

U. S. DEPARTMENT OF AGRICULTURE,

BUREAU OF SOILS—MILTON WHITNEY, Chief.

IN COOPERATION WITH THE STATE OF MISSISSIPPI, THEODORE G. BILBO  
GOVERNOR; E. N. LOWE, DIRECTOR, STATE GEOLOGICAL SURVEY.

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SOIL SURVEY OF MADISON COUNTY,  
MISSISSIPPI.

BY

W. E. THARP, IN CHARGE, E. H. SMIES,  
AND G. W. MUSGRAVE.

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HUGH H. BENNETT, INSPECTOR, SOUTHERN DIVISION.

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[Advance Sheets—Field Operations of the Bureau of Soils, 1917.]



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## LETTER OF TRANSMITTAL.

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U. S. DEPARTMENT OF AGRICULTURE,  
BUREAU OF SOILS,  
*Washington, D. C., August 20, 1919.*

SIR: The field operations of the Bureau of Soils for 1917 included a soil survey of Madison County, Mississippi. This work was carried on in cooperation with the State of Mississippi. I have the honor to transmit herewith the manuscript report and map covering this survey and to recommend their publication as advance sheets of Field Operations of the Bureau of Soils for 1917, as provided by law.

Respectfully,

MILTON WHITNEY,  
*Chief of Bureau.*

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

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### MAP.

Soil map, Madison County sheet, Mississippi.



# SOIL SURVEY OF MADISON COUNTY, MISSISSIPPI.

By W. E. THARP, In Charge, E. H. SMIES, and G. W. MUSGRAVE.—Area Inspected by HUGH H. BENNETT.

## DESCRIPTION OF THE AREA.

Madison County is situated in the central part of Mississippi, its southern boundary being about 6 miles north of Jackson. It is bounded on the north by Attala County; on the east and southeast by Leake, Scott, and Rankin Counties; on the south by Hinds County; and on the northwest by Yazoo County. Its greatest extent, from southwest to northeast, is about 50 miles, while its average width from northwest to southeast is about 15 miles. It comprises an area of about 725 square miles, or 464,000 acres.

Throughout the central and southwestern sections of the county the surface in general is gently rolling to undulating, the latter topography prevailing on the main divides. In the southwest corner of the county the uplands immediately west of Bogue Chitto are hilly, but become somewhat smoother as the western county boundary is approached. In the eastern and northern parts of the county much of the topography ranges from strongly rolling to hilly. In the extreme northeastern part there are some areas of broken land, usually at the heads of local drainage lines. The difference in elevation between the ridge crests and the adjacent bottom land is generally less than 100 feet. From a point a few miles southwest of Flora there is a high divide, with occasional conical hills, extending to Livingston. A somewhat similar high ridge occurs a few miles west of Madison Station. The highest points on these ranges of hills are about 450 feet above sea level, or 100 to 200 feet above the surrounding country. Ridgeland is 358 feet above sea level, and Canton about 224 feet; the uplands immediately north of the latter town are somewhat higher.

The flood plain of the Big Black River forms a strip of level land about  $1\frac{1}{2}$  miles wide along the entire northwestern side of the county.

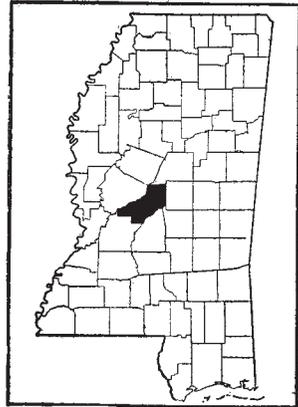


FIG. 1.—Sketch map showing location of the Madison County area, Mississippi.

The alluvial plain of the Pearl River, from 1 to 3 miles wide, similarly borders about 20 miles on the southeastern side. These bottoms, called swamps, are densely forested and are of no present agricultural importance aside from the pasturage afforded hogs and cattle.

Distinct terraces or second bottoms occur to a small extent in the Pearl River Valley and to an important extent along the Big Black River and for several miles up its larger tributaries. The width of these terraces ranges from a fraction of a mile to 2 miles. They lie 10 to 15 feet above the adjacent first bottoms at the northern county boundary and gradually increase in height to about 20 to 40 feet at the southern county line. Practically all of these terraces are cleared and form, with the open, gently sloping uplands to the east, a wide belt of fine agricultural land. North of Doaks Creek the uplands rise rather abruptly from the terraces and in places are too hilly for convenient tillage.

Nearly all the county is drained by the Big Black River. About 30 square miles in the extreme southern part and a strip generally less than 3 miles in width along the southeastern side are tributary to the Pearl River. Bear Creek, which drains most of the south-central part of the county, has a southerly course, and some of its eastern branches originate within a mile of the flood plain of the Pearl River. Doaks Creek has widely extended branches and receives most of the drainage of the northern third of the county.

These streams and their larger tributaries frequently overflow the bottom lands. Their channels are comparatively deep, but crooked and much obstructed by forest débris. Except along the short branches originating in the more hilly sections, there is little sand in the channels, and there is nowhere any rock. All of these streams when at flood height carry much yellowish silt; the deposition of this in the low forested lands has obliterated many old channels, and is otherwise materially improving these lowland soils, compensating for the injury caused in many places on the uplands by excessive erosion.

Most of the drainage ways less than 3 or 4 miles long are dry during the summer. There are very few springs, except in the rougher lands in the northeastern part of the county. Artificial ponds supply much of the water for live stock. Water suitable for home use is generally obtainable in the uplands at depths ranging from 100 to 200 feet. Shallow wells are not usually dependable, except on the terraces.

Throughout the central and southern sections of the county the uplands and second bottoms have largely been cleared of the original forest cover, but there is more or less timber along all the streams, and also on the rougher lands. Most of the timber on the rough

areas in the northeastern and eastern parts of the county consists of second-growth pine.

Except in the vicinity of the towns the rural white population is scattered. The population of this class, which includes that in the small villages, is 4,675 according to the 1910 census. The rural negro population is 24,900, and the total negro population 33,493. Within the last few years several thousand negroes have left the county, and there are scores of unoccupied cabins. A considerable number of white farmers have come from northern States, and there is a small German colony near Gluckstadt.

Canton is the county seat and chief business center. It had a population in 1910 of 3,929. The population of Flora in 1910 was 747, and of Ridgeland 158.

The main line of the Illinois Central Railroad traverses the central part of the county, and the Yazoo & Mississippi Valley Railroad crosses the western part. Flora is a shipping point of local importance on this road.

A fine system of public roads is being constructed. There is rural mail-delivery service from Canton, Camden, and Flora, and several star routes reach the northern and eastern parts of the county. Most of the rural schools have been consolidated. The county agricultural high school is located at Camden.

#### CLIMATE.

The average yearly rainfall in this area, about 50 inches, is ample for most crops. The retentive nature of the prevailing soil types makes them, with reasonably good seed-bed preparation and proper tillage, capable of carrying crops through all ordinary dry periods. The torrential character of some of the summer rains causes injury to crops in many instances, and excessive precipitation during the early part of the growing season is more damaging than the occasional dry periods. This is especially true with respect to cultivated crops on the Grenada and Olivier soils.

Much of the winter precipitation comes in the form of rather slow, continuous rains. There is seldom more than a trace of snow, but the ground sometimes freezes to a depth of 1 or 2 inches. Except when the ground is too wet for tillage farm operations may be carried on the year round.

The mean annual temperature is 64.5° F., and the absolute maximum and minimum 106° and -3° F., respectively. The winter mean is 47.7° F.

The average date of the last killing frost in the spring is March 20 and that of the first in the fall, November 3. The latest recorded killing frost in the spring occurred April 26 and the earliest in the fall, October 15.

The following table, compiled from the records of the United States Weather Bureau station at Canton, gives the normal monthly, seasonal, and annual temperature and precipitation:

*Normal monthly, seasonal, and annual temperature and precipitation at Canton.*

[Elevation, 228 feet.]

Month.	Temperature.			Precipitation.		
	Mean.	Absolute maximum.	Absolute minimum.	Mean.	Total amount for the driest year (1889).	Total amount for the wettest year (1886).
	°F.	°F.	°F.	Inches.	Inches.	Inches.
December.....	48.4	82	11	4.87	1.10	2.75
January.....	46.4	81	12	5.34	4.21	5.81
February.....	48.3	83	-3	5.27	.69	5.94
Winter.....	47.7	83	-3	15.48	6.00	14.50
March.....	58.7	89	23	5.82	4.96	6.18
April.....	64.8	92	30	4.12	5.11	6.04
May.....	72.0	99	35	3.74	.70	4.35
Spring.....	65.0	99	23	13.68	10.77	16.57
June.....	78.6	103	49	4.12	7.04	12.74
July.....	80.6	103	58	4.24	3.03	6.05
August.....	80.4	106	53	3.57	3.12	4.28
Summer.....	79.9	106	49	11.93	13.19	22.80
September.....	75.7	101	38	2.97	.81	7.21
October.....	64.4	98	27	2.16	.28	.08
November.....	55.6	86	15	3.09	3.03	3.52
Fall.....	65.2	101	15	8.22	4.12	10.81
Year.....	64.5	106	-3	49.31	34.08	64.68

#### AGRICULTURE.

The greater part of the tillable land in this county had been cleared and brought into cultivation before the Civil War. Most of the plantations included from one to several hundred acres, and there were a considerable number that embraced several thousand acres, although all of the land may not have been in cultivation. On all these estates cotton was the principal crop, but enough wheat, corn, and other food crops were grown and sufficient live stock was kept to supply domestic needs.

Much land was thrown out of cultivation after the war, but in the next two or three decades this was gradually brought into tillage again, except some of the more hilly lands in the northeastern part of the county, where there are now many old fields covered with pine. During this period cotton was the chief crop, and cotton grow-

ing dominated the agriculture. While many changes in ownership had occurred, the holdings were still generally large, negro tenancy had increased, and many white families had moved to the towns. In general the lands were not as well tilled and the improvements were more poorly maintained than in antebellum times. When any part of an upland field became gullied or otherwise inconvenient to cultivate it was generally abandoned or used only for pasture. Little effort was made to encourage the growth of valuable grasses. Most of the small bottom-land areas, however, were kept in a good state of cultivation. Commercial fertilizers were quite regularly used by some planters, but many landowners employed them very sparingly or only occasionally. Most farms produced sufficient manure to apply on only a small part of the land in cultivation. The planting of cowpeas in corn fields was the most common attempt at soil improvement. It has been many years since cotton seed was regularly returned to the soil—as was done on well-managed plantations.

The following table, compiled from the census, shows the acreage and production of the leading crops at each census year since 1880:

*Acreage and production of principal crops.*

Census.	Cotton.		Corn.		Oats.		Tame grasses and clovers.	
	Acres.	Bales.	Acres.	Bushels.	Acres.	Bushels.	Acres.	Tons.
1910.....	86,211	23,874	50,666	533,145	2,433	45,124	2,837	3,575
1900.....	70,277	26,692	52,913	692,350	2,053	28,020	1,933	2,061
1890.....	74,061	24,031	41,737	579,825	2,251	33,434	.....	.....
1880.....	56,393	21,538	37,989	381,297	1,490	21,107	.....	.....

The value of all grains, seeds, hay, and forage produced in 1909 amounted to nearly \$600,000. Nearly all of these products, however, were produced for local consumption, and only a small proportion can be considered a source of revenue. The value of the cotton crop in 1909 was about \$2,000,000. The total value of all animals sold or slaughtered is given as \$189,018. Since a considerable number of hogs and cattle are sold each year on the local markets, part of this amount may be considered a direct source of income. Until recently, on most of the large estates held by nonresident owners, no cash crop except cotton was produced. Nearly all the food for the tenants was purchased. Most of the smaller farms, especially those operated by the owners, were nearly self-sustaining in food products. Most of the cattle and hogs were native stock, and little interest was taken in improving the quality, and few horses or mules were raised, the work stock being obtained from more northern regions.

The advent of the boll weevil, which became serious about 1910, has caused a great change in agricultural conditions. The decline in cotton production from an average of nearly 25,000 bales, for the decade 1900 to 1910, to 13,233 bales in 1915 is due almost entirely to the weevil. Land values have generally declined, as large areas of land have been abandoned, and several thousand negro laborers have left the county. Cotton growing under present conditions is more or less hazardous. A late season, or protracted wet weather in late July and August, means great injury by the weevil unless the preceding winter was unusually cold. A late season in 1916 resulted on many plantations in returns of only 1 or 2 bales from fields of 10 to 20 acres of land. The total production for the county in 1916 was only about 9,000 bales.

In the last few years there has been a great increase in the proportion of land devoted to corn, oats, and forage crops. A considerable number of silos have been built, much land has been fenced for pasture, and the acreage of lespedeza is being greatly extended. Many head of cattle have been imported for breeding purposes. There has been so far no great extension of dairying, or any marked preference developed for any one breed of cattle or hogs. The tick quarantine has been lifted, so that cattle shipments are now unrestricted.

In 1916 there were shipped from this county to New Orleans, Natchez, St. Louis, and Chicago 6,281 cattle, 2,721 hogs, and about 1,200 sheep and goats.<sup>1</sup> There were also exported 5,786 tons of lespedeza hay, 3,460 bushels of lespedeza seed, 9,800 bushels of oats, and about 11,000 bushels of corn.

The losses so many landowners have experienced in growing cotton have resulted in increased live-stock production, but the longer period required for returns and the greater capital needed are obstacles not easily overcome and development has been retarded by these factors. The grazing season begins about March 15 and lasts until January 1, and with the use of fall-sown oats, crimson clover, and other forage crops the period during which cattle other than dairy cows and those being fattened must be fed may be reduced to a few weeks. The wild cane formerly abundant along the creeks is now confined to a very few places.

Sufficient corn can be produced to meet all local needs, but corn growing involves rather high costs. This is due in part to the low yields, especially on the upland soils, and to the increasing cost of labor. The latter is also a factor of importance in the production of concentrated feeds like peanuts, peas, and beans. The production of pork on a large scale therefore may not be so practicable as that of

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<sup>1</sup> Compiled from bills of lading at various shipping points.

beef. The low price of grazing lands and the use of labor-saving machinery in hay making favor cattle and sheep raising. There are a few small flocks of sheep, and the owners state that they are profitable. There has been no such marked interest in sheep raising, however, as in cattle raising.

The Vicksburg silt loam is recognized as the best corn soil in the county, and the Collins and Olivier silt loams and the low-slope phase of the Grenada silt loam as exceptionably well suited to lespe-deza. These types also produce a good quality of cane and sorghum sirup. The Memphis silt loam is considered a slightly earlier soil than the Grenada silt loam, and its comparative earliness may be of some importance in cotton production under boll-weevil conditions. Cotton grown in the western part of the county has a longer and better quality of fiber than that of similar varieties grown in the northern and eastern section.<sup>1</sup> This indicates a higher adaptation of the Memphis, Lintonia, and Olivier soils of the Big Black Valley to cotton as compared with the Lexington and Grenada types. In all the crops the effect of the low organic-matter content of the soils is apparent in the less vigorous growth and somewhat lighter shade of green than on similar types better supplied with humus.

In the present transitional stage of agriculture there is little definiteness in agricultural methods. The "bedding-up" method of preparing land for cotton, corn, and most cultivated crops is generally practiced, and these beds usually follow the contours of the hills. Some farmers first "flat-break" the ground, then make rather wide low beds with a very shallow water furrow. This permits the use of a two-row corn planter and wheeled tillage implements. Little fall plowing is done, and winter cover crops are seldom grown.

Some farmers have used commercial fertilizer on corn and cotton, and fertilizers have been applied to a small extent on other crops, but there are many farmers who have used none. Acid phosphate and cottonseed meal are most commonly used. Lime has been applied only in an experimental way.

Much improved agricultural machinery is in use, especially on farms where hay and oats are important crops. There are several steam-thrashing outfits near Canton, but in the more hilly parts of the county there are none. As a rule there is little exchange of labor between farmers. On most large farms under resident owners there are both tenants and hired hands. The latter receive from \$12 to \$15 per month, firewood, and a house and garden. Day laborers command about \$1 a day. For chopping cotton negro women receive 50 to 75 cents a day, and about the same amount per 100 pounds for picking cotton. Labor is abundant, but the cost is greater than a few

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<sup>1</sup> This statement is on the authority of several cotton buyers in Canton.

years ago, owing partly to the extensive public improvements now being made in the county. Negro labor only is available.

There has been considerable experimenting with new forage crops. Crimson, red, bur, and alsike clovers have been grown with much success. A variety of velvet beans that matures its seed has given some very large yields. Soy beans are grown on a considerable number of farms. Winter oats are an important crop, and the quality is usually excellent. They are very frequently followed by lespedeza, which is sown early in the spring, and this is becoming the prevailing method for establishing permanent hay lands. Oats drilled on well-prepared ground not later than the middle of September seldom winter kill; those sown late or broadcasted are more frequently injured. Wheat is grown to a very small extent, although the quality and yield are reported as satisfactory. Rust is sometimes very troublesome.

Prior to the appearance of the boll weevil cash rental was paid by many tenants, the rate varying according to the character of the land, but seldom exceeding \$3 or \$4 an acre, which included the use of house, a garden patch, and fuel. Recently various kinds of terms have been made, but there is usually little advance of credit except for the rent.

The present prices at which tillable lands are held ranges rather widely. Well-improved farms near the larger towns range from \$25 to \$50 an acre. Similar lands not so desirably located and with few improvements other than tenants' houses are valued at \$10 to \$25 an acre. Hilly lands and those remote from well-improved roads are offered in some instances as low as \$5 an acre. In general the increasing cost of producing cotton and the higher rates of local taxation tend toward the breaking up of the large holdings. The recognition of the adaptation of the soils to general farming tends to enhance land values, particularly near the towns and consolidated schools and along the improved public roads.

#### SOILS.

The prevailing surface formation in this area is the brown silty material known geologically as loess. Its average thickness in the southwest corner of the county is about 12 feet, but it very gradually becomes thinner toward the east and northeast. In the latter section, particularly on hilly areas, the loess seldom exceeds 3 or 4 feet in depth, and in a few places it is entirely wanting. On the uplands overlooking the Pearl River Valley the average depth is about 5 feet.

On the terraces in the Big Black Valley and along the tributary streams, loess of origin similar or possibly identical to that forming the uplands is the surface material. In the Pearl River Valley the

terrace material, as well as the more recent alluvium, has been derived from widely separated sources. The soils are less silty<sup>1</sup> than those within the loess-covered areas, sand and clay particles forming a larger proportion of their constituents.

Throughout the central, southern, and southwestern parts of the county the loess is underlain by heavy, tenacious clay, usually gray but occasionally oxidized to reddish where it comes in contact with the brown silt. Much of this clay is calcareous, and in places small lime nodules are seen in gullies of sufficient depth to expose the clay.

On the highest ridges in the southern part of the county reddish sand forms the subloessial material. Red sand underlies the loess in most of the northeastern section, particularly on the more elevated ridges and in the rougher areas, but it frequently gives place to the light-colored clay on the smoother lands near the main creeks. In all instances this sandy substratum is well oxidized to depths of 10 to 15 feet; it contains more or less ferruginous material, and there are no visible traces of lime. These formations are respectively the Jackson clay and the Claiborne sands, both of Tertiary age.

The differentiation of the soils into 13 types is based on differences which are the result of various agencies of weathering. Chief among these, especially with respect to agricultural value, are the drainage conditions, or more properly the average moisture content of the first few feet of soil and subsoil material. This is determined by its topographic position, its thickness, and the character of the underlying material.

In the hilly to broken areas in the eastern and northeastern parts of the county the loess in places has been removed, giving place to a grayish sandy soil. This is classed in the Orangeburg series. The other upland soils, derived from loessial formations, are classed in three series, the Memphis, Grenada, and Lexington.

Where it is deepest, as in the extreme southwestern part of the county, and where there is strong relief, the loess has evidently suffered the least degree of change in structure and composition. It has here a brown color throughout its entire depth. There has been little segregation of the iron content into concretions, and the basal material contains more or less lime carbonate. The loess here gives rise to the Memphis silt loam.

Where the average thickness of the loess is less than 8 or 10 feet and the surface relief is very mild the material as a whole is lighter

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<sup>1</sup> Silt consists of the grade of soil particles finer than very fine sand, which is just visible to the naked eye, and larger than clay particles, which are very minute. The latter, if forming more than 25 or 30 per cent of a soil, tend greatly to increase its stickiness when wet and its cohesion when dry. A predominance of silt imparts friability and a degree of porosity very favorable to good moisture conditions.

colored than in the deeper and more hilly areas. Light brown or pale yellowish brown is the characteristic soil color here, and there is usually a grayish or mottled gray and brownish subsurface layer a foot or two in thickness. This layer retards the downward movement of water, and consists of silt particles apparently more firmly held together than those composing the brownish-colored material above or below. When dry this zone has innumerable fine joint planes filled with grayish soil particles, which in part to roadside exposures a characteristic light color. The obscure brownish mottles are due to partial segregation of the ferruginous constituents into stains and small concretions. No evidences of lime carbonate are ever observable.

The development of this grayish zone is undoubtedly due to rather frequent saturation of the soil at this level, with consequent poor aeration. The poor drainage is caused primarily by lack of surface relief, but the fine texture of this material and its capacity for absorbing and retaining water are factors of importance. Where there is some admixture of sand with the loess, or where sandy material 4 or 5 feet thick immediately underlies the silt, the grayish zone is poorly developed or may be entirely absent. This grayish layer is characteristic of the Grenada silt loam, the dominant upland soil of the county.

The Lexington silt loam represents those areas in which the loess has an average depth of less than 3 or 4 feet. In all instances the character of the underlying material affects to some extent the agricultural value of the soil. Coarse sandy material facilitates deep and thorough underdrainage and aeration, which is indicated by the highly oxidized condition of the material. There has also probably been more loss of soluble mineral constituents by leaching than in the less porous soils. When the shallow silty material overlies the gray clay the average moisture conditions and consequently the degree to which oxidation and leaching have taken place are largely determined by the topographic position.

The soils of the stream terraces or second bottoms are classed in the Lintonia, Calhoun, and Olivier series. The same differentiation according to average moisture conditions is observable on the second bottoms as in the uplands. Where the relief is quite pronounced the material is usually well oxidized to a depth of 3 or 4 feet, and normal aeration and drainage prevail. The Lintonia silt loam is the soil developed in areas where these desirable conditions occur.

On local flats and in slight depressions the material has assumed a light-grayish color, is almost entirely lacking in crumb structure, and contains much concretionary material. The subsoil generally has such a structure as to interfere greatly with the movement of moisture. The soil here is recognized as the Calhoun silt loam.

Where the drainage conditions are intermediate between the extremes mentioned above, the surface soil is of a light shade of brown instead of gray, and has a desirable structure. The grayish or mottled subsoil, however, is more or less compact and occasionally almost impervious, and lacks the property of granulation. The soil here is mapped as the Olivier silt loam, which has an extensive occurrence in all the second bottoms.

The soils of the first bottoms are classed in two series—the Vicksburg and the Collins. The alluvial soils in the creek valleys consist chiefly of silt washed from the adjacent uplands since the latter were cleared. The alluvium in the Big Black Valley is largely of loessial origin, and silty clay loam types of soil predominate here. The first-bottom soils along the Pearl River consist of material from more varied sources, and the soils have a textural range from loam to silt loam. The latter generally predominates, particularly in the areas now subject to frequent overflow. The Vicksburg silt loam in general has good drainage and aeration, as is indicated by the brownish coloration to a depth of 3 feet. The Collins soils are characterized by a high average level of the ground water, as indicated by light-colored or mottled subsoils. There is very little true swamp in this county, although all lands subject to overflow are locally called “swamps.”

In the following pages of this report the various soils of Madison County are described in detail and discussed in their relation to agriculture. The distribution of the soils is shown on the map accompanying this report, and the table below gives the name and the actual and relative extent of each:

*Areas of different soils.*

Soil.	Acres.	Per cent.	Soil.	Acres.	Per cent.
Grenada silt loam . . . . .	201,408	} 43.4	Collins silty clay loam . . . . .	19,328	4.2
Low-slope phase . . . . .	4,160		Vicksburg loam . . . . .	17,600	3.8
Vicksburg silt loam . . . . .	55,616	12.0	Orangeburg fine sandy loam . . . . .	6,656	1.4
Lexington silt loam <sup>1</sup> . . . . .	45,824	9.9	Calhoun silt loam . . . . .	1,856	.4
Collins silt loam . . . . .	33,856	7.3	Grenada silty clay loam . . . . .	1,472	.3
Olivier silt loam . . . . .	33,088	7.1	Lintonia fine sandy loam . . . . .	512	.1
Memphis silt loam . . . . .	13,058	} 5.3	Total . . . . .	464,000	.....
Smooth phase . . . . .	11,200				
Lintonia silt loam . . . . .	22,016	4.8			

<sup>1</sup> Includes patches of other soils.

#### MEMPHIS SILT LOAM.

The soil of the Memphis silt loam is a friable, brown silt loam, underlain abruptly at depths varying from 5 to 10 inches by brownish-red or dull-red, moderately friable silty clay, which gradually

changes with increasing depth to a silty clay loam of less reddish color and greater friability. The lower part of the 3-foot soil section is frequently a friable silt loam. Faint grayish and rusty-brown mottlings occur in the lower subsoil in some places, but as a rule gray is lacking in both the subsoil and the underlying material. The latter is a friable, porous silt of light-brown or buff color down to its contact with the underlying Coastal Plain material of clay or sand. In the areas west of Bogue Chitto, particularly those draining into the Bogue Filia, the brown silt has a depth of 10 to 15 feet. The lower part is calcareous, but there is little evidence of free lime within 6 or 8 feet of the surface. Good moisture conditions usually prevail throughout the entire mass, and the uniformly brown surface color and the absence of gray in the subsoil indicate deep and effective aeration.

The Memphis silt loam occurs in the extreme southwestern part of the county. Its eastern limits are not very well defined, as it merges very gradually into the Grenada silt loam. It is typically developed immediately west of Bogue Chitto. There are included many washed slopes occupied by the Memphis silty clay loam. The smaller areas in the central part of the county represent shallower deposits of the loess, and the difference between them and the Grenada silt loam is not so great as in the western areas. There is nowhere any apparent concentration of lime in the substratum, and in places the underlying clay or sand is within 4 or 5 feet of the surface.

The topography of this soil is hilly, with many steep and narrow ridges around the heads of the local drainage ways. The topography usually becomes smoother as the main creeks are approached. Notwithstanding the character of the material composing this soil and the fact that its physical properties give it a high degree of productiveness, its rough topography prevents its full utilization for tilled crops and also causes severe erosion. (See Pl. I, figs. 1 and 2.)

The areas in cultivation give good yields of practically all the common crops. The type is well suited for use as permanent pastures and hay lands, as all the native legumes and grasses grow exceptionally well and endure drought better than on the Lexington and Orangeburg soils. There are many favorable sites for peach orchards, and the type is more suitable for apple trees than any other soil in the county with the possible exception of the Olivier and Lintonia soils.

*Memphis silt loam, smooth phase.*—The Memphis silt loam, smooth phase, occurs in the southwestern part of the county, chiefly in the vicinity of Flora. It differs from the typical soil in having a smoother surface and in including fewer eroded clay loam patches. The topography ranges from gently rolling to strongly undulating. Only a small proportion of the larger areas mapped have such strong re-



FIG. 1.—EROSION IN LOESSIAL REGION.

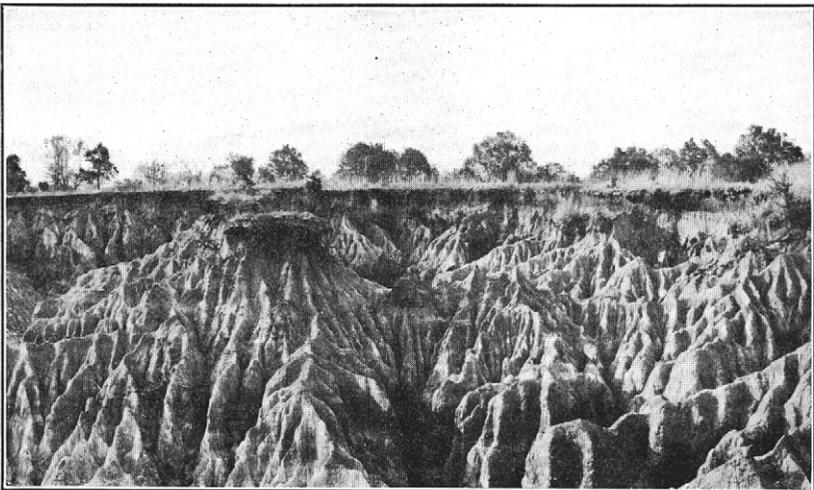


FIG. 2.—COASTAL PLAIN CLAY EXPOSED BY WASHING OFF OF LOESSIAL SOIL.



lief as to prevent the convenient use of farm machinery. The small areas shown on the map are the crests of rather wide ridges where the phase alternates with the Grenada silt loam, the latter occupying all the gentler slopes and flatter portions of these divides. Near Flora there are many small areas of this smooth phase on all the highest portions of the uplands, but it is not practicable to indicate all of them on the map.

Practically all of this soil is or has been in cultivation. Formerly the average yield of cotton was over one bale per acre, and the length and quality of the fiber were very satisfactory. The soil was also highly esteemed for all the minor crops usually grown. The low yields occasionally obtained were usually due to poor tillage or the continuous growing of corn and cotton with very scant returns of any humus-forming material. Much of the type has also suffered severe surface washing.

This phase of the Memphis silt loam is an especially desirable soil for general farming, owing chiefly to the ready response it makes to any method of soil improvement. With increase in the organic content the average yields of all tilled crops as well as lespedeza and other grasses show a marked increase.

The present price of the larger tracts of this phase may be placed at \$20 to \$30 an acre, but improved land near the towns commands a higher price.

#### GRENADA SILT LOAM.

The typical Grenada silt loam is a brown to light yellowish brown silt loam ranging from 5 to 10 inches deep, giving way abruptly to reddish-brown to dull-red silty clay which passes below into brownish or yellowish silty clay loam. The lower subsoil, usually beginning at about 24 inches from the surface, is a light-brown or yellowish-brown silty clay loam, much mottled with gray and containing more or less small rusty-brown and dark-colored ferruginous concretions and concretionary material. This lower subsoil is somewhat impervious, as is evidenced by the seepage of water in wet weather from along its upper level where it is exposed in road cuts and deep gullies.

The surface soil appears to be low in organic matter, but it is very friable and not inclined to become cloddy except where the more compact, reddish-brown subsoil material may be turned up by the plow. Both soil and subsoil are acid according to the litmus-paper test, the grayish lower subsoil material when moist turning the paper pink the instant it is applied.

The grayish subsoil layer is usually 1 or 2 feet in thickness, thus extending below the 3-foot soil section. With increased depth it gradually changes to yellowish or light-brownish, friable silt loam,

which is more pervious and better aerated. The latter consists of loess, as does all of the 3-foot soil section, but the brownish substratum material has undergone less physical change than the overlying grayish material.

The silty material is generally underlain by a heavy clay, the whitish clay exposed in many places in road cuts and the deeper gullies. Such local variations as the type presents are usually the result of differences in topographic position. Where the surface relief is most pronounced the brownish to reddish-brown coloration prevails and the compact, grayish subsoil layer has the least development, or at least lies so deep that it affects the general moisture condition only to a limited degree. Where the general surface relief is slight and on very long, gentle slopes a light-brown to pale-yellowish coloration predominates, and the grayish subsoil zone is thicker, lies nearer the surface, and its influence in wet seasons is more in evidence. As the area of the Memphis silt loam is approached the grayish subsoil layer becomes less noticeable, finally disappearing entirely on the crests of ridges and on the steeper slopes occupied by the Memphis silt loam. This is also true to some extent where friable red sands immediately underlie the loessial material, as in much of the eastern and northeastern parts of the county. Between Canton and Flora and northward much of this is underlain by a stiff, heavy clay at depths usually less than 10 feet, which is very calcareous in many places. East of Canton for 6 or 8 miles and southeastward to the Pearl River, calcareous clay also occurs at depths of 6 to 10 feet. Near Doaks Creek and throughout most of the northeastern part of the county the underlying material is generally a reddish sand, and there is little evidence of lime in it or in the overlying loessial material.

The Grenada silt loam is the dominant upland type in all parts of the county except the extreme southwestern and northeastern sections. Its topography varies from undulating to gently rolling, and only a very small proportion of the type is so hilly as to prevent the use of farm machinery.

Practically all this type was cleared many years ago. The original forest consisted chiefly of oak and hickory, with little or no pine. The Grenada silt loam is a highly desirable type for general farming, although much of it has been almost depleted of the originally low content of humus through long and injudicious use and has become badly washed as the result of careless tillage. In all instances the application of manure or a change for a few years to pasture is followed by improved appearance of the soil and a marked increase in crop yields. Much of the type formerly produced more than one bale of cotton per acre, but the yields in more recent years have been considerably lower.

According to the statements of many farmers, this soil under good tillage, but without commercial fertilizer or previous application of manure, usually yields 15 or 20 bushels of corn per acre or 20 to 25 bushels of oats. Where such crops have been preceded by manuring or where the ground has been seeded to lespedeza or pastured for a few years, yields are about double the above figures. On the demonstration farm of the Illinois Central Railroad at Anderson a 55-acre field in 1915 yielded 2,374 bushels of oats, or 43 bushels per acre. The crop was preceded by four years of lespedeza. In 1910 the oat crop on the same land, after many years of cotton farming, averaged about 20 bushels per acre. A yield of approximately 40 bushels of corn per acre was obtained on the type here under somewhat similar methods of management.

This soil is well adapted to lespedeza, and much of it when thrown out of cultivation becomes well seeded to this plant within two or three years. Many of the best pastures in the county consist largely of this type.

All the forage and truck crops commonly produced in this section of the State are successfully grown on this soil. The yields vary considerably with the methods of tillage and the seasonal conditions, but the type invariably responds well to proper management either in years of excessive or subnormal rainfall. Direct injury to crops by heavy rainfall is generally confined to the flatter areas where the grayish lower subsoil lies within 12 or 18 inches of the surface.

The present price of this land near Canton and for several miles along the improved roads radiating therefrom ranges from \$25 to \$50 an acre. At a greater distance from the town and in sections not traversed by first-class roads the price is much lower, some of the more hilly areas having sold recently for prices as low as \$10 an acre.

All this type is greatly in need of organic matter, and, according to the experience of many farmers, would be benefited by applications of several tons of ground limestone. The approximate amounts of lime required to neutralize the acidity of this soil are indicated in the following table:

*Lime requirement of typical areas of Grenada silt loam.*

Location of field.	Depth of sample (inches).	Pounds of CaO per acre to neutralize soil to depth of 6 inches.	Pounds of CaCO <sub>3</sub> per acre to neutralize soil to depth of 6 inches.
Sample collected 7 miles east of Canton; well-drained cornfield.....	0-8	1,050	1,875
Sample collected 3 miles southwest of Canton; pasture land underlain by calcareous clay at 10-12 feet.....	0-8	700	1,250

Soils of loessial origin are usually not lacking in potash, and if they are reasonably supplied with organic matter there is ordinarily little need to supply this element, but where a soil is as deficient in humus as is this type it is frequently profitable to use a potassium fertilizer if such is obtainable at reasonable cost. The use of acid phosphate has been found to give good results, although little has been used since the advent of the boll weevil. It is doubtful if ground-rock phosphate would prove profitable, except in connection with the turning under of heavy crops of crimson clover, vetch, or other green crops. Some form of terracing or the maintenance of "balks" to prevent erosion is advisable.

*Grenada silt loam, low-slope phase.*—The low-slope phase of the Grenada silt loam occurs on the lowest lying areas of the type, usually at the foot of long gentle declines and adjacent to stream bottoms or terraces. It is distinguished from the typical soil by its lighter color and by the occurrence of the compact gray subsoil at comparatively slight depths. Rusty-brown concretionary material is usually abundant in both soil and subsoil. In extreme developments of the phase the small blackish-brown ferruginous concretions are so abundant on the surface that the soil is locally called "black pebbly land." In such places the subsoil is a very light gray or drab silty clay loam or silty clay. The drainage is especially poor in such places, and the frequent saturation of the surface soil is indicated by its very light color and loose, floury appearance when dry.

As mapped, the narrow areas of this phase along drainage ways include some alluvium and more or less of the typical upland Grenada silt loam. The larger areas generally consist of low slopes and local flats on which the soil consists of variable depths of yellowish-gray to light-brown silt loam and the subsoil is light-gray and mottled.

Most of this phase is in cultivation, but all of it is more or less difficult to manage, especially in wet seasons. The "black pebbly" spots are especially troublesome, as they are very miry when wet. Satisfactory crop yields are dependent upon a favorable season.

The improvement of this phase is especially desirable, as it occurs in small patches in numerous fields, and also because the soil with proper drainage is very productive. Open ditches answer the purpose only in part. Tile drainage has been tried in a few instances, but it has not given marked success. It is said that the tiles fill with silt and do not "draw" for any distance on either side. These conditions are caused by the nongranular structure of this gray silty material and by the subsoil compaction. In such places no tiles less than 6 inches in diameter should be used, and care should be taken to have ample fall and a clear outlet. As lime has a tendency to flocculate the soil particles it is probable that heavy applications in these

whitish spots would be beneficial both in correcting acidity and in improving the physical structure.

The following table gives the results of mechanical analyses of samples of the soil, subsurface soil, subsoil, and lower subsoil of the typical Grenada silt loam:

*Mechanical analyses of Grenada silt loam.*

Number.	Description.	Fine gravel.	Coarse sand.	Medium sand.	Fine sand.	Very fine sand.	Silt.	Clay.
		<i>Per cent.</i>						
423942.....	Soil.....	0.6	0.6	0.3	1.3	9.8	75.8	11.7
423943.....	Subsurface.....	.1	.5	.4	1.2	7.5	63.0	27.4
423944.....	Subsoil.....	.1	.9	.7	1.9	6.4	68.7	21.2
423945.....	Lower subsoil...	.3	2.0	.9	1.6	5.3	69.7	19.7

GRENADE SILTY CLAY LOAM.

The Grenada silty clay loam consists of a reddish-brown silty clay loam which passes at 6 or 8 inches into a reddish-brown to brownish-red or dull-red moderately friable silty clay or silty clay loam. This changes at variable depths within the 3-foot section into yellowish-brown silty clay loam mottled with grayish, especially in the lower part of the subsoil, and generally containing rusty-brown and dark-brown concretionary material. The lower subsoil when dry is compact and difficult to penetrate with a soil auger.

The immediate surface layer is frequently a friable, brownish silt loam, but the heavy reddish-brown material is turned up by the plow. The soil is more cloddy in recently plowed fields than the adjoining Grenada silt loam under similar conditions, and it is more difficult to get into good tilth. Otherwise this type is of about the same agricultural value as the silt loam. It is locally called "clay land."

This type occurs in innumerable small patches on the more rolling areas in the heavier part of the Grenada silt loam. It is largely a product of erosion, resulting from long tillage without steps to prevent washing.

Most of the areas are too small to indicate upon the soil map. A few of the larger ones are shown, but their boundaries as drawn are only approximately correct. As a rule the most pronounced development of the type is on the steeper slopes, those of moderate gradient having a silty soil to a depth of several inches.

Most of this type would be rendered less susceptible to washing and more easily brought into desirable tilth by plowing under a green manure crop, or by seeding to lespedeza and Bermuda grass.

The following table gives the results of mechanical analyses of samples of the soil, subsoil, and lower subsoil of the Grenada silty clay loam:

*Mechanical analyses of Grenada silty clay loam.*

Number.	Description.	Fine gravel.	Coarse sand.	Medium sand.	Fine sand.	Very fine sand.	Silt.	Clay.
		<i>Per cent.</i>						
423922.....	Soil.....	0.1	0.3	0.2	1.2	5.4	65.5	27.0
423923.....	Subsoil.....	.0	.2	.3	1.4	4.3	68.0	25.9
423924.....	Lower subsoil...	.0	.3	.3	1.2	5.3	73.4	19.5

#### LEXINGTON SILT LOAM.

The areas mapped as Lexington silt loam consist of intermingled developments of the Lexington silt loam with about equal areas of Grenada silt loam and smaller areas of the Memphis, Ruston, and Orangeburg soils. There are occasional areas of the Grenada silty clay loam, a very small development of coarse, loose sandy soil similar to the Ruston sandy loam, and areas where sandy material has been washed down from higher lying expanses of the basal sandy beds and spread out over former silty soil. Much of the silt loam included in this type has a very light-brownish to grayish color at the surface, representing either the Pheba silt loam or a very close approach to that type.<sup>1</sup> These soils are so intimately associated that their separate indication on the map is impracticable.

The typical Lexington silt loam is a light-brownish silt loam, underlain at 4 to 8 inches by dull-red to yellowish-brown, moderately friable silty clay. This gradually changes with depth to more sandy, friable material (Coastal Plain material) of red or reddish-yellow color, which in the lower part of the 3-foot section is usually red sandy clay.

The substratum in most places is red sandy material, extending to a considerable depth. In some instances it is a stiff, reddish or red and grayish clay. No evidences of lime are observable in the sand and only faint indications were found in a few places in the exposed clay. The overlying material is also lacking in lime.

The Lexington silt loam and included soils predominate in the extreme eastern and northeastern parts of the county. Smaller areas occur on the southern tributaries of Doaks Creek. The topography varies from sharply rolling to hilly and some small areas overlooking the valley of the Big Black River are quite broken, while those along the head branches of Kentuctah and Cane Creeks and most of the

<sup>1</sup> The Pheba silt loam which has been mapped east of the loess belt proper in Mississippi possesses physical properties almost identical with the Grenada silt loam, except that the soil averages lighter in color.

north-flowing branches north of Kirkwood are hilly. In most instances the roughest areas consist of Lexington and Grenada silt loams on the ridges and Orangeburg fine sandy loam on the steeper slopes, especially at the heads of ravines. On all the more gentle slopes the typical Lexington silt loam is associated with the Grenada silt loam, but in most cases the latter type lacks the distinctive grayish subsoil. On each side of Kentuctah Creek above its junction with Cane Creek the less elevated areas are very generally underlain by clay or stiff sandy clay. The soils are heavier and include many spots not so well drained as the areas underlain by sand. In secs. 27 and 28, T. 11 N., R. 4 E., some of the upland has a very heavy clay subsoil, and patches of heavy silty clay loam occur in the cultivated fields. The heaviest areas are still covered with blackjack oak and post oak.

The areas mapped as Lexington silt loam have about the same agricultural value as the included types elsewhere, except for the rougher topography. Exception may be made in the case of the Lexington soils where the red sandy material is within 24 inches of the surface. Here all crops are more likely to be injured by abnormal weather conditions than where the sandy substratum lies at a greater depth. The soil here also erodes easily, as is evidenced by the many patches of reddish soil in old fields. At Camden, Couparle, and Kirkwood there has been much injury by severe erosion, as is usually the case in lesser degree around old homesteads on elevated sites. Many of the first fields thrown out of cultivation years ago are on this shallow phase of the Lexington. With due allowance for injury by erosion, increased cost of tillage, and economic causes leading to their partial abandonment, it seems that much of this type is naturally less productive than the associated Grenada and Memphis soils. Where deep and relatively loose sandy material forms the subsoil and substratum there has evidently been more loss of soluble mineral elements than occurs where heavier and more retentive materials extend to a greater depth.

All this land is well adapted to pasture and the establishing of permanent pastures would not be difficult, as Bermuda grass and lespedeza grow on lands that have been thrown out of cultivation where the pine and other forest growth is not too heavy. The larger creeks are perennial, as are many of the small branches rising in areas of the Orangeburg fine sandy loam.

The price of much of this land has depreciated since the advent of the boll weevil and the consequent emigration of many negroes. Some of the rougher lands have been offered at \$5 to \$8 an acre. Plantations which include more or less Grenada silt loam and some tillable branch bottoms usually are held at higher prices. In most instances the only improvements are negro cabins.

## ORANGEBURG FINE SANDY LOAM.

In its typical development the Orangeburg fine sandy loam consists of several inches of grayish fine sand or loamy fine sand, passing into yellowish loamy fine sand or fine sandy loam, and this at a depth of 8 or 10 inches into red friable fine sandy clay. At a depth of 18 to 24 inches more friable and somewhat coarser textured material, for instance, sandy loam, is reached in some places, this frequently passing in the lower part of the 3-foot section into reddish loamy sand.

The substratum consists of a red or reddish-brown, friable sandy material. In road cuts 15 or 20 feet deep there is frequently exposed a light-colored sand resting on "pipe" clay, or there may be layers of the latter in the sand. In all instances the sandy material is highly oxidized to a depth of several yards, or to its contact with the heavy clay. Both sand and clay sometimes contain considerable mica. Evidences of lime are entirely lacking.

As a rule there is no stony material present, but in the extreme northeastern part of the county on occasional narrow ridges and conical hills there is much concretionary material and numerous outcrops of ferruginous sandstone. The latter are indicated by rock-outcrop symbols.

The Orangeburg fine sandy loam occurs only in the hilly to broken areas in the eastern and northeastern parts of the county. Owing to the rough topography there is much variation in texture, the soil being more silty and the subsoil less sandy on the upper slopes and crests of the ridges than on the flanks. On the latter and at the heads of ravines the soil is frequently a grayish sand to a depth of 20 to 30 inches, while on the crests of the wider ridges the type passes into the Lexington silt loam. As mapped many small areas of the latter soil are included.

Much of this type has been in cultivation, and as long as the original supply of organic matter lasted good yields of cotton were obtained, but the severe erosion induced by the strong surface relief and the friable character of the soil caused the abandonment of most fields after a few years of tillage. Some of the areas near Camden are still cultivated by negroes, but the returns are poor. Much of the type near Sulphur Springs is so eroded as to be almost useless except for pasture. On open ground Bermuda grass makes a remarkably strong growth, and in the more silty areas of the type lespedeza does well. Most of the land thrown out of tillage is covered with shortleaf pine and consequently is of little value for grazing. Scrub oak, blackjack oak, and pine formed most of the original forest. The type with the included areas of Lexington silt

loam and the numerous narrow branch bottoms is well adapted to grazing.

The present price of this land ranges from \$5 to \$10 an acre.

#### LINTONIA FINE SANDY LOAM.

In a number of places the silt and sand derived from deeply eroded hillsides has been washed down and spread over the adjoining second-bottom lands to such an extent as to change the character of the latter. The resulting soil is the Lintonia fine sandy loam. It varies from a loose, light-colored sand to brownish fine sandy loam in which there is much silt. The depth is variable but usually greater near the base of the hill, decreasing as the distance from the slope increases. Away from the bluff the soil is finer textured and as a rule more productive. The subsoil varies from brown silt loam, representing the original Lintonia silt loam surface soil, to grayish material which was the surface soil of an Olivier or Calhoun type. Small patches of Lintonia fine sandy loam occur along the foot of the uplands north of Sharpsburg, near Doaks Creek, and at a few other places in the county.

Some of this land is in cultivation, and it is highly esteemed for sugar cane, sweet potatoes, and peanuts. Cotton, corn, and cowpeas also do well.

#### LINTONIA SILT LOAM.

The surface soil of the Lintonia silt loam is a brown silt loam which changes at a depth of a few inches to a rather stiff, compact, reddish-brown silty clay loam. With further increase of depth the material usually becomes less compact and somewhat lighter brown. Occasionally faint grayish mottlings occur in the lower subsoil, but pronounced brownish tints typically predominate throughout the 3-foot section. Where the surface relief is slight and where the type passes into the Olivier silt loam—with which it is almost everywhere associated—the subsoil is less compact, is lighter colored, has some grayish mottlings, and contains concretionary material. Both soil and subsoil are acid and there is no visible indication of lime even in the substratum of the higher terraces in the southwestern part of the county.

This type occurs on the highest and best drained parts of the second bottoms of the larger streams. The larger areas near the Big Black River have an undulating surface, and are admirably adapted to tillage. The small areas are usually low ridges. The narrow areas along the margin of the terrace embrace the slope, or glacia, of the terrace, but this is seldom so steep as to be untillable. The areas north of the mouth of Bear Creek lie 10 to 20 feet above

the flood plain of the river, while south of Bear Creek the elevation is generally greater. Some areas near Hanging Moss Creek rise 30 or 40 feet above the river and do not differ essentially from the adjoining upland in general character of the soil.

This type as developed along the small streams is somewhat variable, but for the most part it has good natural drainage and effective aeration to a depth of several feet. These areas are admirably adapted to tillage and need only efficient cultivation and the addition of organic matter to insure good crops.

The areas near Pearl River have in many places a reddish-brown sandy soil and resemble in other respects the Vicksburg loam.

Most of the Lintonia silt loam was brought into cultivation many years ago. All the areas having much surface relief have suffered more or less surface washing, and these lands give rather low average yields, particularly if carelessly tilled. The more nearly level areas have escaped this injury. All of the type is deficient in organic matter, but, in general, is similar in crop adaptation and cultural requirements to the Memphis silt loam.

#### CALHOUN SILT LOAM.

The surface soil of the Calhoun silt loam is a light-grayish silt loam, faintly mottled with yellowish and brownish stains. There is not much change in the material to a depth of about 18 inches, except that the mottling becomes more noticeable and there is considerable yellowish-brown, blackish-brown, and rusty-brown ferruginous concretions of varying degrees of hardness and ranging in size from small shot to marbles. Below 18 inches the subsoil is a compact silt loam or silty clay loam, of light-gray or sometimes very light-drab color, and with much concretionary material, especially in the lower part. The subsoil is nearly impervious, and very frequently though the surface soil is saturated the lower subsoil is comparatively dry.

Throughout the 3-foot section there is an almost entire absence of the "grainy" or crumbly feel common to most soils of similar texture. The surface soil when saturated is a pasty, sticky mud, which on drying tends to form a firmly cemented but somewhat porous crust. The little organic matter present is apparently confined to the first few inches, and in many instances the decaying vegetable fibers are replaced by yellowish stains suggestive of bog iron. In all cases a high degree of acidity is indicated by the litmus-paper test.

The Calhoun silt loam occurs in flat areas and in slight depressions in the Olivier silt loam. No sharp distinction can be drawn between the lighter-colored developments of the Olivier and the less-pronounced developments of the Calhoun. Most of these types

are covered with a rather scant growth of water oak, white oak, and post oak. Several of the areas north of Oaks were originally so thinly forested that they were called "prairie." In many places the type has been improved by the deposition of silt from the adjoining cultivated lands, but most of it has little agricultural value.

Many patches of this type are too small to map. Their improvement is especially desirable, for they cause inconvenience in tillage and are very uncertain in crop yields. Corn makes a poor growth, and cotton is very dependent upon weather conditions. Excessive rains or continued drought cause much injury and rust is very troublesome on the lightest colored phases.

Improved drainage is, of course, the first requisite in using this soil. The prevailing method of draining by open ditches insures satisfactory surface drainage but does not sufficiently improve subsurface conditions. Tile drains have not been tried, but they would probably prove satisfactory, particularly where the subsoil resembles that of the Olivier silt loam rather than that of the typical Calhoun soil. In the latter areas the difficulties to be overcome in installing tile drainage are like those on the low-slope phase of the Grenada silt loam. In all instances the deposition of soil material washed from the adjoining higher lands should be encouraged. Heavy applications of lime and the liberal addition of organic matter should give good results.

#### OLIVIER SILT LOAM.

The soil of the Olivier silt loam is a very friable silt loam, brown to light brown when moist but having a grayish color at the immediate surface when dry. At a somewhat variable depth, in most places not exceeding 8 or 10 inches, the soil changes to a pale-yellow or yellowish-brown silty clay loam to silty clay, typically mottled with rusty brown and containing concretionary material. The lower subsoil is a compact silty clay loam in which slow underdrainage and imperfect aeration have resulted in a light-grayish color and an abundance of rusty-brown and yellowish-brown spots and soft, ferruginous concretions. There is usually not much change in the character of the substratum to a depth of several feet. In the larger areas sand is generally reached at less than 10 or 15 feet, but apparently it does not affect the drainage. The substratum of some small areas is commonly silt loam or silty clay loam, more or less impervious to a depth of several feet.

The soil and subsoil are distinctly acid, and the former apparently has a low organic-matter content. Its friability and consequent easy tillage are due to the high silt content.

The Olivier silt loam is the predominant type on the wide second bottoms of the Big Black River. The surface varies from level to

slightly undulating. The soil is lighter colored in the depressions; on slight elevations and along the channels of streams it is somewhat darker, and the mottled coloration and the compaction of the material are confined to the lower subsoil. There has been some modification in many places by brownish silt washed down from the adjoining uplands. This is especially noticeable along the eastern side of the areas on Bogue Chitto Creek, where the soil is semi-alluvial or of a colluvial nature, along the small drainage lines that cross this wide terrace. The type as developed along Bear and Doaks Creeks and numerous other small streams includes such colluvial-like areas, but in general it consists of the light-colored silty soil with more or less compact, silty clay subsoil.

There are occasional patches of this soil where the surface material in dry weather is loose and whitish, resembling an alkali earth. A laboratory examination of some of this material showed it to be formed of ordinary soil material, with no excess of soluble salts.

The Olivier silt loam is a second-bottom soil of nearly level surface. It stands above overflow except for some low-terrace areas which are inundated at times of exceptionally high overflows.

Nearly all the Olivier silt loam is in cultivation. Ditches must be maintained through all the low-lying areas, and it is necessary to "bed up" all ground planted to corn and cotton to avoid injury by surface water. Injury to crops by rains is generally confined to the flatter areas, or to areas approaching the Calhoun silt loam in character. No tile drains have been installed.

Before the advent of the boll weevil the Olivier silt loam was very generally devoted to cotton. The highest average yields were usually obtained on the darker colored areas, and ranged from about one-half bale to upwards of 1 bale per acre. Excessive rains affected yields on the light-colored areas to a greater extent, and "rust" or yellowing and dropping of the leaves more frequently occurred here.

Owing to its slow drainage this soil does not become warm and in good condition for planting as early as the Lintonia, Memphis, and most of the Grenada soils. It is not well adapted to corn, but fall-sown oats usually do well. Sorghum and sugar cane are very successfully grown, and the quality of sirup obtained is said to be excellent. The type is admirably adapted to lespedeza, and many old cotton fields are now very profitable hay lands. On a rather low lying field on the west side of Bear Creek near Canton, 25 acres produced 50 tons of marketable hay and about 20 bushels of lespedeza seed in 1916.

The present price of this land where desirably located ranges from \$25 to \$50 an acre. Land not so well located, or including more or less of the Calhoun silt loam in spots, and waste ground along creeks

ranges from \$10 to \$25 an acre. In most instances there are no improvements on this type except fences and negro cabins.

In the improvement of the Olivier silt loam better drainage and an increase of organic matter are the first essentials. It is highly probable that tile drainage would be profitable wherever more intensive methods of cultivation are to replace the extensive systems that have prevailed. The marked adaptation of the type to lespe-deza suggests a rotation in which this legume would have an important place.

To ascertain the approximate lime requirements of this type a composite sample was taken in the large area near Moors Ferry Bridge on the Big Black River about 7 miles northwest of Canton and from an area 1 mile southwest of Millville in the Pearl River bottoms. The results are shown in the following table:

*Lime requirement of typical areas of the Olivier silt loam.*

Section of field examined.	Depth of sample (in inches.)	Pounds of CaO per acre to neutralize the soil to a depth of 6 inches.	Pounds of CaCO <sub>3</sub> per acre to neutralize the soil to a depth of 6 inches.
Seven miles northwest of Canton.....	0-8	1,576	2,814
One mile southwest of Millville, Pearl River bottoms.....	0-8	1,050	1,875

The following table gives the results of mechanical analyses of samples of the soil, subsurface soil, subsoil, and lower subsoil of the Olivier silt loam:

*Mechanical analyses of Olivier silt loam.*

Number.	Description.	Fine gravel.	Coarse sand.	Medium sand.	Fine sand.	Very fine sand.	Silt.	Clay.
		<i>Per cent.</i>						
423906.....	Soil.....	0.9	1.2	0.4	1.0	8.7	66.7	21.2
423907.....	Subsurface.....	2.0	1.7	.5	1.3	10.3	75.8	8.4
423908.....	Subsoil.....	.7	.8	.3	.7	5.7	73.1	18.5
423909.....	Lower subsoil...	.1	.6	.3	.9	5.5	64.2	28.4

#### VICKSBURG LOAM.

The Vicksburg loam embraces the higher lying alluvial lands in the Pearl River Valley between Meeks Ferry and the east county boundary. It lies somewhat higher than the strictly alluvial soils of this region, but several feet lower than the Olivier silt loam to the west. It occupies low, flat ridges, seldom rising more than 4 or 5 feet above the local depressions. These latter are very frequently filled by backwater from the river or by overflows from Lake Creek,

but the ridges are only occasionally flooded. The difference in drainage is reflected in the character of the soils. On the higher levels the soil is some shade of brown to a depth of several feet and has other indications of relatively good drainage and aeration, while the lower lying areas have a dark surface soil which changes at a depth of a few inches to light-gray or drab, showing effects of a high water table.

The surface soil of the Vicksburg loam is usually a drab-brown loam or silty loam, moderately high in organic matter and of excellent structure. At a depth of a few inches it usually changes to a dull chocolate brown silty clay loam and in the lower part of the 3-foot section to a yellowish-brown or sometimes a dull orange colored clay or silty clay, which at 30 or 40 inches is more or less mottled with gray.

On the higher ridges the soil is frequently a brown sandy loam with a heavier sandy loam subsoil gradually changing to a yellowish-brown sand at 3 or 4 feet. A few small fields of this sandy soil have been cleared, and good yields of corn, cotton, and watermelons are said to have been obtained.

Somewhat larger patches of the heavier variations near Lake Creek are in cultivation. The soil is easily tilled and has every appearance of a high degree of productiveness. On all except the lower spots the moisture conditions are very satisfactory, except when the streams are at flood stage.

Practically all the type as well as the lower lands is densely forested. Hickory, white oak, water oak, sweet gum, and beech form the prevailing timber. There is much "swamp pine" on the Vicksburg loam itself, but none in the lower depressions.

The soils in the local depressions are quite variable, but as a rule consist of dark-colored silt or silty clay loam underlain by very light gray, plastic silty clay or clay. Very frequently the subsoil is mottled with brownish or yellowish stains that tend to become less noticeable in the lower subsoil, which is often a smooth, tenacious, light-colored silty clay. These soils closely resemble the Collins silty clay loam of the Big Black Valley, but as a whole are less uniform in texture, color, and drainage conditions.

The high average level of the ground water and the frequency of overflows render the low-lying soils of no present agricultural value aside from the possibility of using them for hay and pasture lands, but the ridges—to which the Vicksburg loam is confined—offer greater possibilities. A universal overflow of all these soils has occurred only once or twice in the last 30 years.

No surveys for drainage purposes have been made in this locality, but part of the Vicksburg loam apparently could be rendered rea-

sonably safe for corn, grass, and short-season forage crops by local reclamation work. Many of the summer overflows are due to back-water from the river, which never reaches the higher ground and remains for only a short period on the intermediate levels. The overflow from Lake Creek often fills the depressions, but fails to inundate the ridges. If short levees could be maintained across some of the depressed areas opening into the river, and Lake Creek were rendered capable of more rapid discharge, only the highest floods would seriously affect the greater part of the Vicksburg loam. These, it is stated, most commonly occur in the winter and early spring.

The present price of all these lands is determined almost entirely by the timber values.

#### VICKSBURG SILT LOAM.

The Vicksburg silt loam consists of a brown, mellow silt loam which usually shows little change in color or character of material in the 3-foot section, except that in the lower part some rusty-brown concretionary material and grayish mottlings may occur. Practically all the type along the smaller creeks and short, narrow branch bottoms consists of silty material washed from the adjacent uplands since the latter were cleared. The depth of these deposits is, of course, quite variable, but very generally exceeds 2 or 3 feet. The original soil—now the substratum—is usually lighter colored and less permeable than the overlying material.

Much of the Vicksburg silt loam in Bear Creek Valley has sufficient elevation to escape all except the higher overflows, which usually occur early in the spring. The soil is a dark-brown silt loam changing at 10 or 15 inches to a more compact lighter brown to reddish-brown silt loam or silty clay loam. The highest parts of these better drained lands resemble the Lintonia silt loam. Most of this land is in cultivation, and it is generally safe for corn and all grass and forage crops. Cotton is not so commonly planted as formerly on account of injury by the weevil if planting is delayed by overflows or unfavorable weather.

The lower lying parts of the type along Bear Creek are dark-brown soils, very productive but so often flooded that only a small area has been cleared. Similar conditions exist along Bogue Chitto Creek, but the higher lying areas here are not extensive. Most of the land is still forested and in places there is much wild cane. In the wider parts of these valleys the type as mapped includes some small areas of Collins silt loam.

The north-flowing creeks between Bogue Chitto and Bear Creeks have much recently deposited alluvium, and the Vicksburg silt loam

predominates here. A large proportion of the latter soil, as well as parts of the Collins soils, is highly esteemed for general farming.

The type in the vicinity of Livingston is affected to a slight extent by material washed from exposures of the calcareous clay on the west side of Persimmon Creek.

The Vicksburg silt loam along the innumerable small drainage ways in the Grenada silt loam areas usually consists of light-brownish silt loam varying from a few inches to 2 or 3 feet in depth. It consists of silt derived from the adjacent hillsides. The lower subsoil is generally lighter colored and very frequently has the grayish mottlings and concretionary material common to the subsoil of the Collins soils. Where the adjoining slopes are gentle, small patches of the low-slope phase of the Grenada silt loam commonly occur and are included in the type as mapped. Most of this variation of the Vicksburg silt loam has very desirable moisture conditions wherever open ditches are provided for the prompt escape of storm waters. It yields easily to tillage and, although the organic content is low and soil and subsoil are distinctly acid, good crops are ordinarily obtained. Overflows are usually of short duration, but often do considerable damage to recently planted corn and cotton. These branch bottoms are admirably adapted to lespedeza, white clover, Bermuda grass, paspalum, and Johnson grass, as well as to the cultivated forage crops.

The Vicksburg silt loam along the small tributaries of Hobuck, Kentuctah, and other creeks in the northeastern part of the county varies from a silt to a fine sandy loam. Nearly all the type here is in cultivation, producing much of the corn and cotton now grown in that part of the county.

Prior to the advent of the boll weevil the average yields of cotton on all variations of the Vicksburg silt loam was about 1 bale per acre. The adaptation of any part of the type to cotton under present conditions is largely dependent on the drainage. The sandy areas and areas near deep channels are much better suited to this crop than the wide flat areas approaching the Collins soils in character or the low-slope phase of the Grenada silt loam.

Much of the corn now produced is grown on this type. The yields may be placed between 20 and 50 bushels per acre. The dark-brown areas of the type commonly occurring along the streams in the southwestern part of the county are better adapted to this grain than the lighter colored areas in the eastern part or the sandy alluvium in the northeastern townships.

Much of this type would be improved by growing winter cover crops, which would serve the double purpose of adding organic matter to the soil and catching the silt brought down from the higher lands. The winter rains in many instances erode the naturally bet-

ter drained parts of fields and deposit sediments in untillable portions. The construction of temporary "balks" to check and spread the winter overflows would be profitable in many places. Most of the uncleared area would make fine pasture land if the timber were removed.

The present price of the uncleared areas is determined chiefly by the quality of the timber. The Vicksburg silt loam enhances the value of any farm of which it forms a considerable part.

#### COLLINS SILT LOAM.

The soil of the Collins silt loam is a brown silt loam varying from about 6 inches to 18 inches in depth, but usually the subsurface material is light brown or yellowish brown. The subsoil is a light-gray, compact silt loam to silty clay loam, more or less mottled with rusty brown and yellowish brown and containing much concretionary material.

All this type is subject to overflow. In most places the surface soil consists of silty material of comparatively recent deposition. The depth to which the pronounced brown color extends is determined chiefly by the prevailing subsurface drainage. Where the latter is especially poor, owing either to the high average level of the ground water or to the slow downward escape of surface water through the compact subsoil, or to a combination of these conditions, the brown surface layer is shallow. Where the underdrainage is better the brownish tints prevail to a greater depth, and the subsoil ordinarily has less of the light-grayish coloration. As a rule the concretionary material is most abundant where the drainage is poorest. In all instances the soil and subsoil are acid according to the litmus-paper test. The organic-matter content is somewhat variable, but seldom noticeably high except in swampy spots.

The Collins silt loam covers the first bottoms of the Pearl River from a point a few miles below Meeks Ferry southward. None of this area is in cultivation. The type also predominates along Doaks Creek and all its larger tributaries. Along Hobuck and Kentuctah Creeks the type as mapped includes some Vicksburg silt loam. Most of the areas mentioned above are still forested and of little present agricultural value except for pasture.

The type along the smaller streams in the northeastern part of the county has been very generally modified by recent deposition of sand and silt from the uplands. Areas that originally comprised grayish soils with more or less swampy spots and occasional small muck beds are now tillable. All these, however, require ditching and the maintenance of clear channels in the streams. The latter usually have ample gradient and tend to become deeper and wider

after being straightened. Many small areas are in cultivation, and in favorable seasons good crops of corn and cotton are obtained.

The areas along Hobuck, Kentuctah, Doaks, and Dry Creeks are in process of natural improvement by deposition of silt during the frequent overflows. No cooperative effort to reclaim these lands by straightening the natural channels of the creeks has ever been made. Such an improvement would lessen the average duration of the overflows, but not entirely prevent them. It would also decrease sedimentation, which under present conditions is an important factor in the general upbuilding of this type. The most practicable method seems to lie in the removal or thinning of the timber, followed by close grazing, so that the native pasture grasses may become established. The latter will do well on all open ground where water does not stand more than a few days at a time.

On the darker areas of this type corn, cotton, and other tilled crops do well. The higher areas, or where the grayish subsoil is within a few inches of the surface, are less desirable.

The following table gives the results of mechanical analyses of samples of the soil, subsoil, and lower subsoil of the Collins silt loam:

*Mechanical analyses of Collins silt loam.*

Number.	Description.	Fine gravel.	Coarse sand.	Medium sand.	Fine sand.	Very fine sand.	Silt.	Clay.
		<i>Per cent.</i>						
423930.....	Soil.....	0.1	0.4	0.3	3.3	2.9	73.0	15.3
423931.....	Subsoil.....	.1	.4	.4	3.5	4.1	73.0	18.2
423932.....	Lower subsoil...	.2	.5	.5	9.3	11.1	66.0	12.0

COLLINS SILTY CLAY LOAM.

The soil of the Collins silty clay loam is a dark-brown, heavy silty clay loam, ranging in places to silty clay. It has a somewhat granular structure and cracks at the surface as it dries. At a somewhat variable depth, usually less than 12 to 15 inches, the material changes to light-gray or very light drab silty clay, more or less mottled with various shades of yellow and yellowish brown and containing much concretionary material. The latter varies from soft, blackish to hard, brown, ferruginous concretions the size of peas. This kind of material extends to an undetermined depth, and all of it is so compact as to interfere very seriously with the vertical movement of water. Borings to a depth of 36 inches frequently show the middle subsoil to be saturated after heavy rains, while the lower subsoil was comparatively dry.

The Collins silty clay loam occupies the flood plain of the Big Black River, and much of the surface soil is of recent deposition.

Near the channel of the main stream the soil is somewhat sandy, and the peculiar characteristics of the subsoil are not so pronounced. In some of these places the soil is a loam or sandy loam, but the extent of this material is small.

Practically all this land is nearly flat; the local differences in elevation, except for old channels, seldom exceed 2 or 3 feet. This difference, however, causes corresponding variations in the depth of the dark surface soil, which is deeper on the higher ground and in the immediate vicinity of the channels, and shallower on flats and in depressions where the layer is only a few inches thick.

This soil is heavily forested with water oak, white oak, post oak, hickory, gum, holly, and other deciduous trees. Formerly cane was very abundant, especially on the higher ground, but this is fast disappearing.

The very small area in cultivation consists of small fields near the outer margin of the "swamp," as the overflow land is locally termed. All this type has a high degree of productiveness, but its utilization for crops seems doubtful owing to the frequency of overflows.<sup>1</sup> These occur chiefly in the spring, but may come during the summer. The water spreads rapidly, and flows so swiftly that it tends to wash the surface soil severely where the land is cleared. Small fields, which have been quite successfully cultivated otherwise, are reported to have been injured in this way. The gray subsurface material when exposed is difficult to handle, and the dark-colored surface soil undoubtedly constitutes most of the zone in which growing plants find available nourishment. It is noticeable that the roots of wild cane and of most forest trees do not penetrate the whitish substratum. Probably the greater part of this land could be used for pasturage and for hay production by the growing of such crops as lespedeza and Bermuda grass.

The following table gives the results of mechanical analyses of samples of the soil, subsoil, and lower subsoil of the Collins silty clay loam:

*Mechanical analyses of Collins silty clay loam.*

Number.	Description.	Fine gravel.	Coarse sand.	Medium sand.	Fine sand.	Very fine sand.	Silt.	Clay.
		<i>Per cent.</i>						
423910.....	Soil.....	0.5	1.3	1.3	10.0	6.3	48.1	32.2
423911.....	Subsoil.....	1.1	2.5	1.7	12.6	6.7	54.0	21.1
423912.....	Lower subsoil...	1.3	2.2	1.8	13.4	9.0	51.1	20.9

See report on the Methods and Cost of Reclaiming the Overflowed Lands along the Big Black River, Mississippi. U. S. Dept. of Agriculture Bul. No. 181, 1915.

## SUMMARY.

Madison County is situated in the central part of Mississippi, in the drainage basin of the Big Black River. It has an area of about 725 square miles.

Canton is the county seat and business center. It had a population of 3,929 in 1910. The rural white population in 1910 amounted to about 4,600, and the rural negro population to about 25,000.

The central and southern parts of the county are undulating to rolling, while the northern and northeastern parts are more or less hilly. Most of the uplands, second bottoms, and the small branch bottoms are cleared, while the overflow lands of the larger streams are forested.

The present price of farm lands ranges from \$5 an acre for the least desirable types remote from railways to about \$50 an acre for good farm lands near the towns.

Cotton, corn, hay, and oats are the leading crops. Forage crops and all minor food crops common to this section of the South are produced in considerable quantities. Much attention is being given to cattle and hog raising, especially since the appearance of the boll weevil in 1910.

The soils with some unimportant exceptions are largely silts and silty clay loams free from stones and gravel and easily cultivated.

The Grenada silt loam is the dominant upland type. It is well adapted to cotton, oats, and most of the grass and forage crops common to this region.

The Memphis silt loam is similar to the Grenada, but in general it has somewhat better underdrainage, and seasonal variations in rainfall affect crops to a less degree. Parts of this soil are hilly, but the areas of smoother topography are valued highly for general farming.

The Lexington silt loam represents the shallower areas of the loess, or where reddish sands or light-colored clay lies within 3 or 4 feet of the surface. The types as mapped include some Grenada silt loam. Much of this mixed type is too hilly to be easily tilled, and does not endure long cultivation as well as the typical Grenada and Memphis soils.

The Orangeburg fine sandy loam is distinguished by its sandy texture and red color. It occupies hilly to somewhat broken land. Only small areas are in cultivation.

The Lintonia, Olivier, and Calhoun soils are second-bottom types. The Lintonia fine sandy loam and silt loam are brown soils, well drained and aerated, and similar to the Memphis silt loam in agricultural value. The Olivier silt loam is a lighter colored soil that requires some artificial drainage. Nearly all of it is in cultivation, cotton and lespedeza hay being the principal crops. The Calhoun

silt loam is a grayish soil, poorly drained and generally forested or used only for pasture.

The Vicksburg loam and silt loam are first-bottom soils generally subject to overflow, but producing good crops of corn, cotton, and hay. The areas mapped as these types along the small drainage lines are semicolluvial soils of high agricultural value.

The Collins silt loam and silty clay loam in general represent alluvium subject to frequent overflow. In these soils the average level of the ground water is within a few feet of the surface. Only small areas are in cultivation.



[PUBLIC RESOLUTION—No. 9.]

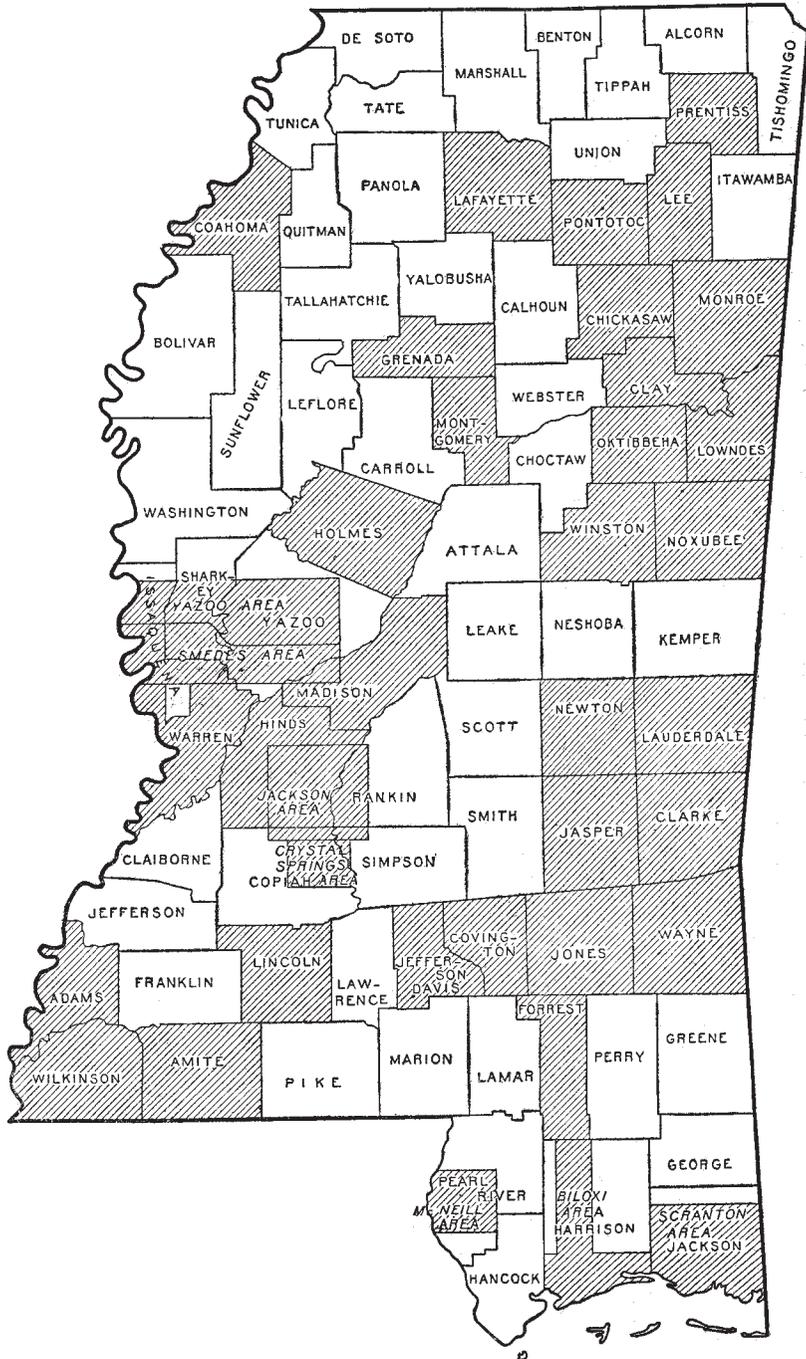
**JOINT RESOLUTION** Amending public resolution numbered eight, Fifty-sixth Congress, second session, approved February twenty-third, nineteen hundred and one, "providing for the printing annually of the report on field operations of the Division of Soils, Department of Agriculture."

*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.

# Accessibility Statement

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