subsoil.

Vanoss soils are associated with Teller soils but are darker colored and less reddish. They are somewhat similar to Mason soils, but they have more rapid internal drainage and less mottling in the lower subsoil. They also have more textural and structural differentiation between horizons.

**Vanoss silt loam, nearly level** (0 to 2 percent slopes) (Vb).—This soil is mapped on old high terraces along the Cimarron and Deep Fork Rivers. The parent material is reddish or reddish-yellow, silty and sandy, alkaline or calcareous sediments deposited by wind or water. Prairie

grasses and scattered elm, hackberry, and mesquite trees grew on these soils. Runoff is slow, and internal drainage is moderate. This soil is closely associated with Teller silt loam, nearly level, but it has a darker colored surface soil and a brown or yellowish-brown, instead of a red, subsoil.

Profile of Vanoss silt loam, nearly level, in a cultivated field about 3 miles east of Oilton in the NE $\frac{1}{4}$  sec. 34, T. 19 N., R. 7 E.:

- 0 to 16 inches, dark grayish-brown silt loam; the 6-inch plow layer is slightly lighter in color; moderate granular structure; friable when moist, hard when dry; neutral.
- 16 to 28 inches, dark-brown clay loam; medium granular structure; crumbly and friable when moist, hard when dry; permeable; neutral.
- 28 to 38 inches, brown clay loam, faintly mottled with strong brown; crumbly and friable; permeable; neutral.
- 38 to 48 inches +, yellowish-brown clay loam; slightly more friable and noticeably more sandy than layer above; neutral to weakly alkaline.

The surface soil ranges in color from very dark grayish brown in undisturbed areas to grayish brown in cultivated fields, and in texture from very fine sandy loam to heavy silt loam. In areas where this soil grades toward the Teller soils, the upper subsoil is brown and the lower subsoil is strong brown to reddish brown.

A few small level areas of Brewer silt loam are included in this mapping unit. These areas have a dark-gray silt loam surface soil 14 inches thick over a dark-gray crumbly clay subsoil. Brewer soils are not mapped separately in Creek County, and they are not described in this report.

*Use and management* (Capability unit I-3).—This is a moderately productive, easily worked soil. It responds well to good management, and it is not susceptible to erosion.

This soil is excellent for crops and well suited to pasture. About three-fourths of it is cultivated. The principal crops are cotton, corn, sorghums, and oats. The rest is used for pasture. This soil is in the Loamy prairie range site.

**Vanoss silt loam, gently sloping** (2 to 4 percent slopes) (Va).—This soil is similar to Vanoss silt loam, nearly level, but its slope makes it slightly susceptible to erosion if cultivated. It occurs in small areas in association with nearly level Vanoss and Teller soils.

*Use and management* (Capability unit IIe-1).—More than half of this soil is used for crops. The same crops are grown as on Vanoss silt loam, nearly level, but yields are slightly lower. Eroded areas are 10 to 20 percent less productive than the normal soil. Good management would restore the original productivity in 2 or 3 years. This soil is in the Loamy prairie range site.

### Verdigris series

These soils occupy the flood plains of streams. The alluvium from which they developed came mostly from dark soils of the prairies; some came from light-colored soils. Soils of this series are moderately well drained, but they are flooded occasionally to frequently. The periodic floods do not prevent successful cultivation except in the narrow flood plains of small streams.

These soils have a dark grayish-brown, friable, slightly acid surface soil and a dark grayish-brown clay loam subsoil. The subsoil is slightly mottled and somewhat finer textured in the lower part. Verdigris soils are

darker colored than the Pulaski soils and have more retentive, less sandy subsoils. They are similar to the Mason soils, which lie slightly higher and are above ordinary overflow.

**Verdigris fine sandy loam** (0 to 1 percent slopes) (Vd).—This soil occupies parts of narrow flood plains, mainly in the central and western parts of the county. The parent materials were slightly acid to weakly alkaline alluvial sediments, most of which were washed from dark soils of the prairie; some were derived from light-colored soils of forested areas. Runoff is slow, and internal drainage is moderate. These soils are flooded for short periods several times a year. Fresh alluvial sediments are deposited on most areas during floods. Native forests of elm, hackberry, oak, pecan, and cottonwood grew on these soils, and some coarse grasses and shrubs covered the ground.

Profile of Verdigris fine sandy loam:

- 0 to 14 inches, grayish-brown fine sandy loam, weakly stratified in lower part with dark grayish-brown silt loam; very friable when moist; slightly acid.
- 14 to 32 inches, dark grayish-brown clay loam; crumbly and friable when moist, moderately sticky when wet; slightly acid to neutral.
- 32 to 50 inches +, dark grayish-brown clay loam, mottled or spotted with light brown; contains thin seams or lenses of light-brown fine sandy loam below about 40 inches; neutral.

Most areas of this soil are covered by recent alluvium, 5 to 15 inches thick. This alluvium ranges from brown to dark grayish brown in color. The texture is fine sandy loam. It is somewhat stratified below plow depth. The clay loam subsoil is dark gray or dark grayish brown in most places.

*Use and management* (Capability unit I-2).—This is a moderately productive soil. It is likely to be flooded late in spring; consequently, cropping is uncertain. This soil does not erode, but a considerable amount of soil material is deposited by floodwater. Areas where floods are least frequent are well suited to crops. Corn, cotton, and sorghums are the most common crops. The soil is also well suited to pasture. Two-thirds of the acreage has been cleared for crops and pasture, and one-third is still under native forest. This soil is in the Loamy bottom-land range site.

**Verdigris silt loam** (0 to 1 percent slopes) (Ve).—This soil is mapped on flood plains of streams throughout the county. The parent material consisted of slightly acid to weakly alkaline alluvial sediments washed from dark soils of the prairies. The native vegetation was a hardwood forest of elm, oak, hackberry, cottonwood, and pecan trees, and scattered coarse grasses. Runoff is slow, and internal drainage is moderate. This soil is flooded one to three times a year; nevertheless, most of it can be successfully cropped.

Profile of Verdigris silt loam in a cultivated field about 4 miles west of Bristow in the SW $\frac{1}{4}$ SW $\frac{1}{4}$  sec. 34, T. 16 N., R. 8 E.:

- 0 to 16 inches, dark grayish-brown silt loam; friable and easily worked when moist, hard when dry; slightly acid.
- 16 to 36 inches, dark grayish-brown clay loam, faintly mottled with brown in the lower part; crumbly and friable when moist, hard when dry; porous and permeable; slightly acid to neutral.
- 36 to 46 inches +, dark grayish-brown clay loam, spotted with brown and gray; friable; permeable; weakly alkaline.

The surface layer is 10 to 20 inches thick. In some places the lower part of this layer is weakly stratified with fine sandy loam and clay loam. The subsoil is slightly acid to weakly alkaline. Stratified darker colored and lighter colored sediments may occur in the lowest layer.

*Use and management* (Capability unit I-2).—This soil is well suited to crops or pasture. It is somewhat more productive than Verdigris fine sandy loam. It is not susceptible to erosion, but soil material may be deposited on the surface by floods. The flood-deposited material replenishes the supply of plant nutrients. About one-fourth of this soil is still under native forest. Half of the remainder is cropped, mostly to corn, cotton, sorghums, and alfalfa. Yields range from almost complete failures to very high yields. Some of the soil is in pasture. This soil is in the Loamy bottom-land range site.

**Verdigris clay loam** (0 to 1 percent slopes) (Vc).—This soil occurs on the wider flood plains of the larger creeks of the county. The alluvial sediments from which it developed are slightly acid to weakly alkaline. They were washed from dark-colored soils of the prairies. Runoff is slow, and internal drainage is moderate. The native vegetation was a forest of elm, hackberry, ash, oak, pecan, and cottonwood, and coarse grasses.

Profile of Verdigris clay loam about ½ mile southeast of Sapulpa in the NW¼SW¼ sec. 6, T. 17 N., R. 12 E.:

- 0 to 20 inches, dark grayish-brown clay loam; moderately granular structure; crumbly and friable when moist, hard when dry; porous; slightly acid.
- 20 to 38 inches, grayish-brown clay loam, slightly mottled with brown and some pale brown; friable; permeable; slightly acid.
- 38 to 46 inches +, grayish-brown clay loam, mottled with other shades of brown; contains pockets and thin seams of brown fine sandy loam; slightly acid.

The color of the surface layer ranges from very dark brown in undisturbed areas to dark grayish brown or dark brown where cultivated. Small areas have a 3- to 5-inch layer of grayish-brown loam that has been deposited on the surface by floodwaters.

*Use and management* (Capability unit I-2).—This is a highly productive soil. Most of the areas are flooded one to three times a year, but this does not prevent their use for cultivated crops. This soil is not susceptible to erosion, but on most areas soil material is deposited during floods.

About one-third of this soil is cultivated. Corn, cotton, and sorghums are the principal crops. About one-fourth is in woodland. The rest is idle or used for pasture. This soil is in the Loamy bottom-land range site.

### Woodson series

These are claypan soils that developed from alkaline or weakly calcareous shales and clays on nearly level to gently sloping prairies. They occupy small nearly level areas in gently sloping shallow valleys. These soils are dark grayish brown to dark gray. They are slightly acid.

Woodson soils are closely associated with soils of the Okemah series. The two series differ little in surface appearance. The Woodson soils have a thinner and more granular surface soil than the Okemah soils, and they have a dark-gray claypan subsoil. Woodson soils are not mapped separately in this county. Areas of Woodson clay loam are included in Okemah and Woodson clay loams, and a profile of the Woodson soil is described under that unit.

### Yahola series

These soils occur on the flood plains of the Deep Fork and Cimarron Rivers and other large streams. The parent material was alluvium derived from grassland soils underlain by redbeds. Soils of the Yahola series have a reddish-brown alkaline or calcareous surface soil and a moderately sandy subsoil.

These soils are moderately to highly productive. Areas that are not flooded too often are well suited to general field crops. Yahola soils are similar to Port soils in surface appearance, but they have a sandier subsoil. They are more alkaline than Pulaski soils. Yahola soils have a sandier subsoil and more rapid internal drainage than the Roebuck soils.

**Yahola very fine sandy loam** (0 to 1 percent slopes) (Yb).—This soil occurs on the flood plains of the Cimarron and Deep Fork Rivers. It developed from calcareous or alkaline sandy alluvial sediments washed from prairies underlain by redbeds. Runoff is slow to moderate, and internal drainage is moderate to rapid. All areas of this soil are periodically flooded. Those on the flood plain of the Deep Fork River are too frequently flooded to be suitable for crops, and they have been left in native hardwood forest. The native vegetation was a forest of elm, ash, oak, cottonwood, and pecan trees. Coarse grasses grew where the forest was thin.

Profile of Yahola very fine sandy loam about ½ mile north of Oilton in the NW¼SW¼ sec. 28, T. 19 N., R. 7 E.:

- 0 to 16 inches, reddish-brown very fine sandy loam; structureless; very friable; alkaline but not calcareous.
- 16 to 46 inches +, reddish-yellow light fine sandy loam, weakly stratified in the lower part with loamy fine sand; very friable and freely permeable; alkaline but not calcareous.

The surface soil is alkaline or calcareous. In color it ranges from light brown to reddish brown and in texture from fine sandy loam to silt loam. Small areas where floodwaters have recently deposited sediments may be weakly stratified.

*Use and management* (Capability unit I-2).—This soil is easily worked and moderately productive. Areas that are not flooded too often are well suited to crops. The soil is not susceptible to erosion. It receives fresh deposits of soil material during floods.

All of the cropland is on the flood plain of the Cimarron River. Cotton, corn, and sorghums are the principal crops. This soil is in the Loamy bottom-land range site.

**Yahola clay loam** (0 to 1 percent slopes) (Ya).—This soil developed from reddish, calcareous, sandy alluvium on the flood plains of the Deep Fork and Cimarron Rivers. The native vegetation was a forest of elm, hackberry, oak, pecan, cottonwood, and ash. Coarse grasses grew where the forest was thin. Runoff is slow, but internal drainage is rapid through the sandy substratum.

This soil is associated with Yahola very fine sandy loam. It is like that soil except for having a finer textured surface soil.

Profile of Yahola clay loam:

- 0 to 14 inches, reddish-brown clay loam; crumbly and friable when moist, moderately sticky when wet; alkaline or weakly calcareous.
- 14 to 45 inches +, reddish-yellow very fine sandy loam, weakly stratified in lower part with loamy sands and clay loams; very permeable; weakly calcareous.

The thickness of the surface soil ranges from 10 to 20 inches. The areas on which alluvial material has recently been deposited are weakly stratified with fine sandy loam. The texture of the subsoil ranges from loamy fine sand to loam. In some places it contains thin lenses or layers of coarser or finer material.

*Use and management* (Capability unit I-2).—This soil is moderately to highly fertile. The fertility is periodically replenished by the addition of alluvial material during floods. The soil does not erode.

Areas that are not often flooded are excellent cropland. They produce high yields of common crops, including alfalfa. Corn, cotton, and sorghums are most commonly grown. Areas that are flooded too frequently to be suitable for crops are well suited to pecan orchards or to pasture. This soil is in the Loamy bottom-land range site.

## **Use and Management of Soils**

This section of the report describes the management that is common in Creek County at the present time, the results of such management, suggested improvements in management, and yields that can be expected.

### **Present Management**

All of the principal crops in 1950—sorghum, corn, small grains, cotton, and peanuts—are soil-depleting crops. Very little plant residue or mineral matter is returned to the soils to replace elements used by crops. The sandy upland soils are being leached of plant nutrients. Many of the cultivated sloping soils are eroding. Sandy sediments from erosion in the sandstone hills are accumulating over some bottom-land soils.

### **Common practices**

Few farmers use regular crop rotations. The same kind of crop is not usually planted on a field in two successive years, but row crops that deplete the soil may succeed one another, year after year. Legumes are grown occasionally by many farmers, but soil-building rotations using legumes are not commonly followed. Shallow-rooted annual legumes are difficult to establish during dry seasons. Deep-rooted perennial legumes are more resistant to drought, but they are not much used.

Except for small-grain fields, the soils are bare or nearly so during the winter. The common practice of grazing the stalk fields during winter removes plant residues. All of the common crops of the area require large amounts of plant nutrients and leave little residue.

Before 1940, very little commercial fertilizer was used. Some fertilizer and limestone are now used, but not as much as in surrounding counties. Nearly three-fourths of the fertilizer applied is mixed, low-analysis fertilizer and is used on row crops. The rest is mostly phosphate fertilizer used on small grains and legumes. Some high-nitrogen fertilizer is applied as a sidedressing on row crops and as a topdressing on small grains. Little manure is available on most farms, and most of it is applied to soils used for special crops and vegetables.

Tillage practices are those common in this part of the State. For small grains, soils are usually plowed 3 or 4 inches deep with a one-way or disk plow 2 to 3 weeks before planting. Fall-seeded grains and green-manure crops are often seeded after disking grain fields harvested the previous spring. Sometimes these crops are drilled in cotton middles or in fields from which corn or peanuts have been harvested. Soils to be planted to row crops are plowed with a lister in spring and are usually plowed again before the crop is seeded on the ridge or in the furrow.

Only enough cultivating to control weeds is done. Corn and cotton are usually cultivated 2 to 4 times. Sorghums are often cultivated only twice. Cotton is thinned and may be hoed once or twice. Most corn is hoed once. Crop residues are grazed off or are left on the land until time to plant again. Some of the sloping soils have been terraced and cultivated on the contour, but most of them have not.

Native pastures receive practically no management. Many pastures in the sandstone hills area of the county are on abandoned crop fields. These support a thin stand of unpalatable grasses and weeds that furnish poor grazing even during the best part of the season. Pastures of bermudagrass and other tame grasses are normally given more care. Many receive lime and phosphate. Sometimes legumes are included in the seeding mixture.

### **Fertility status**

The present fertility of the soils varies considerably, because of differences in inherent fertility and differences in past use and management. Nearly all of the upland soils are low in phosphate. The amount of organic matter in the dark prairie soils is declining. The sandy soils of the river terraces and the sandstone uplands are already low to very low in organic matter, and most of them are deficient in nitrogen.

The amount of available potash in the soils has declined. This shortage may limit yields of the more demanding crops. Almost all the soils need lime if alfalfa or sweet-clover are grown, and lime may benefit other crops as well.

The results of chemical analyses of several virgin soils and cultivated soils are given in table 5.

## **Suggested Use and Management**

This section describes management practices that would enable farmers and ranchers in Creek County to get better yields than are usual under common management and, at the same time, to conserve the soil and maintain or restore its fertility.

### **The capability classification**

The capability classification shows the relative suitability and limitations of soils for crops, grazing, forestry, and wildlife. It is a practical grouping based on the needs of the soils and their responses to management. There are three levels in the grouping—unit, subclass, and class.

The capability unit, sometimes called a management group, is the lowest level of grouping. A capability unit is made up of soils similar in management needs, in risk of damage, and in general suitability for use.

TABLE 5.—Chemical analyses of some horizons of selected soil types

Soil and location of sample	Depth	Soil reaction	Total phosphorus (P)	Available phosphorus (P)	Organic matter	Total nitrogen	Available potash (K)
	<i>Inches</i>	<i>pH</i>	<i>Percent</i>	<i>Lb. per acre</i>	<i>Percent</i>	<i>Percent</i>	<i>Lb. per acre</i>
Bates fine sandy loam.							
Virgin: SE $\frac{1}{4}$ SW $\frac{1}{4}$ sec. 8, T. 18 N., R. 11 E.-----	0-6	6.4	0.020	10.6	2.73	0.1225	208
	12-25	5.7	.015	10.6	1.34	.091	184
Cropped: NE $\frac{1}{4}$ NW $\frac{1}{4}$ sec. 17, T. 18 N., R. 11 E.-----	0-6	5.5	.016	5.8	1.20	.084	88
	12-25	5.5	.015	4.2	1.18	.086	100
Dennis silt loam.							
Virgin: SE $\frac{1}{4}$ SE $\frac{1}{4}$ sec. 5, T. 19 N., R. 7 E.-----	0-6	5.6	.022	9.8	3.55	.149	166
Cropped: SW $\frac{1}{4}$ SW $\frac{1}{4}$ sec. 4, T. 19 N., R. 7 E.-----	0-6	5.5	.019	15.4	2.22	.0965	234
	12-20	5.3	.018	19.4	2.02	.099	166
	20-26	7.1	.014	10.6	1.08	.007	162
Dennis silt loam.							
Virgin: SE $\frac{1}{4}$ SE $\frac{1}{4}$ sec. 14, T. 17 N., R. 10 E.-----	0-6	5.7	.023	5.0	3.20	.141	136
	18-26	5.7	.014	14.6	1.59	.098	216
Cropped: SW $\frac{1}{4}$ SW $\frac{1}{4}$ sec. 13, T. 17 N., R. 10 E.-----	0-6	5.4	.018	8.2	1.75	.0825	132
	12-18	5.5	.017	5.8	1.60	.100	128
	18-26	5.9	.019	5.8	1.18	.0185	162
Dennis silt loam.							
Virgin: SE $\frac{1}{4}$ SE $\frac{1}{4}$ sec. 36, T. 18 N., R. 10 E.-----	0-6	5.9	.018	14.6	2.59	.1225	158
	12-18	5.8	.019	1.8	1.88	.105	128
	18-26	6.4	.014	1.8	.49	.0665	98
Cropped: NE $\frac{1}{4}$ NE $\frac{1}{4}$ sec. 1, T. 17 N., R. 10 E.-----	0-6	5.7	.017	5.0	1.55	.092	84
	12-18	6.1	.016	5.0	.90	.065	62
	18-26	5.9	.022	8.2	1.26	.093	230
Dougherty fine sandy loam.							
Virgin: SW $\frac{1}{4}$ NE $\frac{1}{4}$ sec. 34, T. 14 N., R. 10 E.-----	0-6	6.0	.023	31.4	2.37	.112	114
	15-30	5.0	.016	36.2	.57	.072	154
Cropped: SW $\frac{1}{4}$ NE $\frac{1}{4}$ sec. 34, T. 14 N., R. 10 E.-----	15-30	5.1	.015	2.6	.57	.065	200
Dougherty loamy fine sand.							
Virgin: SW $\frac{1}{4}$ SW $\frac{1}{4}$ sec. 29, T. 14 N., R. 9 E.-----	0-8	5.8	.018	23.4	1.12	.078	110
	8-26	6.2	.012	4.2	.29	.063	96
	26-40	5.2	.015	1.0	.47	.0465	356
Cropped: SW $\frac{1}{4}$ SW $\frac{1}{4}$ sec. 29, T. 14 N., R. 9 E.-----	0-8	6.1	.025	4.2	.20	.063	110
	8-26	6.6	.018	1.0	.43	.043	84
	26-40	5.1	.015	1.0	.37	.043	240
Mason clay loam.							
Virgin: NW $\frac{1}{4}$ SE $\frac{1}{4}$ sec. 22, T. 18 N., R. 11 E.-----	0-6	6.3	.044	33.0	4.11	.1805	320
	12-26	5.5	.025	7.4	1.69	.098	186
Cropped: NW $\frac{1}{4}$ SE $\frac{1}{4}$ sec. 22, T. 18 N., R. 11 E.-----	0-6	5.6	.031	5.8	2.60	.1245	154
	12-26	5.7	.025	5.8	1.69	.098	172
Mason silt loam.							
Virgin: SE $\frac{1}{4}$ NE $\frac{1}{4}$ sec. 27, T. 17 N., R. 10 E.-----	0-6	6.2	.025	5.8	2.14	.1155	172
	12-26	6.0	.020	1.8	1.57	.0965	184
Cropped: NW $\frac{1}{4}$ SW $\frac{1}{4}$ sec. 26, T. 17 N., R. 10 E.-----	0-6	6.2	.032	8.2	1.88	.1335	233
	12-26	5.7	.025	6.7	1.63	.1015	196
Mason silt loam.							
Virgin: SW $\frac{1}{4}$ SW $\frac{1}{4}$ sec. 22, T. 18 N., R. 11 E.-----	0-6	5.8	.032	29.0	2.94	.135	128
Cropped: SE $\frac{1}{4}$ SE $\frac{1}{4}$ sec. 21, T. 18 N., R. 11 E.-----	0-6	5.8	.024	14.6	2.06	.1155	188
	12-26	5.9	.025	4.2	1.29	.0955	188

TABLE 5.—Chemical analyses of some horizons of selected soil types—Continued

Soil and location of sample	Depth	Soil reaction	Total phosphorus (P)	Available phosphorus (P)	Organic matter	Total nitrogen	Available potash (K)
	<i>Inches</i>	<i>pH</i>	<i>Percent</i>	<i>Lb. per acre</i>	<i>Percent</i>	<i>Percent</i>	<i>Lb. per acre</i>
Okemah silt loam. Virgin: SW $\frac{1}{4}$ SE $\frac{1}{4}$ sec. 17, T. 16 N., R. 12 E.-----	0-6	6.0	0.021	7.4	3.12	0.127	144
	12-18	6.0	.019	10.6	1.98	.1085	128
Cropped: SE $\frac{1}{4}$ SW $\frac{1}{4}$ sec. 17, T. 16 N., R. 12 E.-----	0-6	6.0	.023	5.0	2.04	.072	172
	12-18	5.8	.023	13.8	1.77	.1025	160
Okemah clay loam. Virgin: SE $\frac{1}{4}$ SE $\frac{1}{4}$ sec. 29, T. 17 N., R. 12 E.-----	0-6	6.0	.026	5.0	3.43	.140	208
	Cropped: NE $\frac{1}{4}$ NE $\frac{1}{4}$ sec. 32, T. 17 N., R. 12 E.-----	0-6	6.4	.022	19.4	2.41	.113
18-26		7.1	.017	17.0	1.59	.0615	184
Reinach very fine sandy loam. Virgin: SE $\frac{1}{4}$ SW $\frac{1}{4}$ sec. 18 T. 19 N., R. 8 E.-----	0-6	6.5	.033	62.0	2.67	.1175	236
	15-30	6.6	.024	18.6	.82	.0735	162
Cropped: SE $\frac{1}{4}$ SW $\frac{1}{4}$ sec. 18, T. 19 N., R. 8 E.-----	0-6	6.5	.028	49.4	.90	.070	144
	15-30	6.7	.025	57.0	.63	.0685	110
Stephenville fine sandy loam. Virgin: SE $\frac{1}{4}$ SE $\frac{1}{4}$ sec. 23, T. 15 N., R. 8 E.-----	0-6	6.1	.017	5.0	1.26	.085	220
	12-20	5.3	.018	5.0	.55	.072	114
Cropped: NE $\frac{1}{4}$ NE $\frac{1}{4}$ sec. 26, T. 15 N., R. 8 E.-----	0-6	6.5	.021	19.4	1.18	.091	178
	12-20	5.3	.016	4.2	.55	.0735	260
Teller silt loam. Virgin: SW $\frac{1}{4}$ SE $\frac{1}{4}$ sec. 25, T. 19 N., R. 7 E.-----	0-6	6.4	.025	18.6	2.42	.1095	320
	12-26	5.3	.016	8.2	.89	.0815	316
Cropped: SW $\frac{1}{4}$ SE $\frac{1}{4}$ sec. 25, T. 19, N., R. 7 E.-----	0-6	6.4	.015	10.6	1.08	.0825	232
	12-26	5.3	.015	3.4	.73	.0805	188
Vanoss silt loam. Virgin: NE $\frac{1}{4}$ NE $\frac{1}{4}$ sec. 34, T. 19 N., R. 7 E.-----	0-6	6.0	.038	19.4	3.86	.1585	312
	15-25	6.0	.023	13.8	1.49	.100	292
Cropped: SW $\frac{1}{4}$ SW $\frac{1}{4}$ sec. 26, T. 19 N., R. 7 E.-----	0-6	6.5	.022	10.6	1.90	.1085	340
Verdigris silt loam. Cropped: NE $\frac{1}{4}$ NE $\frac{1}{4}$ sec. 16, T. 14 N., R. 9 E.-----	0-6	6.5	.029	14.6	1.62	.0945	252
	12-26	6.4	.022	6.6	1.25	.0885	226
Woodson clay loam. Virgin: NW $\frac{1}{4}$ NW $\frac{1}{4}$ sec. 28, T. 17 N., R. 12 E.-----	0-6	5.8	.035	6.6	4.24	.163	178
	12-24	5.6	.025	5.0	2.71	.119	204
Cropped: NE $\frac{1}{4}$ NE $\frac{1}{4}$ sec. 28, T. 17 N., R. 12 E.-----	0-6	6.1	.037	13.8	3.26	.133	260
	12-18	6.3	.027	11.4	2.18	.1035	222

The next broader grouping, the capability subclass, is used to indicate the dominant kind of limitation. The letter symbol "e" indicates that the main limiting factor is the hazard of erosion if a plant cover is not maintained; "w" means that excess water interferes with cultivation; and "s" shows that the soils are shallow, droughty, or unusually low in fertility.

The broadest grouping, the capability class, is identified by Roman numerals. All eight classes are represented in Creek County. All soils in one class have limitations of about the same degree but not necessarily of the same kind.

In classes I, II, and III are soils that are suitable for annual or periodic cultivation for annual or short-lived

crops. Class I soils are those that have the widest range of use and the least risk of damage. They are level or nearly level, productive, well drained, and easy to work. They can be cultivated with almost no risk of erosion and will remain productive if managed with normal care. Class II soils can be cultivated regularly but do not have so wide a range of suitability as class I soils, or they need more protection. Some class II soils are gently sloping and consequently need moderate care to prevent erosion; others may be slightly droughty or slightly wet, or somewhat limited in depth. Class III soils can be cropped regularly but have a narrower range of use and need still more careful management.

In class IV are soils that should be cultivated only

occasionally or only under very careful management.

In classes V, VI, and VII are soils that as a rule should not be cultivated for annual or short-lived crops but can be used for pasture, range, woodland, or wildlife. Class V soils are nearly level to gently sloping but are droughty, wet, low in fertility, or otherwise unsuitable for cultivation. Class VI soils are not suitable for crops because they are steep or droughty or otherwise limited, but they give fair yields of forage or forest products. Some soils in class VI can, without damage, be cultivated enough so that fruit trees or forest trees can be set out or pasture plants seeded. Class VII soils provide only poor to fair yields of forage or forest products.

In class VIII are soils that have practically no agricultural use. Some of them have value as watersheds, wildlife habitats, or scenery.

The soils of Creek County are grouped into the following classes, subclasses, and units.

**CLASS I.**—Deep, nearly level, productive soils, suitable for intensive cultivation without special practices other than those generally used for good farming.

Unit I-1: Deep, medium-textured and moderately heavy textured soils on high bottom lands or low terraces along streams.

Unit I-2: Deep, medium-textured to fine-textured soils on bottom lands along streams.

Unit I-3: Deep, medium-textured soils on uplands and old stream terraces.

Unit I-4: Deep, fine-textured soils on uplands.

**CLASS II.**—Soils suited to tilled crops, pasture, or trees, but with moderate limitations when tilled.

Subclass IIe: Soils subject to moderate erosion.

Unit IIe-1: Gently sloping, deep, medium-textured soils on old stream terraces.

Unit IIe-2: Gently sloping, deep, medium-textured upland soils.

Unit IIe-3: Deep, moderately coarse textured soils on nearly level uplands.

Subclass IIs: Soils moderately limited by droughtiness and low fertility.

Unit IIs-1: Deep, fine-textured soils on nearly level old stream terraces.

**CLASS III.**—Soils suited to tilled crops, pasture, or trees, but with severe limitations when tilled.

Subclass IIIe: Soils subject to severe erosion.

Unit IIIe-1: Deep, medium-textured soils on sloping uplands.

Unit IIIe-2: Moderately deep, moderately coarse textured soils on sloping uplands.

Unit IIIe-3: Deep, moderately coarse textured soils on high terraces and sloping uplands.

Subclass IIIs: Soils severely limited by low fertility and droughtiness.

Unit IIIs-1: Deep, coarse-textured soils on high terraces.

Subclass IIIw: Soils severely limited by excess water.

Unit IIIw-1: Deep, moderately coarse textured soils on nearly level bottom land that is subject to flooding.

**CLASS IV.**—Soils suited to grass and trees, but if tilled suitable for only limited or occasional cultivation with severe limitations.

Subclass IVE: Soils subject to very severe erosion.

Unit IVE-1: Deep, medium textured to mod-

erately coarse textured soils on sloping old high terraces.

Unit IVE-2: Deep, coarse-textured soils on gently sloping old high terraces.

**CLASS V.**—Soils ordinarily not suitable for cultivation but suitable for pasture or woodland.

Subclass Vw: Soils limited by poor drainage or frequent flooding.

Unit Vw-1: Deep, poorly drained alluvial soils.

Unit Vw-2: Deep alluvial soils with active stream channels.

**CLASS VI.**—Soils ordinarily not suitable for cultivation because of steep slopes, shallow soils, or severe erosion, but suitable for pasture.

Subclass VIe: Soils with severe hazard of erosion.

Unit VIe-1: Shallow to moderately deep sloping soils developed over sandstone.

Subclass VIIs: Soils extremely limited by steepness or shallowness.

Unit VIIs-1: Soils that are shallow, strongly sloping, or severely eroded.

Unit VIIs-2: Shallow upland forested soils.

**CLASS VII.**—Soils not suitable for cultivation and with severe limitations for pasture or woodland.

Subclass VIIe: Soils subject to extreme erosion.

Unit VIIe-1: Sloping, severely eroded soils.

Unit VIIe-2: Broken or severely gullied upland sandy soils.

Subclass VIIIs: Soils extremely limited by low fertility or droughtiness.

Unit VIIIs-1: Soils from coarse-textured sands.

**CLASS VIII.**—Soil not suitable for crops, pasture, or trees.

### **General management**

Some management practices can be applied to all soils used for crops, others to all soils used for pasture, or for woodland, or for wildlife habitats. These basic principles of soil management are summarized according to land use.

**Cropland.**—Lime and fertilize according to needs, as shown by soil tests and field trials. Use crop residues and manures to supply organic matter and to improve soil tilth. Include legumes in the rotation to supply nitrogen and to loosen compact subsoils.

Dispose of excess water by means of well-maintained waterways of adequate capacity. Terrace slopes of 2 to 6 percent. Terrace slopes of less than 2 percent if the slopes are more than 400 feet long. Till parallel to the terraces. If slopes of less than 2 percent are not terraced, use contour tillage and stripcropping to control water erosion. Use a winter cover crop or a stubble mulch to help prevent wind erosion.

To supply organic matter and to maintain fertility, grow annual legumes every third or fourth year or alfalfa as often as practical. Do not grow successive row crops unless fertility is maintained and erosion-control measures are adequate. Use small grain-legume rotations on sandy or eroded lands. Use winter cover crops on sandy lands to add organic matter and to check soil blowing.

**Tame pastures.**—Lime and fertilize soils according to needs, as shown by soil tests. For best results seed with a mixture of legumes and bermudagrass, fescue, or bromegrass; other good pasture plants, especially for sandy soils, are weeping lovegrass and sericea lespedeza. Control grazing to maintain a good cover of grasses and legumes.

**Woodlands.**—Remove undesirable species and poor-quality trees. Thin stands to allow better tree growth. Harvest selectively to obtain the best saw logs. Protect seedlings from fire and grazing, so forests can reproduce naturally. Replant open areas where necessary. The forests of the uplands consist mainly of blackjack oak, post oak, elm, and hickory. These trees are unsuitable for most commercial uses, but they produce some fence posts, firewood, and rough lumber.

The bottom lands produce better lumber. Trees of commercial value suited to the lowlands include red oak, black oak, cottonwood, hackberry, white oak, ash, and pecan.

**Native grassland.**—The management of native grassland is discussed under Range Management.

**Wildlife habitats.**—Even though used for other purposes, land that is properly used and managed will provide some food and shelter for wildlife. Turnrows and odd areas can be used for special wildlife habitats. Plant them to evergreen trees, shrubs, grasses, legumes, or aquatic plants. Protect these areas from burning and overgrazing. Information on management of wildlife habitats can be obtained from your county agent or the local representative of the Soil Conservation Service.

### Management by capability units

All soils in the same capability unit are suitable for about the same crops and need about the same kind of management. Suitable crops and appropriate management for each of the capability units in Creek County are described in the following pages.

**Capability unit I-1** consists of deep, medium textured and moderately heavy textured soils that occur on nearly level high bottom lands or low terraces along streams. These soils are friable and easy to work. They have a high moisture-supplying capacity, and they are highly fertile. The soils in this unit are—

Mason clay loam.  
Mason silt loam.  
Reinach very fine sandy loam.

These soils are suitable for irrigation. They are well suited to all crops grown in the county, especially corn, cotton, and alfalfa. A suitable rotation would be—alfalfa for 3 to 5 years; corn for 2 years; small grain. The streambanks are good sites for raising fruits and berries. These soils are well suited to pastures of bermudagrass overseeded with legumes or of bromegrass-fescue-alfalfa mixtures.

Protect these soils against runoff water from adjacent higher land. To get high yields and to improve the surface structure, maintain a high content of organic matter by proper cropping and tillage. Destroy johnsongrass if it appears on cultivated land.

These soils are in the Loamy bottom-land range site.

**Capability unit I-2** consists of deep, medium-textured to heavy-textured soils. They occur on nearly level bottom lands that are occasionally flooded. These soils are moderately fertile. Although they have moderate to high water-supplying capacity, they may not hold enough moisture for crops in dry years. The soils in this unit are—

Port clay loam.  
Verdigris clay loam.  
Verdigris fine sandy loam.  
Verdigris silt loam.  
Yahola clay loam.  
Yahola very fine sandy loam.

These soils are suitable for irrigation. They are well suited to crops, but the choice of crops may be somewhat limited because of occasional flooding. A suitable rotation would be—alfalfa for 3 to 5 years; corn for 2 years; small grain. This soil is well suited to pastures of bermudagrass overseeded with legumes, and also to pastures of bromegrass-fescue-alfalfa mixtures.

Protect these soils against runoff water from adjacent higher land. Where practical, build dikes to prevent floods. Stabilize the streambanks with trees and other vegetation. Destroy johnsongrass if it appears in cultivated fields. Crops that produce large amounts of organic residues are especially needed on the fine sandy loams to maintain organic matter and structure and to protect the soil from blowing.

These soils are in the Loamy bottom-land range site.

**Capability unit I-3** consists of deep, medium-textured soils on nearly level old stream terraces. These soils are easily worked and are moderate to high in natural fertility. They have moderate to high moisture-supplying capacity. The soils in this unit are—

Choteau very fine sandy loam, nearly level.  
Teller silt loam, nearly level.  
Vanoss silt loam, nearly level.

These soils are suitable for irrigation. They are suited to all crops grown in the county, as well as to the kinds of trees grown in windbreaks and shelterbelts and for post production. A suitable rotation would be—small grain and sweetclover; sweetclover; corn; cotton. These soils are well suited to pastures of bermudagrass overseeded with legumes. They also will grow bromegrass-fescue-alfalfa mixtures.

Terracing and contour farming may be necessary on Teller silt loam, nearly level, and Vanoss silt loam, nearly level, to control erosion. Stabilize drainageways with vegetation, or control the water mechanically. Where necessary, divert runoff water from adjacent higher lying lands.

These soils are in the Loamy prairie range site.

**Capability unit I-4** consists of deep, fine-textured soils on nearly level uplands. They are high in fertility. They have high moisture-supplying capacity, but may not supply enough moisture for crops during extended dry periods. This unit consists of Okemah and Woodson clay loams.

These are productive soils for common field crops. A suitable rotation would be—small grain and sweetclover; sweetclover; wheat; wheat or cotton. These soils are well suited to bermudagrass pastures. Fescue would provide winter and spring grazing.

Plant sweetclover and other deep-rooted legumes to help loosen the subsoil and increase the water-holding capacity. Apply lime and phosphate to legumes. Use nitrogen to increase the growth of grass. Green-manure crops are likely to deplete the moisture in the subsoil; consequently, they do not usually benefit succeeding crops.

These soils are in the Claypan prairie range site.

**Capability unit IIe-1** consists of deep, medium-textured soils on gently sloping old stream terraces. These soils are easily worked and have moderate natural fertility. They have moderate to high moisture-supplying capacity. The soils in this unit are—

Choteau very fine sandy loam, gently sloping.  
Teller silt loam, gently sloping.  
Vanoss silt loam, gently sloping.

These soils are suitable for all crops grown in the county, but a rotation based on small grains will provide the most protection against sheet and gully erosion. A suitable rotation would be—small grain and sweetclover; sweetclover; sorghum; cotton. These soils are well suited to pastures of bermudagrass overseeded with legumes. They also will grow bromegrass-fescue-alfalfa mixtures.

Use erosion-control measures that will prevent the formation of gullies.

These soils are in the Loamy prairie range site.

**Capability unit IIe-2** consists of deep, medium-textured soils on gently sloping uplands. They are easily worked and have moderate natural fertility. They have moderate to high moisture-supplying capacity. The soils in this unit are—

Bates fine sandy loam, gently sloping.  
Dennis and Okemah loams, gently sloping.

These soils are suitable for all crops grown in the county, except that Bates fine sandy loam, gently sloping, is not well suited to alfalfa. Dennis and Okemah soils will grow fescue-alfalfa mixtures. These soils are well suited to pastures of bermudagrass overseeded with legumes. Weeping lovegrass makes a good cover for difficult sites. These soils are also suited to the kinds of trees used for windbreaks or shelterbelts.

Use erosion-control measures to prevent gully and sheet erosion. Rotations based on small grains will provide the best protection. A suitable rotation would be—small grain and sweetclover; sweetclover; sorghum; cotton.

These soils are in the Loamy prairie range site.

**Capability unit IIe-3** consists of deep, moderately coarse textured soils on nearly level uplands. The only soils in this unit are Dougherty and Stidham fine sandy loams, nearly level.

These soils are well suited to vegetables, fruits, and common field crops. They are well suited to pastures of bermudagrass overseeded with legumes.

To control erosion, cultivate slopes on the contour, terrace slopes where necessary, grow winter cover crops, and stripcrop. Grow legumes about half of the time. Grow green-manure crops to supply organic matter.

These soils are in the Sandy savanna range site.

**Capability unit IIs-1** consists of a deep soil that has a claypan subsoil. It occurs on nearly level or depressed areas of old stream terraces. This soil has low to moderate natural fertility and is difficult to till. The moisture-supplying capacity is low. The only soil in this unit is Neosho silt loam.

This soil is better suited to grass and legumes than to cultivated crops. It is not suited to trees. Early-maturing crops give better yields than late-maturing crops, except possibly cotton. A suitable rotation would be—small grain and sweetclover; sweetclover. Small grain can be grown continuously if plenty of fertilizer is applied at seeding time. This soil is fair for pastures of bermudagrass overseeded with legumes, but forage yields are lowered by droughts. Fescue and annual legumes may be grown in most areas.

Surface drainage of wet areas may be practical. Do not permit grazing when the soil is wet, and do not till the soil when it is wet. To increase the supply of organic matter and nitrogen, grow legumes fertilized with phosphate fertilizer and utilize available crop residues and manure.

This soil is in the Claypan prairie range site.

**Capability unit IIIe-1** consists of deep, medium-textured soils on upland slopes. They are easily worked and have low to moderate natural fertility. These soils have moderate to high moisture-supplying capacity. They are very susceptible to erosion if unprotected. The soils in this unit are—

Bates fine sandy loam, sloping.  
Dennis and Okemah loams, sloping.

These soils are suited to the crops commonly grown in the county, except that Bates fine sandy loam, sloping, is not suited to alfalfa. Sorghums do better than corn. A suitable rotation would be—small grain and sweetclover; sweetclover; sorghum; cotton. Small grains can be grown every year if plenty of fertilizer is applied at planting time. The soils are fair for pastures of bermudagrass overseeded with legumes, but forage yields are often lowered by droughts. Fescue may be suitable for some areas, but weeping lovegrass may be more suitable for others. The only trees the soils are suited to are those used for windbreaks and shelterbelts.

Because of the slopes, intensive erosion-control measures are necessary to protect these soils from sheet erosion and gully erosion. Use rotations based on small grains to protect the soils and to add organic matter. Grow row crops only occasionally. Green-manure crops are not beneficial in most seasons, because they draw heavily on the moisture supply during winter and spring and leave the soil too dry for the following summer's crop.

These soils are in the Loamy prairie range site.

**Capability unit IIIe-2** consists of moderately deep, moderately coarse textured soils over sandstone. They occur on gently sloping to sloping uplands. They are low in natural fertility but are very responsive to good management. These soils are slightly to moderately susceptible to erosion. The soils in this unit are Stephenville and Darnell fine sandy loams, gently sloping.

If well managed, these soils are moderately well suited to crops or grass. A suitable cropping system would be to plant sorghum and cowpeas in strips across the direction of the prevailing wind and to alternate these strips yearly. Small grain might be grown every year, with or without a vetch cover crop. Cotton can be grown occasionally if it is followed by a small-grain cover crop. If fertilized properly, these soils are suited to pastures of bermudagrass overseeded with legumes. They are not suited to trees, except the kinds used in windbreaks.

Control erosion by terracing, contour tilling, and contour stripcropping. Grow only legumes or close-growing crops. Use green-manure crops to supply organic matter and protect the soil from erosion.

These soils are in the Sandy savanna range site.

**Capability unit IIIe-3** consists of deep, medium-textured, light-colored soils on high terraces along streams. These soils are easily worked. They are low in natural fertility but are very responsive to good management. The soils in this unit are—

Cleburne fine sandy loam.  
Dougherty and Stidham fine sandy loams, gently sloping.

These soils are well suited to vegetables, fruits, and common field crops. A suitable cropping system would be to plant strips of sorghum and peanuts across the direction of the prevailing wind, alternating the strips yearly. Drill rye between the rows each year for a

winter cover crop. Small grain can be grown every year, with or without vetch. An overseeded summer legume will generally make good pasture. These soils are suited to pastures of bermudagrass overseeded with legumes. Fescue-alfalfa mixtures will also grow.

To control erosion, cultivate slopes on the contour, terrace slopes where necessary, grow winter cover crops, and stripcrop. Grow legumes about one-half the time. Grow green-manure crops to supply organic matter. Plant new orchards on the contour.

These soils are in the Sandy savanna range site.

**Capability unit IIIw-1** consists of deep, moderately coarse textured soil that is moderately often to frequently flooded. It occurs on nearly level bottom lands on the flood plains of small streams. It is moderately productive, easily worked, and fairly resistant to drought. Cropping is hazardous because most areas are flooded several times a year. The only soil in this unit is Pulaski fine sandy loam.

Sorghum and peanuts can be grown in strips across the direction of the prevailing wind. Alternate the strips yearly. Drill rye between the rows each year for a winter cover crop. Small grain can be grown every year, with or without a vetch cover crop. An overseeded summer legume will generally make good pasture. This soil is excellent for pastures of bermudagrass overseeded with legumes. It will also grow fescue-alfalfa mixtures.

Protect the soil against runoff water from adjacent higher land. Where practical, build dikes and deepen stream channels to prevent flooding. Stabilize the streambanks with trees and other vegetation. Grow legumes about one-half of the time.

This soil is in the Loamy bottom-land range site.

**Capability unit IIIs-1** consists of deep coarse-textured soils of high terraces along streams. They are easily worked but are low in natural fertility and are subject to wind erosion damage. This unit consists of Dougherty and Stidham loamy fine sands, nearly level.

If well managed, these soils are suitable for vegetables, tree fruits, and field crops. Grow peanuts and sorghum in strips across the direction of the prevailing wind, alternating the strips each year. Drill rye between the rows for a winter cover crop. Small grain and vetch can be grown every year for winter pasture and seed. These soils are well suited to pastures of bermudagrass overseeded with legumes.

Control erosion by contour stripcropping, winter cover crops, and stubble mulching. Grow legumes often.

This soil is in the Deep sand savanna range site.

**Capability unit IVe-1** consists of deep, medium textured to moderately coarse textured, gently sloping to sloping soils on old high stream terraces. These soils are low to moderate in natural fertility, but they respond to good management. They are very susceptible to erosion. The soils in this unit are—

Dougherty and Stidham fine sandy loams, sloping.  
Teller silt loam, sloping.

The soils of this unit are not well suited to row crops, but small areas may be used for vegetables or for tree fruits. A suitable cropping system might be to grow small grains every year and plant vetch for winter grazing and for seed. Sorghum and cowpeas for forage can be grown on contour strips, alternated yearly. *Sericea lespedeza* is a good ground cover to control erosion. Weeping lovegrass is well suited to the steeper slopes.

These soils are good for pastures of bermudagrass overseeded with legumes.

If these soils are cultivated, the best of management is necessary to control erosion and maintain fertility. Control erosion by terracing slopes of less than 6 percent, and by contour farming and stripcropping. Grow rye and vetch for winter cover and make efficient use of crop residues.

The Dougherty and Stidham soils are in the Sandy savanna range site, and the Teller soil is in the Loamy prairie range site.

**Capability unit IVe-2** consists of deep, coarse-textured, gently sloping soils on old high stream terraces. They are low in natural fertility, but they respond to good management. They are very susceptible to wind erosion. The soils of this unit are—

Dougherty and Stidham loamy fine sands, gently sloping.  
Eufaula loamy fine sand, gently sloping.

The soils of this unit are well suited to special crops and tree fruits but not to general row crops. A suitable cropping system would be to grow small grain every year and plant vetch for winter grazing and for seed. Another system would be to plant sorghum and cowpeas for forage in contour strips, alternating the strips each year. These soils are well suited to pastures of bermudagrass overseeded with legumes.

Control erosion by contour stripcropping, winter cover crops, and stubble mulching. Grow legumes often.

These soils are in the Deep sand savanna range site.

**Capability unit Vw-1** consists of Roebuck clay, which is a deep, fine-textured, alluvial soil that is generally too poorly drained to be suitable for cultivation.

This soil is unsuitable for crops unless drained and protected from floods. It is best suited to trees. The better drained areas are suited to pecans. Very productive pastures of bermudagrass can be established on cleared areas.

This soil is in the Heavy bottom-land range site.

**Capability unit Vw-2** consists entirely of Gullied bottom land. This land type is a deep alluvial deposit that occurs along streambanks and in the low, irregular bottoms next to the stream channels.

These areas are unsuited to crops. The native cover of grass or trees should be maintained. On cleared areas, pastures of bermudagrass, wildrye, and johnsongrass will furnish good grazing, except during winter.

This land type is in the Loamy bottom-land range site.

**Capability unit VIe-1** consists of shallow to moderately deep sloping soils developed over sandstone. They are droughty and low in productivity. If cultivated, they are extremely likely to erode. The only soils in this unit are Stephenville and Darnell fine sandy loams, sloping.

These soils are not suited to crops. They are best suited to cultivated grass.

These soils are in the Sandy savanna range site.

**Capability unit VI s-1** consists of upland soils that are too shallow or too steep for crops but are well suited to grasses. The soils in this unit are—

Collinsville and Bates soils, gently sloping.  
Collinsville and Talihina soils, sloping.  
Collinsville and Talihina soils, strongly sloping.

These soils are suitable only for grass. Windbreaks may be planted on the spots of deeper soils. Use only native grasses on shallow soils. Manage grazing so as to maintain a good stand of grass.

These soils are in the Shallow prairie range site.

**Capability unit VI<sub>s</sub>-2** consists of forested upland soils that are too shallow or too steep for cultivation. The soils in this unit are—

Darnell and Pottsville soils, sloping.

Darnell and Pottsville soils, strongly sloping.

These soils are unsuitable for any agricultural use except woodland or woodland pasture.

These soils are in the Shallow savanna range site.

**Capability unit VII<sub>e</sub>-1** consists of sloping, severely eroded soils. The soils in this unit are—

Bates fine sandy loam, sloping, severely eroded.

Dennis and Okemah loams, sloping, severely eroded.

These soils are unsuitable for crops. They should be seeded or sodded to permanent grasses and managed as grazing land. They are in the Loamy prairie range site.

**Capability unit VII<sub>e</sub>-2** consists of severely eroded and gullied sandy soils. The soils in this unit are—

Broken or gullied sandy upland.

Stephenville and Darnell fine sandy loams, sloping, severely eroded.

This unit is so badly gullied or eroded that it cannot be cultivated. It is poor for grass or trees. The most practical use for it is to plant catalpa, locust, or mulberry trees to be cut for fence posts. These trees can be planted with little preparation of the land, and they help prevent erosion.

Cleared areas could be sodded or seeded to native grasses, but the cost of establishing a stand of grass would be very high because it would be necessary to fill in the gullies and to use large amounts of fertilizer and lime. Areas now in woodland should not be cleared and should be only lightly grazed.

This unit is in the Eroded savanna range site.

**Capability unit VII<sub>s</sub>-1** consists of Eufaula loamy fine sand, strongly sloping, a deep, coarse-textured soil.

This soil is moderately well suited to woodland. Grass and shrubs in woodland provide some grazing or browse. Keep all areas in woodland, and protect them from burning and overgrazing.

This soil is in the Deep sand savanna range site.

**Capability unit VIII** consists entirely of Oil-waste land. This is land that has been used as a disposal ground for oil and salt-water waste from oil wells. It has no value as cropland or grassland in its present condition. Some of the less strongly sloping and less severely gullied areas may become revegetated naturally if no more waste is dumped on them.

## Estimated Yields

The average crop yields that can be expected from each soil over a period of years under two levels of management are presented in table 6. The yields in columns A are those obtained under the type of management now generally used in the county. The yields in columns B are those that can be expected under better management. If erosion or poor cropping practices have seriously reduced the supply of organic matter and plant nutrients, several years of good management probably will be needed to bring the yields up to the level in columns B of the table.

## Range Management

More than half of Creek County consists of native range. As a rule, the soils used for grazing are not suitable

for cultivation. Most of the native range is in the savanna, which is also called the Cross Timbers. The savanna is an open forest of blackjack and post oaks with native grasses between the trees. The rest of the rangeland is on the open prairie. The bottom lands originally supported very productive stands of range grasses, but nearly all of these areas have been cultivated for field crops.

### Range sites and range conditions

A range site is an area of natural grazing land that because of its particular combination of climate, soil, and topography will support a certain climax vegetation. The climax vegetation is the natural plant cover that will maintain and reproduce itself so long as the environment remains unchanged. If the natural balance between the vegetation and its environment is upset by overgrazing, burning, or trampling, some species tend to die out and to be replaced by tougher plants that are likely to be less palatable.

Range condition is a measure of the present grassland as compared with the original natural cover. It is determined by comparing the kind and amount of present vegetation with the climax vegetation. If 76 to 100 percent of the present vegetation is the same as the climax vegetation, the range is in excellent condition. If 51 to 75 percent is the same as the climax vegetation, the range is in good condition. A range is in fair condition if 26 to 50 percent of the vegetation is the same as the climax vegetation. If the percentage is less than 25 percent, the range is in poor condition.

The nine range sites in Creek County are called the Loamy prairie, Claypan prairie, Shallow prairie, Deep sand savanna, Sandy savanna, Shallow savanna, Eroded savanna, Loamy bottom land, and Heavy bottom land. Table 7 shows what soils are in each range site, what plants grow on each range site when it is in excellent condition, and how many acres will probably be needed to support one cow for one year under each class of range condition.

*Loamy prairie site.*—This is tall-grass prairie. Big bluestem is the dominant grass when the range is in excellent condition. Several other grasses and plants are also important parts of the stand. Deep, dark-colored, highly productive soils are characteristic of this site. Moisture and plant roots penetrate deeply. Many areas of this site are used for native hay meadows.

*Claypan prairie site.*—The clay loam and silt loam soils that comprise this site are underlain by layers of dense clay which limits the depths of plant root development. This is considered to be very good grazing land, but its production is somewhat lower than that of the Loamy prairie range site. This site supports the taller grasses. Under grazing abuse, the dominant little bluestem and big bluestem decline rather rapidly and are replaced by the less productive buffalograss, windmillgrass, and silver bluestem.

*Shallow prairie site.*—This site consists of open prairie ridges and shallow stony areas. Little bluestem, side-oats grama, tall dropseed, and meadow dropseed are abundant on this range site. The shorter grasses grow on the shallow soils because there is not room for the deep roots of the tall grasses. Tall grasses such as big bluestem, switchgrass, and Indiangrass grow on the pockets of deep

TABLE 6.—Estimated average acre yields of principal crops on each soil under two levels of management

[Estimates in columns "A" are based on average management, which includes contour tillage, use of suitable plant varieties, timely planting and cultivation, insect control, and efficient harvesting methods. Estimates in columns "B" are based on good management, which includes all of the common management practices, and also crop rotations with legumes and the proper use of fertilizers. Absence of a yield figure indicates the soil is commonly considered unsuited to that crop]

Soils	Corn		Wheat		Oats		Cotton		Sorghums				Alfalfa		Native hay	Peanuts	
									Grain		Forage						
	A	B	A	B	A	B	A	B	A	B	A	B	A	B	Tons	A	B
	Bu.	Bu.	Bu.	Bu.	Bu.	Bu.	Lb.	Lb.	Bu.	Bu.	Tons	Tons	Tons	Tons	Tons	Bu.	Bu.
Bates fine sandy loam, gently sloping	14	22	12	18	20	32	180	240	14	20	1.6	2.5			1.2	20	35
Bates fine sandy loam, sloping	12	20	10	16	18	28	160	220	14	20	1.6	2.5			1.1	17	32
Bates fine sandy loam, sloping, severely eroded																	
Broken or gullied sandy upland																	
Choteau very fine sandy loam, gently sloping	20	32	14	22	22	34	220	300	16	22	2.2	3.3	2.0	2.7	1.5	24	40
Choteau very fine sandy loam, nearly level	22	35	16	24	24	42	240	360	18	26	2.5	4.0	2.0	3.0	1.6	26	44
Cleburne fine sandy loam	12	20			16	24	130	220	12	20	1.5	2.3				16	33
Collinsville and Bates soils, gently sloping															.8		
Collinsville and Talihina soils, sloping															.9		
Collinsville and Talihina soils, strongly sloping															.8		
Darnell and Pottsville soils, sloping																	
Darnell and Pottsville soils, strongly sloping																	
Dennis and Okemah loams, gently sloping	18	30	12	20	25	38	180	290	18	25	1.7	3.3	2.2	3.3	1.4		
Dennis and Okemah loams, sloping	16	26	12	18	22	35			16	23	1.4	3.0			1.2		
Dennis and Okemah loams, sloping, severely eroded															.9		
Dougherty and Stidham fine sandy loams, gently sloping	15	24	8	14	14	26	140	210	16	25	1.7	2.8	1.7	2.4		25	40
Dougherty and Stidham fine sandy loams, nearly level	16	28	10	16	16	30	150	260	18	28	1.8	3.0	1.8	2.5		28	42
Dougherty and Stidham fine sandy loams, sloping	12	20	8	12	12	22	120	180	12	22	1.4	2.5					
Doutherty and Stidham loamy fine sands, gently sloping	8	15					75	130	8	16	.8	1.4				20	32
Dougherty and Stidham loamy fine sands, nearly level	10	16					80	150	10	18	1.0	1.5				24	38
Eufaula loamy fine sand, gently sloping	8	15					70	120	8	16	.8	1.4				18	32
Eufaula loamy fine sand, strongly sloping																	
Gullied bottom land																	
Mason clay loam	16	34	14	23	26	42	200	280	20	34	1.8	3.0	2.7	3.6	1.6		
Mason silt loam	18	35	14	23	28	45	210	300	20	34	1.8	3.0	2.5	3.3	1.6		
Neosho silt loam	12	26	9	17	16	30	140	230	16	26	1.6	2.9			1.2		
Oil-waste land																	
Okemah and Woodson clay loams	18	30	14	26	24	42	210	320	18	32	1.8	2.8	2.2	3.1	1.7		
Port clay loam	28	45	18	30	30	48	260	360	24	36	2.0	3.2	3.0	4.0	1.8		
Pulaski fine sandy loam	22	38	9	18	21	36	165	270	20	33	2.0	3.0	2.0	3.2		26	38
Reinach very fine sandy loam	38	60	16	28	35	50	290	400	30	46	3.0	4.2	3.2	4.5	1.8	32	50
Roebuck clay																	
Stephenville and Darnell fine sandy loams, gently sloping			6	12	12	22	110	180	11	20	1.1	2.0			1.0		
Stephenville and Darnell fine sandy loams, sloping															1.0		
Stephenville and Darnell fine sandy loams, sloping, severely eroded																	
Teller silt loam, gently sloping	16	28	12	18	22	34	220	310	20	32	2.0	3.1	2.5	3.3	1.3	23	38
Teller silt loam, nearly level	21	32	14	22	25	46	240	350	24	38	2.3	3.5	2.8	4.0	1.5	26	42
Teller silt loam, sloping			10	16	18	30					2.0	3.0			1.2		
Vanoss silt loam, gently sloping	22	35	15	21	28	42	260	350	25	35	2.5	3.5	2.6	3.5	1.5	24	38
Vanoss silt loam, nearly level	25	40	15	25	28	45	300	400	25	38	2.5	3.8	3.0	4.0	1.5	26	40
Verdigris clay loam	32	48	20	32	33	50	300	410	28	40	2.6	3.4	3.2	4.5	1.8		
Verdigris fine sandy loam	26	45	18	30	30	45	260	380	23	35	2.4	3.4	3.0	4.3	1.6	30	45
Verdigris silt loam	30	48	20	32	33	50	300	410	28	40	2.6	3.4	3.2	4.5	1.8	32	48
Yahola clay loam	33	55	18	30	35	52	290	415	30	46	2.8	4.0	3.2	4.5	1.8		
Yahola very fine sandy loam	26	45	14	26	32	48	260	380	28	42	2.6	3.8	3.0	4.0	1.6	33	50

TABLE 7.—Range sites and stocking rates

Range site and soils	Dominant plants when range is in excellent condition	Recommended stocking rates by range condition class <sup>1</sup>			
		Excellent	Good	Fair	Poor
Loamy bottom land----- Reinach very fine sandy loam. Port clay loam. Mason clay loam. Mason silt loam. Verdigris clay loam. Verdigris fine sandy loam. Verdigris silt loam. Yahola clay loam. Yahola very fine sandy loam. Pulaski fine sandy loam. Gullied bottomland.	Eastern gamagrass, big bluestem, Florida paspalum, switchgrass, Maximillian sunflower, and Indiangrass, intermixed with scattered hardwood timber.	Acres per cow per year 4 to 5----	Acres per cow per year 6 to 7----	Acres per cow per year 8 to 10---	Acres per cow per year 11 or more.
Heavy bottom land----- Roebuck clay.	Prairie cordgrass, sedges, eastern gamagrass, Virginia wildrye, big bluestem, switchgrass, and tall dropseed, scattered indigobush, hackberry, elm, pecan, and post oak.	7 to 8----	9 to 11---	11 to 13--	14 or more.
Loamy prairie----- Bates fine sandy loam, gently sloping. Bates fine sandy loam, sloping. Bates fine sandy loam, sloping, severely eroded. <sup>2</sup> Choteau very fine sandy loam nearly level. Choteau very fine sandy loam, gently sloping. Dennis and Okemah loams, gently sloping. Dennis and Okemah loams, sloping. Dennis and Okemah loams, sloping, severely eroded. <sup>2</sup> Teller silt loam, nearly level. Teller silt loam, gently sloping. Teller silt loam, sloping. Vanoss silt loam, nearly level. Vanoss silt loam, gently sloping.	Big bluestem, switchgrass, Indiangrass, little bluestem, leadplant, and Maximillian and Ashy sunflowers.	7 to 9----	10 to 13--	14 to 18--	19 or more.
Claypan prairie----- Neosho silt loam. Okemah and Woodson clay loams.	Little bluestem, big bluestem, switchgrass, Indiangrass, side-oats grama, buffalograss, Maximillian sunflower, and leadplant.	10 to 12--	13 to 15--	16 to 19--	20 or more.
Shallow prairie----- Collinsville and Bates soils, gently sloping. Collinsville and Talihina soils, sloping. Collinsville and Talihina soils, strongly sloping.	Little bluestem, switchgrass, Indiangrass, big bluestem, sumac, persimmon, coralberry, and hackberry.	12 to 14--	15 to 17--	18 to 22--	23 or more.
Deep sand savanna----- Dougherty and Stidham loamy fine sands, nearly level. Dougherty and Stidham loamy fine sands, gently sloping. Eufaula loamy fine sand, gently sloping. Eufaula loamy fine sand, strongly sloping.	Big bluestem, little bluestem, Indiangrass, wildrye, and beaked panicum, intermixed with black-jack oak, post oak, hickory, coralberry, and sumac.	11 to 13--	14 to 18--	19 to 24--	25 or more.
Sandy savanna----- Cleburne fine sandy loam. Dougherty and Stidham fine sandy loams, nearly level. Dougherty and Stidham fine sandy loams, gently sloping. Dougherty and Stidham fine sandy loams, sloping. Stephenville and Darnell fine sandy loams, gently sloping. Stephenville and Darnell fine sandy loam, sloping.	Big bluestem, little bluestem, purpletop, Indiangrass, arrowfeather, three-awn, and Virginia tephrosia, intermixed with black-jack oak, post oak, hickory and brush.	9 to 11---	12 to 17--	18 to 22--	23 or more.
Shallow savanna----- Darnell and Pottsville soils, sloping. Darnell and Pottsville soils, strongly sloping.	Big bluestem, little bluestem, side-oats grama, Indiangrass, Stuve's lespedeza, slender and roundhead lespedeza, prairieclover, and leadplant, intermixed with black-jack oak, post oak, and brush.	12 to 14--	15 to 19--	20 to 25--	26 or more.

See footnotes at end of table.

TABLE 7.—*Range sites and stocking rates*—Continued

Range site and soils	Dominant plants when range is in excellent condition	Recommended stocking rates by range condition class <sup>1</sup>			
		Excellent	Good	Fair	Poor
Eroded savanna. Broken or gullied sandy upland. <sup>2</sup> Stephenville and Darnell fine sandy loams, sloping, severely eroded. <sup>2</sup>	Little bluestem, Indiangrass, switchgrass, side-oats grama, tall dropseed, roundhead lespe-deza, and Stuve's lespe-deza.	Acres per cow per year 15 to 19..	Acres per cow per year 20 to 24..	Acres per cow per year 25 to 30..	Acres per cow per year 31 or more.

<sup>1</sup> At these stocking rates, the better grasses should maintain themselves. The effects of weather and management on the better plants should be watched and the grazing adjusted accordingly. On sites in fair and poor condition, it may be necessary to defer grazing for at least two growing seasons before starting summer or year-long use.

<sup>2</sup> Most of these severely eroded areas were formerly cultivated and are now in poor condition. They require careful grazing management and sometimes need reseeding.

soil. This site is less productive than the Loamy prairie site because it is lower in moisture-holding capacity.

*Deep sand savanna site.*—The soils of this site are deep coarse sands that blow badly if cover is removed. They absorb water freely. In excellent condition, this site supports a stand of tall prairie grasses, clumps or single trees of blackjack oak and post oak, and brush. The principal desirable grasses are switchgrass, Indiangrass, little bluestem, and big bluestem. Important legumes are Virginia tephrosia, various perennial lespe-dezas, and tickclover. The range forage production potential is fairly good.

*Sandy savanna site.*—Most of this site is on gently rolling topography. Originally, post oaks and blackjack oaks were scattered among the big bluestem, Indiangrass, switchgrass, and little bluestem. Now much of this range site is in poor condition and has a thick overstory of oak brush.

Soils in this range site are deep sandy loams that have good capacity for absorbing and storing moisture. The shallow Darnell soils over sandstone store little moisture; the grasses on these soils dry out between rains, and brush is likely to be thick. Effective control of the brush is an essential step for economic management of this range site.

*Shallow savanna site.*—Most areas of this range site are strongly sloping to steep. Loose sand and stones occur on the surface. In many places bedrock is near the surface, and there are numerous outcrops of bedrock. Under natural conditions, this site supported grass intermixed with scattered post oaks, blackjack oaks, and brush. In most places, as a result of heavy grazing and fire, the stand of grass has been reduced and the amount of trees and brush has increased greatly. Limited amounts of big bluestem, Indiangrass, switchgrass, and little bluestem grow between the trees.

The shallowness of these soils limits the moisture-holding capacity and restricts the development of plant roots over much of the area. This site is less productive than the Sandy savanna site, but if well managed it provides fair grazing. Control of brush is usually the first step toward efficient grazing management. This site will erode severely if the plant cover is destroyed.

*Eroded savanna site.*—This site consists of formerly cultivated fields. The soils are severely eroded. They

range from shallow sandy soils to deep sands. The potential productivity of this site is lower than that of the uneroded savanna site. Long periods of careful management are required to establish effective erosion control and fair range production. In many places, special measures to control gullying are essential.

*Loamy bottom-land site.*—These deep soils receive additional water from overflow. They comprised the most productive range site in the county, but now practically all of the acreage has been cultivated for field crops. Areas that are flooded too often to be cultivated now support bermudagrass and johnsongrass.

The native grasses were principally eastern gamagrass, Florida paspalum, bottom-land switchgrass, and big bluestem. Some of the bottom lands originally had a savanna type of vegetation, in which hardwood timber grew along with grasses. Many such areas now support a thick stand of timber.

*Heavy bottom-land site.*—This site is frequently flooded. The only soil in it is Roebuch clay. The vegetation consists of the coarser grasses, including prairie cordgrass and bottom-land switchgrass, and some of the more palatable grasses, including big bluestem and Virginia wild-rye. Overgrazing on this site results in an increase in meadow dropseed, prairie dropseed, and other less palatable grasses.

### Factors of management

Native range grasses are a crop and, like any other, they respond to management. To use range efficiently and bring it to maximum production, a rancher should select the kind of livestock to which the range is best suited, limit the number of livestock and the season of use, and control the distribution of grazing.

*Kind of livestock.*—The ranges in Creek County are grazed principally by cattle.

*Proper grazing use.*—The number of livestock to be grazed on the range should be decided according to the length of time that the range will be used and the amount of forage available. Enough forage should be left on the ground to—

1. Mulch the soil and increase water-absorption and water-storage capacity. More soil moisture means more grass.

2. Permit deep vigorous growth of grass roots. Enough green leaves should remain on each plant to provide food to be stored in the roots for early and vigorous spring growth. Generally, about one-half of the leaves can be removed without damaging a plant's vigor and productivity.

3. Protect the soil from wind and water erosion. A good grass cover will prevent erosion and reduce runoff.

4. Allow the climax grasses to crowd out weeds and other inferior plants. This will improve range condition.

5. Provide a feed reserve for periods of drought that might otherwise force sale of livestock at a time when prices are low.

*Season of use.*—Grasses that grow well during cool weather generally furnish the earliest spring grazing and may also supply fall grazing. Warm-season grasses should be used during the summer months. The nutritive value of native meadow hay declines as the plants approach maturity. Most grasses in Creek County grow most rapidly in spring and early in summer. Livestock on grass gain the most weight during this period.

The kinds and amounts of grass that each range will produce and the best time for grazing depend on the range site and the condition of the range. Ranges in fair to poor condition usually should be rested until fall or winter, to permit the better grasses to spread from underground stems and by seeding. Ranges that are in good or excellent condition can also benefit from an occasional rest from grazing during the growing season of the principal forage plants. Your Soil Conservation Service technician can advise on seasons of use and rest for individual ranges.

*Distribution of grazing.*—Many ranges in Creek County are overgrazed. Some are undergrazed or not grazed at all. The distribution of grazing can be improved by the location of water and salt or by fencing.

Poor distribution of water is one of the main causes of uneven grazing. Watering places should be developed over the entire range if possible, so that livestock do not have to walk far to get water. Generally, water is required at about 1-mile intervals in rough country and at 2-mile intervals on more level range.

Salt should be placed in lightly grazed areas where forage is abundant, and where livestock can reach it from several directions. It should not be placed in sandy or other erodible spots. Livestock do not require water and salt at the same location.

Fences are necessary to provide separate pastures for different classes of livestock and for different seasons of use. Where possible, fences should be located on the boundary between two range sites, so that livestock will not overgraze the preferred range site while grazing the other site too lightly.

## Origin and Classification of Soils

Soils are developed by the action of several soil-forming processes on accumulated materials. The factors that determine the characteristics of the soil at any given place are (1) the kind of parent material, (2) the climate under which the parent material has accumulated and has existed since its accumulation, (3) the plant and animal

life on and in the soil, (4) the relief, or lay of the land, and (5) the length of time the forces of soil development have acted on the soil material.

Soils that have well-developed soil characteristics that are due mainly to the influence of climate and vegetation are zonal soils. The Red-Yellow Podzolic soils and the Reddish Prairie soils are the zonal great soil groups represented in this county. Intrazonal soils also have well-developed characteristics, but the influence of climate and vegetation is overshadowed by that of one or more of the other factors of soil formation. The Planosols are the only intrazonal soils in this county. Their dominating characteristics are due to the fine texture of the parent materials, level relief, and age. Azonal soils do not have strongly developed profile characteristics because of extreme youth, strong relief, or unusually stony parent material. The Lithosols and the Alluvial soils are the two azonal great soil groups of this county.

Creek County has a warm-temperate climate. It is in the humid zone, but its climate is drier than the average humid-zone climate. Most of the county is level to gently sloping. Half of the area has slopes of less than 4 percent. In a few places, slopes are steep enough to retard soil development.

The parent materials of the soils of this county consist of products weathered from sandstones and shales and a little that weathered from limestones or limy sandstones on the uplands; old alluvium washed from these kinds of rocks and deposited on stream benches; and recent alluvium deposited on the bottom lands.<sup>4</sup> Most of the sandstones are red or brown in color, and soft. They contain little lime, phosphate, or other easily weathered minerals. Two thick beds of gray shale crop out in the eastern and northern parts of the county. Thinner beds of red shale crop out elsewhere. These shales are high in easily weathered minerals, and the soils formed mostly from them contain moderate amounts of lime, phosphate, and potash. Most of the soils were formed from mixed sandstone and shale materials, however, and contain a moderate or low supply of these nutrients. Few of the soils are more than slightly acid.

Most of the areas underlain by shale had a prairie vegetation of tall grass or shorter grasses, depending on the depth of the soils. The soils of these areas belong to the Reddish Prairie great soil group. The areas underlain by sandstone generally have a scattered forest in which prairie grasses grow between the trees. Red-Yellow Podzolic soils developed in these places.

The Reddish Prairie soils, the Red-Yellow Podzolic soils, and the Planosols are mature soils. They have developed the characteristics that are normal to the climate, vegetation, and relief. The Lithosols and the Alluvial soils are youthful soils, which have not had time to develop fully.

Table 8 shows the classification of the soils of this county into the zonal, intrazonal, and azonal orders and into great soil groups. Some of the factors that affected the development of the soils are also shown in the table.

<sup>4</sup>FATH, A. E. GEOLOGY OF THE BRISTOW QUADRANGLE, CREEK COUNTY, OKLAHOMA. U. S. Geol. Sur. Bul. 759, 63 pp., illus. 1925.

TABLE 8.—*Classification of soils into orders, great soil groups, and series, and some of the factors that influenced soil formation*

ZONAL					
Great soil group and series	Parent material	Slopes	Drainage		Vegetation
			Surface	Internal	
Reddish Prairie soils:					
Bates.....	Neutral sandstone and subsidiary layers of shale.	Gentle to moderate.	Moderate.....	Moderate.....	Grass.
Choteau.....	Slightly acid silty and clayey alluvial sediments overlain by loess.	Level to gentle.	Slow to very slow.	Slow.....	Grass.
Dennis.....	Interbedded neutral sandy shale, sandstone, and subsidiary clay shale.	Gentle to moderate.	Moderate.....	Slow.....	Grass.
Okemah.....	Weak alkaline clay and shaly clay, with local calcareous lenses.	Gentle to moderate.	Slow to moderate.	Very slow.....	Grass.
Teller.....	Neutral to alkaline reddish loamy alluvial deposits and loess.	Level to moderate.	Slow to moderate.	Moderate.....	Open stand of trees with coarse grasses.
Vanoss.....	Neutral to alkaline brownish loamy alluvial and loessal sediments.	Level to gentle.	Slow to moderate.	Moderate.....	Grass.
Red-Yellow Podzolic soils:					
Cleburne.....	Slightly acid to neutral sandstone.....	Nearly level to gentle.	Moderate to rapid.	Moderate.....	Trees.
Dougherty.....	Reddish slightly acid sandy alluvial sediments..	Level to moderate.	Slow to moderate.	Moderate to rapid.	Trees.
Eufaula.....	Reddish acid sandy alluvial or eolian deposits...	Level to strong.	Slow to moderate.	Moderate to rapid.	Trees.
Stephenville.....	Reddish slightly acid to neutral sandstone or interbedded sandstone and sandy shale.	Gentle to moderate.	Slow to moderate.	Rapid.....	Trees.
Stidham.....	Brownish acid sandy alluvial sediments.....	Level to moderate.	Slow to moderate.	Moderate to rapid.	Trees.
INTRAZONAL					
Planosols:					
Neosho.....	Neutral clayey alluvial sediments, somewhat stratified with silts and sands.	Level to concave.	Slow to very slow.	Very slow.....	Grass.
Woodson.....	Weakly alkaline clays and shaly clays, locally calcareous.	Level to gentle.	Slow to moderate.	Very slow.....	Grass.
AZONAL					
Lithosols:					
Collinsville.....	Neutral to slightly acid sandstone with subsidiary layers of sandy shale.	Gentle to moderate.	Moderate.....	Moderate.....	Grass.
Darnell.....	Slightly acid to neutral reddish sandstone.....	Moderate to strong.	Moderate to rapid.	Moderate.....	Scrubby trees.
Pottsville.....	Acid to neutral interbedded clay shale, sandstone, and sandy shale.	Moderate to strong.	Rapid.....	Very slow.....	Scrubby trees.
Talihina.....	Neutral to slightly acid clay shale with lenses of sandstone and sandy shale.	Moderate to strong.	Rapid.....	Very slow.....	Grass.
Alluvial soils:					
Mason.....	Neutral to alkaline and silty to clayey alluvial sediments, somewhat stratified with fine sandy loam.	Level.....	Slow.....	Moderate.....	Trees with ground cover of grass.
Port.....	Neutral to alkaline silty recent alluvium, derived mainly from areas underlain by redbeds.	Level.....	Slow.....	Moderate.....	Trees.
Pulaski.....	Slightly acid sandy alluvium, mainly from sandstone areas.	Level.....	Moderate.....	Moderate.....	Trees.
Reinach.....	Weakly alkaline to calcareous, silty and moderately sandy alluvial deposits.	Level.....	Slow.....	Moderate.....	Trees with ground cover of grass.
Roebuck.....	Weakly calcareous or alkaline clayey alluvium, mainly from areas underlain by redbeds.	Level.....	Very slow.....	Very slow.....	Trees.
Verdigris.....	Slightly acid to weakly alkaline, stratified, loamy to clayey recent alluvium, from the dark prairies.	Level.....	Slow.....	Slow to moderate.	Trees.
Yahola.....	Alkaline to calcareous sandy and loamy reddish alluvium, mainly from areas underlain by redbeds.	Level.....	Slow.....	Moderate to rapid.	Trees.

## Reddish Prairie Soils

The Reddish Prairie soils of this county are generally better developed than the Reddish Prairie soils of cooler regions. Their horizons are well differentiated in texture, structure, color, and reaction.

Most of the Reddish Prairie soils have a slightly acid to neutral, granular, friable A horizon that ranges in color from brown to dark grayish brown. The texture ranges from fine sandy loam to clay loam. In undisturbed areas the surface soil is moderately high in organic matter. The subsoil is yellowish-brown to grayish-brown clay loam or clay, usually mottled somewhat with reddish brown. The subsoil is medium to slightly acid, friable, and massive to granular in the upper part.

The following profile of Okemah silt loam is representative of the very gently sloping Reddish Prairie soils of the county. In texture and structure, the horizons are somewhat more clearly differentiated than in more strongly sloping Reddish Prairie soils. The Okemah soils developed from more clayey and alkaline parent materials and have a heavier lower subsoil than other Reddish Prairie soils. This profile was observed on a slope of 1½ percent in a concave field used for cotton, corn, small grains, and sorghum.

Profile of Okemah silt loam in SW¼SW¼ sec. 17, T. 16 N., R. 12 E; near Mounds:

- A 0 to 15 inches, very dark grayish-brown (10YR 3/2, dry; 10YR 2½/2, moist) to very dark brown (10YR 2½/2, moist) silt loam; strong medium granular structure; friable when moist, hard when dry; a thin platy crust forms on surface of cultivated field if soil dries undisturbed after a rain; slightly acid; grades to B<sub>1</sub> horizon.
- B<sub>1</sub> 15 to 22 inches, dark grayish-brown (10YR 4/2, dry; 10YR 2.5½/2, moist) to very dark grayish-brown (10YR 3/2, moist) silty clay loam; mottles of brown and strong brown comprise 5 to 10 percent of the mass; compound subangular blocky and medium granular structure; crumbly and friable when moist, moderately sticky and plastic when wet; slightly acid.
- B<sub>2</sub> 22 to 38 inches, mottled grayish-brown (2.5Y 5/2, dry; 2.5Y 3½/2, moist) and light olive-brown (2.5Y 5¼/4, dry; 2.5Y 4¼/4, moist) clay; weak blocky structure; very compact when moist, extremely hard when dry; very slowly permeable; contains numerous small dark shot-like concretions of iron; slightly acid to neutral.
- C<sub>1</sub> 38 to 50 inches, mottled light-gray (2.5Y 7½/2, dry; 2.5Y 6½/2, moist), olive-yellow (2.5Y 6⅞/8, dry; 2.5Y 5⅞/8, moist), and pale-olive (5Y 6¼/4, dry; 5Y 5¼/4, moist) clay; massive structure; very slowly permeable; contains a few small concretions of iron; weakly alkaline.
- C 50 to 65 inches +, pale-olive (5Y 6¼/4, dry; 5Y 5¼/4, moist) and yellow (5Y 7/6, dry; 5Y 6/6, moist) shale; alkaline; contains laminations of light-gray calcareous clay and sandstone.

The thickness of the A horizon ranges from 10 to 18 inches. The color is very dark gray in undisturbed areas under native grass, but in cultivated areas the color ranges to grayish brown. The texture of the B<sub>1</sub> horizon ranges from clay loam to silty clay, and the structure ranges from strong medium granular to compound subangular blocky and granular. In some places the B<sub>1</sub> horizon is mottled with brown. The combined thickness of the A and B<sub>1</sub> horizons ranges from 16 to 28 inches.

Other soils of the Reddish Prairie group differ from the above profile because of differences in parent material, relief, and drainage.

The Dennis soils have more sandstone in their parent material, which is less clayey and more permeable than the parent material of the Okemah soils. The soils are more friable and less clayey. They are slightly lighter colored throughout, but have more mottling of red, brown, and reddish brown in the lower horizons than the Okemah. They occur on stronger slopes.

The Bates soils developed from sandstone that contains lenses of sandy shale. They are browner throughout, and have a friable sandy clay loam B horizon. The Choteau soils are somewhat similar to Dennis soils, but they developed from old acid silty and sandy alluvium on nearly level stream terraces.

The Vanoss soils are youthful but moderately well developed Reddish Prairie soils that formed under grass in silty or sandy colian or alluvial materials over neutral to alkaline sandy or silty clay loam. They are brown, deep, friable, and permeable. They are neutral to slightly acid.

The Teller soils are transitional to Red-Yellow Podzolic soils. They developed under a savanna forest from alkaline, reddish, loamy sediments washed mainly from grasslands. They are browner in the upper part than typical Red-Yellow Podzolic soils. The A<sub>1</sub> horizons are darker colored and have better developed and more distinct structure.

## Red-Yellow Podzolic Soils

The Red-Yellow Podzolic soils of this county have developed under hardwood trees and grass. They are not as clearly characteristic of this great soil group as Red-Yellow Podzolic soils that developed in more humid climates under a pine-and-hardwood forest. Some, however, have the thin organic-mineral A<sub>1</sub> horizon, the light-colored, leached, acid A<sub>2</sub> horizon, and the yellowish or reddish, friable, acid sandy clay loam subsoil that are typical of the Red-Yellow Podzolic soils.

The Red-Yellow Podzolic soils of this county are best represented by the following profile of Dougherty fine sandy loam. It was observed in a gently sloping (2 percent) cultivated field that had moderate runoff and moderate internal drainage. The original vegetation was a thick cover of red oak, post oak, blackjack oak, and hickory trees.

Profile of Dougherty fine sandy loam:

- A<sub>1</sub> 0 to 6 inches, grayish-brown (10YR 5½/2, dry) to brown (10YR 4/3, moist) light fine sandy loam; structureless; very friable; slightly acid.
- A<sub>2</sub> 6 to 14 inches, light yellowish-brown (10YR 6¼/4, dry; 10YR 5¼/4, moist) light fine sandy loam; the lower 2 inches is reddish-yellow fine sandy loam or loam; very friable; medium acid.
- B<sub>21</sub> 14 to 34 inches, red (2.5YR 5/6, dry; 2.5YR 4/6, moist) sandy clay loam; massive structure; friable when moist, hard when dry; permeable; medium acid.
- B<sub>22</sub> 34 to 54 inches, reddish-yellow (5YR 6⅞/8, dry; 5YR 5⅞/8, moist) sandy clay loam; massive structure; friable when moist, moderately hard when dry; medium acid.
- C 54 to 70 inches +, reddish-yellow sandy clay loam alluvium, weakly stratified with red and yellowish sandy loam; slightly acid.

In areas where Dougherty soils are transitional to Stidham soils, the upper subsoil is reddish yellow.

The Stidham soils have a light brownish-gray A<sub>1</sub> horizon, a very pale brown A<sub>2</sub> horizon, and an upper subsoil of yellowish-brown sandy clay loam. Their lower

subsoil, beginning 26 to 36 inches below the surface, is yellowish, slightly mottled sandy clay or sandy clay loam; it is moderately plastic and is somewhat less permeable than the subsoil of the Dougherty soil.

The Cleburne soil is similar to the Stidham soil except that it lacks the sandy clay lower subsoil. It developed from sandstone residuum, which lies at depths of about 26 to 46 inches.

The Stephenville soils are similar to the Dougherty soils, but shallower. They are underlain at depths of 20 to 40 inches by partly weathered sandstone.

The Eufaula soils are related to the Stidham and Dougherty soils and are closely associated with them. They have a much thicker A horizon and have no loamy or distinctly heavier layer within 3 feet of the surface. The following profile of Eufaula loamy fine sand was observed on a gently sloping high terrace about 30 feet above the flood plain of the Deep Fork River. The vegetation is a native cover of blackjack oak and post oak.

Profile of Eufaula loamy fine sand in SE $\frac{1}{4}$ SW $\frac{1}{4}$  sec. 31, T. 14 N., R. 9 E., about 12 miles south of Bristow:

- A<sub>1</sub> 0 to 3 inches, dark grayish-brown (10YR 4/2, dry; 10YR 3/2, moist) loamy fine sand; weak granular structure; very friable; slightly acid.
- A<sub>21</sub> 3 to 10 inches, light brownish-gray (10YR 6/2, dry; 10YR 5/2, moist) loamy fine sand; structureless; nearly loose when dry; slightly acid.
- A<sub>22</sub> 10 to 44 inches, light yellowish-brown (10YR 6/4, dry; 10YR 5/4, moist) loamy fine sand; structureless; very friable when moist, loose when dry; medium acid.
- B 44 to 54 inches, reddish-yellow (7.5YR 6/6, dry; 7.5YR 5/6, moist) sandy clay loam, splotched or mottled with light brownish gray and brownish yellow; structureless; friable; permeable; medium acid.
- C 54 to 70 inches, alternating strata of reddish-yellow (7.5YR 6/8, dry) fine sandy loam and fine sand; slightly acid to neutral.

The B horizon may be as described, or it may be yellowish-brown loamy fine sand with narrow bands of reddish-yellow loam or sandy loam.

## Planosols

The Planosols in this county developed on nearly level relief. Their parent materials were shales or slowly permeable sandy clays and clays.

Woodson clay loam is representative of the Planosols in the county. The following profile was observed in a nearly level cultivated area in a shallow valley where common field crops are grown. Runoff is slow. Internal drainage is very slow but adequate for the crops commonly grown in the county, including alfalfa.

Profile of Woodson clay loam near Kiefer in the SW $\frac{1}{4}$ SW $\frac{1}{4}$  sec. 28, T. 17 N., R. 12 E.:

- A 0 to 12 inches, dark-gray (10YR 4/1, dry; 10YR 2/1, moist) clay loam; moderate medium granular structure; aggregates in lower 2 inches faintly coated with gray; friable when moist, very hard when dry; slightly acid.
- B<sub>2</sub> 12 to 22 inches, dark-gray (10YR 4/1, dry; 10YR 2/1, moist) clay, faintly mottled with yellowish brown; mottling in lower part comprises about 10 percent of the mass; weak blocky structure; very compact; extremely hard when dry; neutral.
- B<sub>3</sub> 22 to 34 inches, dark grayish-brown (2.5Y 4/2, dry; 2.5Y 3/2, moist) clay, yellowish-brown and olive-brown mottles comprise 10 to 15 percent; massive structure; very compact; contains a few small crystals of gypsum and small shotlike concretions of iron oxide in lower part; neutral.

C<sub>1</sub> 34 to 44 inches, mottled gray (10YR 6/1, dry), yellowish-brown (10YR 5/6, dry), and olive-brown (2.5Y 4/5, dry) clay; massive structure; very slowly permeable; contains few to numerous small crystals of gypsum and small concretions of iron oxide; alkaline but not calcareous.

C 44 to 56 inches+, partly weathered light olive-gray (5Y 6/2) and light olive-brown (2.5Y 5/4) shale or shaly clay; contains a few small crystals of gypsum, but is not calcareous.

The Neosho soil developed in clayey alluvial sediments on level or concave surfaces. Its profile is somewhat similar to that of the Woodson soils in thickness, structure, and consistence of horizons. This soil has a lighter colored A horizon and a more mottled and more compact upper subsoil.

## Lithosols

The soils in this great soil group are very shallow and stony. They lack well-developed profile characteristics because the strong relief allows rapid erosion, which removes soil about as soon as it develops. The vegetation may be either trees or grasses.

The principal Lithosols of the county are underlain by sandstone, shale, or interbedded sandstone and shale at depths of 5 to 15 inches. A few small areas are underlain by interbedded limestone and shale or interbedded sandy limestone and shale. The rocks under these soils vary so much within short distances and they are so near the surface that the thin profiles of the skeletal soils vary considerably.

The following profile of Darnell stony fine sandy loam was observed on a slope of 7 percent under a cover of scrubby blackjack oak and post oak. It is representative of the shallow Lithosols that overlie sandstone and have a scrubby forest cover.

Profile of Darnell stony fine sandy loam about 5 miles west of Bristow in the SW $\frac{1}{4}$ SW $\frac{1}{4}$  sec. 33, T. 16 N., R. 8 E.:

- A<sub>1</sub> 0 to 4 inches, dark grayish-brown (10YR 4/2, dry; 10YR 3/2, moist) light fine sandy loam; weak granular structure; very friable; numerous fragments of sandstone ranging up to 12 inches in diameter occur on surface; many outcrops of sandstone; slightly acid.
- A<sub>2</sub> 4 to 10 inches, light-brown (7.5YR 6/4, dry; 7.5YR 5/4, moist) light fine sandy loam; structureless; very friable when moist, nearly loose when dry; contains numerous fragments of sandstone; slightly acid; grades to C horizon through a 1- to 2-inch transition zone of yellowish-red (4YR 5/8, dry; 5YR 4/8, moist) fine sandy loam that contains numerous particles of soft partly weathered sandstone.
- C 10 to 40 inches, reddish-yellow (5YR 6/8) to red (2.5YR 5/8) sandstone bedrock; slightly acid to neutral.

Pottsville stony loam, which is closely associated with the Darnell soil, has a thin A<sub>1</sub> horizon of dark grayish-brown loam and a thin A<sub>2</sub> horizon of reddish-yellow loam or clay loam. Slightly acid, thin-bedded, partly weathered, olive-brown, red, or olive-yellow shale or shaly clay and reddish-brown sandstone lie 3 to 15 inches beneath the surface. Sandstone fragments occur on the surface. Outcrops of slightly weathered shale, covered by 2 to 4 inches of sandy clay loam, are common on the steeper slopes. In some places a thin transition layer of reddish-yellow clay lies above the shaly parent material but beneath the soil profile.

Some soils under a grass cover have somewhat similar thin profiles. They most commonly overlie sandstones

and shales, but many combinations of interbedded sandy limestone, limestone, sandstone, and shale occur. Examples are the Collinsville soils, which developed under grass over sandstone. Their profile consists of 8 to 10 inches of slightly acid, dark grayish-brown, granular loam or fine sandy loam over yellowish-brown, slightly acid sandstone bedrock. Outcrops of bedrock and large sandstone fragments on the surface are characteristic. Where the Collinsville soil is transitional toward Bates fine sandy loam, it has a thin, weakly developed B<sub>1</sub> horizon of yellowish-brown loam or sandy clay loam, 3 to 6 inches thick, just above the sandstone. Undisturbed areas of Collinsville soil support a moderately thick cover of bunchgrasses and scattered mesquite shrubs.

Soils of the Talihina series are closely associated with Collinsville soils, but they occupy more strongly sloping surfaces. They are on shaly slopes below ridgetops of Collinsville soils. The Talihina soils overlie shale or interbedded sandy shale, shale, and sandstone, but fragments of sandstone from the higher Collinsville soils are common on the surface of the Talihina soils. The Talihina soils are more clayey. The thin profile consists of olive-gray to dark grayish-brown clay loam over olive-colored, slightly weathered, neutral shale. The vegetation is a mixture of short and tall prairie grasses, and scattered shrubs and scrubby trees. The trees are rather thick in areas next to, or transitional to, Pottsville soils.

### Alluvial Soils

The Alluvial soils in this county range from slightly acid to calcareous in reaction and from dark grayish brown to brown or red in color, depending on the source of the soil materials. They developed from sediments carried by streams and deposited on terraces and flood plains. Some of these materials have not been in place long and have been only slightly modified by soil-forming forces.

The Mason soils are the most extensive Alluvial soils of the area. They show slight profile development. The profile described is on a low terrace about 3 to 5 feet above the flood plain of Polecat Creek. The area is moderately well drained. It is used for growing all crops common in the area, including alfalfa.

Profile of Mason silt loam about 2 miles southwest of Kellyville in the SE $\frac{1}{4}$ NE $\frac{1}{4}$  sec. 27, T. 17 N., R. 10 E.:

- 0 to 15 inches, very dark grayish-brown (10YR 3/2, dry; 10YR 2/2, moist) silt loam; the 5-inch plow layer is grayish brown; moderate medium granular structure; crumbly and friable when moist, hard when dry; slightly acid; grades to horizon below.
- 15 to 35 inches, dark grayish-brown (10YR 4/2, dry; 10YR 3/2, moist) silty clay loam; weak granular structure; numerous pinholes; friable when moist, moderately plastic when wet; slightly acid.
- 35 to 45 inches, grayish-brown (2.5Y 5/2, dry; 2.5Y 4/2, moist) light clay; strong-brown (7.5YR 5/8, dry) and yellowish-brown (10YR 5/6, dry) mottles comprise 10 to 15 percent of the mass; moderately crumbly and friable when moist, plastic when wet; permeable; slightly acid.
- 45 to 60 inches +, dark grayish-brown clay loam that contains thin strata of light-brown fine sandy loam; neutral.

The Verdigris soils are closely related to the Mason soils, but are of more recent origin and show no profile development. They are still flooded periodically. Some areas of Verdigris soils that are next to entrenched channels and are not flooded as often as the others have a weak color profile.

The Pulaski soils consist of brown to reddish-brown slightly acid sandy sediments that have been only slightly altered into a soil. Most of the material was washed from light-colored soils, but some came from Reddish Prairie soils.

The Port, Roebuck, and Yahola soils occur almost entirely on the flood plains of streams that carry sediments from areas of Reddish Prairie and Reddish Chestnut soils underlain by redbeds.

The Port and Yahola soils are similar in surface appearance, but Yahola soils are underlain by more sandy sediments. Yahola soils are generally more calcareous throughout than Port soils. Roebuck soils are poorly drained and normally calcareous. They have a more clayey and mottled subsoil than Port or Yahola soils.

The Reinach soils are similar to the Yahola soils, but they have a somewhat darker surface soil. They are high enough above the stream to be safe from ordinary floods. As a rule, they are more leached of carbonates than the Yahola soils.



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