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, IN CHARGE SOIL SURVEY

SOIL SURVEY OF REYNOLDS COUNTY, MISSOURI.

BY

H. H. KRUSEKOPF, IN CHARGE, AND W. DEYOUNG OF THE UNIVERSITY OF MISSOURI, AND W. I. WATKINS AND C. E. DEARDORFF OF THE U. S. DEPARTMENT OF AGRICULTURE.

HUGH H. BENNETT, INSPECTOR, SOUTHERN DIVISION.

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

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LETTER OF TRANSMITTAL.

U. S. Department of Agriculture,
Bureau of Soils,
Washington, D. C., January 3, 1921.

Sir: Under the cooperative agreement with the University of Missouri Agricultural Experiment Station, F. B. Mumford, Director, a soil survey of Reynolds County, Missouri, was carried to completion during the field season of 1918.

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 1918, as authorized by law.

Respectfully,

Milton Whitney,
Chief of Bureau.

Hon. E. T. Meredith,
Secretary of Agriculture.

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MAP.

Soil map, Reynolds County sheet, Missouri.

SOIL SURVEY OF REYNOLDS COUNTY, MISSOURI.

By H. H. KRUSEKOPF, In Charge, and W. DeYOUNG, of the University of Missouri, and W. I. WATKINS and C. E. DEARDORFF, of the U. S. Department of Agriculture.—Area Inspected by HUGH H. BENNETT.

DESCRIPTION OF THE AREA.

Reynolds County is situated in the southeastern part of Missouri. It lies about 70 miles south of St. Louis and about an equal distance west of the Mississippi River, and comprises an area of 785 square miles, or 502,400 acres.

Physiographically Reynolds County lies in the eastern part of the Missouri Ozark region, on its southern slope, near the crest. As a whole, it is one of the most thoroughly dissected counties in the State. The general slope is toward the south, with altitudes ranging from 450 feet in the larger valleys in the southern part of the county to 1,400 feet near Bunker, in the northwestern part. Isolated hills in the northeastern corner of the county attain a height of approximately 1,700 feet, but these stand well above the general upland level of the county.

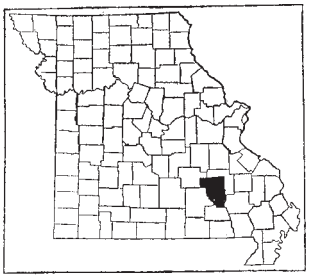

FIG. 1.—Sketch map showing location of the Reynolds County area, Missouri.

The county consists of a thoroughly dissected plain, in which the dissection is relatively deep in the southeastern part along the larger streams and shallow in the rest of the county. No areas of smooth undissected upland, other than very narrow strips along the ridges between drainage systems, remain in the county. In none of these ridges is the width great enough for the laying out of a farm of good size on smooth land. At most it is less than half a mile and in most cases is not more than a few hundred yards. The width is shown on the map by the width of the belt of Lebanon silt loam.

The slopes of the valleys are usually steep, but the width of the valley floors varies considerably. Along the large streams they are narrow. Though they should not be described as canyons, they are not as a rule wider than are the floors of the valley along their tributaries. As a rule the valleys of the large streams have the appearance of being narrower than those of many smaller streams. The streams

themselves, because of their large size and steep fall, shift their channels so much that a rather large part of these valleys consists of gravel and cobblestone belts marking former overflow or permanent channels of the streams. The narrow valleys are covered with timber or brush, while along the smaller streams the channels are narrow, and as a rule the whole valley width consists of open farm land.

The county as a whole is minutely dissected, so much so that very little of it, except the valley floors, is cultivated. The smoother upland slopes may be utilized for pasture, but not as permanent farm land in any other way. In the northeastern part of the county the valleys locally widen to small basins somewhat wider than those elsewhere in the county on streams of the same size.

The dissection ranges from 100 feet in depth on the small streams to about 400 feet as a maximum on the larger streams.

The greater part of the county is drained by Black River and its tributaries. A small area in the northwest corner of the county drains into the Meramec River, and several branches of Current River head along the west county line. The fall of all the streams is great, in many places averaging more than 20 feet per mile.

Owing to the steepness of the slopes, the run-off finds its way quickly to the streams, which rise and fall rapidly. During the summer months or long dry spells the stream beds, except in the case of the larger streams, are almost entirely dry, the water sinking down into the gravel. The valleys as a rule are narrow, and none of the streams has yet developed broad areas of bottom land. The larger streams, such as Black River, flow comparatively swiftly, and water power of considerable volume could be developed at almost any point.

Many of the streams have their source in the mountain springs, which furnish the water supply of many of the farms and often determine their location. Their large number and great volume indicate that much of the regional rainfall is removed by underground drainage. Most of the springs are found in the larger valleys, generally near the mouth or in the lower end of the longer branches. They flow with great regularity and volume, and the water is exceptionally clear and pure.

The entire region was originally covered with forests, and approximately 90 per cent of the area remains so at the present time. (Pl. I, fig. 1.) In the western and southern parts of the county, yellow pine was the prevailing growth, but practically all of this has been succeeded by hardwoods, principally red, black, and white oak, with some walnut, hickory, and elm on the lower slopes and in the valleys. Reproduction of the pine is made impossible by the annual burning over of the timberland. On all the more recently cut-over

land, a dense growth of underbrush has sprung up. In general the trees are larger on northern slopes and in hollows where the soil is moist, deep, and rich, while on the drier southern slopes the forest is more open, and both the trees and undergrowth are stunted. Throughout this region the timber is of good quality and is not, in general, as scrubby as in most of the western Ozark region. The uplands of Reynolds County under forest conditions are subject to relatively little erosion, but, owing to the cutting of the timber and the practice of annually burning over the timberland, destructive stream erosion is taking place in all parts of the area. In the interests of the future agriculture of the county these practices can not be too strongly condemned.

The first settlement in Reynolds County was made in 1812, on Middle Fork. According to the census the population of the county in 1900 was 8,161, and in 1910 it had increased to 9,592, or an average of 11.6 persons per square mile, all of which was classed as rural. The 1920 census reports the population of Reynolds County as 10,106, all classed as rural, and averaging 12.2 persons per square mile. Ellington, the largest village, has a population of 452. Bunker is a sawmill town, the larger part of which lies in Dent County. Centerville, Lesterville, Reynolds, Ruble, Garwood, and Redford are local trading points.

The only railroad traversing the county is the Missouri Southern, which connects with the Missouri Pacific at Leeper and extends to Bunker. St. Louis is the principal market for agricultural products. The wagon roads are, as a whole, in poor condition. They are confined almost entirely to the larger valleys. Since the bottom land has been fenced many of the roads no longer skirt the valley foot slopes but follow the stream courses for long distances. The loose stones and the frequent shifting of the stream channel makes traveling in these places difficult. The secondary roads wind through the forest, following the route most easily passable, usually on the narrow ridges. Road-building material is available in all parts of the county, but little use is made of it.

About one-half of the population is engaged in lumbering, including the making of railroad ties. Ties, mine props, cooperage material, and lumber are exported in large quantity.

CLIMATE.

The climate of Reynolds County, like that of the Ozark region as a whole, is mild, healthful, and adapted to a wide variety of farming interests. The mean annual temperature is 54.4° F. Periods of extremely dry weather, with relatively high temperature, are sometimes experienced in late summer. The falls are characterized by long periods of pleasant weather. Even in winter zero weather is

not common, and periods of such low temperature seldom last more than two or three days.

The average annual rainfall for the county, if the records of Ironton be accepted, is 46.12 inches, while the records of Centerville show the mean as 42.68 inches. The average precipitation during the growing season, that is, from March to September, inclusive, is 30.28 inches, an average of more than 4 inches per month. In winter the average monthly rainfall is a little more than 3 inches. The snowfall is usually light.

The average date of the first killing frost in fall is October 4, and the last in spring, April 27. The latest recorded date of killing frost in spring is May 28, and the earliest in the fall, September 13.

The following tables give climatic data of the region, as shown by the records of the Weather Bureau station at Ironton, Iron County, about 20 miles from the center of Reynolds County, and at Centerville:

Normal monthly, seasonal, and annual temperature and precipitation.

Month.	At Ironton, Iron County.						At Centerville from 1878 to 1903.[1]		
	Temperature.			Precipitation.			Precipitation.		
	Mean.	Absolute maximum.	Absolute minimum.	Mean.	Total amount for the driest year (1901).	Total amount for the wettest year (1905).	Mean.	Total amount for the driest year (1901).	Total amount for the wettest year (1898).
	°F.	°F.	°F.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.
December	34.4	73	−16	2.98	4.36	3.24	2.80	3.65	1.15
January	32.3	75	−33	3.01	1.66	3.26	2.58	1.01	3.69
February	33.4	83	−24	3.47	2.42	1.49	3.30	1.95	1.28
Winter	33.4	83	−33	9.46	8.44	7.99	8.68	6.61	6.12
March	45.1	90	2	4.40	4.93	4.91	3.83	3.32	12.72
April	55.4	91	20	4.38	3.92	4.53	3.76	3.59	3.01
May	64.6	97	26	4.93	.47	4.85	4.65	.32	8.00
Spring	55.0	97	2	13.71	9.32	14.29	12.24	7.23	23.73
June	72.0	102	35	5.08	2.36	3.51	4.87	.63	4.71
July	75.6	113	43	4.57	2.42	14.74	4.19	1.32	15.06
August	74.3	107	40	3.43	1.41	7.62	3.46	1.19	6.33
Summer	74.0	113	35	13.08	6.19	25.87	12.52	3.14	26.10
September	67.7	104	28	3.49	1.26	8.62	3.00	1.32	4.91
October	55.9	96	18	2.67	1.18	5.03	2.35	.75	3.63
November	44.0	83	8	3.71	2.32	1.87	3.89	1.79	3.35
Fall	55.9	104	8	9.87	4.76	15.52	9.24	3.86	11.89
Year	54.4	113	−33	46.12	28.71	63.67	42.68	20.84	67.84

[1] From January, 1893, to December, 1903, the data are from Edge Hill, about 11 miles north of Centerville.

AGRICULTURE.

Reynolds County is similar in its agricultural development to the extensive hilly and more or less stony part of the eastern Ozark region. Throughout this area the upland soils occur on rolling to hilly land, the content of stone and gravel is high, and cultivation is impracticable over much of their extent. Over most of it cultivation is difficult until the stones are removed. Removing them is expensive, though being small, rarely more than a foot in diameter and ordinarily much less, they can be picked up by hand. At present the principal farming areas are those of the valleys and stream bottoms. As a consequence stock raising and forestry are the two most profitable industries.

In general, the agriculture of the county is very limited, owing mainly to the rough, stony character of the land. The growing of grain in the valleys and the utilization of uplands for range pasture constitute the prevailing farm practices. At the present time (1918) practically all of the tillable valley land is farmed (Pl. I, fig. 2), and it is doubtful if any further considerable area of the upland will be cleared of its timber for agricultural use, owing to its rough topography and high content of stone and gravel. The alluvial lands, already fully occupied, will be used for the production of the necessary grain and forage crops. The limited transportation facilities do not favor the development of special industries that require quick marketing and the physical features of the county are such that any change from the present type of agriculture will be slight and will come about slowly.

The first settlements in the county were made in the larger valleys with permanent streams, where water and large timber were abundant, and a fertile soil, practically stone-free, made cultivation easy, while the uplands provided extensive range for the live stock for 7 to 9 months each year. The farmers tilled only enough land to produce grain and hay for the stock and other products for home use. Under the conditions, it is natural that stock raising should have become the principal type of farming and the sale of cattle the chief source of income.

Beginning about 1880, lumbering became an important industry, and in many cases income from this source has supplemented that from stock raising. The pine timber was removed first, and later the hardwoods. The forests were originally more or less open, with an abundant growth of grass covering the ground. It was only in the valleys and in the rougher land along Black River that the original timber growth was so dense as to interfere with the growth of grass; all the western and southern portions of the county were grass-covered, open timberlands. After the removal of the pine and the

larger hardwood trees, a dense growth of young oak timber sprang up and the wild grasses diminished in abundance, greatly reducing the value of the range for pasture. This change did not prove particularly serious at the time, however, since more dependence was being placed on the income from lumbering, but with the cutting of most of the marketable timber and a return to agriculture the injury became more evident.

For a time, therefore, the range conditions were not good, but in more recent years they have improved considerably and seemingly the land carries about as much stock as formerly. This improved condition is due partly to the increased side of the oak brush, which has now become tall enough to allow considerable sunshine to reach the surface through the thick stand of young trees, which is, however, more open than when it was brush, and partly to the natural introduction of lespedeza (Japan clover). This valuable grazing plant does well in forests and on stony land where the cultivated grasses do not thrive.

The important cultivated crops are corn, wheat, and oats. In 1919 corn was grown on 17,011 acres, with a yield of 15.3 bushels per acre. In general, the yields of corn are largest in the larger and lower valleys, while in the narrow valleys, particularly near the heads of streams, the soil is usually so gravelly that heavy yields are rare. Wheat in 1919 occupied 4,428 acres and yielded on the average 5.8 bushels per acre. The area in oats is normally less than 2,000 acres for the county.

Sorghum grows well in this region, but only a small acreage is devoted to the crop. While it produces a large amount of forage on a small acreage, which is of particular importance under the present system of farming, it is grown mainly for sirup, nearly every farmer making a supply for home use. Millet is largely used as a hay crop, and a few farmers have small fields of rape for hog pasture. In general, the growing of forage crops receives very little attention, although there is great need for them to supplement the grazing on the open range during the late summer and in seasons of drought. The sowing of rye would not only provide winter pasture, but would be a means of checking erosion on the valley slopes. Cowpeas thrive well and should find a much more extensive use both as a forage and as a green-manure crop. Some of the more successful farmers in the county make a practice of planting cowpeas in the corn.

The tame grasses are extensively grown in the valleys, occupying 15,159 acres in 1919, with a production of 13,991 tons of hay. In general, timothy is grown mostly on the higher bottoms, terraces, and low slopes. Usually it is allowed to occupy the land from 2 to 4 years, when the grass is crowded out by briers, weeds, and Japan clover. The yield per acre ranges from 1 to 2 tons. Clover thrives on all the

bottom-land areas and on the lower slopes with red clay subsoils. Alfalfa is not grown, but should do well on the better-drained bottoms. Bluegrass thrives on the soils where clover is a success, but on account of its shallow rooting system it does not grow well on the open and droughty upland soils, and though it occasionally makes a fair stand on cleared land, it rarely forms a good sod. The bunch grasses, such as orchard grass, are best adapted to the stony and gravelly uplands, and ought to become the important pasture grasses of the county. Redtop is a valuable grass for this region, and it is possible that Bermuda grass would prove equally as satisfactory.

The more valuable native pasturage plants on the open range are Japan clover and several bunch grasses, among them bluestem. Several wild legumes, including the common hoary pea (*Tephrosia virginiana*), also furnish good grazing for cattle, especially during late summer and fall.

The natural conditions of Reynolds County, including extensive areas of open range, tend to make the raising of live stock the most practical and profitable of the agricultural industries. Practically every farm has a small herd of cattle, which are ranged for about 8 or 10 months of the year and fed during winter months with the hay and fodder grown on the valley lands. When feed is plentiful they are sometimes fattened before marketing, but most of them are sold as feeders. Hogs are ranged and in most cases fattened on corn for market, though in years of abundant mast comparatively little corn is necessary. Hogs are often 2 years old before they are sold, maturing much more slowly under the prevailing system than where grain-fed. Much of the live stock is of only medium quality in breeding, and little is done in the way of providing shelter, both which conditions make for slow growth. It is generally considered that from 6 to 10 acres of the average wild range is required to support a cow or steer during the pasture season.

According to the 1920 census there were in Reynolds County 15,120 cattle, 11,786 hogs, 1,782 sheep, and 3,394 goats. The number of horses and mules raised for sale is small. Only a few flocks of sheep and goats are kept in the county. Goats are kept mainly to clear the land of brush and weeds. A comparison of the total number of live stock (considering 5 hogs or 5 sheep equivalent to a 1,000-pound steer) to the number of acres in the county shows that there is one animal for every 27 acres of land, while for the State this ratio is approximately 1 animal to 11 acres.

The raising of sheep probably offers the best opportunities in the development of the live-stock industry, but as yet the danger from wolves and dogs makes this industry uncertain. Sheep do well where the land is partly cleared and require less grain or concentrated feeds than cattle or hogs. Breeding ewes do not need the free use of grain

when good roughage is furnished. These factors are of great importance in this region, where the area of land suitable for the production of crops is proportionally small. It seems probable that sheep raising will prove most profitable under a semiranching system of management. Herding should prove successful on the large tracts of land as well as on smaller tracts, if held cooperatively. This would largely eliminate the danger from marauding animals and make the building of fences unnecessary. At present the majority of lambs are marketed at weaning time.

Dairying is of little importance in the county, primarily on account of inadequate transportation facilities and natural pastures and, except in restricted areas, inadequate farming land to supply the necessary grain feed.

Fruit growing has not proved profitable in part because the soil and climatic conditions are not especially favorable. Apple trees make slow growth, and if not given more care than they usually receive, become more or less diseased by the time they reach bearing age. Peach trees apparently do better than apples, but the orchards suffer from winterkilling and late spring frosts. The growing of small fruits has received no attention.

Extreme stoniness is one of the chief difficulties encountered in farming the soils of Reynolds County. In the alluvial soils the quantity of stone is rarely sufficient to prevent cultivation and the expense of clearing such land is not prohibitive, but the upland soils are mainly stony loams in which rock fragments constitute from 50 to 80 per cent of the soil material. On such land the removal of even the larger stones is impracticable, and cultivation is almost impossible.

Not much attention is paid to crop rotation, because the high fertility of the alluvial soils does not require it, and because most of the farming land is needed for corn, the same field often being planted in this crop for 5 to 10 years in succession. Fields that have become impoverished are generally seeded to clover and timothy and kept in sod for 2 or 3 years and then planted again to corn.

Farm equipment in Reynolds County is adequate, but not of the expensive type found in sections of greater agricultural development. The tools and implements are light, because with stony soils the fields are of small size and the heavy implements are less satisfactory than light implements.

The use of commercial fertilizers is practically unknown, although a few trials on wheat indicate profitable returns. Acid phosphate and bone meal have been used with good results at the rate of 100 to 300 pounds per acre. Applications of phosphorus do not usually prove of very great value until the soil has been fairly well built up in organic matter and nitrogen. In general, commercial fertilizers

give the best returns when used on wheat. It is not probable, however, that the use of fertilizers will become extensive, as, with the rather high fertility of the bottom lands, their use is not a necessity and the uplands as a whole are not farmed sufficiently to warrant a considerable expense for improving the soil.

Little manure is obtained under the present system of farming, which includes practically no stable feeding. The amount of organic matter and nitrogen obtainable from crop residues and weeds is at best small, and it is usually necessary, where the manure supply is inadequate, to grow green manuring crops in addition in order to maintain the supply of organic matter in the soil. Clover, cowpeas, soy beans, and hairy vetch are legumes which succeed here and which not only furnish organic matter when turned under, but add nitrogen also.

According to the census of 1920, there were 1,073 farms in the county, with an average of 54.5 acres of improved land per farm. The average size was 151.7 acres. About 80 per cent of the farms are operated by the owners. A large part of the county is in large holdings, ranging in size up to 100,000 acres, owned generally by lumber companies.

In 1920 the average assessed value of land in Reynolds County was $15.96 an acre. The selling price ranges from $2.50 to $75 an acre, the lower prices prevailing over most of the upland and in the rougher areas in the eastern and northeastern parts of the county, and the higher values in the bottom lands and valleys, chiefly along Logan Creek and branches of Webb Creek and in Dickens Valley.

The future agriculture of Reynolds County will probably be a development and extension of the present farming system. Better live stock and improved methods of farming are gradually displacing indifferent and sometimes crude practices. With the rapid decline in the lumber industry, more dependence must be placed on the soil and greater effort made to make it yield larger returns.

There can be no great extension of the farmed area, for most of the arable land is now in use. Throughout the county there are, however, small tracts of undeveloped land—at the head of small valleys, and along the low slopes bordering most bottom land—which can be cultivated. The next step probably will be the clearing of the smoother and less stony areas of the forested upland and fitting them for pasture. Practically all the upland, or nearly 90 per cent of the area of the county, would be involved in such a readjustment. While this is not a natural grass country, with proper handling some valuable large pastures can be established. The production of forest products will, however, remain the most profitable industry for most of the upland, and it is improbable that any very large part of the

region will ever be cleared and pastures established.[1] Plate II, figure 1, shows the character of the rougher forest land.

The matter of getting rid of the timber and sprouts is undoubtedly the most difficult part of getting this land in tame grasses. When the trees are cut sprouts immediately spring up and if not killed the whole area soon is covered with a brush thicket. The most common and probably the most successful method of clearing the land is to cut and burn all underbrush up to 8 or 10 inches in diameter and to deaden the larger trees. The burning is probably best done in late winter or early spring, and grass seeded immediately afterwards, preferably in March. Another method is to cut all brush and small trees and deaden the larger trees, allowing all to lie on the ground and decay instead of burning, thus adding organic matter to the soil and making it more drought resistant. On account of the stony character of the land, it is important to give it some protection and to add organic matter, and deadened and decaying timber will do both. It is well known that the tame grasses "catch" best near brush piles or decaying stumps or logs.

The second step in the establishing of permanent pastures is the killing of sprouts, the prevailing practice being to pasture with goats, sheep, or cattle, and to cut all sprouts not destroyed by the animals, usually in late summer. (Pl. II, fig. 2.) Goats are more satisfactory than sheep or cattle, and from 2 to 5 animals are used per acre. From 2 to 4 years are required to clear the land by this method. In places where the land is not too rough and stony, where all the timber has been removed and the stumps cut low, mowing the land with a mower or a sprout killer 2 or 3 times a year gives good results, as the young shoots that come up after each mowing are easily kept down by live stock.

The most common method of seeding the grass is to sow in early spring without cultivating the land. Harrowing to cover the seed gives better results, particularly in dry seasons, but most of the upland in this region is too rough and stony to make cultivation possible, even with the simplest tools. Land partly cleared or that partly covered with sprouts, if not shaded too heavily, will usually get a good stand of grass, the low fertility of the soil, which does not permit the young grass to make a good start, being a more important limiting factor in establishing a sod than the partial shading of the land.

The seeding of a mixture of grasses gives far more satisfactory results than the use of a single grass. Bluegrass and orchard grass should form the bulk of the mixture used, and redtop, timothy, white clover, and red clover the remainder. In general, orchard grass or any of the deep-rooting bunch grasses will give better results than

[1] Mo. Agr. Exp. Sta. Bull. No. 108, "Grass Investigations in the Ozark Uplands."

bluegrass on all the more stony and drier soils. The amount of seed to use varies from 10 to 25 pounds per acre, better results being obtained with the larger amounts because of the unfavorable seed bed. A better stand of grass is usually obtained on north slopes than on the drier and stonier south slopes.

The tame pastures can be used about two weeks earlier in spring and from two to four weeks later in fall than the wild range, and the acreage to maintain live stock during the summer is much smaller, from 3 to 6 acres maintaining a 1,000-pound animal.

SOILS.

The soils of Reynolds County are similar to those of the central Ozark region, and are characterized by their gray color and high content of chert fragments. The uniform character of the soils over the entire area evidences to a marked degree the uniform origin of the soils, and the effect of old age, of long and active weathering, and a uniform vegetative covering on the soil mass. Erosion has further modified the soils and given to the whole region a broken surface.

The upland soils are residual, being derived mainly from underlying cherty limestone and to a less extent from granite and sandstone. The bottomland soils consist of alluvial and colluvial material washed down from the adjoining uplands. Reynolds County lies at the center of the Ozark Uplift. In the northeastern corner of the county the pre-Cambrian igneous rocks cover a large part of the surface. They are the oldest rocks in the State and consist of granite and porphyry. Owing to long weathering, these rocks to a great depth have been largely reduced to clay, and bedrock outcrops only on the steeper slopes, where erosion is active. In the smoother areas rounded bowlders, frequently several feet in diameter, are scattered over the surface. The soil derived from the granite is classed as the Ashe stony loam.

Immediately above the granite is a thin formation of thick-bedded, coarse-grained, crystalline magnesian limestone, giving rise, in part, to the red Baxter soils. Chert is almost entirely absent. This formation outcrops only in the deeper valleys in the eastern part of the county, and surrounds in places the granite intrusions. With the exception of the area near Black, it is rarely exposed sufficiently to be important in affecting the soils.

More than 90 per cent of the area of Reynolds County is underlain by the Gasconade limestone, of the Ozarkian period (Paleozoic), which consists of beds of cherty and chert-free dolomite, chert, and sandstone. The rock everywhere has disintegrated and decomposed to great depths, varying from 30 to 60 feet or more, and it is only along the larger streams that occasional cliffs of chert rock are ex-

posed. It is probable that this formation was originally spread over the granite hills, but all traces of it here have been removed, or if present have been so modified by weathering as to resemble the clays from the granite. Beds of sandstone, usually less than 4 feet in thickness, occur most frequently in the western part of the county.

The soil derived from the Gasconade limestone is everywhere very stony. The chert does not disintegrate into soil, but merely breaks into fragments. Besides the chert the limestone contains a relatively small amount of clay impurities, so that on decomposition a relatively small proportion of fine earth is formed. As the result of the severe erosion, much of the fine soil material has been washed away, thus giving a greater concentration of stone in the soil. The soil on the north slopes carries a much higher percentage of clay than the soil on south slopes. The beds of sandstone are not thick enough to have had any marked effect on the character of the soil. The Gasconade limestone gives rise to the Clarksville soils.

The uniform origin of the soils over most of the county, together with the long period of weathering to which they have been subjected, has resulted in rather uniform upland soils for the entire area. They are prevailingly silty with silty clay or clay subsoils and very little sand in either the soil or the subsoil, but a high percentage of chert gravel and stones throughout the soil mass. The surface soils are prevailingly gray in color, and the subsoil some shade of yellow or brown. The porous nature of the soil has permitted thorough oxidation to great depth, and it is only in the younger soils on the steeper lower slopes that the red coloration remains.

The long-continued weathering of the soils has removed much of the more soluble material, leaving the less soluble. The differences due to origin are thus largely eliminated, and the remaining material is nearly uniform in all its characteristics. It is mainly for this reason that the upland soils of the county are essentially alike everywhere, and no one region can be considered greatly superior to any other. The weathering and leaching is most advanced on the ridges and smoother areas, most of the lime and much of the other more soluble plant food having been removed. The content of phosphorus and potassium is rather low. The content of organic matter is everywhere low, mainly because of fires and erosion. There seems to be no reason for doubting that the old soils were once as rich in these elements as the newer soils, and it must also be assumed that these elements have gradually been leached out and washed away or that the mineral soil constituents with which they were united have been mechanically lost from the soil. The latter explanation is an important one in this region of severe erosion.

On account of the rolling surface conditions were less favorable for the subsoils to become compacted, and in general the subsoils

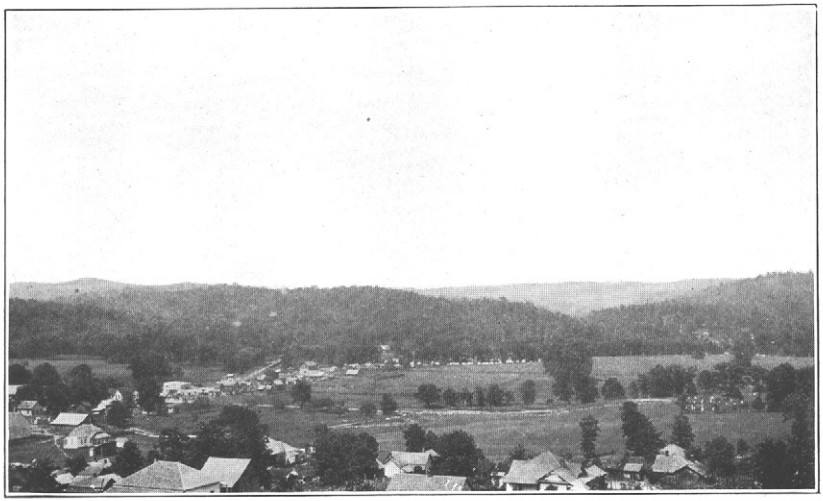

FIG. 1.—VIEW ACROSS LOGAN CREEK VALLEY AT ELLINGTON.

Forested upland in distance is occupied by the Clarksville stony loam.

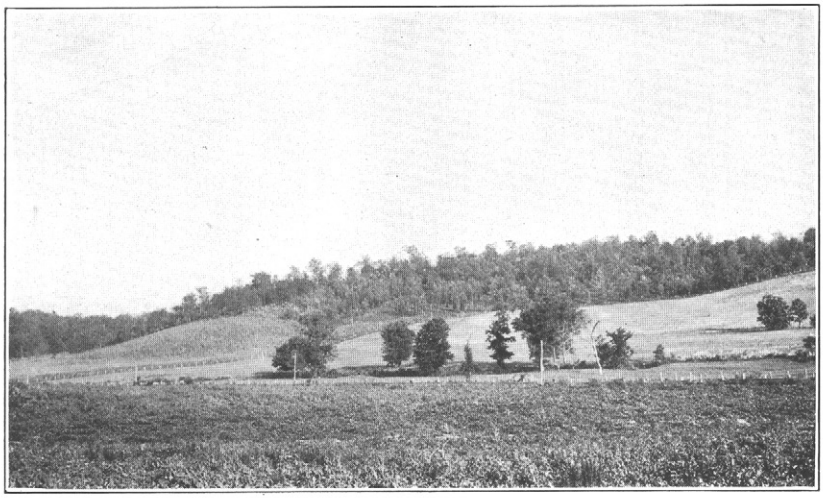

FIG. 2.—CHARACTERISTIC APPEARANCE OF STREAM-BOTTOM AND GENTLE UPLAND SLOPE FARMING LAND.

Huntington gravelly loam in foreground; Baxter gravelly loam on low cleared slope, and Clarksville stony loam on forested upland.

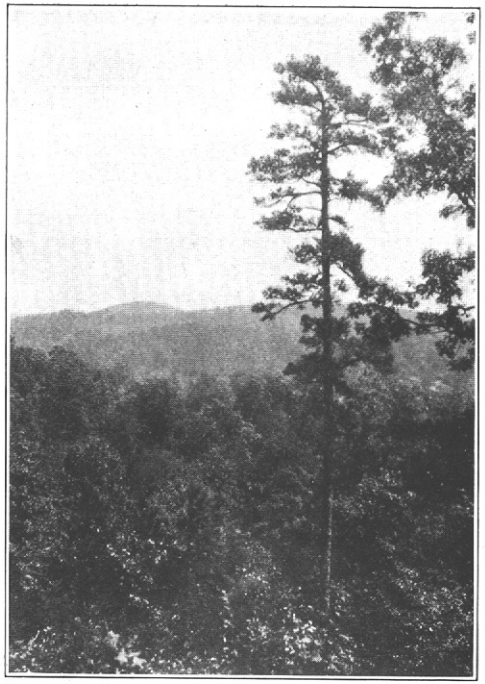

FIG. 1.—VIEW ACROSS ROUGH STONY LAND.

This class of land is mainly too rough and stony for cultivation. It is best adapted to forestry, but has also some value for grazing.

FIG. 2.—A GOOD STAND OF GRASS ON RECENTLY CLEARED CLARKSVILLE GRAVELLY LOAM.

Sprouts have been kept down by goats.

throughout this region do not have the undesirable characteristics of most of the smoother lands of the Ozark region. In Reynolds County it is only on the smoother ridges that hardpan characteristics are found. In these areas the filtration and concentration of clay, iron, and silicious material was not interrupted, and the subsoil has been compacted, this condition being intensified by cementation in many areas. This results in retarding the subdrainage and in lowering the resistance to drought. The compact subsoil and low content of lime are factors unfavorable to clover, and it is recognized that this crop and other deep-rooted or lime-loving crops do not do well on the smoother ridge land, the soils of which are shown on the map as the Lebanon silt loam.

In the hilly areas, on the other hand, the subsoils are not compacted, owing to the gradual creep and the more active erosion of the soil. The lime content is low, but is not as low as in the soils of the level areas, and the subsoil color is deeper and redder, indicating more recent oxidation. In general, there is a greater tendency toward compaction in the subsoils in the western part of the county, where the surface is smoother than in other parts of the area. It is largely for this reason that the level uplands are not as productive as the more stony and hilly areas.

Twelve soil types and two miscellaneous classifications are recognized in Reynolds County. It should be noted, however, that the change from one type to another, particularly on the uplands, is rarely distinct, but consists rather of a gradual transition, sometimes extending over a considerable distance. Moreover, on account of the generally undeveloped condition and inaccessibility of most of the area, the soil boundaries in a few places represent a mere approximation of the correct boundary. This is particularly true of the boundaries between the Ashe stony loam and the Clarksville soils.

The following table gives the names and the actual and relative extent of the various soil types mapped in Reynolds County:

Areas of different soils.

Soil.	Acres.	Per cent.	Soil.	Acres.	Per cent.
Clarksville stony loam	237,952	47.4	Riverwash	7,296	1.5
Rough stony land	74,048	14.7	Huntington loam	4,544	.9
Clarksville gravelly loam	71,936	14.3	Baxter stony loam	2,048	.4
Huntington gravelly loam	27,840	8.5	Cumberland silt loam	1,088	.2
Stony phase	14,848		Baxter silt loam	960	.2
Ashe stony loam	24,576	4.9	Holly silt loam	896	.2
Baxter gravelly loam	14,592	2.9			
Huntington silt loam	11,584	2.3	Total	502,400	.....
Lebanon silt loam	8,192	1.6			

LEBANON SILT LOAM.

The Lebanon silt loam lies on the almost level, stone-free ridge land. The surface soil is uniformly an ashy-gray or light yellowish gray silt loam, which contains a very low percentage of organic matter, and grades at 6 to 8 inches into a light-yellow silt loam which becomes heavier with increasing depth, passing at about 12 inches into yellow or brownish-yellow silty clay loam. At a depth of 16 to 18 inches the subsoil is a friable yellowish-gray silty clay, mottled gray and brown, which is underlain by a mass of chert gravel and gray clay cemented and compacted in such a way as to form a true hardpan which is typically developed only in the level areas. On all the sloping areas and bordering the stony land the subsoil is rarely cemented and the compaction of the material is so slight as to allow the ready percolation of water. The substratum below 36 inches is a gray to light-brown friable silty clay, mottled with red and containing a few small gravel fragments. When exposed to the air and weathering the material oxidizes and takes on a reddish-brown color.

The upper part of the subsoil is usually reached in plowing, but on account of the high content of silt and the thorough oxidation of this horizon, the soil material works up easily into a good seed bed. In general the Lebanon silt loam in this county does not have the undesirable compact subsoil characteristic of the type in the western part of the Ozark region. In most places the gravelly substratum lies less than 3 feet below the surface, and in many places, especially on slopes, chert fragments are encountered throughout the soil mass, but usually not in sufficient quantity to hinder cultivation.

The Lebanon silt loam is an unimportant type in Reynolds County. It occurs mainly on the ridges in the northwestern part of the county, and represents remnants of the original Ozark plain. The forest growth is mainly black oak with some post oak. Blackjack oak is almost entirely absent, and the post oak, which consists mostly of large trees, is not as abundant as on similar soil in other parts of the Ozark region.

Only a few acres of this soil are in cultivation and no effort is made to extend the cleared area chiefly on account of low productiveness. This type may be improved by increasing the supply of phosphorus, nitrogen, and organic matter and by the addition of lime. Most of the type occurs in such irregular areas as to make its cultivation impracticable, and the advantage of being stone free is offset by its relatively low productiveness and unfavorable location.

Wheat and oats give fair returns when fertilized, and clover can be grown with the use of manure and lime, but corn yields are low. This type is best suited to the production of grass, and most of it will probably be included with the surrounding stony soils in pastures. Land values range from $5 to $25 an acre.

CLARKSVILLE STONY LOAM.

The Clarksville stony loam, which is the most extensive upland soil of the county, comprises the rolling to hilly stony land of the region. The soil to a depth of 5 to 7 inches consists of a gray or pale-yellow silt loam grading into yellow silt loam, which gradually becomes heavier with increase in depth. Below 10 to 12 inches the color is usually a brownish yellow and the texture a friable silty clay. The lower subsoil, beginning at a depth of 16 to 18 inches, is uniformly a stony clay loam, with a base color of reddish brown, mottled with gray and yellow, the more eroded areas in the eastern part of the county having more red and brown coloration than in the western part of the county. The upper part of this horizon is usually so compact that it is almost impenetrable with the soil auger. This condition is most pronounced in the smoother areas, where it may have the characteristics of a true hardpan. The compaction of the lower subsoil is due to the filtration of clay and cementation.

The soil mass includes from 25 to 90 per cent of chert fragments, varying in size from small gravel to pieces 1 to 2 feet in diameter. The content of stones is greatest at the immediate surface owing to the concentration of the coarser material through removal of the fine earth by erosion. On some of the steep, hilly areas the loose rocks comprise the surface material to a depth of several feet. The south and west slopes always contain a much higher percentage of stone than do the north or east slopes. In the western part of the county the chert rock is mixed with occasional thin beds of sandstone, which has broken up into rather large fragments and from which enough sand has been derived to give the surface soil a loamy texture. In general, the ridge tops are not as stony as the slopes. In this position a few areas of silt loam occur, but these are so small that they are included with the stony type.

The topography is prevailingly rough and broken, ridges, hills, and hollows being so closely associated that smooth areas containing as much as 40 acres rarely occur. That part of the type lying nearest the larger streams is most deeply dissected.

All of the type is timbered, red, black, and white oak being the predominant growth. All the pine which originally covered the land has been removed.

As developed in this survey the Clarksville stony loam is unsuited to agriculture, both on account of its broken surface and its high content of stone, the removal of which is impracticable. While the inherent fertility of the soil is rather low, it probably is somewhat greater than that of the Lebanon silt loam or even the Clarksville gravelly loam. The high content of stones makes the soil droughty

and this, with the forested condition, has retarded the accumulation of organic matter.

The type is best adapted to forestry or to use as pasture land. Most of it should remain in permanent forest, but by clearing the smoother areas fair pastures can be made. The grasses will probably grow best on the lower slopes and on the north and east hillsides. Lespedeza grows voluntarily over most of the land and red clover and sweet clover should do well on the red subsoil areas where the soil is not too stony.

Land values range from $5 to $25 an acre, depending on location, topography, and stand of timber. Much of the land is held in large tracts by lumber companies.

CLARKSVILLE GRAVELLY LOAM.

The Clarksville gravelly loam represents the moderately rolling and moderately stony land found most extensively in the western part of the county and in small areas at the edge of valleys. The surface soil is a gray to yellowish-gray silt loam, changing beneath to yellow silt loam, which passes into brownish-yellow silty clay at about 12 inches. This in turn rests at about 18 inches on a mass of angular chert fragments mixed with dull-brown clay loam, mottled with gray and yellow. The upper 2 to 4 inches of this part of the subsoil is frequently a gray material, but the lower part averages a moderately friable clay loam. On exposure to air and weathering the subsoil changes to a rather uniform dull brown, but this coloration is not as intense or as uniformly present as in the subsoil of the Clarksville stony loam. In general, the Clarksville gravelly loam is of a lighter color than the stony loam, a result largely due to the smoother surface and consequent greater weathering and leaching of the soil material. Chert gravel comprises 20 to 80 per cent of the soil mass, but the size of the stones averages smaller than in the stony loam.

Small areas occurring as low slopes along the edge of stream valleys have a somewhat deeper and darker surface soil and a deeper red subsoil than the main upland areas. There is no compaction in the subsoil of these slope areas, and in general it closely resembles the subsoil of the Baxter gravelly loam. The gravel and stone is irregularly distributed through the soil mass and is not cemented or compacted as on most of the upland areas. The soil is largely colluvial, consisting of loose soil and stone material that has collected at the foot of the slopes by wash and creep. In potential fertility these low slope areas which contain a higher percentage of organic matter are superior to the main type.

The Clarksville gravelly loam occurs in all parts of the county, but is extensively developed only in the west-central part to the south of

Bunker and Reynolds. In this region it includes most of the upland and extends across the ridges. In all other parts of the county it occurs mainly as long narrow bands bordering valleys, although occasional areas are found on the broader divides or ridges.

The topography varies from moderately rolling to hilly, the more nearly level land occupying the divides, but breaking sharply around stream heads and slopes, while valley areas usually occupy rather steep slopes. The type is not as steeply rolling as the Clarksville stony loam, and generally is not too steep for cultivation, although much of it would be considered so in regions where the soils are more inclined to wash.

With the exception of an occasional small area bordering the bottom land, all the Clarksville gravelly loam is timbered, the tree growth consisting almost exclusively of oaks. On much of the land in the western part of the county the growth is rather brushy, but this is largely because the pine has been removed recently and the hardwood has not attained good size.

For the most part the soil contains such a high percentage of gravel as to make cultivation impracticable. In its agricultural possibilities it is only slightly superior to the Clarksville stony loam. This is especially true of the upland areas. The valley areas will probably be cultivated in time, in conjunction with the adjoining bottom land, but the fields will be small, as they must be confined to the gentle slopes. Good moisture conditions and considerable natural fertility makes the growing of some crops fairly successful in the slope areas, but it is doubtful if any large part of the ridge areas of the type will ever be brought into cultivation. The yields of corn are small, and this, combined with the difficulty of cultivation, makes it an unprofitable crop. The soil is best adapted to grass. Blue grass and red clover thrive on all the low slope areas. These areas, too, are fairly well suited to tree fruits, especially if situated on north or east slopes. Many of the farm houses are located on this type, which is farmed in conjunction with the adjoining bottom land.

In general, the Clarksville gravelly loam can not be considered an agricultural soil. Most of it is best suited for pasture and for the production of forest products and its utilization must be practically like that of the Clarksville stony loam. As pasture it is somewhat superior to the latter.

Land values are about the same as for the stony loam, except for areas adjoining the bottom land, where the value is from $10 to $20 an acre higher.

BAXTER STONY LOAM.

The Baxter stony loam consists of a grayish-brown silt loam 5 to 7 inches deep, grading into a light-brown or reddish-brown silt sub-

soil, becoming heavier with increasing depth. The lower subsoil is a moderately friable reddish-brown or dull-red clay, mottled with yellow, bedrock or large fragments of the parent rock being generally encountered at a depth of about 24 inches. Stones also are scattered throughout the soil section, but are not as numerous as in the Clarksville stony loam. The type differs from the Baxter gravelly loam in occupying steeper slopes and in having a higher content of large chert fragments. The thick beds of limestone outcrop frequently in the form of bluffs.

The type is of little importance and occurs mainly in small, narrow belts, adjacent to the larger valleys. The most extensive area is near Black in the northern part of the county. The land is suited only for forestry and rough pastures. It should be managed in the same way as the adjoining Clarksville soils. Tame grasses and clover make a good growth on cleared areas.

BAXTER GRAVELLY LOAM.

The Baxter gravelly loam includes the brown gravelly soil bordering the stream valleys. The surface soil, to a depth of about 7 inches, is a light-brown or grayish-brown gravelly silt loam, the immediate surface 2 to 3 inches being gray in the natural condition, and reddish gray in cultivated fields, when in a moist state. The subsurface material varies in color from yellow to brown, and is slightly heavier than the surface in texture. The subsoil below 18 inches is predominantly a mass of angular chert gravel, mixed with reddish-brown, crumbly silty clay. On almost level areas the upper subsoil is frequently a yellowish-gray silty clay, compact but not impervious. The subsoil of the rolling areas is almost uniformly a reddish brown, and this readily distinguishes the type from the adjoining Clarksville soils. In general, the soil in the eastern part of the county averages darker in color than that in the western part.

Chert gravel is scattered over the surface and forms from 20 to 60 per cent of the soil mass, the proportion being less than in the corresponding Clarksville type. Many of the fragments are rounded, porous, and of a brown color, indicating rather thorough weathering.

The Baxter gravelly loam occurs only on low slopes, in places resembling terraces, along the larger valleys. (Pl. III, fig. 1.) It corresponds in position and is closely related to the valley areas of the Clarksville gravelly loam. It is found in all parts of the county, but is most extensive along West Fork and the lower part of Black River. The soil is derived in part from almost chert-free limestone, and from material that has gradually accumulated at the foot of slopes. The purely residual areas lie near Black. In general, the Baxter gravelly loam is a much younger soil than the Clarksville,

and therefore is not as thoroughly leached, contains more lime, and is more productive.

The topography varies from gently rolling to hilly. Most of the type is not too steep for cultivation; but in many places it is crossed by draws, so that the fields are usually small, and this, with the high gravel content of the soil, makes cultivation difficult and frequently impracticable. It is largely for this reason that most of the land remains in forest and much of the cleared ground is used for grass. Only the smoother areas and the low slopes that can be cultivated with the adjoining bottom land are used for cultivated crops. Corn yields from 20 to 40 bushels per acre. Clover and other tame grasses do well.

In general, the Baxter gravelly loam offers fair agricultural possibilities. On account of its small extent and difficulty of cultivation a large part of it can probably be handled economically only in conjunction with the Clarksville soils and used for pasture. Areas suitable for cultivation can be used in the production of corn, forage crops, and fruit, but it is as a clover and grass soil that the type probably will give the largest returns.

The Baxter gravelly loam, like all the upland soils of the county, is in need of organic matter. It seems fairly well supplied with lime.

BAXTER SILT LOAM.

The Baxter silt loam differs from the Baxter gravelly loam in having a lower content of chert fragments. The surface soil is a grayish-brown to brown silt loam, grading at 7 to 9 inches into a brown heavy silt loam, which in turn passes at 18 to 24 inches into reddish-brown friable clay, mottled with gray and yellow. It is probable that the subsoil averages slightly heavier in texture and darker in color than in other parts of the Ozark region. A little rounded gravel is scattered throughout the soil section, and large stones are usually encountered in the lower subsoil. In the areas near Black limestone bedrock outcrops in places. The soil surrounding such outcrops is usually darker than that over most of the type, owing to a greater accumulation of organic matter. The forest growth consists mainly of elm, walnut, hickory, red oak, bur oak, with cedar on the glady areas.

The Baxter silt loam occurs in a few small areas in the northeastern part of the county. The soil is derived from rather pure limestone. The surface is gently rolling and the drainage is good. All of the type is under cultivation, and it is considered one of the best upland soils of the county. It is especially well adapted to wheat and clover. Most of the land has been farmed for 50 years or longer, with little attention to rotation or manuring, so that the store of organic matter has been greatly reduced.

ASHE STONY LOAM.

The surface soil of the Ashe stony loam is a gray or yellowish-gray floury silt loam, which quickly changes to grayish-brown or brownish-yellow and becomes heavier with increasing depth. Below 16 to 18 inches the subsoil consists of a friable yellowish-gray clay, highly mottled. In general, the soil of the Ashe stony loam is essentially like the fine material of the Clarksville soils, both in physical properties and in productiveness. This similarity is thought to have resulted from the long period of weathering to which all these soils have been subjected, during which time differences due to origin have largely been effaced. The subsoil of the Ashe stony loam is apparently more retentive of moisture than the subsoil of the Clarksville stony loam, and the former is therefore a somewhat better grass soil.

Throughout the Ashe stony loam there are numerous outcrops of granite rock, and large bowlders varying in size from 6 inches to several feet are scattered over the surface. The outcrops are generally sufficiently far apart to allow cultivation of the intervening areas, but the scattered bowlders make cultivation impracticable. Occasional stone-free areas are found on the ridges and gentle slopes.

The Ashe stony loam occupies the region of "granite hills" or porphyry rocks in the northeastern part of Reynolds County. On account of the ruggedness and inaccessibility of this region the soil boundaries between this type and the surrounding soils is only approximately correct. It is probable that there are included in the Ashe stony loam considerable areas of Clarksville soils, and vice versa, and a more detailed survey would show considerable change from the boundaries indicated on the soil map.

The Ashe stony loam is the predominating soil east of East Fork and north of Little Tomsauk Creek. The next largest area is northeast of Black. The soil is derived from granite, except on some of the lower slopes, where the remnants of chert would indicate that limestone material has entered into its composition to some extent.

The topography varies from hilly to mountainous, the tops of the hills being from 200 to 700 feet above the floor of the creek valleys. The slopes are long and steep, but do not average as steep as those occupied by the Clarksville stony loam. All the type is forested, the tree growth consisting of the various oaks, including some blackjack and post oak. Most of the trees are smaller and more brushy than on the Clarksville soils.

On account of the broken surface and high content of stones, this is a nonagricultural soil. This type, like the Clarksville soils, has its greatest value as forest and pasture land. With clearing,

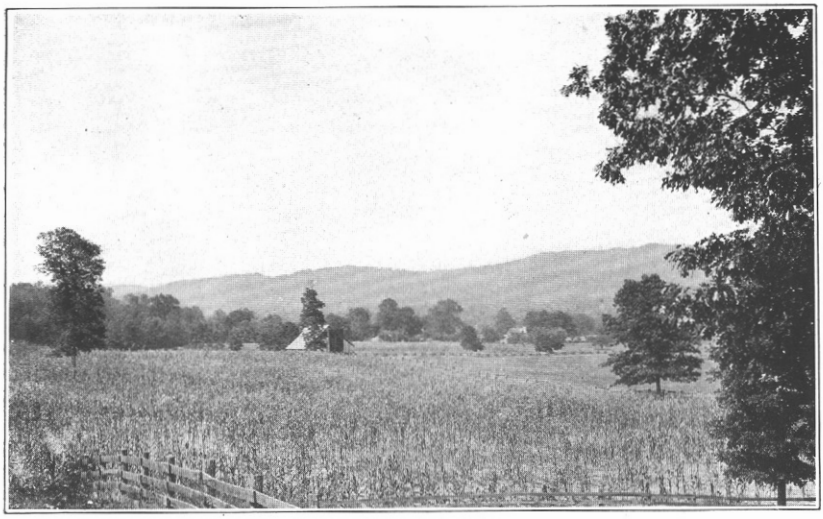

FIG. 1.—VIEW ACROSS ONE OF THE WIDER VALLEYS.

Soil on the gentle slope in foreground is the Baxter gravelly loam.

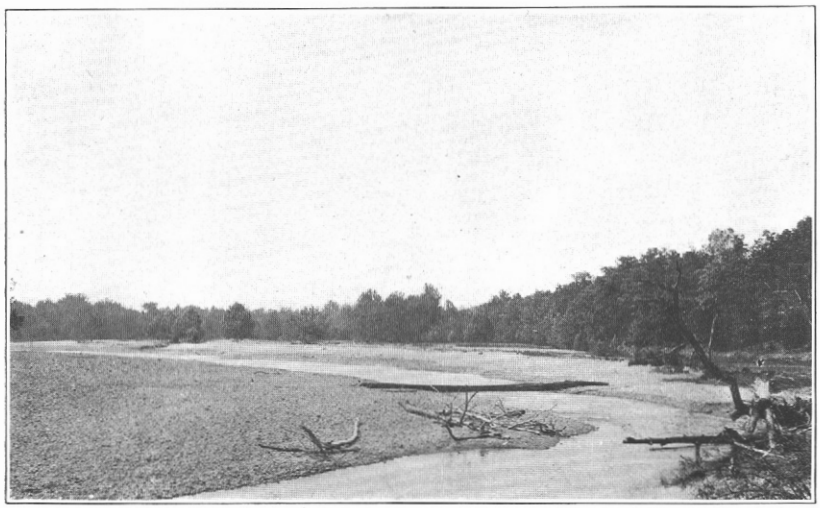

FIG. 2.—CHARACTERISTIC APPEARANCE OF THE VERY LOW AREA OF GRAVELLY ALLUVIUM (RIVERWASH), SUBJECT TO FREQUENT OVERFLOW.

This low, recently placed streamwash has practically no agricultural value. It represents the lowest part of the stream flood plain. The higher adjacent alluvial soils support forests, and, where farmed, rank as good agricultural land.

bluegrass, timothy, and redtop should grow well, but liming would improve the soil for bluegrass and is essential for the growing of clover.

CUMBERLAND SILT LOAM.

The Cumberland silt loam consists of 7 to 12 inches of brown silt loam, underlain by a yellowish-brown silty clay becoming heavier in texture and more reddish in color to a depth of about 20 inches, where it becomes a reddish or yellowish-brown friable clay. A few rounded gravel are mixed with the fine materials through the soil section. The type differs from the Baxter silt loam in that the soil is not as compact and is of a more uniform red color.

The soil is derived mainly from old alluvium, but along the outer edges of the valleys it consists of material washed down from the adjoining hills. It is not subject to overflow, and the boundary between it and the first bottom soils is marked by a distinct bluff, varying in height from 2 to 10 feet. The original forest growth was similar to that found on the first bottoms.

The Cumberland silt loam occurs in several small areas along Black River and some of the larger creeks. All the type has been farmed for many years, and is almost equal in productiveness to the Huntington silt loam, the best first-bottom type. Corn, wheat, clover, and grass are grown, and good yields are obtained. The practice of growing corn several years in succession has diminshed the supply of organic matter in the soil, but the land can be easily built up by the more extensive growing of soil renovating crops such as clover.

HUNTINGTON GRAVELLY LOAM.

The surface soil of the Huntington gravelly loam consists of a dark-brown or brown silt loam 9 to 12 inches deep, carrying a large quantity of chert fragments and waterworn gravel. The fine material of the subsoil is a heavy silt loam, somewhat lighter in color than the surface soil, but usually changing to reddish brown in the lower part. In some areas the subsoil, and occasionally both surface soil and subsoil, are composed almost entirely of gravel. This variation occurs mostly in the narrower valleys and at the mouths of the small draws entering the larger valleys. The soil in Dry Valley is probably more gravelly than the rest of the type in this county.

This alluvial soil is developed in the stream valleys in all parts of the county. While it is subject to occasional overflow, injury has resulted mainly from the washing in of gravel.

The soil is productive and nearly all of it is in cultivation, but on account of its occurrence as narrow belts and its dissection by the

meandering streams the fields are small and not suited to heavy farm implements. Where the content of gravel is high, cultivation is difficult, and such areas are best suited for the production of hay and for pasture. Corn, the most important crop, yields 25 to 60 bushels per acre. Under the present system of farming it is the most profitable crop that can be grown. Clover also does well and is extensively grown. The very stony areas are droughty, but crop failures due to this cause are rare.

Huntington gravelly loam, stony phase.—The Huntington gravelly loam, stony phase, differs from the typical soil in the lighter color of the soil and the higher content of stones. The soil usually is a gray or grayish brown and the subsoil brown. Angular gravel and stones, varying in size from small particles to bowlders 6 inches and more in diameter, make up from 50 to 80 per cent of the soil mass.

The phase occurs in hollows and at the heads of narrow valleys with steep gradients and bordered by steep, chert-covered slopes. It is in part alluvial and in part colluvial in origin. The surface is fairly smooth, except where alluvial fans have been formed and where the winding stream channels dissect the surface.

Only a small percentage of the land is farmed, as the narrowness of the areas, the severe washing to which they are subject, and the high content of gravel make cultivation very difficult and in places impracticable. The soil is droughty and is less productive than the typical Huntington gravelly loam. Corn is the only important crop. Much of the soil offers fair agricultural possibilities and is gradually being cleared when not too distant from other arable bottom lands.

HUNTINGTON LOAM.

The Huntington loam is a brown to light-brown loam, underlain at about 12 to 15 inches by a slightly lighter colored material of about the same texture, which extends to a depth of 3 feet or more. In places the lower subsoil is a silt loam of reddish-brown in color. A few small gravel are scattered through the soil section. The soil is usually loamier along the stream and siltier near the edge of the bluff. Some Huntington fine sandy loam is included in the type as mapped.

The main development of Huntington loam is along the lower part of Sinking and Logan Creeks, although many small areas are found in all parts of the county. These streams head in a region where sandstone is relatively abundant, which accounts for the sandy material deposited in their valleys. The surface varies from level to uneven, and is characterized by low swells and depressions. All the type is subject to overflow, but the flood waters drain off rapidly when the streams resume their channels.

Corn is the principal crop. The yield is usually higher than on the gravelly loam, but does not average as high as on the silt loam of the series. Timothy and clover yield from 1 to 2 tons of hay per acre. Alfalfa can be grown on the well-drained areas.

The soil is naturally productive but could be improved by using it to a greater extent for pasture, by growing clover, by growing cowpeas in the corn, and by crop rotation. Like the Huntington silt loam, it is one of the most valuable soils in the county. Land values range from $25 to $75 an acre, depending on location, size of area, and character of included upland.

HUNTINGTON SILT LOAM.

The Huntington silt loam represents the stone-free bottom land. The surface soil to an average depth of 12 inches is a mellow, brown, or dark-brown silt loam, underlain by a rich-brown silt loam similar to the surface soil, grading into a reddish-brown silty clay loam in the lower part of the 3-foot section. A few gravel particles are scattered through the soil and subsoil, and in places lenses of sand or thin beds of gravel are found in the lower subsoil, but these usually are covered by about 2 feet of stone-free material. Along the stream banks the soil is more loamy than farther back, and some areas of gravelly loam and sandy loam, but of little importance, have been included with the silt loam.

The Huntington silt loam occurs in the broader bottoms of the larger streams and is most extensive along the several branches of Webb Creek and on the upper course of Logan Creek. In most of the other valleys the areas are relatively small, the type here occurring for the most part as isolated patches.

The surface is level or nearly so, with a slight slope toward the stream. Overflows are rare and of short duration. The water table is from 4 to 10 feet below the surface, so that crops rarely suffer for lack of moisture even in the driest years.

This is the most valuable and highly improved soil in the county. It was the first to be cleared, and has been kept under constant cultivation for many years. The natural high productiveness has been maintained by new material from overflows, so that fertilizers are not used or needed. The soil is easily worked, and occurs in sufficiently large areas to permit the use of heavy teams and implements. All these factors give the Huntington silt loam a high value, which is emphasized by contrast of the upland soils existing in this county.

Corn is the most important crop. Yields range from 40 to 75 bushels per acre. Wheat does well, but is not extensively grown. Clover and timothy yield from 1½ to 2 tons of hay per acre. Alfalfa can be successfully grown; the greatest problem in getting a stand is

the eradication of weeds, which maintain a foothold through seeds deposited by flood waters. The most important requirement for this soil is the growing of legume crops in rotation and the turning under of crop residues.

Very few sales are made of land of this type. Values range from $40 to $100 an acre.

HOLLY SILT LOAM.

The Holly silt loam is locally known as "crawfish land." The soil consists of a light-gray silt loam, changing at 5 to 7 inches into almost white, ashy silt loam containing small iron concretions. The subsoil below 18 to 20 inches is a drab or dull-gray silty clay, mottled with yellow and brown in the lower part of the 3-foot profile. In some of the high, level bottom areas, the subsoil is frequently compact and the clay and concretionary material cemented to form a true hardpan. In general, however, the subsoil allows the percolation of water. Certain areas of the type receive seepage water and are more or less "boggy" at all times. These have a heavy dark-gray soil and dark-drab clay subsoil, but when drained and dry the soil quickly takes on the characteristic gray color of the typical areas. A peculiar feature of the type is the presence of small dome-shaped mounds, 1 or 2 feet high, consisting of grayish to brownish silt loam overlying yellowish silty clay loam.

The Holly silt loam is an unimportant type, the largest areas occurring near Lesterville. It is generally associated with the Huntington silt loam, and occurs for the most part as low second bottoms, generally above overflow. However, it is a poorly drained soil, as it is almost invariably in such position as to receive the water from the springs or seeps at the foot of bluffs. In origin it is the same as the Huntington, its peculiar characteristics having resulted from almost constant saturation, whereas the Huntington is well drained.

The native vegetation consists mostly of laurel oak, elm, ash, and water-loving shrubs. All of the type is in cultivation. It is used almost exclusively for hay production or as pasture. The tame grasses do fairly well, but the sods deteriorate quickly. Corn and other grain crops rarely give profitable yields.

The soil is low in organic matter and is acid. Applications of 1 to 3 tons of ground limestone per acre probably would be needed to correct the latter condition. The first requirement for the improvement of the soil is proper drainage. However, as most of the type occurs in small areas, as the productiveness is not great, and as the construction of drainage ways is difficult, the improvement of much of the type would involve a considerable expenditure and would rarely prove profitable under present conditions.

ROUGH STONY LAND.

Rough stony land includes the extensive areas of rough, hilly land, which, on account of steepness of slope, high content of stone fragments, and rock outcrops, is of no agricultural value. It represents the roughest land in the county, and consists of sharp ridges, steep slopes, and narrow hollows. The soil material is like that of the Clarksville stony loam, although in general the lower subsoil is more uniformly of a brown color. The content of rock varies from 50 to 80 per cent and consists of gravel and large pieces of porous chert. Much of the Clarksville soil might properly be classed with Rough stony land, and there are included some patches of Clarksville gravelly loam, but such areas are of no importance and can not be considered separately from the prevailing soils.

Rough stony land occurs in the eastern part of the county along Black River and its larger tributaries. The forest growth is mainly red oak and black oak, with some white oak on the lower slopes, but the underbrush is not as thick as on the less stony soils. Rough stony land should remain in forest. For range pasture it is almost equal to the other upland stony soils, but the removal of the forest to improve the pastures is of doubtful value, because most of the land is too droughty for the tame grasses.

Prices of land of this character range from $2 to $10 an acre, depending on the stand and quality of the forest.

RIVERWASH.

The belts of loose gravel, sand, and stones bordering the larger streams have been mapped as Riverwash. (Pl. III, fig. 2.) The material is like the gravel beds in the stream channels, and is saturated with water a few feet below the surface. At every rise of the stream the materials are reworked, and in many places built up as long ridges paralleling the stream channel.

Riverwash occurs mainly along Black River and the lower courses of West Fork and East Fork. With the aggradation of the streams in this region this wash material is gradually encroaching upon the unoccupied areas of the bottoms as well as extending up the stream valleys as they are deepened. It is only a matter of time until the valleys of all the larger creeks, excepting the coves and other protected places, will be covered by a mass of gravel, and their value for agriculture permanently reduced.

SUMMARY.

Reynolds County is situated in the eastern part of the Ozark region. The county comprises 785 square miles, or 502,400 acres, only 11 per cent of which is improved land.

In general, the surface of the county is rough and hilly, being characterized by sharp ridges, steep slopes, and narrow valleys. The northwestern part is the smoothest, the topography here being moderately rolling, and the northeast corner is the roughest, being semimountainous. The altitude ranges from about 500 feet in the valleys in the southern part of the county to about 1,400 feet near Bunker.

Practically all the upland is forested with hardwoods, and lumbering, including the making of railroad ties. is an important industry.

The population of the county, as reported by the census of 1920, is 10,106, giving a density of 12.2 persons to the square mile. The entire population is classed as rural.

The mean annual temperature is 54.4° F. and the mean annual precipitation 46.12 inches.

The farming land is confined almost entirely to the alluvial valleys. The upland, on account of the rough surface and stony character of the soil, is mostly nonarable, and is suited only for forestry and range pasture. The raising of live stock is the most important agricultural industry, and practically all the cultivated land is used to grow corn and forage crops for winter feed. This type of agriculture is without doubt that best adapted to the natural conditions. The clearing of some of the upland for pasture will provide for some increase in the number of live stock kept, but the small proportion of arable land is a factor limiting development.

The upland soils of Reynolds County are residual from cherty limestone and from granite. They are characterized by their gray color, high content of chert fragments, and relatively low productiveness. The Clarksville and Ashe soils are, with a few minor exceptions, nonarable. The Baxter soils are fairly productive.

The alluvial soils are included in the Cumberland, Huntington, and Holly series. They comprise the most productive land in the county.

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[PUBLIC RESOLUTION—No. 9.]

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

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

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

Approved March 14, 1904.

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

Areas surveyed in Missouri.

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