

Issued June 7, 1915.

U. S. DEPARTMENT OF AGRICULTURE,

BUREAU OF SOILS—MILTON WHITNEY, Chief.

IN COOPERATION WITH THE UNIVERSITY OF MISSOURI AGRICULTURAL
EXPERIMENT STATION, F. B. MUMFORD, DIRECTOR;
M. F. MILLER, PROFESSOR OF SOILS.

SOIL SURVEY OF GREENE COUNTY,
MISSOURI.

BY

H. H. KRUSEKOPF, OF THE UNIVERSITY OF MISSOURI, AND
F. Z. HUTTON, OF THE U. S. DEPARTMENT
OF AGRICULTURE.

HUGH H. BENNETT, INSPECTOR, SOUTHERN DIVISION.

[Advance Sheets—Field Operations of the Bureau of Soils, 1918.]



WASHINGTON:
GOVERNMENT PRINTING OFFICE.
1915.

BUREAU OF SOILS.

MILTON WHITNEY, *Chief of Bureau.*
ALBERT G. RICE, *Chief Clerk.*

SOIL SURVEY.

CURTIS F. MARBUT, *In Charge.*
G. W. BAUMANN, *Executive Assistant.*

COMMITTEE ON THE CORRELATION AND CLASSIFICATION OF SOILS.

CURTIS F. MARBUT, *Chairman.*
HUGH H. BENNETT, *Inspector, Southern Division.*
W. EDWARD HEARN, *Inspector, Southern Division.*
THOMAS D. RICE, *Inspector, Northern Division.*
W. E. McLENDON, *Inspector, Northern Division.*
MACY H. LAPHAM, *Inspector, Western Division.*
J. W. McKERICHER, *Secretary.*

Issued June 7, 1915.

U. S. DEPARTMENT OF AGRICULTURE,

BUREAU OF SOILS—MILTON WHITNEY, Chief.

IN COOPERATION WITH THE UNIVERSITY OF MISSOURI AGRICULTURAL
EXPERIMENT STATION, F. B. MUMFORD, DIRECTOR;
M. F. MILLER, PROFESSOR OF SOILS.

SOIL SURVEY OF GREENE COUNTY,
MISSOURI.

BY

H. H. KRUSEKOPF, OF THE UNIVERSITY OF MISSOURI, AND
F. Z. HUTTON, OF THE U. S. DEPARTMENT
OF AGRICULTURE.

HUGH H. BENNETT, INSPECTOR, SOUTHERN DIVISION.

[Advance Sheets—Field Operations of the Bureau of Soils, 1918.]



WASHINGTON:
GOVERNMENT PRINTING OFFICE.
1915.

LETTER OF TRANSMITTAL.

U. S. DEPARTMENT OF AGRICULTURE,
BUREAU OF SOILS,
Washington, D. C., December 9, 1914.

SIR: In the extension of the soil survey in the State of Missouri a survey was made of Greene County during the field season of 1913. This work was done in cooperation with the University of Missouri Agricultural Experiment Station, and the selection of the area was made after conference with State officials.

I have the honor to transmit herewith the manuscript and map covering this work and to recommend their publication as advance sheets of Field Operations of the Bureau of Soils for 1913, as authorized by law.

Respectfully,

MILTON WHITNEY,
Chief of Bureau.

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

CONTENTS.

	Page.
SOIL SURVEY OF GREENE COUNTY, MISSOURI. By H. H. KRUSEKOPF, OF THE UNIVERSITY OF MISSOURI, and F. Z. HUTTON, OF THE U. S. DEPARTMENT OF AGRICULTURE	5
Description of the area	5
Climate	8
Agriculture	9
Soils	17
Crawford series	21
Crawford gravelly loam	21
Crawford silt loam	24
Lebanon series	26
Lebanon gravelly loam	26
Lebanon silt loam	27
Eldon series	29
Eldon gravelly loam	29
Eldon silt loam	30
Summit series	31
Summit loam	31
Bates series	32
Bates gravelly sand	32
Bates stony sand	32
Clarksville series	33
Clarksville gravelly loam	33
Clarksville silt loam	33
Hannibal series	34
Hannibal fine sandy loam	34
Hannibal silt loam	35
Gasconade series	35
Gasconade silt loam	35
Huntington series	36
Huntington gravelly loam	36
Huntington silt loam	36
Summary	37

ILLUSTRATIONS.

FIGURE.

FIG. 1. Sketch map showing location of the Greene County area, Missouri. Page. 5

MAP.

Soil map, Greene County sheet, Missouri.

SOIL SURVEY OF GREENE COUNTY, MISSOURI.

By H. H. KRUSEKOPF, of the University of Missouri, and F. Z. HUTTON, of the U. S. Department of Agriculture.

DESCRIPTION OF THE AREA.

Greene County is located in the southwestern part of Missouri, on the border of the Ozark Region. It is bounded on the north by Polk and Dallas Counties, on the east by Webster County, on the south by Christian County, and on the west by Lawrence and Dade Counties. It is rectangular in shape, with extreme dimensions of 30 miles from east to west and 22 miles from north to south, and comprises an area of 667 square miles, or 426,880 acres. The county is about 50 miles north of the Arkansas State line and about 60 miles east of the Kansas State line.

Greene County occupies the highest part of the Ozark border region. In general, it comprises a broad plain with a general slope to the west. The great Ozark Divide, which is followed approximately by the St. Louis & San Francisco Railroad, divides the area into two slopes. The drainage of the northern slope is into the Missouri River and that of the southern slope into the White River. The main divide is rather narrow in the eastern part of the county, the land falling away rapidly on both sides, forming the rough broken areas around the headwaters of Pomme de Terre Creek and of the James River. To the west it rapidly broadens, forming a wide, rolling plateau, including the rolling areas extending from Springfield to Bois D'Arc and Republic and on to the west.

The eastern part of the divide at Strafford attains an elevation of about 1,500 feet above sea level, the highest point in the county. The altitudes are lower toward the west, and at Springfield average about 1,300 feet. Near the western county line the average elevation is about 1,100 feet. The lowest altitudes in the valleys of Clear and Sac Creeks where these streams leave the county are about 1,000 feet above sea level. There is a total range in altitude of about 500 feet. The topography ranges from smooth to hilly, although over about three-fourths of the county the surface is gently rolling. The surface features are due almost entirely to stream erosion.



FIG. 1.—Sketch map showing location of the Greene County area, Missouri.

The north slope of the central plateau is more deeply dissected than the south slope. Pomme de Terre Creek, with its tributaries, and the Sac River have cut gorges into the upland plain, leaving broad, rolling interstream divides, with a narrow belt of broken land along the larger streams. The gravelly loam soils bordering these streams include the roughest land in the county. Sac and Clear Creeks are streams of only moderate depth, and are bordered by low hills. To the west of Pomme de Terre Creek is a rather smooth valley averaging 3 or 4 miles in width, and bordered on the east side by an abrupt rise of 50 to 100 feet to the upland. A prominent feature of this valley is Fairgrove Mound, which stands about 100 feet above the floor of the valley.

The south slope of the central plateau is only moderately dissected by James River and Wilson Creek. The abrupt breaks from the level uplands to the valley of James River give a moderately hilly surface, while the drainage area of Wilson Creek is everywhere moderately rolling. In general, Greene County has relatively more smooth land than any other Ozark county to the east or south.

The great divide or watershed of the Ozark uplift extends diagonally through the middle of this county. The northern part of the county is drained mainly by the Sac River, with Clear Creek and Sac Creek as its main tributaries. Pomme de Terre Creek drains the greater part of the northeastern corner of the county. These drainage waters eventually flow into the Osage and Missouri Rivers. South of the divide the James River and Wilson Creek constitute the chief drainage systems. Their waters ultimately find their way through White River into the Mississippi.

Nearly all of these streams originate within the county. Springs are found in all parts of the county, and many of them discharge large quantities of water. No part of the State is better watered, and wells 50 to 60 feet in depth rarely fail.

There are numerous sinks and large caves within the county. Two of the largest caves are Percy Cave, 7 miles northwest of Springfield, and Fisher Cave, near Galloway. The sinks vary in size from a few square yards to several acres, and range in depth from mere depressions to 20 and 40 feet. They are most numerous west of Springfield and north of Republic. Usually they are arranged more or less in groups and have regular trends, which undoubtedly mark crevices and underground streams. They are important in carrying off a large part of the surface drainage. The sink holes on the prairie uplands are frequently used by the farmers as storage basins for watering stock. The smaller streams frequently disappear and seem to find underground channels for considerable distances before they again appear. Wilson Creek disappears in this way in several places, especially in Sec. 18, T. 28 N., R. 22 W.

Like most of the Ozark border region, Greene County was originally either prairie land or open, grass-covered woodland. The great central plateau region was open prairie covered with prairie grass; the stream bottoms and the adjoining slopes were forested. With the settlement of the county and the prevention of prairie fires, the forest growth rapidly spread to the smoother land. At present, however, no extensive areas of woodland remain except in the north-eastern corner of the county. Small tracts occur along all the streams and in the more broken or stony areas. In the region of the Crawford soils, black, red, chestnut, and white oak, and walnut, hickory, elm, mulberry, papaw, and hazel brush abound. On the Lebanon soils post oak, black oak, and blackjack predominate. A small quantity of cordwood, railroad ties, and rough building material is produced each year.

There is a large supply of good building stone within Greene County. Massive beds of pure limestone outcrop at many places, and large quarries are located at Springfield, Ash Grove, Phenix, and Galloway. More than one-half million barrels of lime and hundreds of cars of stone are shipped out of the county annually. Lead and zinc are mined at several places east of Springfield.

Greene County is well supplied with railroads. Lines of the St. Louis & San Francisco Railroad cross the county diagonally from northeast to southwest and from northwest to southeast. The Kansas City, Clinton & Springfield Railway, the Chadwick branch, and the Kansas City-Springfield line of the St. Louis & San Francisco Railroad, and a branch of the Missouri Pacific Railway connect at Springfield. St. Louis, 230 miles, and Kansas City, 200 miles distant, are the principal markets for the county. The wagon roads follow land lines, and for the most part are in fair condition. The chert and hard limestone found in all parts of the county constitute excellent road-building material.

Prior to the war of 1812, Greene County was included in that part of southwestern Missouri known as the "Osage country." Until 1829 it was a part of Wayne County, and after that time it was included in Crawford County. Greene County was established in 1833, its limits extending to the western and southern boundaries of the State, but was reorganized in 1859 with its present boundaries. The first permanent white settlement within this section was made in 1818, on the James River. Many of the early pioneers came from Tennessee and Kentucky. Supplies were bought in St. Louis and shipped by boat to Boonville, and from there freighted south. Springfield was incorporated in 1838, with a population of 250.

The population of Greene County is reported in the 1910 census as 63,831. In the 1900 census it is given as 52,713. Springfield,

according to the census of 1910, has a population of 35,201, showing a marked increase over the 23,267 reported in 1900.

Springfield is the county seat of Greene County and the most important city of the Ozark region. It is a market for grain, fruit, truck, poultry, and cream produced in the near-by counties, and is a distributing point for manufactured products. It is the district headquarters of the St. Louis & San Francisco Railroad, and the offices and shops employ several thousand persons. A number of factories and wholesale houses, one of the State normal schools, and Drury College are located here.

Ash Grove, the second largest town, has a population of 1,075, according to the 1910 census. At this place lime manufacturing is an important industry. Republic, with a population of somewhat less than 1,000, is the center of an important fruit district. Large quarries are located at Phenix and Galloway. Brookline Station, Walnut Grove, Bois D'Arc, Willard, and Strafford are other towns of local importance. Their chief industries are canning and the milling of flour.

CLIMATE.

The climate of Greene County is continental. While there is a fairly wide variation in temperature, extremes of heat and cold are not as great as in the northern part of the State. The annual mean temperature is about 55° F. The average for July, the hottest month, is about 76° F., and for January, the coldest month, about 31° F. Periods of extreme cold are of short duration, and the temperature is seldom lower than 5° to 10° below zero. The average seasonal snowfall is less than 18 inches.

The mean annual precipitation is about 44 inches. The total for the spring months averages about 13 inches and for the summer months about 14 inches. The precipitation is lightest during the winter months, with a total of somewhat less than 8 inches. The mean total for the fall months is about 9 inches. The total rainfall for the crop season—March to September, inclusive—averages about 31 inches. From November to March the precipitation is usually general in character, but during the summer months it occurs mainly as local showers.

The prevailing winds are southerly. Northwesterly winds are common during the winter months. The average hourly wind velocity ranges from 9 to 12.5 miles during the summer months and from 7 to 12 miles during the winter.

The average date of the last killing frost in the spring is April 14 and of the first in the fall October 18, giving a normal growing season of about 6 months. The latest date of killing frost recorded in the spring is May 19 and the earliest in the fall September 28.

The data in the following table are compiled from the records of the Weather Bureau station at Springfield:

Normal monthly, seasonal, and annual temperature and precipitation at Springfield.

Month.	Temperature.			Precipitation.		
	Mean.	Absolute maximum.	Absolute minimum.	Mean.	Total amount for the driest year.	Total amount for the wettest year.
	° F.	° F.	° F.	Inches.	Inches.	Inches.
December.....	35.5	74	-11	2.50	4.15	3.20
January.....	31.3	74	17	2.44	1.82	1.85
February.....	33.6	76	-29	2.73	.66	1.15
Winter.....	33.5			7.67	6.63	6.20
March.....	43.5	92	3	3.50	1.40	4.76
April.....	55.7	88	22	4.02	4.25	6.95
May.....	64.6	89	32	5.86	2.59	8.55
Spring.....	54.6			13.38	8.24	20.26
June.....	72.3	96	46	5.28	2.35	15.20
July.....	76.4	106	53	4.67	1.18	2.45
August.....	74.8	100	44	4.00	1.50	6.60
Summer.....	74.5			13.95	5.03	24.25
September.....	67.9	102	35	3.31	.68	1.90
October.....	57.3	90	21	2.96	.97	7.95
November.....	44.4	79	6	2.89	4.62	4.75
Fall.....	56.5			9.16	6.27	14.60
Year.....	54.8	106	-29	44.16	26.17	65.31

AGRICULTURE.

Agriculturally Greene County ranks first among the counties of the Ozark Region. In the diversity of its agricultural products it is the equal of any county in the State.

The agricultural development of Greene County was accomplished more rapidly and with less difficulty than that of the main body of the Ozark Region to the east and south. When the county was first settled probably two-thirds of its area, including all the smoother land, was prairie land or open grass-covered areas with few trees, which did not require clearing. The early pioneers began at once to cultivate all the staple crops, such as corn, wheat, oats, rye, potatoes, and tobacco. In the early forties every farmer in the county grew cotton, but only for home consumption. The extensive range supported large numbers of cattle, horses, and mules. All products were used locally, as there were no markets or means of

transportation. However, about 1850 to 1870, a large part of the surplus stock, especially horses and mules, was sold to the settlers in Oklahoma and other sections in the Southwest. The completion of the St. Louis & San Francisco Railroad in 1870, and of the "Gulf" line from Kansas City to Memphis in 1878 gave an impetus to the agricultural development of the region.

In 1879 considerably less than half of the county was in cultivation. The Missouri Agricultural Report for 1880 contains the following statement with respect to Greene County:

The present population is estimated at 30,000, while the taxable wealth foots up over \$10,000,000. The inhabitants are made up of people from nearly every State and section in the Union. As an agricultural region, Greene County ranks with the most favored. It is eminently a wheat-growing county, while oats, corn, and potatoes yield abundant returns. It is a natural bluegrass region, furnishing good pasturage for stock three-fourths of the year.

The transition from the first agricultural stage—that of stock raising—to grain growing occurred earlier in Greene County than in the general Ozark Region to the east or south on account of the smoother topography, better soils, and better transportation facilities. Grain growing was profitable, especially on the "red soils" of the county, so that when live stock could not be raised on the open range, grain farming was extended, with a decrease in stock raising. Wheat became an important crop, and for many years was the principal money crop of the county.

As the region became more thickly settled and stock raising was largely abandoned the country was fenced and the annual prairie fires were stopped. All the land not cultivated soon became covered with a dense growth of brush and young timber, consisting largely of post oak, blackjack oak, and black oak. Some of these forested areas remain to the north of Strafford and in T. 28 N., R. 20 W., and T. 30 N., R. 21 W.

The second stage in the agricultural development of the county has continued to the present time with occasional modifications. It was found that grain growing alone was not as remunerative as a somewhat more diversified agriculture. Other crops received increasing attention and the fruit industry was developed to an important extent, but this was not always successful and other attempts were made to readjust the agricultural conditions so as to make farming more profitable. The decreasing productiveness of the soil and the reduction in the size of the farms had a tendency to decrease the farm income. Within the last decade dairying has been introduced with promising results, and this apparently marks the beginning of a third stage in the agricultural history of the county.

Of the cultivated crops, corn is most extensively grown. Since 1908 an average of approximately 80,000 acres, or nearly one-fifth

of the total area of the county, has been devoted to corn each year. The average yield during the same time has been about 28 bushels per acre, or a total average of 2,240,000 bushels annually for the county. Practically all of the crop is used for feed, and in recent years a considerable part of it has been stored as silage. It is not probable that the corn acreage will be extended materially, since most of the corn land is already in use. The bottom lands and the Crawford soils are most desirable for this crop.

Wheat is the money crop of the county, although it is second to corn in acreage. The early settlers soon recognized that the soils of this region produced wheat of exceptionally high quality, and at once began its cultivation on an extensive scale. As early as 1880 wheat was grown on a total of 48,199 acres, and in 1900 this had been increased to 56,792 acres. Since then there has been a gradual decline in the acreage of wheat, due largely to the decreasing productiveness of the land and the low prices received for the grain. The average annual acreage since 1910 has been a little less than 30,000 acres, but the tendency at present is to increase this acreage. Yields commonly range from 10 to 20 bushels per acre, although yields of 35 and 40 bushels are common. Winter wheat is grown exclusively. The crop is grown most extensively in the western part of the county. The use of commercial fertilizers for wheat is becoming more popular, and good results are obtained.

Oats is a crop of secondary importance in Greene County. In acreage it varies greatly from year to year. It was grown most extensively in the period from 1890 to 1900, but since then the acreage has steadily decreased, so that in 1912 the total acreage was 11,131, as compared with 25,331 acres reported in oats in 1890. The yields, too, are variable, and range from almost complete crop failures to 50 bushels per acre, depending upon the season. A production of 30 bushels per acre is about the average.

Kafir and sorghum thrive in Greene County, and are grown as forage crops, while the latter is also used for the production of sorghum sirup. The Lebanon soils are considered the most desirable for sorghum. The acreage of these crops is variable, but is greatest in dry years.

Cowpeas are grown successfully in all parts of the county, and constitute an important forage crop. They have been found especially valuable on the Lebanon soils as a pasture and green-manure crop. The farmers have learned that cowpeas are equal or superior to clover as a crop to build up the land.

Rye is finding favor in all parts of the county as a cover crop and for early spring pasture. Millet, like kafir, is an important dry-year crop. Alfalfa is a crop of no economic importance in Greene

County, but there is no apparent reason why it may not be grown successfully on the better areas of the Crawford and Huntington soils.

A large part of the agricultural land of the county is in sod. Red clover is in many respects one of the most valuable hay crops grown. It thrives throughout the county, but the red soil is the natural clover soil. Sometimes the crop is sown alone, but more often with timothy and orchard grass. Where grown alone the second cutting is used for seed; where mixed with timothy the fields are used as pasture after the first crop is removed for hay. Yields range from 1 to 2 tons of hay per acre. The intelligent use of this crop is an important factor in the agricultural progress of the county.

Of the cultivated grasses, orchard grass, timothy, bluegrass, and redtop are the most important, ranking in the order named. Orchard grass does especially well on the gravelly and open subsoil lands, as it is hardy and withstands the summer heat better than bluegrass, and holds well on the soil.

In general, the soils of this region are too open or porous to be good grass soils, and it is for this reason that the bunch grasses, such as orchard grass, thrive best. A fact as yet not appreciated by the farmers of this region is that the use of manure, and in most cases bone meal, on grass land is highly beneficial.

In connection with bluegrass, white clover is valuable as pasturage. It is a perennial, and does not require reseeding. It grows luxuriantly on all classes of soils. Its maximum growth occurs during the latter part of June and early July, at the time when bluegrass is usually dormant. It does particularly well on the gravelly and flinty soils.

Japan clover is one of the most nutritious of the clovers, and is encountered practically throughout the Ozark region. It thrives in forested as well as in open areas, and furnishes valuable grazing through the latter half of the summer and early fall.

Greene County embraces one of the important fruit-growing districts of the State. The apple is the principal fruit grown. Orchards of 40 and 100 acres are common, while those containing from 200 to 400 acres are not unusual, and several holdings of even a larger acreage under a single management exist in this county. Statistics collected in 1912 indicate a total area of about 4,600 acres in apple orchards. Only three other counties in the State have a larger acreage. Not only is the acreage large, but the general condition of the trees is far above the average for the State. They are also better cared for. In 1912 nearly one-half of all the bearing trees in the county were sprayed, while the average for the State, including Greene County, was only a little over 27 per cent. As

a rule the large orchards are much better cared for than the small ones.

About half the county is formed of soils that produce strong, thrifty apple trees. Ben Davis and Jonathan are probably the most common varieties grown. The region of principal plantings lies west of a line extending from Walnut Grove through Springfield to the James River, although the same soils occur elsewhere in the county. On the soils of the southwestern part of the county apple trees make an especially good growth. These soils are productive, deep, and well underdrained. This region was originally prairie or supported a native growth of black oak and red oak. The Crawford silt loam and gravelly loam are the soils now supporting the best orchards. Contrary to popular opinion, the apple demands a fertile soil in order to be productive and continue in a healthy condition for a long period of years.

Few peach orchards are found in Greene County and the conditions are apparently not favorable for the production of this fruit, which is known to be somewhat more susceptible to injury by frost than is the apple.

The interest in cherry growing is increasing, and small orchards of this fruit are being planted. In a few instances, rather large orchards, some as much as 40 acres in extent, are now in bearing, and no trouble is experienced in finding a ready market for all the fruit.

Pears and plums are produced, though not in sufficient quantities to supply local demands. Grapes are grown at a few points in considerable quantities. Raspberries, blackberries, dewberries, and strawberries are grown on a commercial scale in the southwestern part of the county. Strawberries have probably been more uniformly profitable with a majority of growers than any other kind of fruit.

Some growers who formerly made a specialty of fruit growing are now branching into other lines of farming, realizing that fruit growing is most profitable when combined with some other form of general farming, such as stock raising or dairying.

The surplus fruit products shipped out of Greene County in 1911 are reported as follows: Apples, 29,200 barrels; strawberries, 12,376 crates; peaches, 985 baskets; canned fruit, 1,637,000 pounds. Large quantities of tomatoes are grown for shipping and for canning. This is an important crop in connection with apple growing, the tomatoes often being grown between young apple trees, where they pay for the cultivation of the orchard until the trees come into bearing.

Stock raising is an important industry in Greene County. The favorable climate, the ease with which forage crops can be grown,

and the fact that pasture is the most profitable use to which some of the land can be put, make the industry a profitable one. The general prosperity of the region is largely due to the raising of stock, and as a source of income it holds first place. The surplus stock shipped out of the county in 1911 included 9,271 cattle, 25,586 hogs, 5,595 horses and mules, and 10,188 sheep. The value of this surplus product is reported as approximately \$2,000,000.

Many of the cattle raised each year are marketed as feeders. Hog raising is carried on in conjunction with cattle raising. Small flocks of sheep are found in all parts of the county, and it is probable that their number could be increased with profit. A large number of horses and mules are raised for export. Even where the farm is not devoted mainly to live stock, this branch of agriculture is an important and valuable adjunct.

Although the live-stock industry in Greene County is growing in importance, this will hardly become distinctly a cattle-feeding region. Corn is not grown extensively enough to supply grain to fatten large numbers of stock. It is the relatively large area of pasture land, compared with the area of grain land, that encourages stock raising and dairying. On much of the post-oak land there is a tendency toward a return to grazing.

Dairying seems certain to become one of the leading agricultural industries in Greene County. The high prices of dairy products during recent years have encouraged its extension. The red limestone soils respond readily to manuring, and the use of the manure which is available wherever dairying is practiced is highly beneficial. The natural conditions are especially favorable to dairying in Greene County. Most of the grass and forage crops, such as orchard grass, bluegrass, timothy, clover, cowpeas, and sorghum, do well, and furnish nearly an eight-months grazing season for the stock. The climate is so mild and equable that expensive barns and shelter are unnecessary. There is an abundance of good, clear water, and the herds are generally healthy. Commercial dairying was introduced in 1905. To-day the annual surplus dairy products are valued at approximately \$100,000.

Much of the land that can not be cultivated easily produces good crops of clover, which constitutes excellent pasturage. Clover is a valuable asset to the dairy industry, as the hay in a large measure can be used as a substitute for the expensive grain feeds. Through the extensive growing of forage crops and with the use of silage, a large amount of succulent feed is produced at a minimum cost.

Dairying is successful in all parts of the county, but will probably reach its greatest development in the areas nearest the railroads. Few farms make a specialty of dairying, but there are many farms

on which 10 to 15 cows are kept. Cream and butter are the products exported. Springfield is the most important local market, and from there dairy products in large quantities are shipped to markets east and south. Pure-bred herds of Holsteins and Jerseys form the foundation from which other herds are being developed.

The use of silos is an important factor in the growth of the dairy industry. Hundreds of silos have been constructed in Greene County during the last two years. The average acre of corn grown for silage produces from 8,000 to 20,000 pounds, one acre of productive soil furnishing winter feed for at least three animals. The entire stalk of the corn is used as feed, this being cut up just before maturity, so that all the strength of the ear, leaves, and stalk is conserved. Solid cement silos are found most practical, although the cost is much greater than for wooden silos.

Poultry raising is an important industry on practically every farm in the county. The climatic conditions and easily accessible markets make it a profitable branch of agriculture. Large shipments of poultry are made from Springfield.

The agriculture of Greene County is undergoing a gradual change. It has not assumed that stability which characterizes the agriculture of northern Missouri. Agricultural practices are being changed to conform to economic conditions. Where stock raising is more profitable than grain farming, the cultivated areas are largely being devoted to grass, and vice versa. Fruit growing is being extended or curtailed, according to the relative profits obtained. General farming is practiced in all parts of the county. Orcharding, small-fruit growing, and dairying are becoming important special industries in the central and southwestern sections. In the eastern part of the county the tendency is toward growing fruit, with dairying near the railways. The most important and most promising industry is stock raising in its varied forms. General farming and stock raising promise to prevail in the northern parts of the county. The extension of the live-stock industry will necessitate a slight reduction of the area now devoted to grain crops in order to provide pasture land. Some farmers find that the most profitable use of grain, grass, and other feeds is to feed them on the farm, for it is by this practice that the productiveness of the soils is most easily maintained or improved.

The general agricultural practices of the region are good. Some form of crop rotation is generally followed, and the most improved farm machinery is used throughout the county. Moderately deep plowing and thorough cultivation are usually practiced, and all the barnyard manure available is used.

Probably the most difficult problem in the management of the Greene County soils is the almost universal presence of stone. In the

silt types the stones are not present in sufficient quantities materially to interfere with cultivation. The soils of more than one-half of the county, however, are gravelly loams, the gravel varying in size from small chips to pieces 6 or 8 inches in diameter, and constituting from 20 to 70 per cent of the material. Though the quantity is rarely sufficient to prevent cultivation, it tends to make cultivation difficult. Most of the stony material is in the form of small gravel less than 2 inches in diameter. The expense of clearing the land of the larger stones is not prohibitive. In areas where the gravel content is large, and especially on gravelly south slopes, crops frequently suffer from drought, the gravel keeping the soil so open that it is not retentive of moisture. Droughty areas are numerous in the northwestern part of the county, where the rock is near the surface, frequently having only a few inches of soil covering. The importance of growing the right kind of crop and of practicing proper cultivation in such areas is apparent. Usually crops that cover the ground well, and that need little or no cultivation, do best. Corn is likely to fire, probably because at the time of tasseling, when it is most in need of moisture, the supply usually is lowest.

Commercial fertilizers are not used to a great extent. However, they are becoming more popular, and where used on small grain give good results. Phosphatic fertilizers are used on wheat and give good returns. It is impossible to say what kind and quantities are best suited to the various crops grown upon the different soils. It may be noted, however, that one great need of the soils is nitrogen and organic matter.

According to the census of 1910 there is a total of 385,314 acres in farms in Greene County, of which 303,580 acres are reported improved. The total number of farms in the county is given as 4,434, averaging 86.9 acres per farm. Only a few holdings have more than 500 acres, but there are more than 575 farms that contain less than 25 acres. Of all the farms, 3,198, or about 72 per cent, are operated by the owners, and 1,211, or about 27 per cent, by tenants. The average value of the owned farm is \$5,000 and of the tenanted farm \$4,000. The average value of land per acre is given as \$44.73 in the 1910 census, as compared with \$22.07 reported in 1900. Land values range from \$25 to \$200 an acre, the higher prices prevailing on the better land in the central and southwestern sections of the county. The cheaper land is found in the eastern and northeastern sections. In all parts of the county land values are said to be increasing. Few farms change hands. The improvements that are made are of the most permanent type. In general, this is the most prosperous farming section in all the Ozark region.

SOILS.

Most of the upland soils of Greene County belong in the soil province known as the Limestone Valleys and Uplands, though there are some classed with the Great Plains group. These soils have mainly been formed in place through the decomposition of the underlying rocks. Besides these soils there are representatives of a third group comprising alluvial soils, formed of material washed mainly from the local upland soils, carried down by the streams, and deposited along their flood plains.

The rocks giving rise to the soils of the upland are of sedimentary origin and belong to the lower Carboniferous and Devonian systems, with a few limestone and sandstone outcrops of probably Silurian age. The various formations dip slightly to the southwest, so that the top or more recently deposited beds are found in the southwestern part of the county, while the oldest or lowest beds come to the surface in the northeastern part. The higher beds have been most important in the formation of the soils.

The varied character of the soils in Greene County is due to the differences in the composition of the geological formations from which they are derived. Outliers of the coal measures, consisting of shale, sandstone, and conglomerate, occurring on the highest points or in pockets and overlying all other formations, are found in all parts of the county, but are most extensive in the western sections. They give rise to the Bates series, characterized by red mottled subsoils and containing a fairly large percentage of iron and argillaceous material. There is every reason to believe that the Coal Measure deposits at one time covered a large part of the region. This is indicated by the sandstone fragments found in many places on the surface.

The two formations that are most important in soil-forming material, and that extend over about 90 per cent of the county, are the Upper and Lower Burlington limestones. The former, averaging about 200 feet in thickness, is the most extensive, and gives rise to the best soils in the county. It is characterized by thick beds of coarse-grained, crystalline, grayish, and rather pure limestone, intercalated with thin beds and lenses of chert. The chert of this formation is usually soft, owing to its calcareous nature. It is very ferruginous, fossiliferous, and easily decomposed.

The decomposition of these alternating beds of limestone and chert gives rise to materials which, when well drained, form the Crawford and Clarksville soils. Types of the former series occur where massive beds of pure limestone approach the surface. Owing to its remarkable purity and its coarse-grained crystalline struc-

ture, the Upper Burlington limestone is rapidly disintegrated and decomposed, and its tendency to disintegrate into a mixture of calcareous sand and clay before complete decomposition permits thorough oxidation of the material, and in addition gives a soil or at least a subsoil with a considerable content of lime.

The Clarksville soils seem to represent limestone material carrying a lower percentage of both lime and iron compounds than is carried by the Crawford soils. This may be due to a lower percentage of these compounds in the original rock, but seems to be due mainly to leaching during and since the disintegration of the rock. They are usually more cherty than the Crawford soils and in many cases seem to be older; that is, the layer of Clarksville soil material is usually thicker than that of the Crawford soils. The parent rock from which fresh accessions of newly disintegrated material are derived is so far below the surface that it has little or no effect in rejuvenating the soil or replacing leached material. The great abundance of chert in much of the soil, where it occurs on slopes, tends to favor the rapid percolation of water and leaching. There is, however, little tendency toward the accumulation of clay in the upper subsoil, even in the more nearly level areas. The Clarksville soils seem to be more closely associated with the lower Burlington limestone than with the coarser grained, more massive, and less cherty upper Burlington limestone.

The lower Burlington averages about 70 feet in thickness. The upper beds are made up of 5 to 20 feet of a yellowish-white, very hard chert, some fragments of which have very sharp edges. The basal part is made up of a heavily bedded, bluish or slate-colored, fine-grained, very hard limestone, which often contains lenticular masses of chert. The soils derived from the lower Burlington differ greatly in productiveness from those coming from the upper Burlington. Both rock formations are made up of alternating beds of chert and limestone. In both the heavy deposits of chert are in the upper part of the formations, but in the lower Burlington both the chert and limestone are extremely hard and compact, while in the upper Burlington the reverse is the case. The decomposition of the upper part of the lower Burlington gives heavy layers of broken chert with very little admixture of soil, except that obtained from the decomposition of superincumbent beds. The flinty, cherty slopes of the southeastern part of the county, which are usually forested, are good examples of soil derived from the upper layers of the lower Burlington beds.

The decomposition of the lower limestone beds is slow and results in a much poorer soil than that of the upper Burlington. The abundance of thin, intercalated beds of chert also renders this soil

very stony; and it is more argillaceous and lacks the porosity necessary for a good soil.

The Lebanon soils stretch in a continuous belt from the middle of the north line of the county in a curve southeastward to the southeastern corner. It will be noticed that this belt corresponds roughly to the main watershed of the county and includes the greater part of its flat land. This fact of its occurrence, as well as the character of the soil, indicates at least two possible sources for the soil material, but only one conclusion as to the cause of the fundamental characteristics of the soil. The material may be a remnant of an old deposit, which was laid on top of the lower Carboniferous limestone of the region and has been completely eroded from most of the other parts of the county, or it may be merely disintegrated upper and lower Burlington material, which has remained on this watershed for a long time.

The grayish or at least the light color of the soil, the heavy character of the subsoil, and its poor drainage are clearly due to local conditions. These soil characteristics are such as are developed in old plateau areas where soil material has lain unaltered for a long period of time and where poor drainage resulting from the flat topography has caused the accumulation of clay in the subsoil and has not permitted its thorough oxidation. As the streams work headward into such areas the stagnant material is either entirely or partly removed or, through creep down the slopes, its heavy subsoil becomes broken up and oxidation through the resulting better drainage completes the conversion of the soil to some other type.

Below the lower Burlington occur the Chouteau limestone, Hannibal shale, and Louisiana limestone of the Mississippian series. The Chouteau limestone is a fine-grained, compact, heavily bedded, and generally arenaceous magnesian limestone which is buff to yellow in color. It contains but little chert, and in the lower layers is quite earthy. Its average thickness is about 30 feet. The formation is too thin to be important as soil-forming material. In its decomposition it has become mixed with the lower Burlington, giving rise to the Lebanon soils. It decomposes into a yellowish, sticky clay.

The Hannibal shale usually consists of two parts—an upper, which is commonly a yellowish sandstone penetrated everywhere by worm-like borings that are filled with less indurated material, and a lower part, consisting of bluish compact shale. The formation has a thickness of 10 to 100 feet. The sandstone usually ranges from a few feet to nearly 25 feet in thickness, while the shales are several times as thick. The sandstone is quite durable, and in weathering usually forms benches or terraces, protecting the softer and more easily decomposed shales beneath, and in some cases forming flat-topped

mounds. The lowland in which Fair Grove is located is marked on the south and west side by such a terrace. The sandstone in this terrace is light to dark yellow in color and grades into silico-magnesian shales 5 to 70 feet thick. These shales are compact and usually gray to blue, but in some places greenish in color. They are soft, and when exposed to the air decompose rapidly into a bluish-green clay, which, when mixed with material from the Chouteau and Burlington formations, makes a good soil. The characteristic features of the landscape are due to the presence of these shales.

The Devonian beds are too thin to form a soil with any distinctive character, but the material resulting from their decomposition adds materially to the productiveness of the soils with which it is mixed.

The Silurian rocks occur only as outcrops in the county. The outcrops are mainly in the valley of Pomme de Terre Creek. These rocks do not enter into the formation of the soils.

The rocks of the various formations in the county are disintegrated to depths of 1 foot to 20 feet. None of the soil types in the county is derived from any one of the formations exclusively, as all the formations above have contributed more or less material to the soil of lower lying areas. Each formation originally extended farther east, and has been worn back to its present position, leaving some of its decomposition products distributed over the surface.

In general, the soils of Greene County consist of silt, with very little sand or clay. They are, therefore, usually mellow, or are easily made so with proper treatment. They are well drained and are moderately early and warm. These characteristics are due in part to the presence of stone or gravel in the soil. Such material is almost universal in its occurrence, and in parts of the gravelly types is very abundant.

Like the soil, the subsoil has a varying proportion of stone and gravel intimately mixed with other constituents. Throughout the county the lower strata are largely made up of chert, with varying quantities of fine material. Frequently, where the soil is very stony, the subsoil is slightly less stony, and vice versa. Throughout the county the stone content of the subsoil is more uniform than that of the surface soil.

The alluvial soils are made up of material washed from all the soils of the drainage basins of the streams along which they occur, carried by water in suspension and redeposited. They vary in character, depending upon the source from which they are derived, the methods of deposition, and the processes of weathering since their deposition.

In general, the fine material of the alluvial soils closely resembles that of the upland soils. Where it is derived largely from the Craw-

ford soils it is brown in color, and where derived from the Lebanon soils it is lighter brown to gray. In the western and northwestern part of the county much material has been carried down from the Bates soils, giving the alluvial soils a dark color. In narrow valleys and along small streams the soil is both alluvial and colluvial in origin and contains varying quantities of stone washed down from the ravines and draws. The alluvial soils are included in the Huntington series.

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

Areas of different soils.

Soil.	Acres.	Per cent.	Soil.	Acres.	Per cent.
Crawford gravelly loam	131,200	} 32.9	Gasconade silt loam	6,016	1.4
Glade phase	9,536		Bates gravelly sand	4,928	1.2
Crawford silt loam	86,016	20.2	Summit loam	2,880	.7
Lebanon gravelly loam	64,512	15.1	Clarksville gravelly loam	1,984	.5
Lebanon silt loam	45,504	10.6	Clarksville silt loam	1,152	.3
Huntington silt loam	24,768	5.8	Hannibal fine sandy loam	1,024	.2
Eldon silt loam	21,120	4.9	Bates stony sand	128	.1
Huntington gravelly loam	10,304	2.4			
Hannibal silt loam	8,960	2.1	Total	426,880
Eldon gravelly loam	6,848	1.6			

CRAWFORD SERIES.

The surface soils of the Crawford series are dark brown to reddish brown, with reddish-brown to red subsoils. The series comprises residual limestone soils of the prairie regions. Although derived from limestone, these soils contain only a small percentage of lime, differing materially in this respect from the soils of the Houston series which occur in the Cretaceous black prairies of the Coastal Plain. The members of the Crawford series occupy undulating or rolling areas, and sometimes local areas of rough, broken topography. They are generally well drained. The gravelly loam and silt loam types are recognized in Greene County. Together they cover more than half the county.

CRAWFORD GRAVELLY LOAM.

In its typical development the Crawford gravelly loam consists of a brown, reddish-brown, or dark-brown, mellow silt loam, grading at about 8 to 15 inches into a reddish-brown or red friable silty clay loam, which becomes redder and more gravelly with depth, passing at about 18 to 30 inches into red crumbly clay generally carrying such large quantities of angular chert fragments that bor-

ing is impossible. Chert fragments are distributed throughout the soil section, but are much more abundant in the lower strata. The soil contains approximately 10 to 30 per cent, and the subsoil approximately 20 to 70 per cent of this material. This description is applicable to the smoother parts of the type, including the more nearly level areas. Some of the more gentle lower slopes also do not carry nearly so much gravel in the surface soil as in the subsoil. This is especially true in the southern part of the county and in that part of the type drained by Wilson Creek, which contains less gravel than the average. To the west of Republic the soil averages darker in color and the subsoil contains relatively more chert than the typical soil. The soil of this region is largely derived from the cherty upper layers of the Upper Burlington, which accounts for the larger proportion of chert.

The higher areas, such as the ridges and slight knolls and the steeper slopes, are considerably more gravelly, frequently containing enough chert fragments to make it very difficult to plow to depths of more than 4 to 8 inches. Here the brownish or reddish-brown gravelly loam is often directly underlain by a mass of chert and reddish clay like that characteristically developed in the lower subsoil and substratum of the main portion of the type. This cherty layer often contains 75 per cent or more of chert. Occasionally it is possible to bore to a depth of 3 feet, owing to the fact that there is present only a moderate quantity of fragments from the surface downward, but such areas are rare.

In the northwestern part of the county, north of Ash Grove, the soil mantle of the Crawford gravelly loam is thin, and bedrock is usually encountered within a few feet of the surface. Massive beds of limestone outcrop on most of the steeper slopes, and frequently in moderately rolling areas. Limestone fragments are scattered through the soil.

Another variation of the type occurs to the southwest of Springfield in the lower part of the area drained by the James River. The soil is brownish gray to light brown, and is underlain by a yellowish-brown friable silty clay, mottled with gray and brown. When dry the color of the surface soil is gray, similar to that of the Lebanon soils. This variation in the soil is due to a variation in the Upper Burlington limestone. The rocks in this region are harder, more compact, and finer grained, and contain a harder chert which gives rise to the mottled soil. In its agricultural value it equals the typical soil. It is superior as a grass soil.

Throughout the type there are areas too small to map separately, varying from about 1 acre to 6 acres in extent, where the soil is a black silt, grading into a black or dark-brown silt or silty clay. These areas usually occur near the heads of draws and where the

limestone beds are exposed at the surface. In physical properties and agricultural value this black land corresponds with the typical soil.

In many places, particularly in the western part of the county, the soil contains small quantities of sand. This sand is a product of the sandstone and shales which at one time covered this region. The sand does not affect the soil materially, but tends to give it a darker color.

The topography of the type varies from undulating or almost level to moderately hilly. It averages gently rolling, the slopes being usually rounded and regular. The smoother areas occur in the southern half of the county and make up a large part of the smooth land near Republic. The more rolling areas are encountered in the northwestern part of the county in the drainage area of Clear Creek.

A great part of this type was originally prairie. The forest growth is mainly black oak and red oak, with some walnut, hickory, and elm. White oak occurs on slopes facing the north. As on all the soil types of the Ozark Region, this timber has grown up since the settlement of the region and the checking of the prairie fires. Before that time there was a growth, often very dense, of hazel and sumac brush. Just as such land is now described as "black-oak" land, a large part of it was formerly known as "hazel and sumac" land.

Probably 85 per cent of the Crawford gravelly loam is under cultivation, and it is one of the best soils in the county. It is used for the production of all the staple crops, but produces particularly good yields of wheat and fruit. Of the grasses, bunch grasses, such as orchard grass and timothy, do best, as the soil is too open for bluegrass to make a dense growth. Corn yields from 20 to 70 bushels per acre, with an average of about 35 bushels. Wheat yields from 10 to 30 bushels per acre, averaging 20 bushels or more with good management. For clover this type is unexcelled in all the Ozark Region. It produces $1\frac{1}{2}$ to 3 tons of hay per acre.

The Crawford gravelly loam is considered especially valuable as a fruit soil, and is extensively used for orchard and bush fruits and strawberries in the southwestern part of the county. The open subsoil is favorable to root development and the trees make a vigorous growth. The fruit is of high flavor. In the northwestern part of the county the type is used for corn, clover, and grass almost exclusively.

The physical condition of this soil where it is handled in such a way as to maintain its productiveness is excellent. The fine material is almost wholly silt and clay, but the soil contains a sufficiently

large quantity of gravel of all sizes to keep it in a mellow condition. Owing to its porous subsoil and the presence of stone in the soil, the type does not wash badly even on the slopes. The content of organic matter, which is in many cases low, is easily built up by plowing under stable manure and green legume crops. No soil responds more readily to applications of manure than do these red limestone soils.

Large quantities of stone have been cleared from the farms on this type, but in many fields enough stone remains seriously to hinder the use of farm machinery. The greatest progress in clearing the land has been made in the southern part of the county.

Owing to its stony character, the Crawford gravelly loam is not adapted to the use of heavy farm machinery. It is rarely possible to plow deeper than 6 or 8 inches. Where the gravelly subsoil is near the surface, the soil is not retentive of water, and in times of drought crops are likely to suffer.

Crawford gravelly loam, glade phase.—The glade phase of the Crawford gravelly loam comprises areas of limestone outcrop forming bluffs along the various streams and areas where the thick beds of Burlington limestone lie at or near the surface, associated with irregular patches of thin, brownish to reddish gravelly loam. Cultivation is impossible. What little soil material is present supports scattered buckbrush, hazel, redbud, locust, sumac, oak, hickory, and hog plum, and some grass. Land of this phase is used for woodlots or pasture.

The stony ledges and outcrops occur in all parts of this type, but are most numerous in the western part of the county. Only the larger bodies are indicated on the map.

CRAWFORD SILT LOAM.

The Crawford silt loam is locally known as "red clay" on account of its characteristic red color. The surface soil is a snuff brown or light reddish brown silt loam, underlain at about 8 to 16 inches by chocolate-red or reddish-brown, friable clay loam which grades below into brick-red, friable silty clay. A mass of white and reddish angular cherty fragments mixed with a small quantity of red clay is usually encountered at depths of about 24 to 40 inches, so that the lower stratum is always similar to the cherty subsoil of the gravelly loam type. Usually there are a few chert fragments present on the surface and through the body of the soil. Included within the type are small areas of Crawford gravelly loam, and small areas of the silt loam are likewise found within the gravelly loam. The boundaries between these two types are necessarily more or less arbitrary, as the distinguishing feature between the two is almost entirely the content of chert gravel. The fine material of the two

types is identical. As in the case of the gravelly loam, a reddish cast can be distinguished in the surface material in looking across fields, while upon close inspection the same material is seen to have a snuff-brown or chocolate-brown color.

In places the surface soil has a grayish-brown color, approaching that of the Lebanon silt loam. In a few areas, such as that just east of Walnut Grove, the subsoil is noticeably friable, even in the deeper part. In general, that portion of the type along the Clinton line of the St. Louis & San Francisco Railroad is noticeably darker in both soil and subsoil. Such an area of dark soil is included within the limits of Springfield.

The Crawford silt loam has a typically undulating to nearly level surface. It occupies the high broad plateau region to the south and west of Springfield. Small areas are found also as low slopes or high bench lands along the larger streams.

Practically all of the main body of the soil originally was prairie, or was covered with a growth of hazel brush and sumac. It was the first soil to be cultivated, not only on account of its greater productiveness, but because of the smoothness of the land and the absence of heavy forest growth. The smoothness of the land permits the use of modern farm machinery, and wheat, which produces good yields, is grown extensively. The next most important crop is corn. Under favorable conditions of season and tillage, and where the humus content is fairly high, yields of 35 to 80 bushels of corn and 15 to 30 bushels of wheat per acre are secured. Recently farmers have been using large quantities of bone meal with wheat, materially increasing the yields. As a clover soil this type ranks with the gravelly loam. It is well suited to pasture grass, hay, and all the staple crops of the county, and is especially desirable for wheat.

A larger part of this soil is devoted to fruit growing than of any other type in the area. This is not due to the fact that it is better suited to the growth of fruit trees or plants, but rather to its situation along the railways. Many growers say that fruit trees do not do so well on the prairie silt loam as on the "black-oak" gravelly loam. Small fruits and vegetables thrive. Alfalfa does well where the soil has a large organic-matter content, but little attempt is made to grow this crop.

All the Crawford silt loam is in a high state of cultivation, and it constitutes the most valuable land in the county because of its favorable location with respect to the towns and railroads, the smoothness of the land and the absence of stone, and its high productiveness. The many substantial farmhouses, thrifty orchards, and well-tilled fields indicate a general condition of prosperity throughout this type.

LEBANON SERIES.

The surface soils of the Lebanon series are gray to brownish gray. Typically the upper subsoil is a yellowish and the deeper subsoil a yellowish-brown to chocolate-brown or mottled yellow, gray, and drab color. In local areas of poor surface drainage the soils are nearly black and the subsoils mottled with brown, yellow, red, and gray. A so-called hardpan of reddish and gray chert fragments, often firmly cemented, is usually encountered within the 3-foot section.

LEBANON GRAVELLY LOAM.

The typical soil of the Lebanon gravelly loam is a brownish-gray to light grayish brown, friable silt loam, low in organic matter and carrying 20 to 50 per cent of chert fragments of varying sizes up to 1 foot in diameter. At about 6 to 8 inches the soil grades into a brownish-yellow or pale-yellowish silty clay loam, underlain at about 12 to 24 inches by a yellow to reddish-yellow silty clay faintly mottled with gray or by a mottled yellowish-brown and gray plastic clay. The subsoil contains about the same quantity of chert fragments as the soil, or a little more, to a depth of about 15 to 22 inches, where a mass of cherty gravel and reddish clay is encountered. In places the heavy plastic clay is absent, while in others it appears above or below the gravelly stratum. Immediately above the cherty subsoil the fine material usually is lighter in color and more mottled than the soil material above it. With increasing depth the subsoil becomes redder, particularly in the western border of the main body of the type.

The Lebanon gravelly loam is derived very largely from the upper beds of the Lower Burlington limestone. The abundance of thin intercalated beds of chert makes the soil very stony. The proportion of rock fragments varies greatly. Generally, the soil contains more stone than the corresponding Crawford type, and in places from 40 to 60 per cent of the soil mass is composed of stones. The chert fragments vary from small gravel to pieces a foot or more in diameter. They are lighter in color, more angular, and harder than the chert present in the Crawford soils. Where the large stones are absent cultivation is not especially difficult.

South of Ebenezer and near Plano are patches of Lebanon gravelly loam characterized by a high content of stone and a growth of post oak. These areas are derived largely from chert of the Coal Measures, but since the soil resembles closely that of the typical soil, it is included with the latter.

Another variation of the type occurs on the south side of the Fair Grove Valley and along the lower Sac Creek Valley. The slopes of

these valleys where this soil is found are gravelly in the higher areas, the lower slopes containing very little chert, but varying quantities of limestone fragments and argillaceous sandstone. The soil is lighter than the typical and the subsoil consists of pale-yellow clay underlain by mottled red and gray, friable silty clay. The material is derived very largely from the Hannibal shale and for the most part these areas are covered with post oak. Agriculturally they are inferior to the typical soil.

The Lebanon gravelly loam varies in topography from rolling to moderately hilly, the rougher areas occurring along the James River. Topographic features influence the type to a large degree, for on the steeper slopes, where erosion is more active, the soil contains more stone, and usually is a stony loam. In general, this type represents the roughest land in the county.

The smoother areas of the type were originally prairie. Post oak, with some blackjack and black oak, constitute the characteristic forest growth. White oak and red oak occur on the lower, cooler slopes.

Only a very small part of this type is used for agriculture. Where the larger stones are removed, however, it is equal in value to the silt loam type. Cultivated areas are used for corn and grass. Nitrogen and organic matter are apparently needed to bring out the best qualities of the type. Removal of loose stones from the fields so that thorough cultivation can be easily accomplished will also improve the yields. Grass and clover do almost as well on this soil as on the poorer Crawford soil, and its best use is for pasture land. It is considered a good fruit soil, but the trees do not make as strong a growth as on the red (Crawford) soils. Tomatoes, cantaloupes, and other vegetables do particularly well, especially where organic matter is added to the soil. In general, the type is best suited to grass and fruit trees.

LEBANON SILT LOAM.

The Lebanon silt loam is essentially the same as the Lebanon gravelly loam, except that it contains a smaller quantity of chert fragments. The surface soil is a gray to light grayish brown, floury silt loam, underlain at about 6 to 8 inches by brownish-yellow or pale-yellow silt loam, which grades quickly into yellow, moderately friable silty clay loam. The subsoil, beginning usually at about 16 to 24 inches, is a rather stiff clay of a mottled yellow or yellowish-brown and gray color. This passes below generally into crumbly silty clay of a mottled gray or drab, yellow and reddish color. The mottled subsoil is one of the most pronounced characteristics of the type. The heavy brown clay layer, as described for the type in other areas, occurs only in the flat post-oak lands to the north of Strafford. A few chert fragments are scattered through

the soil and subsoil, and the chert layer is invariably encountered at 30 to 40 inches.

Throughout the type there are slight knolls and depressions, on which the subsoil is a rather heavy silt or silty clay, compact but friable, and of a distinct dull-brown color. These areas occur mainly in the western part of the county, and have a slightly greater agricultural value than the typical soil. The occasional post-oak flats found within this type are shallow depressions with little or no drainage. The soil in these flats is light ashy gray, and is underlain by drab or bluish, heavy plastic clay. The flats support a growth of post oak, and are of little agricultural value.

The topography of the Lebanon silt loam is level to slightly undulating, broken only where erosion has taken place. The type lies higher than any of the surrounding soils, and as a consequence the land slopes toward the outer margins of these areas. In a general way the type represents a high plain or plateau forming the highest land in the county. Few streams traverse areas of this soil, for the reason that as soon as a stream cuts into the surface to any depth a different soil type is formed. The surface relief is sufficient to insure good drainage, but in the post-oak flats the density of the subsoil checks the downward percolation of moisture.

Originally this type was prairie, with occasional clumps of post oak. At present only a small part of the type is forested, the tree growth consisting principally of post oak, with some blackjack and black oak. The clearing of the land is not as difficult as keeping down the sprouts which follow the removal of the timber and persist for several years afterwards.

The greater part of this soil is devoted to general farm crops, consisting of corn, wheat, and grass. Corn yields average about 22 to 35 bushels per acre. For the production of timothy and redtop hay, this type is almost equal to the Crawford silt loam. Clover does fairly well, except in the typical post-oak areas. Cowpeas produce good yields. With good management and with the use of phosphate fertilizers this soil compares favorably with the Crawford silt loam as a wheat or oat soil. A small part of the Lebanon silt loam is used for orchard fruits, which, with good management, make a good growth. It is not, however, as good a fruit soil as the gravelly loam, as the close subsoil retards the development of the roots.

While this soil is not as productive as some other types in the county, it can easily be built up to a fair state of productiveness. It is lacking in both organic matter and phosphorus, but these can be supplied by growing cowpeas and by using phosphate fertilizers. Numerous tests indicate that the soil is slightly acid, which condition can be corrected by the use of lime. In general, the type is best suited to the production of small grain and grass crops. The topog-

raphy permits the use of improved farm machinery. On account of the heavy subsoil the type is somewhat subject to drought.

This is not regarded as a good clover soil. The plants do not catch as well as on the red soils or the gravelly type, and do not make so rank a growth. Not nearly so much attention is given to clover as on other soils. There is a demand for clover or some other legume, however, as the soil is badly in need of organic matter.

The results of mechanical analyses of samples of the soil, subsoil, and lower subsoil of the Lebanon silt loam are given in the following table:

Mechanical analyses of Lebanon silt loam.

Number.	Description.	Fine gravel.	Coarse sand.	Medium sand.	Fine sand.	Very fine sand.	Silt.	Clay.
		<i>Per cent.</i>						
342905.....	Soil.....	1.4	2.2	1.0	1.4	2.8	76.7	14.6
342906.....	Subsoil.....	.4	1.4	.8	1.2	1.8	67.8	26.8
342907.....	Lower subsoil...	.4	.5	.5	1.2	3.0	69.5	24.8

ELDON SERIES.

The surface soils of the Eldon series are dark brown to nearly black. The upper subsoil is gray or grayish yellow to yellowish brown and has a friable or crumbly structure. This is underlain by mottled gray and red, moderately plastic to crumbly silty clay material, while the lower subsoil is mottled gray and yellow in color and rather plastic. Usually a compact layer consisting largely of angular chert mixed with some reddish clay is encountered at depths of 18 to 30 inches. This stratum is generally encountered within a few inches of the surface on the upper slopes and frequently lies as deep as 4 feet on the lower slopes. The soils of the Eldon series are derived from limestone. They are prairie soils, and the topography is gently rolling, with rounded ridges and gentle slopes. The series is closely related to the Lebanon series, but the color of the surface material is much darker. Drainage is well established. Two types, the Eldon gravelly loam and the Eldon silt loam, are recognized in this county.

ELDON GRAVELLY LOAM.

The surface soil of the Eldon gravelly loam is a dark-brown to black gravelly silt loam, underlain at about 8 to 10 inches by brownish to reddish clay. A mass of chert gravel is usually encountered at about 24 to 30 inches. The fragments are small in comparison to the gravel of the Crawford series, rarely being more than 3 inches in diameter. A few sandstone fragments also are found. Occasional areas resemble the Crawford gravelly loam, although the color is

more a dull red and the soil is more compact than in the latter type. Areas of Crawford silt loam too small to map are found.

The Eldon gravelly loam, like the Gasconade silt loam, occurs in the notheastern part of the county, and is always associated with the latter. It occupies gentle slopes or high benches along Pomme de Terre Creek.

Like the Gasconade silt loam, the Eldon gravelly loam is one of the strongest soils in the county. Wherever the chert subsoil is near the surface, the type is not very drought resistant, and is rather difficult to cultivate. Corn and clover are the crops most extensively grown on this soil. Fair yields are obtained.

ELDON SILT LOAM.

The Eldon silt loam is typically a black, very dark gray, or dark grayish brown silt loam, underlain at about 8 to 10 inches by mottled grayish-brown, or light-brown, gray and ochereous yellow friable silty loam or silty clay loam. This passes at about 18 to 24 inches into clay, which is mottled red, yellow, and gray. The lower-subsoil in places is a crumbly clay, mottled brown, yellow, and gray in color. Dark oxide of iron material is frequently noticeable in the subsoil. A few chert fragments, usually of large size, are scattered through the soil section, but the "chert mass" is rarely encountered within the 3-foot section.

There are included within this type slight knolls on which the cherty subsoil is within 18 inches of the surface. In lower positions where there has been more or less accumulation of colluvial material, almost black, mellow silt loam may extend from the surface down to a depth of 2 feet or more, grading into a light-gray, floury silt, which passes into a gray or drab clay mottled with brown and yellow. Iron concretions are abundant in the lower subsoil. The surface drainage and underdrainage is poor, especially in those areas southeast of Springfield.

The boundary between the Eldon silt loam and the Crawford silt loam is placed more or less arbitrarily, as the two soils grade into each other very imperceptibly. The dark phase of the Crawford silt loam closely resembles the Eldon silt loam. This blending is especially marked to the north of Willard, and here much of the black soil is underlain by a dark-brown to brown silt which changes to a mottled brown silty clay at lower depths.

The soil is derived from the Coal Measures shales and sandstones and from limestone. The subsoil usually has the appearance of being derived from shale. Sandstone fragments are almost invariably associated with the type.

The topography is undulating to almost level. As a rule this type is associated with the Crawford silt loam, and with it occupies the

high, flat plateau areas. The smooth surface, together with the compact subsoil, tends to give the soil poor underdrainage, but this is easily remedied by constructing ditches and installing tile drains.

The Eldon silt loam is a typical prairie soil, and was one of the first to be brought under cultivation. It is best suited to the production of grass and oats. In favorable years fair crops of corn and wheat are obtained. In the vicinity of Willard much of the black land is used for orchards, and although the trees do fairly well, they are not as thrifty as those growing on the red soils. In general, the Eldon silt loam is not used for growing fruit. Clover does not catch well on a large part of it.

To improve this soil surface drainage and underdrainage are necessary. It is inclined to be cold and soggy in the spring. Numerous tests indicate that the soil is acid.

In the following table the results of mechanical analyses of samples of the soil and subsoil of this type are given:

Mechanical analyses of Eldon silt loam.

Number.	Description.	Fine gravel.	Coarse sand.	Medium sand.	Fine sand.	Very fine sand.	Silt.	Clay.
		<i>Per cent.</i>						
342910.....	Soil.....	1.0	2.4	1.4	2.4	4.2	72.0	16.5
342911.....	Subsoil.....	.8	.7	.4	1.8	5.1	70.6	20.5

SUMMIT SERIES.

The soils of the Summit series are dark gray to black, with mottled yellow and gray subsoils. This series occupies smooth and nearly flat to sharply rolling prairies. The soils are of residual origin and are derived from calcareous shales associated with thin interbedded layers of limestone. They contain large quantities of organic matter. Drainage is usually well established. These soils have a darker color than the Bates and the Oswego soils, with which they are commonly associated. They are known locally as "black limestone lands." The series is represented in Greene County by a single type, the Summit loam.

SUMMIT LOAM.

The Summit loam is a rather unimportant type, occurring as isolated patches, mainly in the southwestern part of the county. The soil to a depth of 12 to 15 inches is a very dark brown to almost black, friable loam. This grades into dark-brown or yellowish-brown fine loam, which changes below to a reddish-brown, slightly mottled silt loam or silty clay loam. In some places the soil throughout the 3-foot soil section is a dark-brown fine loam, but always the sand content decreases with depth. Bits of sandstone are scattered through-

out the surface soil, and a few chert fragments are found in the lower subsoil and substratum. The type is subject to minor variations where the soil is gray in color, with a silty clay subsoil.

The upper part of the soil is largely derived from sandstone, but the lower part is probably from limestone. The topography is smooth to undulating.

This is a fairly good soil, and is used almost exclusively for corn and wheat. With proper treatment large yields of clover and corn are obtained.

BATES SERIES.

The soils of the Bates series are typically dark gray, and the subsoils yellowish and mottled red or yellowish or buff in the upper part and mottled with yellow and red in the deeper section. The series is residual in origin, and is derived from sandstone and shale rocks. The soils are usually well drained and have a level to undulating topography. Two members of this series, the Bates stony sand and gravelly sand, are encountered in Greene County.

BATES GRAVELLY SAND.

The surface soil of the Bates gravelly sand is a grayish-brown to light reddish brown fine sand or loamy fine sand which grades below into dark-brown or reddish-brown material of about the same texture. Small fragments of sandstone are abundant throughout the soil section. The lower subsoil is composed of chert and sandstone fragments, and it is rarely possible to penetrate more than 24 inches with a soil auger.

The soil material is derived from brown fine-grained sandstone, and is mixed in the lower subsoil with a varying quantity of material from the cherty limestone. The type has a gently rolling topography, and usually occupies the high upland divides. It occurs as slight ridges standing a few feet above the surrounding country. Approaching the outer edges of the type the sand content decreases and the subsoil approaches that of the Crawford gravelly loam.

In favorable seasons this soil produces fair yields, but in dry years the yields are materially reduced. The more sandy areas are not drought resistant and are low in organic matter. The soil is easy to cultivate and with proper management can be made to yield fair returns of corn, melons, or truck crops. Green manuring and liming are very advantageous.

BATES STONY SAND.

The Bates stony sand is essentially the same as the Bates gravelly sand, but contains large sandstones and stone outcrops, so that it can not be cultivated. The type is usually associated with the gravelly

sand. Numerous areas of the Bates stony sand, too small to indicate on the map, are included with the Bates gravelly sand. On account of its small extent and stony character this type is of little value except for forestry.

CLARKSVILLE SERIES.

The surface soils of the Clarksville series are gray, with yellow subsoils and red substrata. The soils are gravelly as a rule, the gravel consisting of chert fragments. They are derived from cherty limestones. The Clarksville soils occupy both level and undulating uplands and rough, hilly country with steep slopes. The series is extensively developed in northern Alabama, Tennessee, and Kentucky. In Greene County, Missouri, two types are recognized—the Clarksville gravelly loam and the Clarksville silt loam.

CLARKSVILLE GRAVELLY LOAM.

The Clarksville gravelly loam is a gray, very gravelly silt loam which grades at about 5 to 6 inches into pale-yellowish or slightly reddish yellow very gravelly silt loam. The surface soil to a depth of 5 to 10 inches carries from 40 to 60 per cent of whitish and reddish angular chert fragments, ranging to 2 inches in diameter, while the subsoil carries from 50 to 90 per cent of larger fragments, commonly fitted together somewhat in the form of the original rock, so that they can not be easily pried out. The very cherty, compact layer has a mottled reddish and gray color.

The boundary between this soil and the Lebanon gravelly loam is often difficult to establish, owing to the way the two types grade into each other. Numerous spots of the Clarksville type, too small and irregular in outline to be mapped separately, are included with the Lebanon gravelly loam. The Clarksville gravelly loam always carries a much larger percentage of chert than the Lebanon, and the chert is smaller, more angular, and lighter in color.

The type occupies slopes and ravines. On account of the large gravel content, it is very difficult to cultivate, and the greater part of it remains forested.

The soil is very shallow, and the subsoil is porous, making the type droughty. The organic-matter content is extremely low. This type is highly prized as a tomato soil. Where organic matter is supplied, grass makes a good growth and corn produces fair yields.

CLARKSVILLE SILT LOAM.

The Clarksville silt loam is found in only one area, about 3 miles northwest of Ebenezer. The surface soil is a light ashy gray silt loam, changing at about 5 inches to a light-gray or pale-yellow silty

clay. This is underlain at about 12 to 15 inches by a yellowish-gray compact clay, which is more friable and mottled in the lower part.

With the occasional exception of a few large chert fragments, this soil is stone free throughout the 3-foot section. It occupies the upland flats, and is locally known as "post oak flats," on account of its exclusive growth of post oak forest.

Only a small part of the type is under cultivation. It is cold and poorly drained and considered the poorest of the tillable upland soils of the region. It is rather difficult to work, and requires careful cultivation, the addition of large quantities of organic matter and lime, and drainage in order to produce fair crops. The soil gives the best results with timothy, redbud, and sorghum.

HANNIBAL SERIES.

The surface soils of the Hannibal series are gray to brown and overlie yellowish or greenish-yellow, tenacious subsoils. These soils are of residual origin and are derived from soft, easily weathered shales. They sometimes contain fragments of the shale and of the sandstone which immediately overlies it. The series occupies slopes or benches and sometimes gullied or eroded steep hillsides. Low-lying areas are poorly drained, but otherwise the drainage is well established. Two members of the Hannibal series are encountered in Greene County—the fine sandy loam and the silt loam.

HANNIBAL FINE SANDY LOAM.

The Hannibal fine sandy loam, to a depth of 8 inches, is a yellowish-gray to brownish-gray loam to very fine sandy loam, containing a few small chert and sandstone fragments. The sand is fine enough in places to make the soil a fine loam. The subsoil is a yellowish to light-brown heavy loam, or silty clay, containing a small quantity of very fine sand. The sand content decreases with depth, and the lower subsoil varies from clay to clay loam. The white angular chert mass is usually encountered at a depth of about 30 inches.

The Hannibal fine sandy loam is encountered in one area of 1,024 acres, about 3 miles northeast of Strafford. It occurs on gentle slopes just below the higher lying Lebanon gravelly loam. Its location and topography are due to its origin from the sandstone of the Hannibal formation. The sandstone is thin, and the soil derived from it is of limited distribution.

All of the type is cleared and is fairly productive. It is a good wheat soil and produces fair yields of corn. Cowpeas are one of the most profitable crops grown. Where used as a green manure they add organic matter, in which the soil is markedly deficient.

HANNIBAL SILT LOAM.

The Hannibal silt loam is a gray or yellowish-gray silt loam, underlain by a pale-yellow silty clay, which grades at about 20 to 24 inches into mottled gray and yellow, stiff clay.

The soil material is largely derived from the shales of the Hannibal formation, and the type occurs as high bench land along the larger streams where this formation is exposed. The largest areas lie to the west and south of Fair Grove. The type is practically stone free throughout the soil section, excepting such fragments as have drifted down upon it from the higher lying chert beds.

All of the type is under cultivation. Corn, wheat, and grass are the crops grown. This is not as strong a soil as the Lebanon silt loam.

GASCONADE SERIES.

The Gasconade series includes dark-gray to black soils with mottled brown, yellow, and red, plastic and usually heavy clay subsoils. These soils are of residual origin, and are underlain by a stratum of chert-free limestone, from which they are derived. The surface is undulating to gently sloping. In general, the drainage is good, but there are a few places where springs keep the soil in a permanently soggy condition. A great part of this series was originally prairie land. Only one member of the series, the Gasconade silt loam, is encountered in this county.

GASCONADE SILT LOAM.

The Gasconade silt loam is typically a black or dark-brown mellow silt loam, grading at about 10 to 12 inches into a dark-brown to yellowish-brown silt loam or silty clay loam. In the lower parts of the type, where accumulations of colluvial materials occur, an almost black mellow silt loam extends in some places from the surface to a depth of 2 feet or more. A few chert and limestone fragments are scattered throughout the soil section, and bedrock is frequently encountered within 36 inches of the surface.

The Gasconade silt loam is encountered in the north and northeastern part of the county. It occurs as gentle slopes and high benches, or at the base of the escarpment marking the outcrop of the Hannibal formation. Material from the Burlington, Chouteau, and Louisiana limestones has entered into the composition of this soil. Wherever the type adjoins the higher Lebanon gravelly loam, material from the latter washes over it, but the boundary between the types is always marked by a distinct bluff or escarpment.

The Gasconade silt loam differs from the Eldon silt loam in origin and topography, and in having a darker colored subsoil.

Practically all of the type is in cultivation. It is used for the production of corn, wheat, and clover. The yields are about the same as on the Crawford silt loam. Owing to its higher productivity, this soil has a greater value than the surrounding soils of the Lebanon series.

HUNTINGTON SERIES.

The Huntington soils are light brown to brown, and the subsoils are yellow to light brown. Frequently there is little change in the color or character of the material from the surface downward throughout the soil section. These soils are developed in the first bottoms of streams, where they are subject to overflow. As a rule they are well drained. They consist generally of material derived from limestone, sandstone, and shale soils. Two types of the Huntington series, the gravelly loam and silt loam, are encountered in Greene County. This series comprises all of the alluvial soils of the county.

HUNTINGTON GRAVELLY LOAM.

The Huntington gravelly loam is a brown to dark grayish brown gravelly silt loam or loam, showing very little change in texture, but becoming lighter in color with increasing depth. The content of gravel increases downward, so that boring is not always possible much below 15 to 20 inches. The outer border of the type is frequently marked by rock outcrops.

This type occurs along the smaller streams in all parts of the county. It is both alluvial and colluvial in origin. The content of gravel is variable, but is rarely sufficient to make cultivation very difficult. A greater hindrance to cultivation is the narrowness of these soil areas. The stones are small except where a ravine or hollow from the hills opens out into an area of level bottom, and heavy rains have washed down stones and spread them in cone fashion at the mouth of the hollow. Areas of Dunning gravelly loam, too small to map separately, are included with this type.

Practically all of the area occupied by this soil is in cultivation. The type is well adapted to general farming. It produces good crops of corn, wheat, and clover. Bluegrass grows luxuriantly. For small fruits and garden truck this is one of the best soils in the county.

HUNTINGTON SILT LOAM.

The typical Huntington silt loam, as it occurs along all the larger streams, is predominantly a brown to dark-brown silt loam, grading at about 12 inches into a brownish, friable silt loam to silty clay loam, which becomes lighter in color and heavier in texture with depth.

There are numerous variations in this type, as in the gravelly loam of this series, but these are so small and so varied in character

and irregular in outline that they can not be indicated satisfactorily on the map. Occasionally the lower subsoil is slightly mottled with gray, and where the drainage is poor it is a grayish-brown silt, containing iron nodules. The lower subsoil and substratum are in places cherty. The texture of the subsoil is always very much the same as that of the surface soil. Occasionally the subsoil is yellowish brown in color, with a dark-gray surface soil. Along Asher Creek and its tributaries and the streams in the northwestern part of the county and at the heads of many of the smaller draws, the type consists of a very dark gray to black silt loam which does not show much change within the 3-foot section. The soil of these darker areas is partly derived from the soils of the Bates, Hannibal, and Eldon series. In physical properties and agricultural value it is similar to the typical soil. There are included gravelly loam spots along the outer edges of the type adjoining the stream channel and on the occasional slight elevations. This type includes areas of Dunning silt loam too small to be shown separately on the map.

The Huntington silt loam occurs as more or less narrow belts along most of the streams. The surface is level to sloping and, except during occasional overflows, the drainage is good.

Originally the areas of this soil were covered with a heavy growth of walnut, hickory, elm, and papaw. It was one of the first soils to be cleared and farmed by the early pioneers, and at present it is all under cultivation. The type is subject to overflow, but usually the floods occur early in the spring, recede rapidly, and do little damage. The permeable nature of the soil allows the water to drain away very rapidly.

The Huntington silt loam is the best corn soil in the county and is used largely for this crop. Yields range from 40 to 80 bushels per acre. Areas not subject to overflow produce good yields of wheat, clover, and grass. The better land of this type is adapted to alfalfa.

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

Mechanical analyses of Huntington silt loam.

Number.	Description.	Fine gravel.	Coarse sand.	Medium sand.	Fine sand.	Very fine sand.	Silt.	Clay.
		<i>Per cent.</i>						
342920.....	Soil.....	1.5	2.0	8.3	21.5	7.2	42.1	17.0
342921.....	Subsoil.....	.0	.3	.4	1.7	5.0	78.5	13.8

SUMMARY.

Greene County, Missouri, is situated in the southwestern part of the State, on the west slope of the Ozark region. It has an area of 667 square miles, or 426,880 acres.

The topography varies from smooth to hilly, although prevalently it is gently rolling. The hilly areas are confined to the country along the Sac River and the tributaries of the James River.

The climate is mild and well suited to general farming. The mean annual temperature is about 55° F. The average annual precipitation of about 44 inches is well distributed throughout the year.

General farming, together with stock raising, fruit growing, and dairying, are the important features of the agriculture. Wheat is the most important money crop and is extensively grown. Corn, oats, clover, orchard grass, timothy, and cowpeas are the other important crops, ranking in the order named. Large numbers of cattle, hogs, horses, and mules are marketed annually. Commercial orcharding and small-fruit growing are practiced in the central and southwestern parts of the county. In recent years dairying has been introduced and is rapidly growing into an important industry. In general, the farm practices are of the most improved kind.

All of the upland soils are residual, and by far the greater part is derived from cherty limestone. Sixteen soil types, representing nine series, are mapped.

The Crawford soils are the most extensive in the county. They are characterized by their reddish color and mellow structure. They are productive and are adapted to all the staple crops and to fruit and truck.

The Lebanon soils are not so well adapted to corn as the Crawford soils, and are principally devoted to wheat and grass.

The Hannibal soils are derived from the Hannibal shales and sandstones, and are characterized by their gray color. They are fairly productive.

The Eldon soils are of small extent, but are highly prized for corn, wheat, and grass.

The Bates soils are grayish-brown in color, and are largely derived from sandstone. They are best adapted to corn and truck.

The Clarksville soils are closely related to the soils of the Lebanon series, and the Gasconade and Summit soils are similar to the Eldon in agricultural value.

The alluvial soils are included in the Huntington series. Although subject to occasional overflow, they comprise some of the most productive land in the county. They are used for the production of corn almost exclusively, but are well adapted to alfalfa, wheat, and garden truck.

In general, all the soils of Greene County contain more or less gravel, but where not too gravelly to interfere with cultivation they are well adapted to staple crops and respond readily to good agricultural practices.

[PUBLIC RESOLUTION—No. 9.]

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

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

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

Approved, March 14, 1904.

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

NRCS Accessibility Statement

This document is not accessible by screen-reader software. The Natural Resources Conservation Service (NRCS) is committed to making its information accessible to all of its customers and employees. If you are experiencing accessibility issues and need assistance, please contact our Helpdesk by phone at 1-800-457-3642 or by e-mail at ServiceDesk-FTC@ftc.usda.gov. For assistance with publications that include maps, graphs, or similar forms of information, you may also wish to contact our State or local office. You can locate the correct office and phone number at <http://offices.sc.egov.usda.gov/locator/app>.

The U.S. Department of Agriculture (USDA) prohibits discrimination in all its programs and activities on the basis of race, color, national origin, age, disability, and where applicable, sex, marital status, familial status, parental status, religion, sexual orientation, genetic information, political beliefs, reprisal, or because all or a part of an individual's income is derived from any public assistance program. (Not all prohibited bases apply to all programs.) Persons with disabilities who require alternative means for communication of program information (Braille, large print, audiotope, etc.) should contact USDA's TARGET Center at (202) 720-2600 (voice and TDD). To file a complaint of discrimination write to USDA, Director, Office of Civil Rights, 1400 Independence Avenue, S.W., Washington, D.C. 20250-9410 or call (800) 795-3272 (voice) or (202) 720-6382 (TDD). USDA is an equal opportunity provider and employer.