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BUREAU OF CHEMISTRY AND SOILS
In cooperation with the Arkansas Agricultural Experiment Station

# SOIL SURVEY
OF
# BRADLEY COUNTY, ARKANSAS

BY
E. B. DEETER, in Charge, W. J. LATIMER
and C. E. BORN

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# SOIL SURVEY OF BRADLEY COUNTY, ARKANSAS

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## COUNTY SURVEYED

Bradley County is in the southeastern part of Arkansas. Warren, the county seat, is about 80 miles almost due south of Little Rock, the State capital. The road distance from Warren to Pine Bluff and to El Dorado is about 50 miles.

The length of the county from north to south is about 37 miles. The county varies from a maximum width of 24 miles to a point at the confluence of Ouachita River and Saline River at the extreme southern tip. The total area is 646 square miles, or 413,440 acres.

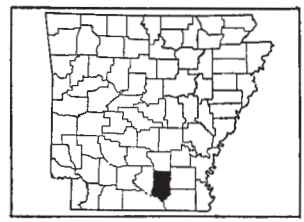

FIGURE 1.—Sketch map showing location of Bradley County, Ark.

Bradley County is part of a smooth plain which slopes very gently southward. It is crossed by a number of moderately large streams, all of which flow southward down the slope of the plain. Each of these flows in a shallow, flat-bottomed valley whose width is dependent mainly on the size of the stream. The basins of all the streams within this plain are narrow. The long tributaries flow approximately parallel to the main stream and in a minor way constitute a part of the parallel southward-flowing stream system.

A belt of upland, ranging in width from less than a mile to several miles and lying parallel to the larger streams, both main and tributary, and immediately adjacent to the respective valleys on both sides, has been made hilly by erosion. None of the hills rise above the original level of the plain. Inland from these narrow hilly belts the original plain is still intact.

The hilly belts are marked on the soil map by belts of Ruston soils, and the remnants of the old plain are shown mainly by areas of Caddo soils. Certain low mounds and faint ridges on the old plain are marked by the presence of Ruston soils.

With Saline River on the east and Moro Creek on the west, the central part of Bradley County is drained from north to south by Eagle Creek, with such important feeders as Irish Bill, Steep Bank Eagle, Brushy Eagle, Grassy Pond, Beech, Halfway, Charivari, and Tulip Creeks. Here again, well-drained, gently sloping or moderately steep ridges and hills from 20 to 50 feet above the first bottoms occur in close proximity to the drainage ways. Ridge land is especially extensive in the vicinity of Hermitage and several miles north and south of Gravelridge.

Between each of the three major stream systems of Bradley County (Moro Creek, Eagle Creek, and Saline River) the divides comprise

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wide areas of flat or gently undulating country, some parts of which are called flatwoods. Natural drainage in these areas is deficient, some of the lowest and wettest situations being known as pin-oak flats because of the abundance of moisture-loving oaks. The largest of these flat belts begins at the Cleveland County line, extends east of Banks, and widens toward the south, until below Jersey, Hermitage, and Johnsville it constitutes by far the greater part of the uplands in the southern part of the county.

Ouachita River, Saline River, and Eagle Creek join in the extreme southern end of the county. This section is characterized by wide, poorly drained bottom lands, interspersed with low, islandlike ridges or second bottoms, such as Greens Island, Kemp Island, and Sand Ridge. A number of lakes, such as Greens, Pair o' Geese, and Eagle, consist of old river channels. In addition to these abandoned channels there is an intricate network of sloughs. Inundations are often deep and prolonged.

Nearly 100 years ago the first settlers made their homes near Saline River, east of the present county seat. Bradley County was organized December 18, 1840, but in 1873 part of its territory was taken to make up Cleveland County. Most of the inhabitants are descended from native white families. A very large percentage came from the Southern States. There are also many negroes in the county. The 1920 census reports for Bradley County a population of 15,970, and for the county seat, Warren, a population of 2,145. However, local post-office authorities serve about 7,000 people, because most of the mill forces live just outside the corporate limits. Hermitage and Banks are small towns, important as trading centers; and Ingalls, Vick, Morobay, Jersey, and Johnsville are of less importance.

A branch line of the Missouri Pacific Railroad connects Warren with the main line at Dermott, Chicot County. Almost all other towns of importance are on a branch of the Chicago, Rock Island & Pacific Railway which runs diagonally across the county from northwest to southeast. The Warren & Ouachita Valley Railway runs from Warren to Banks, a distance of 16 miles, and forms an important connecting link between the Missouri Pacific on the east and the Chicago, Rock Island & Pacific on the west.

At the present time some of the main county roads are passable throughout the year, but many are in need of improvement. Under recently enacted highway legislation, a start has been made on two State highways through the county. County roads are also gradually being improved. Telephone service through the rural districts is fairly good.

Lumbering and farming are the chief industries of Bradley County. Four mills at Warren are producing the Arkansas soft pine and hardwood lumber which is shipped to all parts of the United States. Many smaller lumber mills are located in various parts of the county.

## CLIMATE

It may be said that the climate of Bradley County is favorable to the production of a wide range of crops. The mean annual rainfall is 53 inches and the mean annual temperature about 63° F. As the average date of the last killing frost is March 28 and that of the first is November 2, a frost-free season of 218 days may usually be relied on.

As would be expected, there are some extremes of weather. Temperatures as high as 110° and as low as −10° have been recorded, but they are of rare occurrence. Then again, there may be unfavorable crop years, because of a cool, wet spring or an excessively dry summer.

The climatic data in Table 1 are compiled from the records of the Weather Bureau station at Warren.

TABLE 1.—*Normal monthly, seasonal, and annual temperature and precipitation at Warren*

[Elevation, 206 feet]

| Month | Temperature | | | Precipitation | | | |
|---|---|---|---|---|---|---|---|
| | Mean | Absolute maximum | Absolute minimum | Mean | Total amount for the driest year (1921) | Total amount for the wettest year (1905) | Snow, average depth |
| | ° *F.* | ° *F.* | ° *F.* | *Inches* | *Inches* | *Inches* | *Inches* |
| December | 44.3 | 81 | 6 | 5.58 | 2.99 | 6.67 | 0.9 |
| January | 44.8 | 82 | −8 | 4.76 | 2.98 | 6.51 | .7 |
| February | 44.8 | 88 | −10 | 4.56 | 3.31 | 3.43 | 1.3 |
| Winter | 44.6 | 88 | −10 | 14.90 | 9.28 | 16.61 | 2.9 |
| March | 55.3 | 95 | 20 | 5.52 | 4.57 | 10.80 | .4 |
| April | 62.8 | 93 | 28 | 5.27 | 6.43 | 10.79 | 0 |
| May | 71.0 | 100 | 34 | 4.69 | 2.25 | 6.57 | 0 |
| Spring | 63.0 | 100 | 20 | 15.48 | 13.25 | 28.16 | .4 |
| June | 78.5 | 108 | 47 | 4.05 | 2.16 | 7.20 | 0 |
| July | 81.8 | 110 | 53 | 3.67 | 3.39 | 9.02 | 0 |
| August | 81.2 | 109 | 52 | 3.86 | 4.44 | 5.99 | 0 |
| Summer | 80.5 | 110 | 47 | 11.58 | 9.99 | 22.21 | 0 |
| September | 76.4 | 105 | 37 | 4.60 | 4.15 | 6.07 | 0 |
| October | 63.8 | 96 | 22 | 3.15 | .35 | 5.28 | 0 |
| November | 53.7 | 87 | 12 | 3.81 | 2.08 | 3.54 | 0 |
| Fall | 64.6 | 105 | 12 | 11.56 | 6.58 | 14.89 | 0 |
| Year | 63.2 | 110 | −10 | 53.52 | 39.10 | 81.87 | 3.3 |

## AGRICULTURE

Since Bradley County first assumed importance in agriculture no radical change has occurred in the character of its chief products. Table 2 shows the acreage and production of the principal crops in the last four census years.

TABLE 2.—*Acreage and production of principal crops in stated years*

| Year | Cotton | | Corn | | Hay and forage | |
|---|---|---|---|---|---|---|
| | *Acres* | *Bales* | *Acres* | *Bushels* | *Acres* | *Tons* |
| 1889 | 14,970 | 6,218 | 12,653 | 182,992 | 13 | 26 |
| 1899 | 12,916 | 3,831 | 17,940 | 219,880 | 758 | 483 |
| 1909 | 12,942 | 3,701 | 15,104 | 195,230 | 1,207 | 1,272 |
| 1919 | 18,223 | 4,738 | 19,263 | 217,523 | 3,433 | 2,458 |

A glance at Table 2 reveals the fact that, although varying in acreage from year to year, cotton and corn have always been the chief crops. With a few important exceptions, farmers depend on cotton as the main cash crop. Not enough corn is grown to supply the local demand, but that produced is ground into meal for home use and is fed to work animals, hogs, and occasionally to beef animals. Table 2 shows a gratifying increase in the acreage devoted to hay and forage crops, but the county is still far from being able to supply its own demands. The situation can best be understood from the figures given in Table 3.

TABLE 3.—*Farm products shipped into Bradley County in one year* [1]

| Product | Quantity | Value | Product | Quantity | Value |
|---|---|---|---|---|---|
| | *Carloads* | *Dollars* | | *Bushels* | *Dollars* |
| Hay | 80 | 32,000 | Potatoes | 5,190 | 10,380 |
| Mixed feed | 555 | 555,000 | Onions | 1,000 | 1,500 |
| Corn | 6 | 3,600 | | *Tons* | |
| Oats | 20 | 23,000 | Cabbage | 60 | 6,000 |
| | *Pounds* | | | *Cases* | |
| Meat | 840,600 | 168,120 | Eggs | 100 | 1,500 |
| Butter | 3,500 | 1,750 | | | |
| Cheese | 10,400 | 4,160 | | | |

[1] Information received from railroad agents at Warren, Hermitage, Ingalls, and Vick.

Table 4 gives the value of all agricultural products, by classes according to the 1920 census.

TABLE 4.—*Value of all agricultural products, by classes, in 1919*

| | Dollars | | Dollars |
|---|---|---|---|
| Cereals | 398,848 | Livestock and products—Continued. | |
| Other grains and seeds | 19,764 | Dairy products (excluding those for home use) | 113,856 |
| Hay and forage | 51,993 | Poultry and eggs | 92,945 |
| Vegetables | 219,129 | Wool, etc. | 784 |
| Fruits and nuts | 50,272 | | |
| All other crops (principally cotton) | 1,037,688 | Total | 2,170,803 |
| Livestock and products: | | | |
| Animals sold and slaughtered (estimated) | 185,524 | | |

It will be seen from Table 4 that there is a large home market for certain farm products. It is estimated that the shortage of certain crops for farm use only is as follows: Corn, 8,730 acres; oats for grain and hay, 14,400 acres; hay and forage, 10,600 acres; and potatoes, 540 acres.

However, the situation is not so hopeless as it would appear at first sight. Since the 1920 census was taken, the local county agents and the home demonstration agent have organized rural communities for the purpose of encouraging more efficient farm methods. To remedy the feed shortage, campaigns for increased acreage of oats have been conducted; cotton is fertilized more intelligently; the acreage of hay crops, particularly Lespedeza, is increasing; and breeds of hogs are being improved.

Sweet potatoes of the Nancy Hall, Porto Rico, and Key West varieties are steadily increasing in acreage. The quality is excellent. The same is true of sorghum and sugarcane grown for sirup, which is made at small mills scattered about the county. Many farmers

have small fields of cowpeas, soy beans, and peanuts. A number of small peach orchards have recently been planted. Butter, eggs, poultry, meats, strawberries, cabbage, and other vegetables furnish a source of income to some farmers, with the local towns and logging camps as the markets.

With the large mills at Warren and the many smaller ones scattered over the county, there is little doubt that the farming industry is seriously affected by the source of income offered by them. Many people work in the woods or at the mills during slack seasons on the farm and many have come to depend chiefly on such activities for a livelihood.

The flat, poorly drained uplands and alluvial lands of the county show very little development. Only a comparatively small part of such areas is used, and this is devoted to hay production. The higher, better drained ridges, second bottoms, and first bottoms constitute the land used chiefly for cotton and corn.

Plowing is started in winter by some farmers, but many others do their plowing just before planting time. According to general practice, land intended for cotton is bedded, the fertilizer is distributed in a shallow furrow and is covered, and the cotton is planted. Early planting is favored, so that the cotton may mature before the boll weevil becomes too active. Planting is often in early April, but cool, wet weather sometimes delays it until May. The common practice has been to "chop" cotton with hand hoes in order to have a rather thin stand. Many farmers favor planting in rows 3 feet apart and thinning the plants in the row to intervals of the hoe's width, or about 6 inches, leaving from two to five stalks at a place. The best farmers make frequent shallow cultivations, but in some instances the crop is laid by too early. Calcium arsenate has been used by many to poison the boll weevil and leaf worm. The chief varieties of cotton are Half-and-Half, Mebane, Triumph, Acala, and Rowden. The 1920 census shows the average yield of cotton in 1919 as 0.26, or about one-fourth bale, to the acre.

Corn does not yield heavily, but in a good season it has been shown that it is possible, through improved methods, to produce yields larger than the average. The old practice of making the last cultivation of corn a deep one is being discarded rapidly in favor of more frequent shallow cultivation. Another common and progressive step is growing cowpeas, soy beans, or velvet beans along with the corn. The most common varieties of corn are Mosby, Hastings Prolific, and Raymer. Raymer is an important variety developed locally. The 1920 census reports an average production of 11.3 bushels to the acre for 1919. Yields ranging from 40 to 50 bushels to the acre have been obtained on well-drained bottom lands. Better than average yields are also obtained on the uplands, where a sustained effort is made to increase the humus supply through the growing of legumes and the use of barnyard manure.

The terracing of slopes is becoming widespread in an effort to check erosion of the hill lands. To assist in this work, levels are maintained in scattered parts of the county for the use of the farmers. The wide-base terrace, on which crops can be grown, is gradually taking the place of the ordinary ridge type, which has been common.

The supply of barnyard manure is not large, as few animals are kept on the farms and as they are allowed free range.

The fall-sown oat crop is beginning to assume some importance, particularly in years when a feed shortage is threatened. Appler and Red Rustproof (Red Texas) are the common varieties. The crop affords spring grazing and a supply of early summer feed. It is also grown on land most subjected to washing and leaching by rains. Oats are either threshed or fed in the bundle. Cowpeas, soy beans, peanuts, corn, Lespedeza, or late potatoes may follow as a second crop after fall-sown oats.

Rye is occasionally grown as a feed crop and to add humus to the soil. Wheat is of minor importance.

The livestock industry has not developed to any extent, although conditions are improving with encouragement by the banks and the county agent. A serious drawback to cattle raising is the prevalence of the cattle tick which causes Texas fever. This could be overcome by systematic dipping. Other conditions are favorable to the industry. Cottonseed meal, corn, oats, and legume hays can be used for winter feed, and grazing can generally be depended on for a long period. More seeded pastures would add to the grazing capacity of the county, a large percentage of which is cut over and timbered. As land values are low, it would seem that certain phases of the livestock industry should prove successful. Some herds contain good-grade Jerseys.

In recent years hog raising has received considerable impetus, largely through the agency of community club work and assistance from local banks. The razorback is rapidly giving way to good strains of Poland China, Duroc-Jersey, and Hampshire. In the bottom lands, especially in the southern part of the county, hogs subsist largely on mast, roots, and other wild vegetation.

The general farm equipment and buildings, although not elaborate, apparently meet the requirements. In Tables 5 and 6, farm areas and the value of farm property in Bradley County are shown. Data are from the 1920 Federal census.

TABLE 5.—*Farm areas in 1920*

| Area | Total farms | Area in farms | Area per farm | Improved land per farm | |
|---|---|---|---|---|---|
| *Acres* | *Number* | *Per cent* | *Acres* | *Per cent* | *Acres* |
| 421,760 | 1,895 | 34.2 | 76.2 | 44.9 | 34.2 |

TABLE 6.—*Value of farm property per farm in 1920*

| All property | Land | Buildings | Implements | Domestic animals | Land value per acre |
|---|---|---|---|---|---|
| *Dollars* | *Per cent* | *Per cent* | *Per cent* | *Per cent* | *Dollars* |
| 2,388 | 52.0 | 21.5 | 5.7 | 20.8 | 16.29 |

A few tractors are now in use, and many farmers are acquiring improved modern machinery. The 1920 census reports 1,891 horses and 2,108 mules on farms; also 794 beef cattle, 9,623 dairy cattle, 680 sheep, 2,341 goats, 17,257 swine, 47,011 chickens, 4,224 other poultry, and 1,221 hives of bees.

With cotton and corn as the chief crops, not much attention is paid to the practice of definite rotations. Since one of the deterrents to maximum crop production is deficiency of organic matter in the soil, best results can not be expected unless some provision is made for growing soil-improving crops, as the legumes, in a rotation with those crops whose residues add very little humus. Many of the better farmers are growing legumes with the corn. In this way soil productivity is being greatly increased.

The use of commercial fertilizers has increased rapidly during the last few years. The census reported $19,918 expended for this purpose in 1909; $65,466 in 1919; and for the season of 1924 the expenditure is locally estimated as being approximately $100,000. Analyses show that some of the commercial fertilizers used have the following composition: 1.65–10–1,[1] 3–8–3, 2–8–2, 3–10–3, 1–11–0, 3–10–0, and 2–8–6. However, considerable nitrate of soda, superphosphate (acid phosphate), and some kainit have been purchased recently through the Warren Chamber of Commerce. The mixing was done by the farmers themselves, or the materials were used as separate applications.

Cotton receives a very large percentage of the total quantity of fertilizer used. It formerly received from 150 to 200 pounds to the acre, but many farmers now apply from 300 to 600 pounds. The results of experiments conducted by the Arkansas Agricultural Experiment Station indicate that the upland soils need phosphorus, nitrogen, and potash in the order named. The details of fertilizer requirements will be taken up in the discussion of the different soils.

Of the 1,895 farms in Bradley County in 1920, 1,391 were operated by white and 504 by colored farmers. Of the total number, the last census reports 686 farms, a percentage of 36.2, operated by tenants. Two general systems of renting prevail. Where the owner furnishes seed, teams, and tools, he usually receives one-half the crops; where the tenant furnishes the equipment, the owner usually receives one-third of the corn and one-fourth of the cotton. Very little extra labor is employed, except in picking cotton. During the season of 1924 the price paid for picking cotton was about $1 a hundred pounds.

The size of the farms commonly ranges from 40 to 160 acres, with an average of 76.2 acres. Land values range from $10 to $40 an acre, very poor or very good land being priced beyond these limits.

## SOILS

The soils of Bradley County are grouped according to degree of development, position of occurrence, and character of parent material. They are further classified into series on the basis of similarity in color, structure, and drainage. Each series comprises soil types which are differentiated on the basis of texture.

In this discussion, the term "mature soil" is used. A mature soil, in a region where the annual rainfall is 30 or more inches, is a well-drained soil consisting of two distinct layers which may be designated as the surface and the subsoil, underlain by a third layer, the substratum.

The first layer is the comparatively light-textured surface soil. From this layer have been leached most of the fine-textured materials, clay and silt.

[1] Percentages of nitrogen, phosphoric acid, and potash, respectively.

The second layer consists of the comparatively heavy material beneath the surface soil. It might be termed a layer of concentration, for it contains the fine-grained silt and clay brought down from above by the percolating soil water. Here also, the original parent material has been almost completely weathered into clay and silt. Agriculturally, this layer is extremely important, as it affects the supply of soil moisture. It commonly contains a higher percentage of potassium than the other layers, but neither layer contains lime carbonate nor any other easily soluble constituent.

The substratum consists of only slightly weathered or unweathered parent material, representing the kind of material from which the soil above has developed. It is not, as a rule, so heavy in texture as the subsoil layer.

The characteristics common to all well-drained upland soils of Bradley County are (1) a dark surface layer, about an inch thick, consisting commonly of a mixture of leaf mold and soil material; (2) a light-colored layer ranging in color from yellow to brown and in thickness from 12 to 15 inches; (3) a comparatively light textured subsurface layer; (4) a heavier textured yellowish-red or red subsoil continuing to a depth of about 2 feet and underlain by looser material; (5) the absence of lime carbonate throughout and of any accumulation of salts.

The most representative mature soils are the members of the Ruston series, of which the gravelly fine sandy loam, fine sandy loam, and very fine sandy loam have been mapped. The virgin soils of this series commonly have a 1-inch surface covering of dark leaf mold mixed with sandy material. Beneath this the surface soil is brown or yellowish brown. The subsoil consists of friable fine sandy clay, commonly yellowish red in color, which continues to a depth ranging from 24 to 30 inches. The substratum, which has not yet been so thoroughly weathered as the material above, consists of yellowish-red, loose, open fine sandy clay, splotched in many places with red and yellow. Drainage is good.

The members of the Susquehanna series show considerable contrast to those of the Ruston. The features of the very fine sandy loam illustrate the characteristics of these soils. The surface soil consists of a thin layer of leaf mold over yellowish-brown or brownish-yellow fine or very fine sandy loam. The well-defined subsoil of brick-red, heavy, plastic clay continues to a depth of 18 or 20 inches. The unweathered layer, or substratum, is plastic clay mottled with red and gray, the latter color increasing in prominence with depth. On the other hand, Susquehanna silty clay loam is a soil not yet well developed, as it has no layer corresponding to the brick-red heavy plastic clay layer in the very fine sandy loam. The surface soil is brown or reddish-yellow silty clay loam which, at a depth ranging from 4 to 6 inches, merges directly into the imperfectly weathered substratum of plastic clay mottled with red, yellow, and gray.

The Orangeburg soils, of which the fine sandy loam was mapped, are characterized by a brown, light-brown, or yellowish-brown surface layer and by a deep-red or almost blood-red friable subsoil, which continues to a depth of 36 or 40 inches. The substratum is also deep red, but the material is much looser and more incoherent than that in the subsoil layer.

The Moro Bay series is represented by the very fine sandy loam and silt loam. The virgin soils have a thin coating of dark leaf mold and soil particles over the true surface soil, which shades from brown or yellowish brown into reddish yellow where it grades into the subsoil. The subsoil is similar to that of the Ruston soils, in that it has the characteristics of a zone of accumulation of clay material. It is yellowish-red, firm, somewhat friable clay or sandy clay. The substratum begins at a depth ranging from 18 to 24 inches and somewhat resembles that in the imperfectly drained Caddo soils. The upper part is yellow, grading into mottled pale yellow and gray. In many places black concretionary material is present.

The Caddo soils are typically developed in large, smooth areas along the wide, almost level watersheds where drainage is not nearly so good as on the more undulating areas. They give evidence of the influence of excessive moisture for considerable periods of time. Imperfectly drained gentle slopes are also covered by Caddo soils, of which the fine sandy loam, very fine sandy loam, and silt loam members are found in Bradley County. On the soil in wooded areas is the usual thin layer of leaf mold; below this the light-textured surface layer continues to a depth ranging from 10 to 20 inches and is mottled with yellow and gray. The underlying heavy layer is only moderately developed. It consists of sandy clay variegated with yellow, pale yellow, gray, bluish gray, and yellowish brown. At a depth ranging from 3 to 4 feet, a loose mixture of sand and clay also shows various mottled colors. Small iron concretions may be found in any part of the soil. Dome-shaped mounds are scattered irregularly over the surface. In the better drained phases of the Caddo soils the subsoil is more definitely developed and has a yellow color. However, below this the lack of good drainage is again evidenced by the slightly mottled condition of the material.

The second-bottom or terrace soils of Bradley County are grouped in three series, the Kalmia, Cahaba, and Myatt.

The Kalmia soils show much variation, but typically the surface soil is brown or yellowish brown. The subsoil, the most variable layer, in most places is yellow with some faint mottles of gray, is somewhat compact, but is everywhere friable. The substratum commonly contains various mottles of yellow, gray, and reddish brown, and concretionary material is common in it. The very fine sandy loam and loamy fine sand members of this series were mapped.

Cahaba fine sandy loam is brown or rich-brown fine sandy loam grading in color to yellow. The subsoil is reddish-yellow or decidedly red, friable sandy clay. Drainage is well established.

Myatt very fine sandy loam is a poorly drained terrace soil. The surface soil is mottled gray and yellow, and the subsoil is compact clay or waxy, heavy clay, mottled gray and dull yellow.

The first-bottom soils are divided into two groups. The better drained soils are classed in the Ochlockonee series, of which the surface soils are brown and the subsoils yellow. In many places mottles of gray occur in the lower part of the subsoil. Ochlockonee silt loam and Ochlockonee very fine sandy loam were mapped.

The Bibb series represents extensive, poorly drained first-bottom lands. Gray is the dominant color, but the soil is mottled with yellow, yellowish brown, rust brown, and bluish gray. Bibb very fine sandy loam, Bibb silt loam, and Bibb clay were mapped.

The Lufkin soils, represented by the very fine sandy loam, are wet soils occurring in low, nearly level places. To a depth ranging from 12 to 15 inches the soil is mottled light gray and brownish yellow. This layer grades into a wet, sticky, gray and yellow layer. Below a depth ranging from 18 to 28 inches is very stiff, plastic clay, mottled gray and yellow. Iron concretions are common throughout the soil.

Montrose silty clay loam, which represents the Montrose series in this county, has a surface soil 3 or 4 inches thick, mottled rust brown and gray. Below this to a depth of 10 or 12 inches the material is silty clay mottled yellow, gray, and rust brown. This grades into mottled bluish-gray and yellow, sticky, plastic clay.

Prescott very fine sandy loam, the only member of the Prescott series mapped, occurs in only two areas. It consists of gray and rust-brown very fine sandy loam which grades, at a depth of about 10 inches, into sticky, moist, very fine sandy clay, which in turn grades into tough, impervious clay, mottled dull brown or rust brown and gray. Below a depth of 24 inches is very stiff, tough clay which is mottled yellowish brown and gray. The principal difference between the Prescott and Lufkin soils is the prairie condition of the former.

In the following pages of this report the soils are described in detail and their agricultural importance is discussed; the accompanying soil map shows their distribution; and Table 7 gives their name, acreage, and proportionate extent.

TABLE 7.—*Acreage and proportionate extent of soils mapped in Bradley County, Ark.*

| Type of soil | Acres | Per cent | Type of soil | Acres | Per cent |
|---|---|---|---|---|---|
| Ruston very fine sandy loam | 6,336 | 1.5 | Caddo silt loam | 5,760 | 1.4 |
| Ruston fine sandy loam | 29,568 | 7.2 | Kalmia loamy fine sand | 1,344 | .3 |
| Ruston gravelly fine sandy loam | 16,512 | 4.0 | Kalmia very fine sandy loam | 4,544 | 1.1 |
| Ochlockonee very fine sandy loam | 13,952 | 3.4 | Cahaba fine sandy loam | 640 | .2 |
| Ochlockonee silt loam | 26,176 | 6.3 | Lufkin very fine sandy loam | 2,560 | .6 |
| Moro Bay very fine sandy loam | 5,184 | 1.2 | Montrose silty clay loam | 1,408 | .3 |
| Moro Bay silt loam | 1,920 | .4 | Prescott very fine sandy loam | 640 | .2 |
| Susquehanna very fine sandy loam | 14,912 | 5.5 | Myatt very fine sandy loam | 9,856 | 2.4 |
| Steep phase | 7,808 | | Bibb very fine sandy loam | 28,096 | 6.8 |
| Susquehanna silty clay loam | 9,920 | 2.4 | Bibb silt loam | 28,352 | 6.9 |
| Orangeburg fine sandy loam | 2,368 | .5 | Bibb clay | 25,024 | 6.1 |
| Caddo fine sandy loam | 80,640 | 22.0 | | | |
| Better drained phase | 10,944 | | Total | 413,440 | |
| Caddo very fine sandy loam | 74,688 | 19.3 | | | |
| Better drained phase | 4,288 | | | | |

RUSTON VERY FINE SANDY LOAM

Ruston very fine sandy loam, in its natural or virgin timbered state, has a brown surface layer, about an inch thick, consisting of leaf mold mingled with very fine sandy material. Beneath this is yellowish-brown very fine sandy loam which becomes more yellow at a depth of about 4 inches and continues to a depth ranging from 12 to 15 inches. In the next layer have been stored fine particles washed down from above. This layer is 12 or 14 inches thick and consists of yellowish-red friable fine sandy clay. It is underlain by yellowish-red and ocher-yellow friable partly weathered clay which, at a depth of 38 or 40 inches, grades into material practically unaffected by agencies of weathering. In places, small quantities of rounded

quartz gravel may occur on the surface and through the soil. Gravel symbols indicate on the map areas in which the gravel is abundant.

In some localities, particularly in the vicinity of Warren, Ruston very fine sandy loam and Moro Bay very fine sandy loam are so intimately associated that the former, as mapped, may contain small areas of the latter. In these areas slightly imperfect underdrainage has resulted in the formation of a yellow lower subsoil layer. In other included areas a short distance north and northeast of Warren the surface soil is brown or rich-brown very fine sandy loam which grades, at a depth ranging from 6 to 10 inches, into reddish-brown very fine sandy loam. Below this, at a depth ranging from 10 to 14 inches, is brownish-red, friable fine sandy clay loam which averages 3 or 4 inches in thickness and is underlain by friable, red fine sandy clay. In places, fragments of ferruginous or iron-ore rock are scattered over the surface. The distinguishing characteristics of such areas are the predominance of red throughout the soil, its open structure, and its friable consistence.

Ruston very fine sandy loam occurs most commonly on gently sloping and slightly rolling ridges. A few slopes are steep. The largest area is in the vicinity of Warren, but important areas are west and southeast of Parnell Springs, north of Williford School, and scattered elsewhere in the county.

This soil is well drained and desirable for farming, and about 90 per cent of it is cultivated. Pine, oak, and scattered hickory cover the remainder. Cotton and corn are the most important crops. A little truck farming is carried on near Warren. The yields are about the same as on the other Ruston soils, and the same cultural methods are used. Land freshly cleared is first planted to corn.

A few of the more remote areas can be bought for about $15 an acre, but most of the soil commands from $40 to $50 an acre.

As this soil has a finer texture than the other Ruston soils, it has a tendency to pack more readily after rains. However, efficient cultural methods can easily remedy this condition. More attention should be paid to maintaining the supply of humus by growing and turning under leguminous crops.

### RUSTON FINE SANDY LOAM

Virgin Ruston fine sandy loam has a surface layer, an inch thick, of dark-brown fine sandy loam mixed with forest mold, and a second layer of yellowish-brown fine sandy loam which, at a depth of 7 or 8 inches, becomes more yellow and is more coherent. Below a depth varying from 15 to 18 inches is a heavier subsoil layer, which consists of yellowish-red, friable, fine sandy clay continuous to a depth ranging from 24 to 28 inches. This layer is apparently a zone of accumulation or accretion of the maximum quantity of clay or colloidal material. Beneath it, to a depth of 3 feet, is partly weathered material consisting of yellowish-red clay splotched with red and yellow. This quickly grades to the unweathered, unconsolidated material.

The soil is one in which the original minerals have been broken down and the soluble parts largely removed, leaving the soil free from soluble salts, carbonates, or minerals that are readily decomposed. The heavier material has been removed from the surface soil, leaving a high proportion of fine sand, but has accumulated below in

a much heavier clay subsoil, made friable by drainage and aeration to such an extent as to become well oxidized.

The surface of plowed fields, when dry, may be very light brown or almost gray. In places, rounded quartz gravel is present on the surface and through the soil. Where the quantity of gravel is large and the area extensive enough, gravel symbols have been used on the map to show such areas.

Because of the very intricate drainage conditions on numerous ridge tops and slopes, it has not everywhere been possible to separate definitely Ruston fine sandy loam from closely allied soils, such as Moro Bay fine sandy loam and Caddo fine sandy loam, better drained phase. One soil merges with another within comparatively short distances. For instance, a well-drained slope may be covered with typical Ruston fine sandy loam; in the soil up the slope and near the more level ridge top the lower part of the subsoil is slightly mottled with gray and yellow, but retains the yellowish-red color of the upper part; beyond this transitional zone the flatter area on top of the ridge is not so well drained and the upper subsoil layer is yellow, with yellow and gray beneath. Again, there are patches where the upper part of the subsoil is like that of the typical soil, but where, at a depth of 28 or 30 inches, there is somewhat plastic, stiff, compact, reddish-yellow clay. This represents Cuthbert fine sandy loam. Also, in spots where most of the surface soil has been washed away parts of the red clay subsoil have been plowed up and brought to the surface, giving a reddish cast to the soil. Very small areas of Ruston loamy fine sand are included with Ruston fine sandy loam. Some of these occur 1 mile east of Morobay, north of Hortons Island, 3½ miles southeast of Marsden, and 1½ miles northwest of Wagnon Church.

Ruston fine sandy loam is one of the extensive upland soils of Bradley County. It occurs on well-drained slopes and tops of ridges. About 85 per cent of it is in cultivation, and the remainder supports a forest growth of shortleaf pine, loblolly pine, various oaks, and a few hickory.

Cotton and corn are of major importance, yields of the former averaging one-third bale and of the latter from 12 to 15 bushels to the acre. With proper cultural methods and the intelligent use of fertilizer, from one-half to three-quarters bale of cotton to the acre is obtained, whereas corn yields may be between 20 and 30 bushels to the acre. Fertilizers used are about the same as those used on Ruston gravelly fine sandy loam.

The acreage devoted to fall-sown oats has been rapidly increasing. Most of the crop is fed in the sheaf, but some of it is threshed. In one instance, oats fertilized at planting time and later top-dressed with fertilizer yielded 65 bushels to the acre.

Velvet beans, cowpeas, and soy beans are planted extensively, most commonly with the corn, but cowpeas, soy beans, and peanuts are also grown alone as feed crops. Considerable sorghum is grown for sirup and hay.

Nancy Hall and Porto Rico sweet potatoes are grown on many farms. The quality is good, and yields range from 125 to 200 bushels to the acre. There appears to be no good market for this product, some of which is fed to hogs. Potatoes of the Red Triumph variety are commonly grown in small areas for home consumption.

During the present season (1925) an effort is being made to raise tomatoes commercially, the young plants being started in coldframes. In one instance more than 4¼ tons of Jersey Wakefield cabbage were obtained from one-half acre which had been heavily fertilized. Practically all the ordinary vegetables do well, as do also strawberries, raspberries, and blackberries.

Many small home peach orchards, a few of which have recently been pruned and well cared for, give excellent promise. Apples do not thrive. Small scattered vineyards indicate that the soil and climate are well adapted to grape production.

Farmers living on this soil usually allow their cattle and hogs to run on the open range.

Current values of Ruston fine sandy loam range from $15 to $25 an acre. Unfavorable or exceptionally good locations command prices below or above these limits.

During the formation of Ruston fine sandy loam much of the soluble salts and readily decomposable minerals (plant food) were removed. Therefore, when the land is first cleared and cultivated it does not contain a large quantity of necessary elements. It is especially poor in phosphorus and almost equally so in nitrogen. Potassium is not abundant, but most crops do not require this element in so large a quantity as the first two mentioned.

To obtain better results on this soil it is essential that the supply of organic matter be increased and then maintained. Under the present system of farming, the land lies idle and bare after the crop has been gathered, thus allowing it to be washed and leached until it is plowed the following spring. Hence, in a few years after "fresh" land has first been cultivated, yields decline rapidly. As the supply of organic matter becomes depleted, the land can not absorb and hold rainfall as it should and is unable to withstand drought. All farmers, realizing that they can not produce something from nothing, have been relying more and more on commercial fertilizers.

However, it should be noted that the best results can not be obtained from the use of commercial fertilizers, unless there is sufficient organic matter to keep the soil in good physical condition and able to hold moisture. Conclusive proof of this was furnished during the drought of 1924. Where land was plowed early the following year commercial fertilizer could be seen exposed on the surface. It had not become available to the crop because of insufficient moisture in the soil. The fact that Lespedeza will not attain much growth on the upland soils may be due to lack of humus.

The supply of organic matter can be increased through the use of barnyard manure, all of which should be carefully saved. Cornstalks and cotton stalks should be plowed under. It is highly important that definite rotations, including cowpeas, soy beans, or velvet beans, be adopted. Winter cover crops, such as oats, rye, or bur clover, would tend to prevent washing of the soil and leaching of the plant-food elements.

The use of commercial fertilizers should be most profitable where these conditions are met. The results of Arkansas experiments indicate that from 300 to 400 pounds to the acre of a 3–9–3 or 4–10–4 fertilizer are profitable for cotton. With manure, 200 pounds to the acre of superphosphate (acid phosphate) make a good combination.

Where there is some organic matter in the soil the quantity of nitrogen can be reduced. Also where the soils tend to be heavy less potash may be used. Kainit is successfully used to combat rust.

Some farmers say that the use of commercial fertilizers on corn means the difference between success and failure. Under present soil conditions from 200 to 300 pounds to the acre of fertilizer analyzing from 8 to 10 per cent phosphoric acid, 2 or 3 per cent nitrogen, and 2 or 3 per cent potash is sufficient.

During the progress of this soil survey many instances were noted of the laying by of cotton and corn too early. The better farmers make frequent shallow cultivations.

Ruston fine sandy loam offers exceptional opportunities for the commercial production of peaches, grapes, and truck crops.

### RUSTON GRAVELLY FINE SANDY LOAM

The surface soil of Ruston gravelly fine sandy loam consists of brown gravelly fine sandy loam underlain, at a depth of about 6 inches, by reddish-brown, sticky, gravelly fine sandy loam. The subsoil, beginning at a depth ranging from 10 to 15 inches and continuing to an average depth of 30 inches, consists of a mass of quartz gravel, bound together by reddish-brown or yellowish-red sandy clay. The unweathered layer, or substratum, is not nearly so coherent as the material of the layer above. It is made up of mingled quartz and chert gravel and rather loose sandy material. Although the gravel is present in variable quantities, in most places there is enough to dull the farm tools used in tillage operations. Gravel constitutes from 25 to 50 per cent of the mass of the surface soil. Below this layer it is more abundant, and pits show the gravel to a depth of at least 20 feet. Both surface soil and subsoil show an acid reaction.

In some places Ruston gravelly fine sandy loam and Ruston fine sandy loam are so intimately associated that it was not deemed practical to separate them in mapping. Gravel symbols were used to indicate the more extensive and pronounced gravelly areas. The total area of Ruston gravelly fine sandy loam is considerably larger than the figures of the report would indicate, as some of it was mapped as Ruston fine sandy loam with gravel symbols.

Between Banks and Jersey areas of typical Ruston gravelly fine sandy loam are associated with small areas in which the subsoil is red, approaching the Orangeburg soils in color. Such areas are not sharply defined and were not extensive enough to map separately. Here, also, are included small areas of Susquehanna gravelly fine sandy loam, which occur as narrow strips or belts on the lower slopes of hills. The subsoil in these areas is stiff, plastic, red clay. In the extreme northeast corner of the county at Harmony School the material is coarse enough to be classified as gravelly sandy loam, but it is of comparatively small extent.

This soil has a fairly wide distribution in Bradley County, but the chief development is in the vicinity of Jersey and northward toward Banks, in the vicinity of Gravelridge, and between Hermitage and Warren. It most commonly occurs on the higher ridge crests and slopes bordering drainage ways. The relief ranges from almost level to gently or steeply sloping. The level ridge tops are not large and are surrounded by slopes. The topographic position and the friability of the soil materials insure excellent drainage.

The total area of Ruston gravelly fine sandy loam is not large. Although the gravel has a tendency to retard cultural operations, this is one of the best and most highly favored soils in the county. At least 90 per cent of it is under cultivation. The remainder is timbered with pine, oak, and hickory.

Cotton and corn are by far the most important crops on this soil. Velvet beans, cowpeas, and soy beans are grown to some extent, usually with the corn, being planted either in the middles or in the row. There are a number of small home orchards. The average yield of cotton is about one-third bale to the acre and of corn from 12 to 15 bushels. Some farmers obtain from one-half to three-quarters bale of cotton to the acre and from 20 to 25 bushels of corn.

The kind and quantity of fertilizer used on cotton varies greatly. In many places the old custom of using from 150 to 200 pounds to the acre still prevails, but in recent years the practice of using from 250 to 300 pounds is common. Some farmers use as much as 600 pounds. Where it is available manure is highly valued. Home-mixed fertilizers consisting of two parts of superphosphate and one part of nitrate of soda are frequently used. Many farmers use various combinations of superphosphate and cottonseed meal; others apply ready-mixed complete fertilizers both of high and low analyses. In some instances commercial fertilizers are used on corn at the rate of 200 pounds to the acre.

The current selling price of Ruston gravelly fine sandy loam varies from $15 to $25 an acre. For areas especially well located with reference to towns or main roads the value may be as high as $40 an acre.

As this soil occurs on rather steep slopes, it has a tendency to wash badly. Hundreds of acres have been terraced, and practically all areas should be treated in this manner. Wide-base terraces which can be cultivated are favored. For detailed suggestions as to soil improvement consult the recommendations given for Ruston fine sandy loam.

### OCHLOCKONEE VERY FINE SANDY LOAM

The surface soil of Ochlockonee very fine sandy loam consists of brown very fine sandy loam which grades in color, at a depth of 12 or 14 inches, to yellow. This may continue to a depth of 40 or more inches, or it may become heavier with depth and grade, at a depth ranging from 18 to 24 inches, into yellow very fine sandy clay which in places shows faint mottles of gray at a depth ranging from 30 to 36 inches. Tests indicate that the soil is acid.

Three miles southeast of Carmel Church the subsoil is decidedly gray. It ranges from very fine sandy loam to silty clay loam. In the vicinity of Long View Ferry the surface soil of brown very fine sandy loam grades into yellow very fine sandy loam, and below a depth ranging from 24 to 30 inches the material is pale-yellow very fine sandy loam mottled somewhat with gray. Nearer the river the soil is brown loamy very fine sand which becomes light yellow with depth and which, below a depth of 16 or 18 inches, is light gray. Along Saline River and southeast of Warren the texture is fine sandy loam. Near the river bridge on the Warren-Monticello road the soil is brown loamy fine sand, grading at a depth of 4 or 5 inches

into light yellowish-brown loamy fine sand and at a depth of 18 inches into yellowish-brown fine sandy loam or fine sandy clay.

This is a well-drained first-bottom soil found in widely scattered parts of the county, notably along the upper reaches of Eagle Creek, the small branches entering Saline River, south of Warren, along Beech Creek, 1½ miles southeast of Morobay on Ouachita River, and along Saline River and other streams.

At least 50 per cent of this soil is cultivated. Cotton, corn, and hay are the important crops. Velvet beans or cowpeas are sometimes planted with the corn. Yields of cotton range from one-third to one-half bale to the acre and of corn from 12 to 25 bushels.

With the exceptions of a few very sandy areas and some that are imperfectly drained, Ochlockonee very fine sandy loam is highly valued for crop production. Superphosphate would be beneficial to the cotton crop. Higher areas above overflow would make good truck lands.

### OCHLOCKONEE SILT LOAM

Ochlockonee silt loam consists of mellow, rich-brown silt loam which, with increasing depth, becomes a little heavier in texture and lighter in color. Below a depth of 18 inches the material is brownish-yellow or yellow heavy silt loam or silty clay loam. It has an acid reaction.

In many places, as in an area one-quarter mile north of Pattsville, the subsoil is imperfectly drained. Here rich-brown silt loam grades, at a depth ranging from 15 to 18 inches, into yellowish-brown silt loam, which in turn grades, at a depth of 24 or 26 inches, into yellow silty clay loam. Below a depth ranging from 28 to 34 inches the subsoil is silty clay, mottled pale yellow and gray.

The preceding descriptions apply to the soils of the creek bottoms, but along Saline River areas show some variations. In places the material is silty clay loam in texture and is dark brown on the surface. These areas are locally called black land. About 4 miles southeast of Warren, along Saline River, the soil is light-brown silt loam grading, at a depth of 6 or 8 inches, into yellow silty clay loam. Below a depth of about 28 inches the material is compact pale-yellow and light bluish-gray fine sandy clay. In included poorly drained depressions the light bluish-gray and pale-yellow material is near the surface. Some areas consist of Bibb silt loam or of gray silty clay loam. In another area in the same vicinity the soil consists of a 6-inch layer of rich-brown silt loam which is abruptly underlain by yellowish-brown silty clay loam and, at a depth of 12 inches, by yellow silty clay. Below a depth of 26 or 28 inches there is plastic silty clay mottled yellow and bluish gray.

Ochlockonee silt loam is an extensive first-bottom soil. In the creek bottoms it has a level or hummocky surface, and abandoned channels and sloughs are numerous. The Saline River bottoms vary decidedly in elevation above overflow.

In general, drainage is fair or good, although it is poor in the included smaller areas of the Bibb soils. The timber growth consists of red gum, sweet gum, hickory, holly, oak, ironwood, sycamore, birch, beech, elm, maple, and, in places, pine.

About 2 per cent of the total area of this soil is in cultivation. Corn is the chief crop, together with cotton, cowpeas, oats, Lespedeza,

and ribbon cane. The yield of corn ranges from 15 to 40 bushels to the acre, without fertilization, and of cotton from one-third to one-half bale. In several fields where cotton inclined to rank growth rather than to fruiting the use of superphosphate proved successful. A few farmers use oats and Lespedeza in combination. During most seasons the soil does not warm up quickly and planting is late.

The average current price for this soil is reported as being $15 an acre, but some improved farms are said to be held at prices ranging from $30 to $40 an acre.

This is one of the most fertile soils in Bradley County, as it is much richer in nitrogen than the upland soils. The fact that so little of this soil is cultivated is largely owing to its susceptibility to overflow. Along the creeks the overflow is caused chiefly by the débris which fills the channels. Straightening and clearing some of these channels and constructing ditches, large or small as the case demands, would reclaim large areas of good land. Under present conditions Lespedeza would be a very desirable crop.

### MORO BAY VERY FINE SANDY LOAM

Moro Bay very fine sandy loam in forested areas is a fairly dark-brown mixture of leaf mold and very fine sandy loam to a depth of 1 inch. This grades into yellowish-brown very fine sandy loam continuing to a depth of 6 or 8 inches and this to reddish-yellow heavy very fine sandy loam continuing to a depth of 10 or 12 inches. The subsoil below is a well-developed layer in which has been concentrated colloidal or clay particles, washed down by percolating water from the topsoil above. It is yellowish-red, friable very fine sandy clay and continues to an average depth of 18 inches. Between depths of 18 and 24 inches is yellow very fine sandy clay, which is underlain by compact pale-yellow very fine sandy clay material mottled with gray and commonly containing some rust-brown concretions. Small quantities of quartz gravel are present in many places throughout the soil.

In a number of areas between Warren and Carmel School and east of the main highway the surface 8-inch layer consists of rich-brown, mellow, very fine sandy loam which grades into reddish-brown heavy very fine sandy loam. Between depths of 10 and 14 inches is yellowish-red, slightly plastic clay which grades into rather stiff yellow clay continuous to a depth of 20 inches. The next lower layer consists of compact clay mottled pale yellow, yellowish brown, and gray and containing dark concretions.

Moro Bay very fine sandy loam occurs north of Warren and east of Morobay on almost flat or gently sloping ridges. The upper part of the soil, closely resembling that of the Ruston soils, is well drained. The lower layers bear a close resemblance to Caddo very fine sandy loam, and drainage is somewhat deficient.

This soil is highly valued for crop production, and about 60 per cent of it is cultivated. Much of the remainder is owned by lumber companies. Pine and oak form the principal timber growth.

Cotton and corn are the leading crops. A little truck farming is carried on near Warren. The yields are good, about the same as on

the Ruston soils. It is said that the soil packs and quickly forms a crust after rains, but generally the cultural methods are good and take care of this condition. On one farm vegetables were fertilized with a 2.47–10–3 fertilizer.

Moro Bay very fine sandy loam is classed among the better upland soils of Bradley County, but it requires more organic matter, which can be supplied by legume crops. The addition of organic matter would also improve the physical condition of the soil. For cotton it would pay to use from 300 to 400 pounds to the acre of fertilizer rich in phosphorus and nitrogen.

### MORO BAY SILT LOAM

Moro Bay silt loam in forested areas has a 1-inch surface layer of dark-brown leaf mold mixed with silt loam. Under this is brown silt loam, and between depths of 4 and 6 inches is yellowish-brown silt loam. At a depth of 6 or 7 inches reddish-yellow clay loam appears. This grades, at a depth ranging from 8 to 10 inches, into yellowish-red friable clay which is continuous to a depth of 20 or 24 inches. The material below is yellow or reddish-yellow silty clay, and below a depth of about 28 inches mottled pale-yellow and gray silty clay occurs. In places concretionary material appears in this lower layer.

Some variations occur in scattered areas. Rich-brown silt loam grades, at a depth of 6 inches, into light-brown silty clay loam, underlain at a depth of 14 inches by yellow silty clay. Below a depth of 26 inches the material is sandy clay, somewhat plastic and mottled yellow, reddish yellow, and red.

Moro Bay silt loam occurs only in the vicinity of Warren and a few miles north of that city. It is not very extensive. It occupies almost level or gently sloping areas where surface drainage is fair or good but underdrainage is rather poor.

Wooded areas support oak, pine, hickory, and buckeye trees, and sparkleberry bushes. About 80 per cent of this soil is cleared and used for the production of cotton, corn, and truck crops, and for pasture land.

From $15 to $20 an acre is probably a high price for this land, except for areas near Warren.

Moro Bay silt loam is a good soil but requires careful management. It is inclined to clod easily. It needs organic matter and drainage would benefit some areas.

### SUSQUEHANNA VERY FINE SANDY LOAM

In forested areas, virgin Susquehanna very fine sandy loam has a surface layer, an inch or more thick, of dark-brown very fine sandy loam which contains a high percentage of organic matter, largely leaves in various stages of decomposition. Under this coating is brown very fine sandy loam which grows lighter in color with increasing depth until it has a more yellowish cast. The average thickness of the surface soil is about 10 inches. It is strongly acid. This soil exhibits mature characteristics in that it has a well-developed subsoil where fine clay particles have accumulated in brick-red plastic clay. It is heavy and sticky when wet, and at all times is dense and tight. This layer is from 8 to 10 inches thick, and it, too, is very strongly acid. The transition from surface soil to subsoil

is rather abrupt. The layer representing partly weathered or unweathered parent material, the substratum, begins at a depth of 18 or 20 inches. This material consists of plastic clay mottled red and gray, the latter color growing more prominent with depth.

One variation in this soil is in the thickness of the surface layer of very fine sandy loam, which may vary from 5 or 6 inches on slopes subject to washing to 15 inches in more nearly level areas. Red clay crops out in spots where the topsoil has been washed away. Some areas are really Susquehanna gravelly very fine sandy loam. Practically all this variation occurs northwest and east of Banks, and gravel symbols have been used to indicate gravel where it occurs in large quantities.

A very large part of the total area of Susquehanna very fine sandy loam is in the northern part of the county. Extensive areas are northwest of Banks, in the vicinity of Weeks School and Parnell Springs, and northwest and south of Warren.

Most of this soil occurs on gentle or moderately steep slopes and on the crests of ridges which are well drained by numerous streams. Most of these streams are intermittent and have gradients that allow surface water to be quickly removed. About 15 per cent of the total area is in cultivation. The remainder is largely cut-over land representing old forests of pine, oak, and some hickory.

Cotton and corn are the leading crops. The average yield of cotton is from one-quarter to one-third bale and of corn from 10 to 15 bushels to the acre. Sweet potatoes do well, yielding as much as 200 bushels to the acre.

The current range in the selling price of this soil is said to be from about $10 to $20 an acre.

Susquehanna very fine sandy loam represents a considerable area of potential farm land. It is especially adapted to the production of cotton and sweet potatoes.

To improve this soil, the supply of organic matter should be increased and areas should be carefully terraced, as much of the soil is very susceptible to erosion. It is likely that cotton could be produced with less potash fertilizer than on the sandier hill soils. The heavy, plastic subsoil is not favorable to the production of peaches. Young trees apparently do well until the roots begin to come in contact with this heavy layer. Then the trees quickly decline in vigor.

*Susquehanna very fine sandy loam, steep phase.*—Practically all of the steep phase of Susquehanna very fine sandy loam is found in the Saline River hills, on the west side of the river. It extends from a point immediately southeast of Warren to a point below Johnsville, a linear distance of 18 miles.

Inasmuch as the areas are steeply sloping, the soil changes quickly within short distances, varying from Susquehanna very fine sandy loam or fine sandy loam to clay. A very intricate system of numerous gullies and many stream channels has carved deeply into the hills, the drainage ways having a fall steep enough to carry rainfall quickly to Saline River. The tops of the ridges are from 75 feet to more than 100 feet above the main valleys.

Practically none of this land is in cultivation, and most of it is held by lumber companies. Pine is the predominant growth, with a scattering of oak.

Table 8 shows the results of mechanical analyses of samples of the surface soil, subsurface soil, and subsoil layers of typical Susquehanna very fine sandy loam.

TABLE 8.—*Mechanical analyses of Susquehanna very fine sandy loam*

| No. | Description | Fine gravel | Coarse sand | Medium sand | Fine sand | Very fine sand | Silt | Clay |
|---|---|---|---|---|---|---|---|---|
| | | *Per cent* | *Per cent* | *Per cent* | *Per cent* | *Per cent* | *Per cent* | *Per cent* |
| 462396 | Surface soil, 0 to 1½ inches | 0.0 | 0.4 | 0.2 | 35.4 | 27.2 | 26.9 | 10.6 |
| 462397 | Subsurface soil, 1½ to 4 inches | .4 | .4 | .4 | 42.1 | 23.0 | 26.5 | 7.0 |
| 462398 | Subsurface soil, 4 to 10 inches | .0 | .4 | .2 | 30.2 | 34.6 | 24.8 | 9.2 |
| 462399 | Subsoil, 10 to 18 inches | .0 | .2 | .0 | 15.4 | 19.8 | 17.8 | 47.0 |
| 4623100 | Subsoil, 18 to 36 inches | .0 | .0 | .2 | 20.0 | 20.8 | 22.5 | 36.9 |

### SUSQUEHANNA SILTY CLAY LOAM

Virgin Susquehanna silty clay loam has a 1-inch surface layer of dark-brown or even darker silt loam, underlain by brown or light reddish-yellow silty clay loam from 4 to 6 inches thick. Unlike Susquehanna very fine sandy loam, this soil is immature, as weathering processes have not produced a well-defined subsoil layer, or zone of red clay accumulation. In other words, the surface soil, though rather shallow, is immediately underlain by the substratum, which consists of mottled reddish-yellow, gray, and brownish-red silty clay, and grades, at a depth of about 12 inches, into plastic clay, mottled red, yellow, and gray. The Soiltex test indicates an acid condition.

There are so many variations in this soil that their total area almost equals that of the typical soil. In one place, about 4 miles west of Warren, the soil is brown silt loam grading, at a depth varying from 3 to 5 inches, into heavy, plastic, red clay underlain, at a depth ranging from 15 to 18 inches, by mottled red and bluish-gray, plastic clay which is extremely sticky when wet. Another variation occurs one-half mile south of Warren. Light-brown silt loam grades, at a depth of 4 inches, into yellowish-red or buff heavy clay which is mottled with pale yellow at a depth of 12 inches. At a depth of 16 inches it is mottled red and bluish-gray plastic clay.

Just northeast of Warren the soil is rich-brown silty clay loam to a depth of 4 or 6 inches. Within short distances the layer below this may be mottled red and gray plastic clay or pale-yellow plastic clay which is mottled red and gray at a depth of 18 or 20 inches. About 6 miles south of Warren a slope is covered with mottled red and pale-yellow, plastic, heavy clay which grades downward into mottled red and grayish-yellow plastic clay, the red decreasing with depth until at a depth of 18 or 20 inches the color is pale yellow with light bluish-gray mottling. Near by there is a shallow covering of fine sandy loam, and at another place the surface soil consists of red clay loam 3 or 4 inches thick.

Small, scattered areas of Susquehanna fine sandy loam are included in mapping. These differ from the silty clay loam chiefly in the texture of the material. They occur generally on slopes susceptible to erosion and have a lower value than the typical soil. The larger areas are those 1¾ miles northwest of Wagnon Church and north of Lanark School.

Susquehanna silty clay loam occurs almost wholly in the northeastern part of Bradley County. The largest area lies between Warren and Parnell Springs. Another is in the immediate vicinity of Warren, and isolated areas are south of Warren.

Typically, the larger areas are almost flat or very gently undulating, and surface water is not readily removed after rains. The heavy clay subsoil, also, does not readily allow the downward movement of water. For this reason the land must be plowed only when the moisture content is favorable, or large, intractable clods will result. Small areas are on gentle slopes, where the surface drainage is good.

About 15 per cent of this soil is in cultivation, and most of the remainder has been cut over. It is said that the original tree growth consisted largely of hickory and oak, although at present pine is making much headway.

Cotton is the main crop. Some corn is grown, and a fair acreage is devoted to pasture. Cattle and hogs range the forest. The cotton yield is largely influenced by the season. A wet season may result in almost total failure, whereas good weather may bring a yield of one-half bale or more to the acre. On one farm, the crop was fertilized with a complete mixture applied at the rate of 200 pounds to the acre.

Near Warren this land is held at prices ranging from $25 to $40 an acre, but farther away the cut-over land sells for about $10.

Susquehanna silty clay loam must be carefully managed. Undoubtedly, ditching would be beneficial. Where drainage is good, large areas of this soil are well adapted to cotton production. It is believed that the use of potash could be largely dispensed with for the cotton crop. The lay of the land makes it favorable for the production of hay, particularly Lespedeza. Instead of preserving the comparatively poor range now afforded to live-stock, it would be better to build fences and seed pastures.

### ORANGEBURG FINE SANDY LOAM

Virgin Orangeburg fine sandy loam has a 1-inch surface layer of brown fine sandy loam mixed with grass roots and forest mold. Below this a layer from 15 to 18 inches thick of yellow or yellowish-brown fine sandy loam grades into reddish-brown compact fine sandy loam which is 2 or 3 inches thick. These layers constitute the material which has been leached of most of its fine particles and soluble minerals. The subsoil continues to a depth ranging from 36 to 40 inches. The material is deep-red, almost blood-red, friable fine sandy clay, which becomes somewhat hard in dry seasons and which contains a concentration of fine material washed from the soil above. The substratum, representing in its upper part partly weathered material, is also red but is not so heavy as the material above. It is more open sandy clay, with faint spots of gray appearing at a depth of about 7 feet. Both surface soil and subsoil give an acid reaction.

In areas 2½ miles northwest of Johnsville and 2½ miles northwest of Banks the surface soil of fine sandy loam is from 24 to 30 inches in thickness. On the other hand, there are patches where erosion has removed enough of the sandy mantle to give the surface a reddish cast in plowed fields. Such areas resemble the Greenville

soils. In a number of places the quantity of chert and quartz gravel is large enough to form Orangeburg gravelly fine sandy loam, but such areas were not sufficiently numerous to separate. They are indicated on the map by gravel symbols.

Orangeburg fine sandy loam occurs in widely scattered, isolated areas. Representative areas are west of Wagnon Church and 2 miles north of Hermitage. The soil occurs on rolling hills which are well drained. Most of it is good farming land, and almost 95 per cent of it is cultivated.

One-third bale of cotton and 15 bushels of corn to the acre are average yields. Some good farmers, however, obtain nearly one-half bale of cotton and 20 bushels of corn to the acre. Velvet beans, cowpeas, and soy beans are grown to some extent. Small patches are devoted to vegetables. The soil is well adapted to growing peaches.

Depending on the location and improvements, land of this kind is said to sell between $15 and $40 an acre.

Orangeburg fine sandy loam is one of the desirable soils of Bradley County. By maintaining a good supply of organic matter and using from 300 to 400 pounds to the acre of commercial fertilizer, good yields of cotton can be obtained. Phosphorus and nitrogen, especially, are needed. Terraces are needed over most of this soil to prevent gullying.

### CADDO FINE SANDY LOAM

Caddo fine sandy loam in forested areas has a 1-inch dark-brown surface layer of leaf mold mixed with fine sand. Beneath this, mottled gray and yellow fine sandy loam or yellow fine sandy loam quickly grades into mottled pale-yellow and gray fine sandy loam. The surface soil ranges in thickness from 12 to 24 inches, averaging about 20 inches. The subsoil is fine sandy clay, which is usually wet and which may be loose and mushy. The color mottles show various shades and combinations of yellow, pale yellow, gray, bluish gray, and yellowish brown. Below a depth of 45 or 50 inches the material is mottled or splotched sandy clay which may contain iron concretions. Quartz and chert gravel may be found in any part of the soil. The surface of plowed fields has a gray shade. The various layers are very strongly acid.

Over wide areas, dome-shaped mounds occur at irregular intervals. They range from 2 to 4 feet in height and from 15 to 20 feet in diameter. The soil on these mounds varies. It may consist of light-brown fine sandy loam underlain at a depth of 3 or 4 inches by yellow fine sandy loam which grades, at a depth ranging from 12 to 15 inches, into yellowish-red friable fine sandy clay. Or, instead of this heavier layer, the material may become lighter in texture, becoming pale-yellow loamy fine sand.

Caddo fine sandy loam shows some variation within short distances, principally in the character of its subsoil. A variation of common occurrence is found in an area one-half mile southwest of Pattsville. Here the soil, to a depth of 1 or 2 inches, is light-brown fine sandy loam underlain by mottled gray, yellow, and brownish-yellow fine sandy loam. At a depth of about 6 inches the mottling becomes lighter, and near a depth of 3 feet the fine sandy loam, especially where it is water-logged, has little firmness and runs like quicksand.

Along streams some of the areas mapped as Caddo fine sandy loam show many differences, owing to the washing in of material from near-by hills. In places narrow strips of alluvial soils are included.

This is one of the most extensive soils in Bradley County. One large belt, known as flatwoods, begins 5 miles south of Banks and, with only minor interruptions, extends 12 miles to Marsden. Another large area is roughly bounded by Pattsville, Ingalls, Vick, and Johnsville.

The surface of this soil is characteristically flat over the large areas, but the soil occurs also on low, gentle slopes along the bases of ridges. In both situations drainage is poor, and the soil is subject to the influence of excessive moisture for considerable periods.

Although Caddo fine sandy loam has a large acreage, not more than 2 per cent of it is in cultivation. At one time it supported a good stand of shortleaf pine of excellent quality, but most of this has been cut and the remainder is rapidly disappearing. There is a scattering of oak and a little gum. Few farms are composed entirely of this soil, most of the cultivated area representing poorly drained parts of fields that are composed largely of better soils.

Cotton, corn, cowpeas, and hay are grown. The yield of cotton ranges from one-sixth to one-third bale and of corn from 8 to 12 bushels to the acre. The forested areas are used as open range for cattle and hogs.

The average selling price of this land at this time (1925) is said to be about $10 an acre. Much of it is held by lumber companies.

It is believed that the greater part of the Caddo fine sandy loam, with its poor drainage and apparent lack of plant food, is not suited to growing cotton and corn. Analyses, made by the Arkansas Agricultural Experiment Station, show that the percentages of nitrogen and phosphorus present are very low. In other sections similar soils, when ditched and drained, have produced strawberries successfully. However, one of the best examples of managing this soil profitably is at Vick. Here a rather large acreage is devoted to Lespedeza, and the hay is sold locally.

*Caddo fine sandy loam, better drained phase.*—The better drained phase of Caddo fine sandy loam has a surface layer of dark-brown forest mold and earthy material from one-half to 1 inch in thickness. Beneath it is light-brown or grayish-brown fine sandy loam which grades, at a depth of about 6 inches, into yellow, heavy fine sandy loam. The subsoil begins at a depth of 12 or 14 inches, averages about a foot in thickness, and consists of bright-yellow fine sandy clay or pale-yellow fine sandy clay with an occasional splotch of yellowish brown. Below this layer, at a depth of 24 or 26 inches, is mottled gray, yellow, and brownish-yellow fine sandy clay containing in some places black concretions. In other places it may be noticeably compacted, resembling a hardpan. Iron concretions may be scattered over the surface and throughout the soil. Small, rounded quartz and chert gravel are also distributed in this manner, but not in great abundance. In the areas 2¼ miles northeast of Marsden and 1¼ miles northeast of Hopewell School the subsoil is friable, yellow fine sandy clay to a depth of 36 or more inches. Here the soil is Norfolk fine sandy loam. It was not extensive enough to show separately.

The better drained phase of Caddo fine sandy loam does not occur in large areas as does the typical soil, but in the aggregate it covers a considerable acreage. Practically all of it occurs in a wide east-west belt in the middle of the county. It represents a transition, both in characteristics and in position, between the well-drained Ruston soils and the poorly drained typical Caddo fine sandy loam. For instance, where the larger streams have cut rather deeply into the uplands, their alluvial belts are bordered by pronounced ridges of well-drained Ruston soils; retreating from this margin of good drainage, the slope becomes more gentle as it merges and spreads out into the poorly drained flatwoods. Near the heads of streams, where the bordering ridges and slopes are not so pronounced and where drainage is not sufficiently well developed, Ruston soils do not occur, and the better drained phase of the Caddo soil is the only transitional soil. It is this transitional zone that characterizes the phase and justifies its separation. An excellent example of this development is along Beech Creek between Hermitage and Jersey. Other areas are on isolated, low ridges in the large tracts of the typical soil.

Drainage conditions vary from fair to almost as good as on the Ruston soils. This soil is highly valued for the ordinary crops of the region. About 25 per cent of it is cultivated. Most of the remainder is cut-over land owned by lumber companies. Pine and some oak constitute the timber growth.

From one-quarter to one-third bale of cotton and from 8 to 12 bushels of corn to the acre are the usual yields, but with favorable conditions and good methods these yields are often exceeded to a marked degree. Cotton land receives from 200 to 300 pounds to the acre of complete fertilizers or a mixture of 2 parts of superphosphate to 1 part of nitrate of soda.

The current selling price of this soil ranges from $10 to $15 an acre.

After this soil has been cultivated for a few years it is in need of humus. Legume crops should be grown to supply this deficiency. Maintaining the supply of organic matter usually means the difference between success and failure. Complete fertilizers, analyzing 3–9–3 or 4–10–4, should be used at the rate of 300 or 400 pounds to the acre for cotton. Corn may be fertilized with a smaller quantity, but for this crop more dependence should be placed on the fertilizer value of velvet beans, cowpeas, or soy beans. The growing of peanuts in conjunction with hog raising could well be practiced on this soil.

### CADDO VERY FINE SANDY LOAM

Virgin Caddo very fine sandy loam has a 1-inch surface layer of brown very fine sandy loam over pale-yellow very fine sandy loam slightly mottled with gray. At a depth of 10 or 12 inches this grades into pale-yellow very fine sandy loam mottled with light bluish gray. Below a depth ranging from 20 to 24 inches there is bluish-gray very fine sandy clay mottled with pale yellow. This material is rather mushy when wet. Small quantities of iron concretions and rounded quartz gravel may be found from the surface down.

In extensive, widely scattered areas, the topsoil is mottled gray and yellow very fine sandy loam and grades, at a depth of 12 or 15

inches, into mottled gray, yellow, and brownish-yellow heavy very fine sandy loam which continues to a depth exceeding 36 inches. In contrast to this light-textured variation there are areas where yellow very fine sandy loam is underlain, at a depth of 6 or 8 inches, by mottled yellow and gray heavy very fine sandy loam, continuous to a depth ranging from 12 to 15 inches. This in turn is underlain by yellow or brownish-yellow and bluish-gray heavy very fine sandy clay, commonly of rather gummy consistence. This variation occurs mostly in the northwestern part of the county, where it is slightly influenced as to consistence by the near-by formations giving rise to the Susquehanna soils. For instance, about 10 miles west of Warren, along the old Camden road, the subsoil consists of mottled gray, bluish-gray, and yellow friable very fine sandy clay, but at a depth of 40 inches the material overlies mottled bluish-gray, yellow, and red heavy plastic clay. Here the soil in all layers is very strongly acid.

Included with Caddo very fine sandy loam are some low, wet areas which have the heavy subsoil of Lufkin very fine sandy loam. Such areas occur 1 mile northwest and 1¾ miles southwest of Sunnyside School. Northeast of Morobay there are included spots of Caddo silt loam. In many sections, such as south of Jersey and Vick, the boundary between Caddo very fine sandy loam and Caddo fine sandy loam is so indefinite that it was necessary to draw a rather arbitrary boundary between them on the map.

Characteristic and numerous dome-shaped mounds consist of brown very fine sandy loam, grading, at a depth of 8 inches, into yellow heavier very fine sandy loam. Below a depth of 18 or 20 inches there is buff or reddish-yellow friable very fine sandy clay.

Caddo very fine sandy loam is an extensive soil, occurring in large continuous belts. Typical areas near Banks extend north and northeast to the county line; others are northeast of Morobay, south of Vick, and south of Warren. The surface varies from almost level to slightly billowy, and many smaller areas occur on the gentle slopes near ridges and along drainage ways. Both surface drainage and underdrainage are generally poor, and it is not uncommon for water to stand over the surface for some time after rains.

Less than 1 per cent of the Caddo very fine sandy loam is in cultivation. Most of it is considered as open range for cattle, hogs, and goats. The original stand of shortleaf yellow pine is being rapidly cut, leaving a rather desolate cut-over country. In certain sections there is also a scattering of sweet gum, black gum, white oak, elm, water oak, and post oak.

On some farms this soil is used as pasture land and for growing Lespedeza. Native grasses thrive. The yields on the small area cultivated are about the same as on Caddo fine sandy loam. The two soils have about the same sale value, and the suggestions for utilization are the same. The natural growth of timber on cut-over lands will produce from 200 to 500 feet of lumber (board measure) to the acre annually, under proper protection. The present methods of cutting timber do not produce favorable conditions for reforestation. As trees are felled young trees are destroyed. Old tree tops are scattered about and provide ready fuel for sweeping and repeated fires that destroy young seedlings. Loblolly pine, when not hindered in its growth, will attain a height of 45 feet in 20 years and nearly

75 feet in 40 years, yielding at the latter age large quantities of low-grade lumber. Both shortleaf and loblolly pine are frequent and abundant seeders when more than 30 years old.

Well-managed woods can be made very valuable. Too many people start fires, especially on land belonging to others, because they imagine that better grass will result. The grass has a value of a few cents an acre, whereas several dollars' worth of timber may be destroyed.

*Caddo very fine sandy loam, better drained phase.*—The surface soil of Caddo very fine sandy loam, better drained phase, consists of a thin layer of forest mold, underlain by a layer, 2 or 3 inches thick, of light-brown very fine sandy loam which grades in color to yellow and which becomes heavier at a depth of 8 or 10 inches. The subsoil, beginning at a depth of 15 or 16 inches, is yellow friable very fine sandy clay, which is more compact and mottled with gray at a depth of 28 or 30 inches.

Most of the soil of this phase occurs south of Vick and north from Banks to the Cleveland County line, but other areas are widely scattered. It occurs either on isolated ridges a few feet above typical Caddo very fine sandy loam or on slopes above first-bottom lands. The ridges are slightly undulating, but most of the slopes are gentle. Surface drainage is fairly good, and underdrainage could be considered fair.

The total extent of the better drained phase of Caddo very fine sandy loam is large enough to warrant its separation. About 40 per cent of it is in cultivation. The rest of it is cut-over land or supports a growth of pine and oak.

Cotton yields from one-quarter to one-third bale to the acre and corn from 10 to 12 bushels. However, the soil holds possibilities for much better yields than this. Drainage is usually sufficient for the ordinary crops, and with the use of fertilizers and the growing of legumes more profitable results can be obtained.

### CADDO SILT LOAM

Caddo silt loam has a surface layer, from one-half to 1 inch thick, of dark-brown silt loam mingled with leaf mold. Below this is silt loam, mottled brown and yellow, which, at a depth of about 4 inches, grades into yellow heavy silt loam with rust-brown mottles. Below an average depth of 12 inches is silty clay loam or silty clay mottled gray, yellow, and rust brown and containing a high percentage of dark-brown or almost black concretionary material.

A few better drained areas have been included in mapping. Here light-brown silt loam is underlain at a depth of 6 or 8 inches by yellow silty clay loam which, at a depth of 10 or 12 inches, grades into yellow silty clay. Mottles of light gray, which appear at a depth of 20 or 28 inches, become pronounced within 6 or 8 inches. Small concretions are found in many places in this lower layer. Where the soil is in close proximity to the Montrose and Susquehanna soils, there are narrow transitional areas in which the lower part of the subsoil is rather heavy clay. The principal occurrence of this better drained variation is 1 mile northeast of North Oak Grove School.

Caddo silt loam occurs only in the region north and west of Warren. It occupies flat or very gently sloping areas which are poorly drained.

About 5 per cent of it is cultivated to cotton and corn. Some of it is cleared and used as pasture, but the greater part is timbered with pine, oak, hickory, sweet gum, and black gum. Crop yields are low, but on the better drained areas cotton yields average one-third bale and corn yields range from 12 to 15 bushels to the acre.

The selling price of this land at this time is generally said to range from $15 to $20 an acre.

This soil requires better drainage before it can be cultivated with any degree of success. The growing of Lespedeza and redtop should prove profitable.

### KALMIA LOAMY FINE SAND

Virgin Kalmia loamy fine sand has a 1-inch cover of leaf mold. The soil is light-brown loamy fine sand which, at a depth of 6 or 8 inches, grades into yellow loamy fine sand that becomes paler with depth. Mottles of gray appear at a depth ranging from 30 to 36 inches.

In places areas of loose Kalmia fine sand are included. Near Frank Lake the soil, to a depth of 18 or 20 inches, consists of almost black loamy fine sand underlain by yellow or orange-colored fine sand. The dark color results from charcoal and other débris accumulated while the place was the site of an Indian camp. Fragments of pottery and stone arrowheads are numerous.

This soil occurs on low ridges, or islands, in the Ouachita River bottoms and to a less extent along Moro Creek and Saline River. The surface is gently undulating, and drainage is well established.

Cotton and corn are the leading crops, and about 60 per cent of the soil is cultivated. The usual yields are from one-quarter to one-third bale of cotton and from 12 to 15 bushels of corn to the acre. On one farm cotton was fertilized at the rate of 600 pounds to the acre and gave promise of yielding from one-half to 1 bale to the acre, until it was injured by the army worm. Watermelons, peanuts, sorghum, and velvet beans are grown to some extent.

As Kalmia loamy fine sand is a light-textured soil, it would be benefited by the addition of organic matter, which would not only add to its fertility but would also aid in holding moisture. Fertilizers for cotton should contain nitrogen, phosphoric acid, and potash. This soil warms up early, and where well situated it could be used profitably for the production of truck crops.

### KALMIA VERY FINE SANDY LOAM

Kalmia very fine sandy loam in its natural forested state is a dark-brown mixture of decayed vegetation and very fine sandy loam to a depth of 2 inches. The soil is so variable that several descriptions are given. Two miles southeast of Eagle Lake School the soil consists of light grayish-brown loamy very fine sand or very fine sandy loam grading, at a depth of about 10 inches, into yellow very fine sandy loam. Below a depth of 16 inches the material is very friable, very fine sandy clay mottled yellow, reddish brown, and gray. In an area 1½ miles south of Eagle Lake School a light-brown very fine sandy loam layer, 1½ inches thick, is underlain by yellow very fine sandy loam. Below a depth of 12 inches is a layer of yellow, friable, and compact very fine sandy clay which is mottled with gray at a

depth of 18 or 20 inches. Below a depth of 20 inches the clay is mottled yellow and bluish gray and contains some rust-brown concretions. Small hummocks consist of Leaf very fine sandy loam or of Cahaba very fine sandy loam. In places the texture is fine sandy loam.

Kemp Island is made up mainly of Kalmia very fine sandy loam, but there are included patches of Cahaba very fine sandy loam and of Myatt very fine sandy loam. This soil is also found between Greens Lake and Pair o' Geese Lake, in the vicinity of Eagle Lake, northwest of Corinth School, and in a few other scattered localities.

The surface varies from almost level or very gently sloping to rather billowy, with occasional swells and depressions. Surface drainage is fair or good, but in many places underdrainage is imperfect.

Not more than 10 per cent of the total area of Kalmia very fine sandy loam is cultivated, but practically all of it has been cut over. Pine, oak, and some gum form the principal tree growth. One-third bale of cotton and from 12 to 15 bushels of corn to the acre are average yields.

This soil offers opportunity for new farms, as most of it is cut over, and it can produce good crops.

### CAHABA FINE SANDY LOAM

Cahaba fine sandy loam in forested areas has a surface cover from one-half to 1 inch thick of dark-brown leaf mold mixed with earthy material. Below this, brown or rich-brown fine sandy loam grades, at a depth of 6 or 7 inches, into light-brown or yellow heavy fine sandy loam, underlain at a depth of 10 inches by reddish-yellow friable fine sandy clay. Many cultivated fields have a slightly reddish cast.

Some included areas have a red subsoil. West of Corinth School and also on Oak Ridge, which is northwest of Pair o' Geese Lake, are included areas where the texture is very fine sandy loam.

Cahaba fine sandy loam does not occur in large areas, but it is a fairly widespread, well-drained terrace or hammock soil. It is either level or gently sloping and is easily cultivated. About 50 per cent of it is used for crop production. The timber is mainly pine, oak, and some hickory.

Good yields of cotton and corn are obtained, and the cultural methods are better than the average, especially in the Corinth community. Here, also, there is some diversification of crops.

This is among the best soils in the county. It does not wash to any extent, and if care is taken to maintain fertility good results may be expected.

### LUFKIN VERY FINE SANDY LOAM

Lufkin very fine sandy loam in forested areas has a surface layer, about 1 inch thick, containing only a little organic matter. Below this is a layer, from 12 to 15 inches thick, of mottled light-gray and yellowish very fine sandy loam which may contain some rust-brown concretions and which is underlain by sticky very fine sandy loam mottled gray and yellow. Below a depth ranging from about 18 to 28 inches is a very compact layer consisting in many places of plastic clay,

mottled bluish or ash gray and brownish yellow and commonly containing concretionary material. When dry, the surface of this soil is almost white. The gray colors, no doubt, show a lack of oxidation, owing to the imperfect drainage resulting from the imperviousness of the lower part of the subsoil which causes the soil above it to be water-logged for long periods.

In the northwestern part of the county there are some small areas where the soil, as the depth approaches 3 feet, is plastic clay mottled gray, yellow, and red. One area of fine sandy loam occurs 1 mile southeast of Gravelridge.

The largest areas of this soil are east of Broad, 4 miles northeast of Jersey, and 4 miles southwest of Jersey. The soil is known locally as "pin-oak flats." It occurs in low, flat places where much of it is covered with water for months. On a few narrow slopes drainage is only slightly better. All the areas of Lufkin very fine sandy loam are forested with pin oak and some pine, black gum, and sweet gum. One area supports considerable palmetto.

Where the land is not held for its timber it commands a low selling price. Very little of it should be cultivated. Its best use is for pasture and timber land.

### MONTROSE SILTY CLAY LOAM

Montrose silty clay loam in forested areas has a surface layer, an inch or more in thickness, of brown silty clay loam which grades into mottled rust-brown and gray or pale-yellow and rust-brown silty clay loam, 3 or 4 inches thick, which contains in places a few small iron concretions. The subsoil is mottled yellow, gray, and rust-brown silty clay which, at a depth ranging from 10 to 12 inches, grades into sticky, plastic clay mottled bluish gray, yellow, and in a few places reddish brown and containing some concretions.

In places the lower part of the soil has a little red or reddish-yellow mottling with the gray. Just northeast of Warren and in a few other scattered spots the soil consists of yellow or mottled yellow and gray clay a few inches thick and underlain by plastic yellow and bluish-gray clay.

Almost all of the Montrose silty clay loam is found north and west of Warren within a radius of 5 or 6 miles. The surface is flat, but locally there are irregular, small, low hummocks and shallow depressions like hog wallows. Drainage is poor.

Very little, if any, of this soil is in cultivation. The timber consists largely of post oak, hickory, and pine.

Under present conditions of poor drainage this land has little agricultural value. It is possible that Lespedeza and redtop would succeed, and if ditches were dug to remove excess water cotton might be grown successfully.

### PRESCOTT VERY FINE SANDY LOAM

Prescott very fine sandy loam in virgin areas has a mere film of light grayish-brown very fine sandy loam over a 10-inch layer of mottled gray and rust-brown very fine sandy loam containing some iron concretions. Between depths of 10 and 14 inches there is a sticky (when wet) very fine sandy clay mottled yellow and gray.

This grades into tough, impervious clay, mottled yellowish brown and gray. Below a depth of 24 inches, very compact clay is mottled yellowish brown and gray and contains very slight traces of grayish very fine sand. The clay layers are so tough and impervious that they are comparatively dry at a time when water stands on the surface.

Small patches of silt loam are included in mapped areas of Prescott very fine sandy loam. In The Prairie, southeast of Warren, are two small areas of black crumbly muck covered with water or saturated continuously. These are indicated on the soil map by swamp symbols. The surface layer, which is from 6 to 12 inches thick, contains some brown peat or decomposed grass roots. In places there is no peaty material but only crumbly black muck. The organic material ranges from 10 to 16 inches in thickness and is underlain by black mucky sand or gray fine sandy loam. Saw grass predominates, but myrtle is thick in places. Tests indicate only a faintly acid condition.

Only two areas of this soil occur in Bradley County. The largest is 5 miles southeast of Warren on the Monticello road, and a small area is in section 22, T. 16 S., R. 9 W.

Most of the land is known as prairie, but it supports scattered clumps of stunted pine and post oak which grow on low mounds and ridges of Caddo very fine sandy loam. The surface otherwise is flat, and the soil is very poorly drained.

The covering of grass is very sparse, and the soil has little agricultural value, even for pasture. If there were larger continuous areas, rice might be profitably grown, as irrigation water could be easily held.

### MYATT VERY FINE SANDY LOAM

Myatt very fine sandy loam in forested areas has a mere film, at most one-half inch thick, of dark-gray very fine sandy loam over a layer, 5 or 6 inches thick, of light-gray very fine sandy loam with slight brownish-yellow mottling. Below this, to a depth of about 18 inches, there is compact very fine sandy loam mottled gray and yellowish brown, which grades into mottled gray and brownish-yellow sticky (when wet) heavy very fine sandy loam. Below a depth of 24 inches the material is compact, rather waxy dry clay, mottled gray and dull yellow. This lower layer is almost impervious to water and keeps the soil above it water-logged. In fact, when water stands on the surface, this tight clay layer may appear to be fairly dry. Some areas have a compact sandy layer in the lower part of the subsoil. This material is as impervious as the brown clay layer.

Dome-shaped mounds are common. In some of these the soil, to a depth of about 18 inches, is brown very fine sandy loam grading downward into yellow, light very fine sandy loam. Below a depth of 24 inches the material is loose gray very fine sand with faint yellow mottles. In the southern part of the county the soil, on some low ridges in the Ouachita River bottoms, has a different profile. On Garrett Ridge, at a depth of 8 or 10 inches, the mottled gray and yellow very fine sandy loam is abruptly underlain by mottled gray, yellow, and yellowish-brown compact clay somewhat waxy when dry

but containing some very fine sand in places. These ridges occur on low positions above ordinary overflows.

In some places it was almost impossible to say whether certain flats were Myatt soils or Caddo soils, as the Myatt soil is of a gradational character, resembling the Caddo soils. One such area, mapped as Caddo very fine sandy loam, occurs 2 or 3 miles southeast of Marsden. In other places the Caddo soils merge with areas of the Myatt soils.

Typically Myatt very fine sandy loam occurs on flat second bottoms or terraces along the outer edge of the stream bottoms. The elevation above the stream bottoms is from 4 to 6 feet, and the slope may be either pronounced or gradual. The largest and most numerous areas are along Moro Creek, Eagle Creek, and in the Ouachita River bottoms.

The surface is generally flat, with only small ridges and depressions and the mounds previously described. Drainage conditions are poor, and water commonly stands on the surface.

Only a very few small patches of this soil are in cultivation. The timber consists of pine, post oak, sweet gum, red oak, white oak, and black gum, most of which has been cut over. The woods are utilized as range for hogs and cattle.

Probably the best means of utilizing this land is for the growth of trees or for pasture and hay land. Similar poorly drained soils in Louisiana have been ditched and drained and used for growing strawberries.

### BIBB VERY FINE SANDY LOAM

The surface soil of Bibb very fine sandy loam is mottled dark-gray and rust-brown very fine sandy loam about 10 inches thick, grading into heavy very fine sandy loam, mottled gray and rust brown and containing some dark concretions. Below a depth of about 15 inches the material is mottled light-gray and yellowish-brown very fine sandy clay, containing concretions. It is rather sticky when wet.

In an area one-quarter mile north of Pattsville the surface soil of light-gray very fine sandy loam grades, at a depth of about 8 or 10 inches, into almost white very fine sandy loam mottled somewhat with pale yellow. At a depth ranging from 28 to 34 inches a compact layer of almost white very fine sandy loam containing an abundance of limonite-yellow and rust-brown concretionary material occurs. This lower layer constitutes a true hardpan and is dry in places when the soil above is saturated.

Where the soil occurs on the outer edge of the bottoms next to the upland it may be largely influenced by wash from the adjacent ridges and may be subject only to very severe overflows. For instance, in areas 2¼ miles northeast of Warren and 1¾ miles east of Saline School gray or grayish-brown very fine sandy loam is underlain at a depth of 4 or 6 inches by gray, heavy very fine sandy clay streaked with black.

In the northeast corner of the county, along the lower course of Saline River, and in a few other widely scattered sections along small streams, the material is fine sandy loam. There are also patches where the alluvial material is so mixed and lacking in uniformity as to have few definite soil characteristics. For instance, near Mud

Lake, along Ouachita River, some of the soil is gray and pale-yellow fine sand.

This is a poorly drained first-bottom soil found in widely scattered parts of the county both in the wide alluvial belts of the larger streams and as narrow strips along smaller branches.

The timber is about the same as that on Bibb silt loam. Practically none of the soil is cultivated. A few fields have been cleared and are used for pasture land. On one of these there was a good stand of Bermuda grass.

This land must be drained before it can be cultivated successfully.

### BIBB SILT LOAM

The surface soil of Bibb silt loam, to a depth of 10 or 12 inches, is mottled gray and rust-brown silt loam. It is underlain by a layer about a foot thick of sticky, fairly plastic, gray silty clay, slightly tinged with rust brown and yellow. Below this is light bluish-gray decidedly plastic clay, mottled somewhat with brownish yellow. Black concretions are present in many places below a depth of 12 or 15 inches.

Some soils of various textures are included with Bibb silt loam in mapping. A silty clay loam occurs along Saline River 3 miles east of Broad, along Moro Creek near the Cleveland County line, and in other scattered areas. A lighter textured soil, very fine sandy loam, is included immediately along stream or slough channels or near the edge of the upland, where sandy material is washed in and covers narrow strips. In some better drained positions the surface soil, to a depth of a few inches, is brown, but quickly grades into the predominant gray material. Some of the Bibb silt loam also includes small, irregular ridges or hummocks of Kalmia very fine sandy loam, Kalmia fine sandy loam, and Kalmia loamy fine sand. This is particularly true along Moro Creek and above the junction of Eagle and Steep Bank Eagle Creeks.

Bibb silt loam is a poorly drained first-bottom soil occurring extensively along Moro Creek, Eagle Creek, and to a much less extent along Saline River and smaller streams.

The generally flat surface is broken by many small depressions, sloughs, ponds, and cypress brakes. Overflows are not uncommon, and particularly along Moro Creek they may be prolonged. Water stands in shallow depressions during the winter and spring months.

Practically none of this soil is cultivated. It is free range for livestock. Most of the hardwoods are of good quality. They include ash, hickory, cypress, white oak, black gum, red gum, elm, overcup oak, holly, pin oak, and some red oak. There is also some pine.

Cut-over land of this kind sells for $10 or $15 an acre, but well-forested areas should command a higher price.

Hardwood trees on Bibb silt loam attain good size and quality, and as reforestation after cutting is generally promising and the trees make a fairly rapid growth, this soil can best be used for forestry. Extensive drainage ditches would reclaim the land and make available its natural fertility for growing corn. At present such crops as redtop, Lespedeza, and Bermuda grass might be profitable.

### BIBB CLAY

Bibb clay, to a depth of 40 inches, consists of mottled light bluish-gray and brownish-yellow heavy, plastic clay which cracks on drying. On slight elevations or along stream and slough banks sandy material may be present at a depth below 18 inches.

Included with Bibb clay are areas of Bibb very fine sandy loam, occurring as narrow embankments along lakes and sloughs and as small mounds and ridges. In places sand has been deposited over the clay areas by swift overflow waters.

This soil occurs only in the extreme southern part of the county, where it is extensive. It begins east of Morobay, and in a wide belt follows Ouachita River to its confluence with Saline River, up which it extends to a point beyond the Chicago, Rock Island & Pacific Railway. It is a first-bottom soil subject to deep and prolonged inundation.

The surface of Bibb clay is flat over wide areas but broken in places by numerous depressions, sloughs, streams, lakes, and ridges.

A different soil occupies some of the higher ridges, but others, such as Hurricane Ridge, are covered by heavy Bibb clay. Drainage is poor over most of the bottoms.

None of this soil is cultivated, but it supports a heavy growth of pin oak and post oak. Cypress grows along drainage ways, as do various other hardwoods.

Many hogs and some cattle find their subsistence in this section. Certain farmers own as many as 75 or 100 hogs, usually razorbacks. During overflows the hogs are either driven to the islandlike ridges or are killed and hauled out in boats. The lakes and streams abound in game fish and attract many anglers.

Almost the entire area of Bibb clay is owned by lumber companies.

## SUMMARY

Bradley County is in the southeastern part of Arkansas. The county seat is Warren.

Bradley County has three drainage systems: Moro Creek, Ouachita River, and Eagle Creek and Saline River. The belts or ridges of desirable farm lands which border these stream bottoms are separated by level, poorly drained areas.

Lumbering and farming are the principal industries. The length of the frost-free season averages 218 days. Cotton and corn are the principal crops, but the acreages of oats and hay crops are rapidly increasing.

The 1920 census reports 1,895 farms, having an average area of 76.2 acres, of which 34.2 acres are improved. Not much attention is paid to crop rotation for building up fertility.

The soils of Bradley County are in need of organic matter, the supply of which should not only be increased but maintained by crop rotations which include legume crops. The use of commercial fertilizers at the rate of 300 or 400 pounds to the acre is desirable for the cotton crop, but even then the best results are obtained only where the supply of organic matter is sufficient for the soil to have a good physical and chemical condition.

Although practically all the soils are very strongly acid, it would hardly be advisable to use lime at present. The present soil fertility would be further lowered by the stimulation given, as lime makes plant food available but does not replace the elements removed. However, where crop rotations are such as to include soil-building crops the use of lime should be beneficial.

As quickly as markets can be found, other cash crops in addition to cotton would serve to improve the present restricted type of agriculture.

Land values range from $10 to $40 an acre.

The Ruston, Susquehanna, and Caddo soils are the most extensive upland soils.

Second-bottom or terrace soils are included in the Kalmia and Cahaba series. Most of these soils are desirable for the general crops. The Myatt soils occur on poorly drained areas of the terraces. The first-bottom soils comprise those of the Ochlockonee and Bibb series.

The Lufkin, Montrose, and Prescott soils commonly occur as flat, poorly drained areas.

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## [PUBLIC RESOLUTION—No. 9]

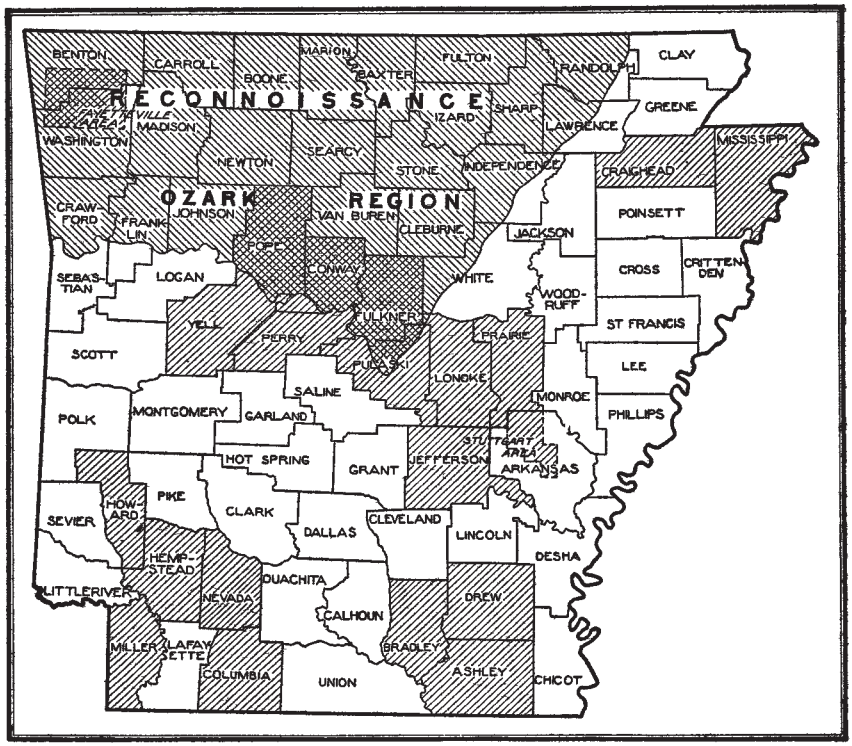
JOINT RESOLUTION Amending public resolution numbered eight, Fifty-sixth Congress, second session, approved February twenty-third, nineteen hundred and one, "providing for the printing annually of the report on field operations of the Division of Soils, Department of Agriculture."

*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, and on July 1, 1927, the Bureau of Soils became a unit of the Bureau of Chemistry and Soils.]




Areas surveyed in Arkansas, shown by shading

U. S. GOVERNMENT PRINTING OFFICE: 1929

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