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U. S. DEPARTMENT OF AGRICULTURE,

BUREAU OF SOILS—MILTON WHITNEY, Chief.

IN COOPERATION WITH THE STATE OF MISSISSIPPI, EARL BREWER, GOVERNOR;
E. N. LOWE, DIRECTOR, STATE GEOLOGICAL SURVEY.

SOIL SURVEY OF GRENADA COUNTY,
MISSISSIPPI.

BY

W. E. THARP, OF THE U. S. DEPARTMENT OF AGRICULTURE,
IN CHARGE, AND J. B. HOGAN, OF THE MISSISSIPPI
GEOLOGICAL SURVEY.

HUGH H. BENNETT, INSPECTOR, SOUTHERN DIVISION.

[Advance Sheets—Field Operations of the Bureau of Soils, 1915.]



WASHINGTON:
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LETTER OF TRANSMITTAL

U. S. DEPARTMENT OF AGRICULTURE,
BUREAU OF SOILS,
Washington, D. C., July 18, 1916.

SIR: Under the cooperative agreement with the State of Mississippi a soil survey of Grenada County was carried to completion during the field season of 1915.

I have the honor to transmit herewith the manuscript and map covering this work and to recommend their publication as advance sheets of Field Operations of the Bureau of Soils for 1915, as authorized by law.

Respectfully,

MILTON WHITNEY,
Chief of Bureau.

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

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MAP.

Soil map, Grenada County sheet, Mississippi.

SOIL SURVEY OF GRENADA COUNTY, MISSISSIPPI.

By W. E. THARP, of the U. S. Department of Agriculture, In Charge, and J. B. HOGAN, of the Mississippi Geological Survey.—Area Inspected by HUGH H. BENNETT.

DESCRIPTION OF THE AREA.

Grenada County is situated in the north-central part of Mississippi. It is bounded on the north by Tallahatchie and Yalobusha Counties, on the east by Calhoun and Webster Counties, on the south by Carroll and Montgomery Counties, and on the west by Le Flore and Tallahatchie Counties. The county is approximately 36 miles long from east to west and ranges from 9 to 15 miles in width from north to south. It comprises an area of 444 square miles, or 284,160 acres.

The greater part of the county consists of rolling to hilly uplands. The western end, comprising the territory west of a line drawn through Le Flore, Parsons, and Oxberry to the northern boundary, lies in the Mississippi flood plain, and the remainder embraces the valleys of the Yalobusha River and its tributaries.

The Yalobusha River flows through the central part of the county in a general east-west direction, being joined at a point about one-third the distance across the county by the Shoener River, which enters the county from the northeast, and about halfway across by Batupan River, which enters from the south. Below the junction of the latter the valley of the Yalobusha, including both bottom land and terraces, has an average width of about 3 miles. East of the junction of the Shoener the valley is from 1 to 2 miles wide, and the second bottoms or terraces have less elevation above the first bottoms than along the lower course of the stream. The terraces, which range in extent from a few acres to occasional tracts of several square miles, are noticeable features of each of the larger valleys, but have no considerable development along the foot of the uplands overlooking the wide alluvial plain which forms the western end of the county.

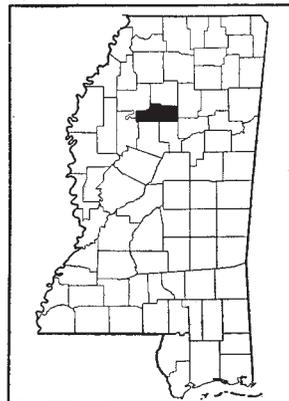


FIG. 1.—Sketch map showing location of the Grenada County area, Mississippi.

The uplands of the northwest part of the county have, in general, mild contours, and there is no rough land except near the north boundary line. The topography is characterized by long, gentle slopes toward the south and by the occurrence of many small, parallel branch bottoms opening upon the wide terraces of the Yalobusha Valley. East of the Shoener River the uplands are generally hilly and include but few areas that may be termed rolling, except in the northeastern part of the county, where the average decline toward the Yalobusha bottoms is so moderate as to afford considerable areas of gently rolling land.

In the extreme eastern part of the county, south of the Yalobusha River, there are several square miles of relatively smooth upland, but west of this section the county is strongly rolling to very hilly. Most of the area drained by Butputter and Redgrass Creeks consists of high interstream divides, hilly to broken throughout their higher parts, but with lower slopes that include much rolling land, and in many places include narrow strips of very gently sloping hill-sides along the creek valleys.

The uplands lying between the valley of the Batupan River and the Yalobusha bottoms are generally very hilly, in some places consisting of a succession of narrow ridges and ravines, with occasional stony peaks rising to a sufficient height to command a view of all the surrounding territory.

West of the Batupan Valley a somewhat similar area of rough, deeply incised uplands extends for a mile or two to the west, thence gradually changing to the more evenly rounded ridges and broader divides that characterize all the uplands of the southwestern part of the county.

Much of this section is too hilly to admit of convenient cultivation, especially as the western limits of the upland are approached, but there are also wide tracts of gently rolling land whose surface configuration and soil conditions are highly favorable for farming.

The hilly to broken lands are mostly covered with a mixed growth of shortleaf pine and hardwoods. Much of the less hilly upland has been allowed to grow up in pine, or is tilled only in part, since there are many gullies and deeply eroded places. The small creek valleys and most of the gently sloping lands adjoining them are practically all in cultivation. The numerous small creeks give an abundance of water for live stock, and a supply for domestic use is obtainable from wells of moderate depth. In the Yalobusha Valley there are many strong artesian wells.

All the terrace lands are cleared, except for inextensive included areas of wet land. A slowly increasing proportion of the first bottoms is being cultivated, but much of this land is still forested.

The earliest settlements in the territory now embraced in Grenada County were made about 1830. The total population of the county, as given by the 1910 census, is 15,727, of which 82 per cent is rural, giving a density of 29.2 persons per square mile. A large proportion of the rural population is colored.

Grenada, the county seat and largest town, located near the center of the county, had a population in 1910 of 2,814. Graysport, Holcomb, Elliott, and Hardy Station are among the more important of the smaller places.

The main line of the Illinois Central Railroad crosses the county from north to south, and a branch of this system extends from Grenada to Jackson, Tenn. A branch of the Yazoo & Mississippi Valley Railroad connects with the Illinois Central at Grenada. These lines afford shipping facilities to points north, south, and west.

The public roads that follow the valleys are generally kept in repair, but those crossing the hilly sections have many steep gradients and are difficult to maintain in good condition during wet seasons.

All sections of the county are served by rural mail delivery or star routes.

CLIMATE.

There is no Weather Bureau station in Grenada County, but the records of the station at Water Valley, about 25 miles north of Grenada, in Yalobusha County, may be taken as representative of the conditions in Grenada County.

The mean annual temperature at Water Valley is 62.6° F., the winter, spring, summer, and fall means being 44.7°, 62.9°, 79.3°, and 63.4°, respectively. The highest temperature on record is 108° F., in July, and the lowest, -9° F., in February.

The average yearly rainfall amounts to 53.24 inches, which is ample for most crops. The retentive nature of the predominating soils renders them quite resistant to drought if reasonably well managed. The injury done to cultivated lands by the rather frequent torrential rains is much more serious than that caused by the occasional periods of dry weather.

As a rule, the ground freezes a number of times during the winter to a depth of 2 or 3 inches. In most years tillage operations may be carried on during practically every month. Snow seldom lies on the ground more than a few days.

The average date of the last killing frost in the spring is March 27 and of the first in the fall, October 31, so that the average growing season is 218 days in length. The earliest reported date of killing frost in the fall is October 11, and the latest in the spring is April 22.

The following table gives the normal monthly, seasonal, and annual temperature and precipitation at Water Valley:

Normal monthly, seasonal, and annual temperature and precipitation at Water Valley, Yalobusha County.

Month.	Temperature.			Precipitation.		
	Mean.	Absolute maximum.	Absolute minimum.	Mean.	Total amount for the driest year.	Total amount for the wettest year.
	° F.	° F.	° F.	Inches.	Inches.	Inches.
December.....	45.7	77	4	4.86	0.96	4.55
January.....	43.5	80	- 2	5.33	4.64	1.96
February.....	44.8	79	- 9	4.93	3.73	5.36
Winter.....	44.7	80	- 9	15.12	9.33	11.87
March.....	54.9	89	17	6.51	2.30	3.52
April.....	63.2	96	28	4.75	3.51	10.62
May.....	70.7	100	37	4.57	2.29	5.50
Spring.....	62.9	100	17	15.83	8.10	19.64
June.....	77.6	103	46	5.03	8.47	11.88
July.....	80.3	108	56	4.38	3.72	7.89
August.....	80.1	107	56	3.35	3.24	1.83
Summer.....	79.3	108	46	12.76	15.43	21.60
September.....	74.6	102	38	3.43	1.54	2.23
October.....	63.0	98	28	2.51	0.39	12.23
November.....	52.6	85	16	3.59	4.64	3.97
Fall.....	63.4	102	16	9.53	6.57	18.43
Year.....	62.6	108	- 9	53.24	39.43	71.54

AGRICULTURE.

Considerable diversity of crops marked the early agriculture, and most plantations were practically self-sustaining. Little meat was purchased, and enough corn and wheat for domestic use was produced. Orchards of peach, pear, and apple trees were more common than at present. Although for a decade or more before the Civil War cotton was the chief crop, it was not as important relatively as later, when it became the chief money crop and other products, with the possible exception of corn, ceased to receive much attention.

Within the last few years more land has been devoted to grain and hay, and many high-grade cattle and hogs of improved breeds have been introduced. Tick eradication has so far progressed that the county has been released from quarantine. Much land has been fenced for pasture, chiefly the hill lands that have been out of cultivation for many years. Dairying is given some attention by

a few farmers near Grenada. There are a few small flocks of sheep on the uplands. These are kept at a very low cost, and sheep raising would doubtless increase in importance if it were not for the menace of the numerous dogs.

Oats are coming into favor for winter grazing and many small fields are sowed for this purpose. Very little rye is grown and no wheat. In a few places crimson clover has been grown as a winter cover crop, with good results.

There are many obstacles in the way of agricultural progress not easily overcome. Cotton has long been the basis of credit and the advances that many farmers require are not readily obtained on other crops or products. Much new machinery is needed, and most farms have not the fences and buildings necessary for the proper care of live stock. While the owners of small farms are relatively free to adopt different lines of farming so far as they are able financially, the large land owners can not employ their colored laborers in any way so satisfactorily as in cotton growing. The negroes, as a rule, are not inclined to grow any crop other than cotton, and are unskilled in the use of farm machinery and the handling of live stock.

The cotton boll weevil appeared in this county in 1912, but so far has not caused serious injury. The extent to which the crop may be injured is largely determined by seasonal conditions. In the year 1914 dry weather prevailed during June, July, and a part of August, and the weevil did no great damage, but later in the season, when rains set in, the weevils increased so rapidly that little of the late crop matured.

The following table gives the acreage and production of the leading crops of the county, as reported by the censuses of 1880, 1890, 1900, and 1910:

Acreage and production of leading crops.

Census year.	Cotton.		Corn.		Oats.		Cultivated grasses.		Sweet potatoes.	
	Acreage.	Production.	Acreage.	Production.	Acreage.	Production.	Acreage.	Production.	Acreage.	Production.
	<i>Acres.</i>	<i>Bales.</i>	<i>Acres.</i>	<i>Bushels.</i>	<i>Acres.</i>	<i>Bushels.</i>	<i>Acres.</i>	<i>Tons.</i>	<i>Acres.</i>	<i>Bushels.</i>
1880	25,390	10,228	15,906	163,580	568	6,223	364	27,142
1890	31,828	10,449	19,872	289,349	244	2,912	530	31,412
1900	30,172	11,707	26,481	373,150	459	5,380	450	662	298	22,715
1910	37,152	10,625	24,477	301,623	232	3,234	1,510	1,614	541	33,982

Cotton is grown on all the soil types of the county. Seed selection, fertilization, cultural methods, and seasonal conditions usually have more influence upon the yields than can be attributed to soil

differences. Some soil types, however, are less affected by adverse weather than others, and there are also differences with respect to tillage requirements and drainage conditions that enter quite largely into the cost of production. The cotton produced in the eastern part of the county has a shorter staple and grades somewhat lower than that grown in the central and western parts,¹ indicating that the Collins, Lexington, and Grenada silt loams do not produce as good a staple as the Memphis and Lintonia silt loams and the Vicksburg soils.

The Vicksburg silt loam is recognized as the best corn soil of the county, especially the heavy, darker colored areas in the Yalobusha Valley.

Some of the small farms have comparatively more improved machinery than the large plantations. On the latter the farming equipment consists chiefly of the simple tools required in the cultivation of cotton, but 2-horse plows and disk harrows are coming into common use. As a rule, mowers and hay rakes are the only machinery used in making hay. There are very few self-binders or corn harvesters, and no large thrashing outfits. Mules are preferred to horses for farm work.

In the preparation of land for cotton, corn, and other tilled crops both the "flat-breaking" and the "bedding-up" methods are followed, the latter almost exclusively by negro farmers and irrespective of the soil conditions. A combination of these methods is followed by many farmers. The ground is plowed rather deep and then replowed, several furrows being thrown together at the second plowing and the ridges worked down with a harrow, leaving shallow water furrows a few feet apart. On the level areas, except where the soil is a sandy loam, the "bedding-up" method is invariably followed in the culture of corn and cotton. Much of the corn is cut for fodder. A few silos have been built recently.

Oats sown on well-prepared ground not later than October 1 usually yield from 20 to 30 bushels, and occasionally as much as 60 bushels per acre. The tendency of the heavier soils to "heave" badly during the winter and thus injure fall-sown grains is less noticeable where the seed is drilled than where sown broadcast.

The irregular size and outline of the fields on many farms and the occurrence of different types of soil within narrow limits are unfavorable to the use of improved machinery and the practice of a systematic rotation of crops. As a rule, corn and cotton are grown continuously as long as reasonably good yields are obtained. On the uplands the necessity for increasing the organic-matter content of the soil is met by sowing cowpeas with corn, but in many instances the land is devoted to tilled crops as long as reasonably good yields

¹ According to reports of cotton buyers in Grenada.

are obtained and is then allowed to lie idle or is used only as pasture. The second-bottom types, particularly those inclined to be poorly drained, are more frequently sown to lespedeza, and the acreage of this crop is increasing. In the first bottoms the addition of sediment during the frequent overflows makes it possible to grow tilled crops for long periods without changing to grass or leguminous crops.

Few farmers make regular use of commercial fertilizer and many do not employ it at all. The mixture most frequently used consists of cottonseed meal and acid phosphate. The rate of application ranges from 100 to 200 pounds per acre. The proportion of potash is generally small in all the ready-mixed brands offered for sale. In many cases farmers purchase the meal and acid phosphate separately and mix them at home. No raw-rock phosphate has been used and lime only in an experimental way.

Judging from the reports of farmers, acid phosphate invariably gives increased yields of cotton, corn, and cowpeas on the Lexington, Grenada, Olivier, and Calhoun soils, as well as on most of the Memphis silt loam, provided the physical conditions are reasonably good.

Farm hands employed by the month receive from \$10 to \$15. In all instances the use of a cabin and small plot of ground is included. Day laborers get about \$1 a day, but not much labor at this wage is used in ordinary farm operations.

The census of 1910 reports the number of farms in the county as 2,260 and the average size as 90 acres. As the census classes each tenancy as a farm, the average size of the individual holdings is much above 90 acres. Many of the plantations in the Yalobusha Valley embrace 1,000 acres or more, while few farms in the hilly sections include less than 160 acres, except those of negroes, which range from a few acres of rough land to occasionally one-quarter or one-half section of good upland.

In 1880, 56 per cent of the farms were operated by tenants, as compared with 74 per cent in 1910. While some of this increase may be only apparent and due to different bases in tabulation, there has undoubtedly been a decrease in the number of resident white owners of land in most neighborhoods remote from the railways.

SOILS.

The upland soils, which form the greater part of the area of Grenada County, are derived chiefly from loessial material, with considerable areas in which the soils have been modified by admixture of materials from the sand and clay beds of Coastal Plain formations underlying the loess, and inextensive areas where the soils consist chiefly of this Coastal Plain material, the loessial covering being very thin or entirely wanting.

The loess,¹ or brown silt, is a blanket formation, probably of wind-blown origin, covering the older Coastal Plain formations, which had been eroded to about their present surface configuration before the loess was deposited. The loess is thickest on the uplands of the western part of the county, the deposit becoming thinner in the central and eastern parts. In the former section the depth of the material ranges from about 15 to 30 feet, and the covering is more or less continuous as far east as the range of hills west of Grenada. Here the crests and steeper slopes of the ridges show many exposures of red sand and light-colored clay. East of the Batupan River the loess has an average depth of only a few feet and the influence of the underlying red sands or stiff clays upon the soils is easily observable, the subsoils containing much material derived from these beds. In many places the occurrence of the loose sand and beds of impervious clay at such shallow depths strongly affects drainage or otherwise modifies the physical character of the soil mass as a whole. The Coastal Plain beds show no evidence of the presence of lime, according to simple field tests.

The shallower loessial deposits in the central and eastern parts of the county are often quite compact in their basal portion and frequently show some mottling of grayish and brownish colors in the lower subsoil. This character of soil is most frequently observed on the lower slopes of the uplands, where the substratum is often very light colored and quite compact. Exposures in ditches and deep road cuts weather to a peculiar buttressed form, unlike the comparatively smooth, perpendicular walls of road cuts in the deep development of the loess. The shallow loess deposits are represented by the Grenada silt loam. Typically this soil has a moderately smooth surface, but hilly areas occur.

The deeper areas of the loess give rise to the Memphis silt loam. Characteristically the soil is not influenced within the 3-foot section by the underlying materials. In addition to the typical soil, a smooth phase is indicated on the map. Where the underlying Coastal Plain material lies within the 3-foot section the soil is classed as Lexington silt loam.

Areas of the upland in which the material is largely or entirely derived from the Coastal Plain beds are classed as Ruston sandy loam, although this type as mapped includes patches of the Lexington and Grenada silt loams. The Coastal Plain material consists of deposits which were brought down by drainage waters from areas to the north, covered by limestone, sandstone, shale, and probably other formations.

¹ For description of the loess of western Mississippi see Bul. No. 8, Preliminary Study of the Soils of Mississippi, State Geological Survey; also for copy of analyses and lime determinations see Soil Survey of Warren County, Miss., Field Operations, U. S. Bureau of Soils, 1912.

Very rough, broken areas over which the soils are so varied within narrow limits that they could not be mapped as separate types are classed as the Guin stony sandy loam.

The materials from which the upland soils have been derived have obviously been modified since their original deposition by erosion, by the growth and decay of vegetation, and by weathering in general.

The surface soils of the Memphis series characteristically are light brown and very silty, while the subsoils are reddish brown or buff colored. The Grenada soils are similar to the Memphis, but more frequently have compact subsoils, in many places showing gray mottlings in the lower part. The types in the Lexington series, on the other hand, while having brown, very silty surface soils, are characterized by reddish, sandy subsoils. The surface soils of the Ruston series are quite unlike those of both the Memphis and Lexington series, but the subsoils resemble those of the Lexington series. All these soils in their typical development are well drained.

The first-bottom and second-bottom soils represent recent and relatively old alluvium, respectively, the materials having been washed entirely or mainly from the loessial uplands and being predominantly very silty. There are many places, especially in the eastern part of the county, where the alluvium contains wash from exposures of Coastal Plain material. Here it is more sandy and variable from place to place. The Vicksburg soils, as mapped, in places include considerable Coastal Plain wash.

The material of the second bottoms, or stream terraces, was deposited when the overflow waters of the streams reached higher levels than at present. As in the case of the upland soils, changes have taken place in the alluvial material since its deposition, chiefly through the influence of varying drainage conditions. Where the material is well drained the color is brown to yellowish brown; in areas of intermediate drainage conditions the surface soil is brown and the subsoil grayish or mottled; and where drainage has been most deficient the soil is light grayish, with mottlings of yellow and brown, and contains iron concretions and concretionary material.

The first-bottom soils are classed in three series—the Vicksburg, Waverly, and Collins. The essential differences in these series seem to have been brought about by differences in the drainage conditions, caused by variations in the character and depth of the underlying material; that is, whether it is an impervious clay or not and whether it lies within the 3-foot section or below that level. The Vicksburg series has brown, mellow surface soils, overlying lighter brown or yellowish-brown, slightly heavier, friable subsoils. The underdrainage is good. In the Waverly series, on the other hand, both surface drainage and underdrainage are poor. The surface soils are light gray and somewhat compact, overlying a much heavier, com-

compact, impervious clay, light gray or mottled in color, and containing iron concretions and concretionary material. The Collins series is intermediate between the Vicksburg and Waverly series. The surface soils are brown and mellow, while the subsoils are gray, consisting in the lower part of compact, impervious clay like that of the Waverly series.

These three series have their equivalents in the soils of the stream terraces or second bottoms, the Lintonia being the terrace equivalent of the Vicksburg, the Calhoun of the Waverly, and the Olivier of the Collins series.

The first-bottom alluvium, in which there is such variation in texture and color of the material that satisfactory separation into soil types could not be made on a map of the scale used in the present survey, is classed as Meadow.

The following table shows the actual and relative extent of each of the various soil types mapped in Grenada County:

Areas of different soils.

Soil.	Acres.	Per cent.	Soil.	Acres.	Per cent.
Grenada silt loam.....	44,032	} 24.9	Olivier silt loam.....	16,128	5.7
Hilly phase.....	26,560		Collins silty clay loam.....	12,544	4.4
Lexington silt loam.....	37,632	13.2	Waverly silt loam.....	12,224	4.3
Vicksburg silt loam.....	36,160	12.7	Guin stony sandy loam.....	8,064	2.8
Memphis silt loam.....	12,352	} 9.6	Ruston sandy loam.....	7,808	2.8
Smooth phase.....	14,720		Vicksburg fine sandy loam....	6,784	2.4
Collins silt loam.....	25,664	9.0	Calhoun silt loam.....	2,560	.9
Lintonia silt loam.....	17,088	} 7.0	Meadow.....	960	.3
Slope phase.....	2,880				
			Total.....	284,160

MEMPHIS SILT LOAM.

The typical Memphis silt loam consists of a brown silt loam underlain at a depth of about 8 to 12 inches by a buff or light reddish brown silty clay loam to silty clay. This heavier layer shows but little change within the 3-foot section, except that frequently the lower subsoil is somewhat lighter in color and more compact. In places the lower subsoil appears to carry more silt than the upper subsoil and to have a somewhat more friable structure. There are many included areas in which the subsoil is of a yellow or yellowish-brown color, with grayish mottlings in the lower part. Here the subsoil is usually very compact, and is more impervious to water and air. Also, on washed slopes there are many included spots of silty clay loam or areas in which the heavy subsoil material comes very near the surface. On the steeper slopes there are some included areas of Lexington silt loam. These varia-

tions are too small and too irregularly distributed to admit of satisfactory separation on a map of the scale used.

Although the dry surface of roadside exposures is rather compact, the moist material is invariably friable and is easily penetrated with an auger. Near the western limit of the development of the type the depth to the underlying sands or clay ranges from 12 to 15 feet, while a few miles to the east it is about 10 feet. In the former situation fossil shells sometimes occur in the lower part of the material, but in the latter no such evidences of lime are observable. Both surface soil and subsoil are acid according to the litmus-paper test.

The Memphis silt loam occurs in the western part of the county, chiefly in the uplands drained by streams flowing west or northwest.

The topography ranges from rolling to broken, and much of the land is too uneven for safe or easy cultivation. It is mostly covered with a mixed growth of hardwoods, in which there is more or less shortleaf pine. The latter tree is most common on or near land formerly in cultivation.

Owing to the rough surface, very little of this type is now in cultivation. A rather small proportion is included in open pastures, and all clovers and the grasses common to the section do well on it.

The price of land of this type ranges generally from \$10 to \$15 an acre.

Memphis silt loam, smooth phase.—The smooth phase of the Memphis silt loam differs from the typical soil mainly in its smoother topography. Since most of the phase is or has been in cultivation, its surface soil contains less organic matter and is, therefore, generally lighter colored and more compact than that of the typical soil. It has some tendency to pack or form a crust after rains, but a good condition of tilth may be obtained with a minimum of labor. According to the litmus-paper test the surface soil and subsoil are acid.

The Memphis silt loam, smooth phase, occurs in areas of considerable size near Holcomb and east of Sparta Church. The topography is prevaillingly gently rolling to rolling. Most of the land is cultivable, although there are slopes which wash badly if not properly handled. Artificial drainage is necessary in the broad swales that often form the heads of drainage ways. Elsewhere the natural drainage is good.

The yield of cotton on this soil ordinarily ranges from about one-third to one-half bale per acre, without fertilization. With fertilizer or manure the yield is considerably greater. Corn usually yields 15 to 20 bushels per acre. Oats do well, particularly where fertilizer is used.

Such minor crops as cowpeas, soy beans, peanuts, sweet potatoes, and sorghum yield well. Where well cultivated cowpeas seldom fail

to mature seed, as sometimes occurs on the alluvial soils. The quality of vegetables and grains is good, and varieties of cotton seldom deteriorate in length of staple, as they do on some soils that have been long in cultivation.

This type seems well suited to peaches, as indicated by the condition of numerous trees planted in yards or in the small home orchards. Pears and plums thrive, although the former are subject to attack by blight here as in other sections. Some fine individual pecan trees are growing on this soil.

The present price of land of the Memphis silt loam, smooth phase, ranges from about \$15 to \$25 an acre.

With reasonably careful management the smooth phase of the Memphis silt loam is very productive. Among the necessary provisions are the frequent change to some hay or pasture crop and the growing of winter cover crops to prevent erosion.

GRENADA SILT LOAM.

The surface soil of the Grenada silt loam consists of a light grayish brown to brown or reddish-brown, friable silt loam, from 6 to 10 inches deep. The subsoil is a friable silty clay loam of a brownish to reddish-brown color. The lower part of the subsoil is more or less compact, usually mottled with grayish colors, and contains considerable quantities of iron concretions, which are most numerous where the underlying reddish sands or clays lie near the surface. In the eastern part of the county, where the type is associated with the Lexington silt loam, many minor soil variations occur. According to field tests both the soil and subsoil are acid.

This type is quite widely distributed. With its hilly phase it occupies about 25 per cent of the area of the county. South of Grenada there are a number of small areas, most of which occupy the lower parts of the long slopes extending from the higher ridges to the old terraces along the streams. At the foot of the slopes in many places the drainage is poor. Most of the areas near Redgrass, But-putter, and Little Horsepen Creeks occur on the lower slopes of the divides. Here the subsoil in many places approaches a hardpan in texture and the underdrainage is poor. On the north side of the Yalobusha Valley and east of the Shooner River the type occupies long, gentle slopes extending from the second bottoms to the crests of divides near the north boundary of the county. Here the loessial material ranges from about 8 to 12 feet in depth and rests on friable, red sandy loam. Both the topography and the structure of the soil favor excessive drainage. Much of this otherwise valuable land is deeply gullied.

Nearly all the smoother areas of the Grenada silt loam are now or have been in cultivation. Most of the badly eroded land is used

only as pastures, and most of the areas having a very compact subsoil have been thrown out of cultivation.

The larger and smoother areas of this type have about the same crop adaptation as the Memphis silt loam, but much of it is less desirable, owing to local variations in the subsoil and consequent poor subdrainage.

Grenada silt loam, hilly phase.—The hilly phase of the Grenada silt loam includes those areas that are too rough for cultivation except in small patches on the tops of ridges or on gentle slopes. The areas a few miles west of Grenada are similar to the Memphis silt loam in topography and in general character of the soil; those nearer the town are rougher. There are many variations in the soil where the conditions approximate those giving the Lexington silt loam or Guin sandy loam. East of the Batupan River the boundary between the Lexington silt loam and the Grenada silt loam is more or less arbitrary. The latter is the less rugged and includes larger areas of tillable land.

The hilly phase of the Grenada silt loam is generally covered with a mixed growth of hardwoods and shortleaf pine. The soil is well suited to Bermuda grass and Japan clover, but owing to the small proportion of the phase that is cleared these valuable pasture grasses are not so abundant as on the main type. The phase is generally well watered and could be transformed into good grazing land. The present price of land of this phase is about \$10 an acre.

LEXINGTON SILT LOAM.

The most important difference between the Lexington silt loam and the Memphis silt loam lies in the presence of Coastal Plain material within the 3-foot section in the case of the former. The typical soil consists of light-brown to brown silt loam underlain at 6 to 10 inches by a buff or light reddish brown silty clay loam or silty clay, which passes within the 3-foot section into more sandy material. At a slightly greater depth comparatively loose red sand or red sandy loam is encountered. The typical lower subsoil thus approaches the character of the Ruston and Orangeburg subsoils. A few included areas of Memphis silt loam were not separated on account of their small size.

As mapped, the Lexington silt loam is quite variable, especially in depth to the underlying sandy material.

In many places the subsoil consists of a stiff, heavy, reddish-brown silty clay, changing with depth to a less pervious clay of lighter color. This variation is of most frequent occurrence on the lower and middle slopes of hills in those localities where the hard, white, shaly clay beds occur. On the crests of sharp ridges and the tops of the higher

hills the soil is usually more sandy and often carries some iron-cemented sandstone and other ferruginous material.

The Lexington silt loam is of common occurrence throughout the eastern half of the county. The topography ranges from hilly to broken. As a rule the areas drained by the middle and lower tributaries of Redgrass and Butputter Creeks are not so rough as those on the headwaters of these streams. Nearly all the areas in the southeastern part of the county are very hilly and the proportion of tillable land is small. Most of the areas of the type associated with the Guin stony sandy loam are very rough and of little value except for pasture.

The run-off is rapid and erosion is rather serious. Underdrainage in general is satisfactory, except in areas having a compact stratum of clay near the surface, which are seepy after heavy rains. In a few places there is sufficient loose sand to affect unfavorably the moisture-holding capacity of the soil.

This type is cultivated only on the wider ridges and gentler slopes. Many small fields formerly cultivated have been abandoned and now support a growth consisting mainly of broom sedge and pine. The farms usually include much brushy pasture land, while the tilled land is confined to the branch bottoms and the small included areas of Memphis silt loam. On the uncleared areas much of the undergrowth consists of a rather coarse, bunchy grass and in abandoned fields lespedeza, Bermuda grass, and broom sedge spring up. The forest growth consists mainly of shortleaf pine, with more or less post, white, and black oak, hickory, ash, and poplar, the latter being most abundant on areas of heavier soil and in the ravines.

Corn gives low yields, except on recently cleared land or where well fertilized. The best yields of cotton are generally obtained on the heavier variations of the type, and in seasons of abundant rainfall. As a rule the yields are lower than on the Memphis silt loam or the adjoining bottom-land types. Sugar cane, sweet potatoes, and most garden vegetables do well. On many of the southerly slopes Irish potatoes, tomatoes, and other truck crops would mature earlier than on the adjacent soils. Most of this type can be more profitably used for pastures than for any other purpose.

The present price of land of the Lexington silt loam ranges from \$5 to \$15 an acre.

RUSTON SANDY LOAM.

The Ruston sandy loam consists of a grayish sandy loam or loamy sand, about 6 to 8 inches deep, passing abruptly into yellowish material of about the same texture, which is underlain by yellowish-red or dull-red, compact, friable sandy clay. Below 20 to 30 inches this

clay usually grades into a coarse, loose, sandy material. There are some included areas of Ruston fine sandy loam and Lexington silt loam too small to separate on the soil map.

The Ruston sandy loam is confined to the eastern half of the county. In the section between Gores Springs Church and Graysport it generally occupies the higher divides, but extends in only a few places to the lower slopes; here the sandy-loam surface soil is but a few inches deep and the subsoil is generally a stiff, reddish silty clay loam. North of Graysport, toward the county boundary, there are considerable areas of this type associated with the Lexington silt loam, and variations representing transitions between the two types are of frequent occurrence in this section. On the high divide west of Cowpen Creek the type occurs on the crests and upper slopes, while farther west, near Rauseville Chapel, it is generally confined to the lower hillsides.

In the southeastern part of the county, on the divides between Butter Creek and its numerous small, south-flowing branches, there are many patches having a light reddish brown to grayish-brown sandy loam surface soil and a heavy silty clay subsoil. These occur for the most part about halfway between the top of the divide and the foot of the slopes. Not all of them are indicated on the map. In all the areas of Guin stony sandy loam and Lexington silt loam east of the Batupan River there are small areas of Ruston sandy loam and fine sandy loam.

The topography of those parts of the county in which the Ruston sandy loam occurs is prevailingly rolling to hilly, but the areas of this type usually have a somewhat smoother surface than the surrounding soils.

A considerable part of the Ruston sandy loam, including most of the areas near Gores Springs Church and Rauseville Chapel, is in cultivation. Cotton, of which the yield is lower than on the associated silt loams, is practically the only field crop. Newly cleared land produces well for a few years, after which its productiveness decreases, the small quantity of organic matter in the surface soil rapidly disappearing. Areas having a clay subsoil remain productive much longer than those in which the subsoil and substratum are very sandy.

No definite statement as to land values on the Ruston sandy loam can be made, as few farms consist entirely of soil of this type. In general it is not valued as highly as are the adjoining Lexington and Memphis soils.

GUIN STONY SANDY LOAM.

The larger areas mapped as Guin stony sandy loam represent rough, broken land in which such a variety of soils and soil conditions

occur within narrow limits as to preclude satisfactory separation into types. The dominant soil consists of a grayish sand to fine sandy loam, underlain at a depth of 5 to 10 inches by red clay or sandy clay, usually very plastic but in many places resembling the subsoil of the Ruston sandy loam. In other places the subsoil is a sticky, tenacious, nearly impervious clay, more or less mottled with gray, similar to the Susquehanna clay subsoil, mapped in other parts of the State. This variation is generally observed where the white, shaly clay beds occur. On the higher ridges there are many included patches of Ruston sandy loam and Orangeburg sandy loam and fine sandy loam. On the lower slopes the prevailing material is the loess or brown silt loam from which the Lexington and Memphis silt loams are derived, and variations of these two types are predominant in the less broken parts of the areas.

The crests of the ridges and high mounds that stand from 20 to 50 feet above the general level of the neighboring hills are thickly strewn with large and small fragments of iron-cemented stone. Some of these are hard, platy pieces, while others have a concretionary form. Masses of the latter several feet in diameter are of common occurrence in some places. There is considerable ferruginous material of finer or softer structure, and all deep road cuts reveal much of this material, as well as bright-red sand.

The largest areas of Guin stony sandy loam occur in the central part of the county, the type constituting the higher and rougher parts of the uplands immediately south of the Yalobusha River and overlooking the valley of the Batupan River. Elsewhere the type is of very small extent.

There is a considerable total area of this land, but most of it is unsuitable for farming. The occasional patches in cultivation are mostly included Ruston sandy loam or Lexington silt loam areas. They are used for the production of cotton and corn.

The forest growth consists chiefly of pine and oak, with some hickory and poplar.

The price of land consisting chiefly of this type varies, but is seldom higher than \$10 an acre. Well-forested areas bring the highest prices. The best use of this soil is for forest and pasture land.

LINTONIA SILT LOAM.

The Lintonia silt loam consists of a brown silt loam, underlain at a depth of about 10 inches by a reddish-brown, buff or yellowish-brown silty clay loam to silty clay, which usually becomes more compact with depth. The reddish tint in the subsoil is most pronounced where the drainage is best, as on slight inclines, while the lighter shades occur in the more poorly drained areas. Where water movement in the lower subsoil is slow the latter shows more or less grayish

mottling. Frequent variations in this respect occur within narrow limits, but practically all the type has good drainage and aeration to a depth of several feet. The soil according to the litmus-paper test is acid, but not so strongly acid as the light-colored soils of the terraces.

The Lintonia silt loam occurs on the second bottoms of the Yalobusha River and its larger tributaries. From Grenada eastward the type is generally confined to the outer margin of the terraces, where the drainage is good. Farther back from the river, where the surface has less relief, this type merges with the Olivier silt loam. This association of the two types is observable along Batupan River. The elevation above the first bottoms generally is not more than 10 to 15 feet.

The areas on the south side of the river northeast of Dubard and the terrace on which Holcomb is situated lie 20 to 30 feet above the first bottoms. Near Holcomb several distinct benches are observable. The wide terrace above Parsons is nearly level, and its surface has an elevation of 30 to 40 feet above the valley floor.

The drainage of the high terraces is generally good, and few spots occur where crops are damaged in wet weather. This unfavorable condition exists most frequently in the small areas in the Yalobusha Valley east of Grenada, where the compact substratum of white silty material lies within a few feet of the surface.

All this type is in cultivation. Much of it, cleared 60 or 70 years ago, is still producing good crops. It is easily tilled and responds readily to fertilization.

Cotton yields from two-thirds to 1 bale per acre, and the quality of the fiber is good. Corn does very well on this type, and where cowpeas have been grown the preceding year, or vegetable matter in some other form has been returned to the soil, the yields range from 25 to 40 bushels per acre. Oats have been grown only in a small way, but the results are usually satisfactory, and the ease with which heavy machinery may be operated favors their more extensive production. Minor crops do about as well on this soil as on the more desirable areas of the Memphis silt loam. Owing to the somewhat higher moisture content, Bermuda grass and lespedeza make a better growth on this type than on the upland soils.

The price of land of the Lintonia silt loam in the vicinity of Grenada, Dubard, and Holcomb ranges from \$25 to \$50 an acre. Land more remote from railways brings only about half as much. Nearly all the dwelling houses of the white residents in the river valleys are located on the higher portions of this type.

Lintonia silt loam, slope phase.—A few narrow areas of outwash material at the foot of the hills overlooking the larger valleys are mapped as the slope phase of the Lintonia silt loam. These areas

owe their origin to creep and wash of the loess onto the margin of the adjacent bottom land. Streams issuing from the hills and crossing the alluvial plain without definite or permanent channels deposit their load of silt as broad, low fans at the margin of the valley. The most notable example of this is Hoffa Creek, near Oxberry, which is extending its daltalike deposits of silt over an area of more than a square mile.

The surface soil of this phase of the Lintonia silt loam consists of a very friable, brown silt loam, with a relatively large content of very fine sand. The upper subsoil has essentially the same texture and structure as the surface soil, but is usually a little lighter colored, and the lower subsoil is frequently mottled faintly with gray. In places where the original surface has been covered with later accretions the subsoil is a very dark brown, porous silt loam. Practically everywhere, however, the surface soil and subsoil have a friable structure. The drainage is good, except at the lower margins of the areas where the phase merges into the Olivier or Waverly soils.

Nearly all this phase of the Lintonia silt loam is cultivated and has a high agricultural value. It is used largely for cotton, which yields a bale or more per acre. Corn, oats, and lespedeza also do well.

OLIVIER SILT LOAM.

The Olivier silt loam consists of a brown, friable silt loam, 6 to 10 inches deep, underlain by a yellow or yellowish-brown silty clay loam which changes at a depth of 25 to 30 inches to a compact, rather plastic, gray silty clay loam, mottled with yellowish brown and containing considerable rusty-brown or black concretions and concretionary material. The substratum usually is a light-gray, silty material containing considerable yellowish or brownish concretions. It is so compact that penetration with a soil auger is difficult and exposed surfaces in ditch banks are firmly cemented. According to the statements of well diggers, this layer is 5 to 10 feet thick and rests upon sand or sandy material.

In the Yalobusha Valley from Grenada eastward this substratum underlies all the terraces at a comparatively shallow depth. It underlies also the larger terraces along the Batupan River, but does not occur generally near the stream. Usually it is encountered at a depth of 2 or 3 feet in the Olivier soils and somewhat nearer the surface in the Calhoun silt loam.

The Olivier silt loam occurs on all the terraces, but is most extensively developed on those along the Yalobusha River. It is associated with the Lintonia and Calhoun silt loams, and in general agricultural value is intermediate between these soils. The natural drainage is not so good as that of the Lintonia, but better than that of the Calhoun silt loam.

The type is also developed on the gently sloping outer margins of the first bottoms where they lie for the most part above the usual limits of overflow. The areas near Le Flore and Parsons are of this character and include many low swales where the soil is similar to the Collins silt loam. In general, these low areas are without the compact substratum which characterizes the type on the terraces, and they have better drainage than the terrace areas.

The areas of Olivier silt loam near Oxberry consist of low second bottoms which merge imperceptibly into the lower land near the river. They are intersected by numerous shallow bayous that afford fair surface drainage. On the slight elevations the soil resembles somewhat the Lintonia silt loam, but as a rule the salient characteristics of the Olivier silt loam prevail.

Most of this type is in cultivation. Owing chiefly to the poorer drainage, the yields of cotton and corn ordinarily are somewhat lower than on the Lintonia soils. Lespedeza does very well and some fine grasslands of this growth have been established. Bermuda grass thrives, but spreads less rapidly than on lighter textured and warmer soils. Sorghum, sugar cane, oats, and rye are all successfully grown, the last two chiefly in small patches for winter feed. In rainy winters the ground becomes too soft for grazing cattle and horses.

In recent years small tracts of land a few miles from Grenada consisting chiefly of this type have been sold for as much as \$40 an acre. Land several miles from towns commands about one-third or one-half this price. There are few buildings on this type, such improvements being situated on adjoining higher ground.

In nearly all areas of this type there are open ditches to facilitate surface drainage, but practically no tile drains have been installed. Where the land is to be used chiefly for pasture it may not be advisable to make expensive improvements in drainage, but if more intensive farming is to be followed, tile drainage would be advisable, particularly on account of the natural adaptation of these terrace lands for diversified farming and the use of labor-saving machinery.

The Olivier soils require heavy applications of lime. This material is not now available, however, from any local source.

CALHOUN SILT LOAM.

The surface soil of the Calhoun silt loam, to a depth of about 8 to 15 inches, is a dull-gray to pale yellowish brown silt loam, mottled with lighter gray and rusty brown. The subsoil is a grayish silt loam, usually mottled with yellowish brown and rusty brown and changing at a depth of about 20 to 30 inches to a gray or whitish, compact silt loam or silty clay loam or clay, with yellowish-brown and rusty-brown patches, the latter representing ferruginous material. Small black concretions are present throughout the soil section,

being most numerous in the compact lower layer. Both soil and subsoil are acid and as a rule lack the crumby or grainy feel usually more or less noticeable in the soils of darker color. In the lightest colored areas the soil is very soft and pasty when wet and has a floury feel when dry. There is a decided tendency toward cementation on drying, owing to the fineness of the material and the almost entire absence of organic matter. Much of the type as mapped is darker colored than typical, resembling the Olivier silt loam, from which it is separated by rather arbitrary boundaries.

The Calhoun silt loam occurs on the terraces along the larger streams. It has been developed where the natural drainage is very poor, as in flat or slightly depressed areas which have a compact substratum. Small areas are occasionally encountered in the bottom lands along the creeks where the outer margins rise slightly in passing into the adjoining hillsides. The largest areas lie in the Yalobusha Valley between Grenada and the eastern boundary of the county.

The original vegetation included much post oak and water oak and some beech and hickory, as well as many other water-loving trees and shrubs:

The small areas under cultivation consist mostly of variations resembling the Olivier silt loam. In very wet or very dry seasons cotton on these light-colored areas usually fails to mature. Corn fares even worse and is seldom planted on this soil. Under very favorable conditions fair yields of cotton are obtained. Lespedeza thrives and seems to offer the most promising means of utilizing such areas of this soil as are cleared. Heavy applications of lime are advisable.

Uncleared lands of this type are valued chiefly for their timber.

VICKSBURG FINE SANDY LOAM.

All the sandy alluvial land in the county is mapped with the Vicksburg fine sandy loam. The typical soil consists of a brown loamy fine sand to fine sandy loam, underlain at variable depths by lighter brown fine sandy loam, frequently mottled with grayish and rusty brown. As mapped, the type includes other soils which could not be separated satisfactorily on account of their small area or patchy occurrence. Some of these included areas are coarse sand and some silt loam in texture.

The Vicksburg fine sandy loam occurs principally along the Yalobusha River. It is largely confined to the immediate vicinity of the channel. Just below the mouth of the Shoener River the type is mapped quite extensively, much of the soil here being a medium to coarse sandy loam. The small areas near the foot of the uplands, in

the northern part of the Yalobusha Valley, consist chiefly of rather coarse textured, light-brownish sand washed from the gullies in the hills near by.

Most of the fine sandy loam areas along Batupan River consist of silt and sand recently deposited upon heavier alluvium. In places near the channel the soil is a loose, deep sand of little agricultural value, but farther back, where the texture is finer, a very productive soil has been formed.

Small areas of this type also occur along some of the small streams originating in areas of the Guin stony sandy loam, Ruston sandy loam, and Lexington silt loam.

Although most of this type is subject to overflow, the drainage conditions are good when the streams are at their normal stage. On the coarsest textured areas cotton suffers during short periods of dry weather, but elsewhere there is little likelihood of serious injury from this cause. In many instances crops endure quite marked extremes of rainfall better than on the adjoining heavier soils, but this is due chiefly to the better tilth of the sandy land under the rather careless management of negro tenants.

The yields of cotton on this type are quite variable, but compare well with those on the Vicksburg silt loam. Corn does fairly well on areas of the heavier soil, but the yields on the lighter areas are usually low. The type is a favorite soil for gardens and patches of early Irish potatoes. Bermuda grass does especially well, spreading more rapidly than on the silt loam soils.

Owing to its irregular occurrence and rather intimate association with other types, an estimate of the value of land of the Vicksburg fine sandy loam is impracticable. In general it is considered as valuable for general farming as the best areas of the Vicksburg silt loam.

VICKSBURG SILT LOAM.

The Vicksburg silt loam consists of a mellow, brown silt loam, usually underlain at about 10 to 15 inches by a somewhat lighter brown or yellowish-brown silt loam which ordinarily shows but little change within the 3-foot section. In places the lower part of the subsoil is somewhat sandy, and where the substratum is a compact, silty material the lower subsoil is usually more or less mottled with gray. In the broader bottoms, such as those of the Yalobusha River, the surface soil is usually not so deep and the subsoil is heavier and has a more buff or yellowish-brown color. Much of the soil in these broader bottoms consists of a brown silt loam, underlain at a depth of about 6 to 10 inches by a yellowish-brown to buff or light reddish brown silt loam to silty clay loam. As the banks of the streams are approached the content of sand usually increases, and in many places

the type grades into a sandy loam. In the eastern part of the county this type is usually associated with the Collins silt loam.

The Vicksburg silt loam is most extensively developed along the Yalobusha River. It also occupies almost all the bottoms of the small creeks in the western half of the county. In the eastern half it is confined to the higher parts of the stream valleys and to small areas where drainage is favored by proximity to channels or by the presence of a sandy substratum, although the latter is seldom an important factor in the development of the type. The surface of the large areas in the Yalobusha Valley is somewhat uneven and depressions are numerous.

All the type is subject to overflow. In the small valleys the floods are generally of short duration. In the valleys of the Yalobusha and Shooner Rivers they last longer, but occur as a rule only in the winter. Much rich alluvium is deposited by the flood waters. In many of the small branch bottoms the deposits have filled depressions that formerly were swamps.

Practically all this type in the smaller valleys is under cultivation, but much of it in the Yalobusha Valley is still forested. Under good cultural methods a yield of more than 1 bale of cotton per acre is frequently obtained, while yields of 40 to 50 bushels of corn per acre are reported. Sugar cane, sorghum, sweet potatoes, and peanuts do well. Lespedeza, Bermuda grass, and carpet grass usually take possession of land remaining untilled for a season. In the Yalobusha bottoms overflow limits the use of the land chiefly to corn and cotton. Much of the type is cultivated by negro tenants. Uncleared areas support more or less wild cane, which enhances their value for pastures.

There are very few farms consisting entirely of land of the Vicksburg silt loam, but in the case of many it forms the greater proportion of the land in cultivation. In the branch bottoms the areas are necessarily small and of irregular outline, but those in the creek valleys and near the rivers are much larger. The price of land of this type ranges from \$25 to \$50 an acre, the price depending mainly upon the location.

COLLINS SILT LOAM.

The Collins silt loam consists of a light-brown to brown silt loam, passing abruptly into a yellowish-brown or grayish-brown silt loam, underlain at a depth of 15 to 20 inches by a light-gray, compact silt loam, mottled with rusty brown and containing small ferruginous concretions. The lower subsoil is a gray to light-drab, compact, plastic silty clay loam containing much concretionary material. In places the surface soil has been washed away by flood waters, but as a rule there has been deposition rather than removal of material. Many former swamp depressions, "maple slashes," have been filled sufficiently to admit of their cultivation. In such places the friable

brown material is generally deeper than elsewhere. On slight elevations and near the stream channels the Collins silt loam frequently merges into the Vicksburg silt loam, while in flats or slightly depressed areas it approaches in character the Waverly silt loam. Such local variations in the nature of the soil are characteristic of practically all the small valleys in the eastern half of the county. In all instances both the surface soil and subsoil are acid, according to the litmus-paper test, and there is no evidence of lime in the substratum or in the recently deposited alluvium, except in the western part of the county, where the calcareous substratum of the uplands contributes some material to the alluvial soils. The content of organic matter is low, particularly in cultivated fields, but the friability of the surface soil and the deposition of material by overflows render the lack of organic matter of less importance than in similar soils lying above the reach of flood waters.

The Collins silt loam is the principal type in the creek valleys in the eastern half of the county. The largest areas occur in the Yalobusha and Shooner Valleys. The soil here is somewhat heavier than in the areas near the smaller streams.

The greater part of this type in the creek bottoms is cultivated. Cotton yields from one-half to 1 bale per acre. Where fields include patches of Waverly silt loam the yield may be considerably reduced, owing to the fact that the more compact soil of the latter type is easily affected by any excess or deficiency of rainfall. Most of the type is not well suited to corn, although a yield of 25 to 30 bushels per acre is sometimes obtained. Oats, sorghum, sugar cane, and lespedeza do well. In the eastern part of the county, upon a farm on which excellent tillage methods are followed regularly, a yield of 53 bushels of oats per acre was obtained in 1915, and the following crop of lespedeza yielded about $2\frac{1}{2}$ tons of hay per acre. Yields of 2 to 3 tons of sorghum forage per acre are reported, and the second growth usually makes good fall pasturage. The sirup from sugar cane grown on this soil is light colored and of good quality.

In the lower Yalobusha Valley the Collins silt loam is usually somewhat darker colored and more productive than in the creek valleys. In this section corn and cotton make good yields in favorable seasons, but the overflows are a rather serious matter. The areas in the Yalobusha Valley above Holcomb and those in the Shooner Valley are mostly covered with an open forest in which oak trees predominate. In places there is much small cane, and all land from which the timber has been removed supports more or less lespedeza and Bermuda grass. The areas in which this type prevails are used to a considerable extent for pastures, and on account of the increased interest in cattle raising they are now held in higher esteem than formerly.

The price of land of the Collins silt loam is largely determined by the value of the timber and probably averages about \$10 an acre. Cultivated areas are generally valued somewhat lower than land of the adjoining Vicksburg silt loam, owing to the superiority of the latter type for the production of corn and cotton and to the lower cost of draining. Practically all the Collins silt loam requires drainage before it can be profitably cultivated.

COLLINS SILTY CLAY LOAM.

The surface soil of the Collins silty clay loam, to a depth of about 12 inches, is a heavy silt loam or silty clay loam, of a pronounced brown color. The subsoil is usually of a texture similar to the soil, but it is more or less mottled with gray and rusty brown in the upper part and becomes light gray in the lower part. The lower subsoil usually contains some yellowish-brown iron stains and small brownish-black concretions, indicative of poor underdrainage and lack of aeration. There also is usually some concretionary material in the surface soil and upper subsoil. Litmus-paper tests show both soil and subsoil to be acid.

This type is developed in the lower Yalobusha Valley and in the wide flood plain between the Yalobusha and Tallahatchie Rivers. Like the Collins silt loam, it occurs in slightly elevated positions or in the immediate vicinity of stream channels, and aeration and oxidation have extended to a depth of 1 or 2 feet. All the type, however, is subject to frequent overflows. If protected from floods it would have a high agricultural value. This is especially true of the cane ridges, in which the soil has a dark chocolate brown color and friable structure, due to the presence of considerable organic matter.

In the extreme northwest corner of the county, throughout most of sections 6 and 7, the soil is much heavier than elsewhere. The surface soil here is a dark-brown silty clay, somewhat mottled with lighter brown and gray. When wet it is very adhesive and on drying it cracks deeply and the surface becomes granular. The subsoil is a lighter colored, tenacious clay, showing some mottling in the upper part but very little in the lower. The lower subsoil in places is very light colored and nearly impervious to air and water. None of this included area of heavy soil is cultivated. If reclaimed it would have about the same agricultural value as the large areas of Sharkey clay (buckshot land) to the west.

Practically all the Collins silty clay loam is forested. White oak, post oak, water oak, and gum are the principal trees, with considerable hickory, ash, hackberry, and soft maple. As a rule there is less overcup oak and more gum on this type than on the Waverly silt loam. South of the Yalobusha River there are heavy canebrakes,

but north of the stream the cane has been much thinned in recent years by fires. The price of land of this type is determined chiefly by the value of the timber.

WAVERLY SILT LOAM.

The Waverly silt loam consists of a grayish or mottled brown, grayish, and rusty-brown silt loam, underlain at a depth of 8 to 10 inches by a grayish or yellowish silt loam, mottled with rusty brown. In the lower subsoil there is usually a compact layer of impervious silt to silty clay loam, mottled grayish and rusty brown and containing brown and black iron concretions and concretionary material. Both soil and subsoil are decidedly acid and apparently low in organic matter, except in the first 2 or 3 inches, where there is in some instances enough to give the material a dark color. As a rule the surface soil and upper subsoil are plastic, while the lower material is somewhat friable, especially where the brownish mottling prevails. There are occasional spots in the smaller areas of this type and of the adjoining Collins silt loam, on which a white crust forms during dry weather. A sample of this substance collected near a small stream in the northeastern part of the county contained about 66 per cent sodium sulphate, the remainder being chiefly common salt. The type can be easily cultivated when moist, but is likely to form a hard crust after rains.

The Waverly silt loam is most extensively developed in the wide flood plain between the lower Yalobusha River and the northern and western boundaries of the county. The areas elsewhere are small and usually less uniform than the larger areas. The type in the Yalobusha Valley is so intimately associated with the Vicksburg and Collins soils that only the approximate extent of the individual developments can be shown on the soil map. A very small proportion of the type here is cultivated. Many small areas of the Waverly silt loam occur along the minor streams, usually adjoining larger areas of the Collins silt loam, from which this type differs mainly in its poorer drainage.

The topography is prevailingly flat, or nearly so, and the drainage is poor. Overflows from the Yalobusha and Tallahatchie Rivers are of frequent occurrence during the winter and occasionally in the summer, though as a rule there are no floods between April and January, and during this period the surface soil is free from excess water. The average level of the ground water, however, is high. At the time of the soil survey, in April, 1915, even in the highest areas it was generally within 20 inches of the surface. During the summer season it is considerably lower than this.

The greater part of this type is forested. The trees consist chiefly of overcup oak, post oak, and white oak, with considerable water oak in places, and some black gum, sweet gum, and ash. In the ponds

cypress is abundant. On the typical Waverly soil there is little or no wild cane, and everywhere the woods are remarkably free from undergrowth.

The Waverly silt loam is farmed in a few places in the eastern part of the county, where it approaches the characteristics of the Collins silt loam. In favorable seasons cotton does fairly well, but the yields are usually less than on the Collins soil. Cotton is frequently attacked by rust. Corn does poorly, but sorghum, sugar cane, and oats do well. The value of oats for winter grazing, however, is lessened by the softness of the ground during the winter. Lespedeza thrives on this soil and undoubtedly affords the most profitable means of utilizing much of it.

The present price of this land is determined almost entirely by the value of the timber.

The Waverly silt loam requires thorough drainage before it can be successfully used for agriculture. In all cultivated fields open ditches have been established.

MEADOW.

Meadow includes soils so variable in texture and color from place to place and through the vertical section that satisfactory differentiation into types is impracticable. The predominant material consists of brown loam, silt loam or fine sandy loam, but there are local areas of reddish-brown material washed from the nearby slopes of reddish soils. The subsoil is frequently mottled with gray and rusty brown. The material consists of both alluvial and colluvial deposits.

Throughout most of its course in this county the Batupan River has a deep channel and is bordered by a narrow flood plain lying 10 to 15 feet below the general level of the first bottoms. This low stream border consists mostly of a bed of loose sand, and in places drifts of white sand extend onto the higher ground for some distance. All these sandy deposits are mapped as Meadow. The lower lying areas support a scattered growth of willow, birch, sycamore, and other small trees.

SUMMARY.

Grenada County is situated in the north-central part of Mississippi. It has an area of 444 square miles, or 284,160 acres. The greater part of the county consists of prevailing rolling to hilly uplands, in places very rough. The western end of the county, comprising an area of about 50 square miles, lies in the Mississippi flood plain, and the remainder of the lowlands is embraced within the valleys of the Yalobusha River and its tributaries.

The greater part of the Mississippi flood plain, as well as most of the first-bottom land of the Yalobusha River is heavily forested, but the alluvial soil along the small streams is in cultivation. The smoother upland areas are largely cleared, although much of this

land is now unused except as pastures. All the rough areas are covered with a mixed growth of hardwoods and shortleaf pine.

Grenada County was first settled about 1830. In 1910 the population, as reported by the census, was 15,727, of which 82.1 per cent was rural. A large proportion of the rural population is colored.

Agriculture is the chief pursuit of Grenada County, and cotton is the principal crop. During recent years increasing attention has been given to the production of corn, oats, and hay and the raising of live stock. The character of the soils, the climate, and the general conditions with respect to transportation facilities and markets favor diversification of crops and the extension of stock raising. The plantations in the valleys are generally large and are worked chiefly by negro tenants; those on the uplands are smaller and are more commonly operated by resident owners. Farm labor is usually abundant. Tenants receive from one-fourth to one-third of the crops produced.

The upland soils of the western and central parts of the county are of loessial origin. In the eastern half of the county the loess is seldom more than a few feet deep, and the underlying Coastal Plain material, consisting mostly of sand and clay, enters largely into the composition of the soils.

The dominant type in the western part of the uplands is the Memphis silt loam, a friable brown soil deficient in organic matter but otherwise well suited to the production of cotton, corn, and various grasses and clovers, as well as truck and fruit. Much of this type is too hilly for convenient cultivation. The smooth phase of the Memphis silt loam, owing to its more favorable topography, admits of the use of all kinds of farm machinery, and is a somewhat better soil. It is used mainly for the production of cotton, corn, and oats. Cowpeas, soy beans, peanuts, sweet potatoes, and sorghum are also grown.

The Grenada silt loam is similar to the Memphis, but its subsoil is usually more compact and underdrainage is less thorough. This type occurs throughout the central and eastern parts of the county. Nearly all the smoother areas are now or have been in cultivation. The hilly phase of the Grenada silt loam includes those areas that are too rough for cultivation except in small patches on the tops of ridges or on gentle slopes.

The Lexington silt loam is of considerable extent throughout the eastern half of the county. This type differs from the Grenada silt loam mainly in the presence of Coastal Plain material within the 3-foot section. The topography ranges from hilly to broken. Only the wider ridge areas and the gentler slopes of this type are cultivated. Corn and cotton give lower yields than on the Memphis silt loam or the adjoining bottom-land types. Sugar cane, sweet potatoes, and most garden vegetables do well.

The Ruston sandy loam occurs throughout the uplands of the central and eastern parts of the county. This type usually has a clayey subsoil, and the moisture conditions are favorable for most tilled crops. A large part of the type is under cultivation. Cotton is the only field crop grown. The yield is lower than on the associated silt loams.

Very rough, broken areas over which the soils are so varied within narrow limits that they can not be satisfactorily mapped as separate types are classed as the Guin stony sandy loam. The largest areas occur in the central part of the county. Most of this land has no agricultural value except for grazing.

The terrace soils of the county are included in the Lintonia, Olivier, and Calhoun series. The well-drained areas are mapped as the Lintonia silt loam, a brown, friable soil of high agricultural value. All this type is in cultivation and the common crops do well on it. A few narrow areas of outwash material at the foot of the hills overlooking the larger valleys are mapped as the slope phase of the Lintonia silt loam. This phase has a high agricultural value, and nearly all the land is cultivated, being used largely for cotton.

The Olivier silt loam is not so well drained as the Lintonia, but most of it is in cultivation. It produces lower yields of cotton and corn than the Lintonia soils, owing chiefly to the less satisfactory drainage conditions.

The Calhoun silt loam is very poorly drained, and only a few small areas are under cultivation. The type is valued chiefly for its forest growth.

In the first bottoms there are three series, the material of which is wholly or to a large extent derived from the loessial uplands. These are the Vicksburg, Collins, and Waverly series. The differences between the soils of these series seem to be due to variations in the drainage conditions. The Vicksburg fine sandy loam and silt loam are brown, well-drained soils, highly esteemed for cotton and corn.

The Collins silt loam resembles the Vicksburg, but has a light-colored subsoil, and the natural drainage is deficient. Most of the type has been artificially drained, and crop yields are comparable with those on the Vicksburg silt loam.

The Collins silty clay loam is developed only in the western part of the county. It is a very productive soil, but is subject to deep overflows from the lower Yalobusha and Tallahatchie Rivers. Only a small proportion of it has been cleared.

The Waverly silt loam is a light-gray soil, poorly drained and of little present agricultural value.

Meadow includes alluvial soils of such variable character that no satisfactory separation into types is practicable. It is of slight agricultural importance.

[PUBLIC RESOLUTION—No. 9.]

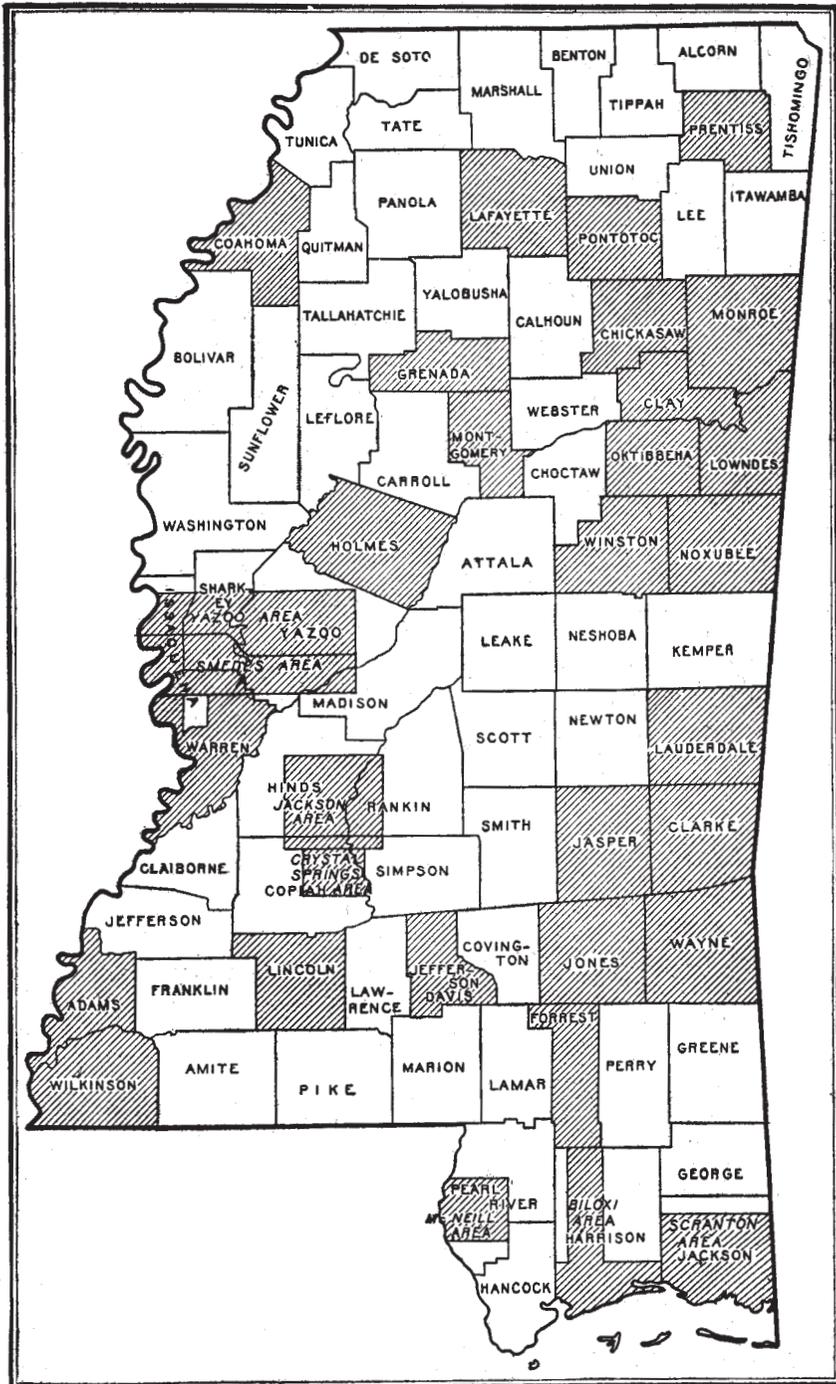
JOINT RESOLUTION Amending public resolution numbered eight, Fifty-Sixth Congress, second session, approved February twenty-third, nineteen hundred and one, "providing for the printing annually of the report on field operations of the Division of Soils, Department of Agriculture."

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

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

Approved, March 14, 1904.

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



Areas surveyed in Mississippi.

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