

Issued May 31, 1916.

U. S. DEPARTMENT OF AGRICULTURE,

BUREAU OF SOILS—MILTON WHITNEY, Chief.

IN COOPERATION WITH THE GEORGIA STATE COLLEGE OF AGRICULTURE,  
ANDREW M. SOULE, PRESIDENT; DAVID D. LONG,  
IN CHARGE SOIL SURVEY.

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SOIL SURVEY OF CLAY COUNTY,  
GEORGIA.

BY

WILLIAM G. SMITH AND N. M. KIRK.

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HUGH H. BENNETT, INSPECTOR, SOUTHERN DIVISION.

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[Advance Sheets—Field Operations of the Bureau of Soils, 1914.]



WASHINGTON:  
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1916.

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## LETTER OF TRANSMITTAL.

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U. S. DEPARTMENT OF AGRICULTURE,  
BUREAU OF SOILS,  
*Washington, D. C., September 15, 1915.*

SIR: Under the cooperative agreement with the Georgia State College of Agriculture a soil survey of Clay County was carried to completion during the field season of 1914. The selection of this area was made after conference with State officials.

I have the honor to transmit herewith the manuscript and map covering this work and to recommend their publication as advance sheets of Field Operations of the Bureau of Soils for 1914, as authorized by law.

Respectfully,

MILTON WHITNEY,  
*Chief of Bureau.*

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

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## FIGURE.

FIG. 1. Sketch map showing location of the Clay County area, Georgia.....	Page. 5
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## MAP.

Soil map, Clay County sheet, Georgia.

# SOIL SURVEY OF CLAY COUNTY, GEORGIA.

By WILLIAM G. SMITH and N. M. KIRK.

## DESCRIPTION OF THE AREA.

Clay County is located in the southwestern part of Georgia, about 130 miles from the Gulf of Mexico. It is bounded on the north by Quitman and Randolph Counties, on the east by Randolph and Calhoun Counties, on the south by Early County, and on the west by the Chattahoochee River, which here forms the State line between Georgia and Alabama. The county is about 20 miles long from north to south, and has a maximum width of about 14 miles. The area embraces 133,760 acres, or 209 square miles.

The county lies wholly within the Coastal Plain and has, as a whole, a low relief. The extreme difference of elevation between the lowest and highest areas is about 300 feet, while the local range rarely amounts to more than 150 feet.

Topographically the county is a dissected plain, the degree of dissection varying inversely with the distance from the valley of the master stream of the county, the Chattahoochee River, which forms the western boundary. In general the dissection is both less complete and less deep in the extreme eastern part of the county. There are no areas, however, that can be considered as unmodified or unreduced remnants of the original plain surface. The smoothest upland areas have suffered more or less degradation during the progress of the existing erosion cycle and are now undulating to rolling rather than flat. Such areas lie along the watershed ridges between the streams of the eastern part of the county. The northeastern part of the county has the largest area of relatively smooth upland, and there is another area lying as an east-west belt extending eastward from Fort Gaines past Zetto, Bellville, and Oakland, with narrower belts running northward and southward as branches from it. As the valley of the Chattahoochee is approached the dissection becomes more complete and deeper, the slope steeper, and the topography in general



FIG. 1.—Sketch map showing location of the Clay County area, Georgia.

much rougher, a belt of maximum roughness lying immediately adjacent to the eastern boundary of the river valley and properly considered as the Chattahoochee River bluff. It extends from Fort Gaines due northward to the northern part of the county and slightly southeastward to the southern part of the county, with narrower belts extending eastward up the larger tributary streams. The two principal tributary belts are the Cemocheechee Creek belt across the central part of the county and the Colomokee Creek belt across the southern part. The bluff belt is in general thoroughly cut by steep-sided, narrow, and relatively deep valleys and ravines. The depth, however, rarely exceeds 175 feet.

The valley of the Chattahoochee River reaches a maximum width of at least 5 miles, practically all of it lying on the Clay County side at the northern boundary of the county. About 2 miles south of the mouth of Pataula Creek the river leaves the western side of the valley and turns southeastward across it. At Fort Gaines the river strikes a low bluff, terminating a narrow fringe of high terrace about a mile wide on which the town stands. The river therefore lies here within about a mile of the eastern side of the valley, and it maintains this distance to the south line of the county. The broad valley north of Fort Gaines consists of a belt of smooth, uneroded, low terrace flats lying between the Fort Gaines and Credille Mill road and the river and a higher undulating to rolling belt lying between the same road and the valley bluff running about due northward from Fort Gaines. South of Fort Gaines the narrow belt of valley lying in Clay County consists wholly of the high rolling terrace, the greater part of it being more rolling than the high terrace north of town and differing little from the hilly belts of the upland.

The whole county lies within the drainage basin of the Chattahoochee River. There are five or six main tributaries of this river which flow entirely across the county, and these have many branches which ramify into practically all parts of the county. The larger streams have a permanent flow of water and have steep gradients, and along them several small power plants for the grinding of corn, ginning of cotton, etc., have been installed. These larger streams have deep valleys, becoming deeper as the Chattahoochee River is approached, with rather narrow bottoms. The smaller tributaries have an intermittent flow. Most of these, especially in the central and western parts of the county, have steep gradients with rapid flow, and are actively cutting down their channel beds. In the eastern part of the county the grades are not so steep, the valley depressions are less pronounced, and there is less active cutting or erosion.

Settlement in this region began in the thirties, the settlers coming largely from the east. The second-bottom lands along the Chatta-

hoochee River and some of its tributaries were among the first to be cultivated. Gradually the higher lands eastward were opened up, the longleaf pine being largely removed for lumber, until now most of the lands having surface features suitable for farming are under cultivation.

The county was established in 1854 from parts of Early and Randolph Counties. The census of 1910 shows a total population of 8,960, or about 44 persons per square mile for the county. A large proportion of the population resides on farms, and of this class possibly 90 per cent are colored. In 1900 the population was 8,568, and in 1890 it was 7,817. Fort Gaines, the county seat and the most important town, has a population of 1,320, according to the 1910 census. It occupies in part the site of an old frontier fort built by Gen. Gaines in 1816 for protection against the Indians. It was one of the important landings on the Chattahoochee River in the early days when steamboats afforded the only mode of travel, except by team. Fort Gaines, before the building of the railroads, was a central point for overland transportation of merchandise, cotton, and other materials to inland towns. Bluffton, the next town in size, has a population of 325.

Since the building of the railway in 1860 the steamboat service has declined in importance, though boats are scheduled between Apalachicola, Fla., and Columbus, Ga., four times a week.

Fort Gaines is now the terminus of a 22-mile spur of the Central of Georgia Railway, which extends through the central part of the county and connects with the main line at Cuthbert. This railway passes through the narrowest part of Clay County, 8 miles of its track lying within the limits of the county.

Owing to the more or less hilly character of the area, the laying out of a public-road system to include easy gradients at reasonable cost of construction is difficult. Sand-clay roads are being constructed, with side and spur ditching to prevent serious washing during heavy rains. Considering the difficulties to be overcome, the highways in Clay County may be regarded as quite satisfactory.

Fort Gaines is the only market of any importance. Here the cotton crop is largely marketed. Since there are no large towns there is no great local incentive for building up special industries. Trucking, fruit growing, dairying, and the production of pork will depend, for any important advancement, upon facilities for shipment to outside markets.

#### CLIMATE.

Clay County lies within the warm temperate zone. The mean annual temperature is 65.4° F. The highest temperature recorded

at Fort Gaines is 105° F., and the lowest is 10° F. The summers are long and hot, while the winters are mild, with periods of cold, damp weather.

The average date of the last killing frost in the spring, according to the records of the Weather Bureau Station at Fort Gaines, is March 13, and that of the first in the fall is November 9. This gives a normal growing season of 241 days or nearly 8 months. The latest date of a killing frost, recorded in the spring, is April 8, while the earliest recorded in the fall is October 20.

As a rule the winter months are sufficiently mild for growing such crops as oats, vetch, crimson clover, cabbage, turnips, etc. Much outdoor work can be done in the winter, such as plowing and preparing the land for the next season's crops, fencing and clearing the land, road building, etc.

In general the county is favored with an abundant rainfall, well distributed throughout the year, so that but few crop failures result from the lack of moisture. The mean annual precipitation, as recorded at Fort Gaines, is 50.78 inches. The rainfall is generally lightest during September, October, and November.

An average of about one-third of the days in the year is recorded as cloudy and rainy. Of the remainder some are partly cloudy, but the greater number are clear. The prevailing wind direction for the year is south. The average velocity ranges from about 4 miles per hour for July and August to about 6 miles per hour for December to April, inclusive. The annual average is 5 miles per hour.

Storms are likely to occur any month in the year, but the more severe storms—accompanied by much lightning, heavy rainfall, and high wind velocities—usually occur within the season of subtropical storms from August to October.

During the winter, when the prevailing winds are from the west or northwest, the tempering influence of the ocean and the Gulf is less and short periods of unusually cold weather, with cold winds and rain, may be experienced.

The following table gives the normal monthly, seasonal, and annual temperatures and precipitation as compiled from the records of the Weather Bureau Station at Fort Gaines.

*Normal monthly, seasonal, and annual temperature and precipitation at Fort Gaines.*

Month.	Temperature.			Precipitation.		
	Mean.	Absolute maximum.	Absolute minimum.	Mean.	Total amount for the driest year (1913).	Total amount for the wettest year (1912).
	° F.	° F.	° F.	Inches.	Inches.	Inches.
December.....	49.4	81	12	4.67	2.97	4.35
January.....	47.6	83	12	3.56	4.09	9.15
February.....	48.8	82	10	6.35	5.45	4.84
Winter.....	48.6	83	10	14.58	12.51	18.34
March.....	60.0	92	25	5.19	3.04	7.13
April.....	65.4	93	33	3.57	6.40	9.87
May.....	73.8	100	42	3.43	1.67	2.71
Spring.....	66.4	100	25	12.19	11.11	19.71
June.....	79.8	102	47	4.30	2.34	3.46
July.....	81.4	105	60	5.89	5.89	7.51
August.....	80.6	104	60	5.69	4.95	9.29
Summer.....	80.6	105	47	15.88	13.18	20.26
September.....	76.4	100	42	3.09	2.15	4.95
October.....	65.5	99	29	2.52	1.25	2.57
November.....	56.2	84	20	2.52	1.58	4.85
Fall.....	66.0	100	20	8.13	4.98	12.37
Year.....	65.4	105	10	50.78	41.78	70.68

#### AGRICULTURE.

Before the early seventies the cultivated area in Clay County was confined largely to the "second-bottom" lands along the Chattahoochee River and some of its tributaries. About this time commercial fertilizers were introduced, and the crop acreage began to increase in all parts of the county.

Cotton has been the principal crop for the last 75 years, and the proportion of land in cotton is larger to-day than formerly. Corn and some oats have been produced as stock feed, but not in sufficient quantities to supply the needs of the county. Less than half the area of the county is cultivated, although it is estimated that at least 75 per cent may be brought into cultivation. The uncultivated portion includes steep broken lands, low overflow lands, deep sandy land of a droughty nature, a considerable area of good tillable land under forest, and some pasture lands.

At the present time cotton is the principal crop, with 33,642 acres, according to the 1910 census, out of a total of 85,000 acres of im-

proved land in farms, devoted to its production. Corn is the next most important crop, with a total of 19,475 acres. Oats are of minor importance, being grown on only 1,385 acres. No other crops are produced to any considerable extent. There is no live stock aside from the work stock and a few milch cows for use on the farms; the raising or fattening of cattle as an industry is not practiced, and only a few hogs are raised, these partly supplying the needs of the farm.

A considerable proportion of the tillable land, including the uplands and stream terraces, is admirably suited to cultivation, being practically level to gently rolling, and comprising light-textured soils which are easily cultivated with light implements and teams. The rougher portion of the county, including chiefly the gullies and steep slopes, can not safely be cultivated owing to danger of erosion, or can not be cultivated at all because of the steepness of the slopes. Much of this rough country, however, could be used for pasturing cattle. Owing to the suitability of the soil for Bermuda grass, the protection Bermuda sod affords against erosion, and the value of the grass for pasturage, it should be grown extensively over the rougher areas.

Excepting the narrow strips mapped as Meadow along the small streams of the county and a few acres of low alluvial land along the Chattahoochee River, there is no land in the county subject to frequent overflow. Of the terrace or second-bottom lands, the greater part may be cultivated, these lands being subject to overflow only at rare intervals.

Little attempt has been made to adjust crops to those soils to which they are best suited, or to develop industries to which certain of the soils are peculiarly adapted. There are soils in this county which in other localities have been used for the development of a greater variety of farm crops as the basis for establishing a live-stock industry and dairying, where the conditions have been favorable. These adaptations are indicated in the discussion of the several soil types.

The valuable leguminous crops that have been so important in rotations and soil improvement in other localities have received very little attention in this area, although practically all of the soils would be benefited by the extensive use of such crops in rotations.

The methods of agriculture employed in the county are those incident to a one-crop type of farming, as cotton production, whereby rather shallow cultivation is required. Proper attention has not been given to the maintenance of humus in the soil, or to such resting of the soil as comes through changes in cultivation, and the introduction of crops of different habits of growth in a rotation system of

agriculture. Several of the soils would be benefited by earlier and deeper plowing, and practically all of them by growing the legumes from time to time and incorporating the vines or stubble into the soil in those fields which include thin soils or soils of naturally low productiveness. The failure to raise cattle and hogs or to develop the dairy industry is responsible for the lack of that substantial improvement that is brought to a soil through the raising of forage crops and the return of the stable manure to the soil.

The farm equipment is well suited to the one-crop system that prevails. Mule power and light plows, which accomplish satisfactory tillage of the light, easily handled soils, are used, and the small, inexpensive barns afford sufficient protection for the stock in this region of mild temperatures and provide storage space sufficient to hold the feed required for the small amount of live stock.

The methods of cultivation are based entirely upon the system of cotton culture, requiring the use of light implements and frequent shallow cultivation. If there is any inadequacy in handling the soils, it is the failure to seed to winter cover crops, and the lack of deep, fall plowing, such as would give the soil better opportunity of improvement through winter freezing. With little diversity of crops, the present form of agriculture being based almost exclusively upon cotton production with some corn for the work stock, there is virtually no opportunity to follow up-to-date methods.

Fertilizers are used very extensively for cotton, at the rate of about 200 to 400 pounds and at a cost of approximately \$2.50 to \$5 per acre. Fertilizers are less frequently used for corn, and in lighter applications than in the case of cotton.

There is sufficient labor of the kind well adapted to the cropping system in vogue. The laborers are mainly negroes.

The average size of the farms is about 93.5 acres.<sup>1</sup>

About 20 per cent of the farms are operated by the owners and 80 per cent by tenants, who usually work on shares, receiving one-half of the crop where the owner furnishes the land, work stock, and all necessary equipment. During the season an advance of \$10 to \$12 a month may be made by the landowner for subsistence, and this is deducted from the tenant's share when the crop is harvested.

#### SOILS.

The soils of Clay County are comprised broadly in two divisions or soil provinces: (1) the Coastal Plain soils, or soils of the uplands, and (2) the alluvial soils, consisting of (a) the stream-terrace soils, and (b) stream-bottom soils.

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<sup>1</sup> The average size of holdings is really much greater, the census tabulating each tenancy as a farm.

The Coastal Plain division includes unconsolidated old sedimentary materials—beds of gravel, sand, clay, and sandy clay—and still older (underlying) beds of consolidated material, chiefly limestone. These strata are made up of water-laid materials which were washed from land areas in prehistoric time and deposited evidently under varying conditions, probably as marine, lacustrine, and fluvial beds. The materials have undergone alteration by the assorting and grinding action of waves, by chemical action, by solution in water, and by weathering since the recession of the water. The soils represent the products derived from the underlying beds through varied processes of weathering. Most of the upland soils have been derived from unconsolidated materials. There are some small areas the soil of which represents residual products formed by the decay of limestone.

The first-bottom soils occur as narrow flood-plain strips along the various streams. Here the materials represent soil washed from the various higher lying soils of the drainage basins, mainly from the Coastal Plain soils, and deposited by overflow water. This process of sedimentation is still going on, and the flood plains accordingly are being built up gradually, each overflow adding more of the alluvial sediments. The stream terraces, or second bottoms, are composed of alluvium deposited by streams when their channels had not cut to their present low positions and the overflows reached higher levels. These terraces occur as successive benches or strips along the Chattahoochee River, rising from levels just above the present bottoms to somewhat over 200 feet above. With the cessation of overflows the alluvium on these terraces began to be altered by weathering processes, which obviously have advanced further on the higher, older levels, and in those situations most thoroughly drained, oxidation, probably the most important agent affecting the color of the soil, being accelerated by the better drainage and consequent better aeration. In places the soils of the higher terraces have been brought to resemble, in their physical properties, the still older sedimentary soils of the uplands. But it is not unlikely that there are mineralogical differences in the materials of the two divisions.

The materials of the terraces have been washed from all the soils occurring in the drainage basin of the Chattahoochee River, including Appalachian, Piedmont, and the Coastal Plain soils.

In mapping the soils the different classes of materials have been separated into soil types according to texture. These various types have been grouped into series, the series including all those types of soil having the same general origin and drainage conditions, the same range of color in the surface soil, and the same range of structure and color in the subsoil.

The upland soils are grouped with the Greenville, Orangeburg, Norfolk, Ruston, Tifton, Susquehanna, Sumter, Grady, and Rough gullied land.

The Greenville series is characterized by the brown to reddish-brown color of the surface soils, and by the deep-red color and moderately friable structure of the subsoils. This series is represented by extensive areas of well-drained, good agricultural land.

The Orangeburg soils differ from the Greenville chiefly in that the color of the surface soils is grayish instead of reddish. The subsoils of the two series are essentially the same.

The Norfolk soils, on the other hand, have friable subsoils of a decidedly yellow color. Their surface soils are gray, much the same as those of the Orangeburg. These soils have good drainage and high agricultural value.

The Ruston series comprises soils having in the subsoils a color intermediate between the red of the Orangeburg or Greenville and the yellow of the Norfolk. The soils are grayish, underlain by reddish-yellow to yellowish-red or dull-red, friable subsoils. There are large areas of Ruston soil in the county, including good farm land.

The Tifton soils differ from the Norfolk chiefly in the presence of a conspicuous amount of ferruginous concretions known as "pimples" or "pebbles." The soil color of the Tifton on the whole is browner than the corresponding material of the Norfolk, but there is little difference in the color of the subsoil.

The Susquehanna series is represented by a single type. The soil is grayish to yellowish and the subsoil mottled red, gray, and yellow. The surface is irregular and the soil is subject to severe erosion. It has a low agricultural value.

The Sumter soils are gray to light brown, underlain by yellow, friable subsoils, much like the Norfolk soils. They differ from them, however, in their derivation from cherty calcareous rocks rather than from sands and clays.

The Grady soils are gray and poorly drained, occurring in low depressed, usually inclosed, basins. Their subsoils are saturated with water most of the year.

The first-bottom division of the alluvial soils is classed as Meadow and Congaree loam, while the terrace division embraces the Leaf, Kalmia, Cahaba, Amite, and Chattahoochee series. The terrace soils of the area are composed of older alluvium derived from Coastal Plain and Piedmont soils.

The Leaf soils are dark gray in the upper part and drab, mottled drab and red or mottled drab, yellow, and red in the subsoil. The subsoil is plastic and impervious, and the series is poorly drained, both on this account and on account of the flat to depressed surface.

The Kalmia series includes grayish soils overlying yellow, friable subsoils, often somewhat mottled with gray, especially in the poorer drained positions. The drainage of the Kalmia is not so well established as that of the Cahaba soils.

The soils of the Cahaba series are brownish to grayish, and the subsoils dull red to reddish yellow. The Cahaba soils carry considerable mica, and on the lower terraces the subsoil is generally rather heavy.

Meadow consists of poorly drained first-bottom alluvium of such varied texture and color that satisfactory separation into series and types is impracticable.

The Amite soils are similar to, if not identical with, the Greenville soils, though they have been derived by weathering from river-terrace deposits. Their topography is smoother than that of the Orangeburg soils.

The Chattahoochee soils are very much like, if not identical with, the Orangeburg soils, but have been derived by weathering from terrace deposits. Their topography is smoother than that of the Orangeburg soils.

Rough gullied land comprises steep slopes which can not be satisfactorily cultivated. The soil is representative of the Orangeburg, Ruston, and Susquehanna series. This land is devoted mainly to forestry, to which it is best suited.

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

*Areas of different soils.*

Soils.	Acres.	Per cent.	Soils.	Acres.	Per cent.
Norfolk fine sand.....	28,672	21.4	Orangeburg fine sandy loam..	3,008	2.3
Greenville sandy loam.....	12,992	9.7	Orangeburg loamy sand.....	2,816	2.1
Greenville loamy sand.....	10,240	7.7	Chattahoochee fine sandy		
Tifton fine sandy loam.....	7,360	5.5	loam.....	2,176	1.6
Cahaba fine sandy loam.....	7,168	5.4	Ruston sand.....	2,048	1.5
Norfolk sand.....	5,824	5.4	Rough gullied land.....	2,048	1.5
Loamy phase.....	1,280		Leaf fine sandy loam.....	1,920	1.4
Meadow.....	6,528	4.9	Cahaba fine sand.....	1,792	1.3
Greenville clay loam.....	6,208	4.6	Grady silty clay loam.....	1,600	1.2
Kalmia fine sandy loam.....	6,208	4.6	Susquehanna fine sandy loam.	1,536	1.1
Norfolk fine sandy loam.....	5,056	3.8	Cahaba clay loam.....	1,472	1.1
Ruston fine sandy loam.....	3,584	2.7	Amite loamy sand.....	1,152	.9
Kalmia sand.....	3,520	2.6	Sumter stony loam.....	896	.7
Kalmia fine sand.....	3,328	2.5			
Orangeburg sandy loam.....	3,328	2.5	Total.....	133,760	.....

GREENVILLE SERIES.

The soils of the Greenville series are prevailingly red, ranging from dark red to reddish brown. These soils are closely associated with

those of the Orangeburg series in distribution. The subsoils are influenced to some extent by the underlying limestone which is present in some places. The Greenville soils are generally more retentive of moisture than the Orangeburg. They occupy level to gently rolling areas in the Coastal Plain uplands. The mineral is sedimentary, mainly from sands and clays.

#### GREENVILLE LOAMY SAND.

The surface soil of the Greenville loamy sand consists of a dark-red to reddish-brown loamy sand 6 to 8 inches deep, while the subsoil is a red loamy sand to a depth of 3 feet or more. The lower subsoil of some areas is quite sticky, owing to a relatively high clay content. The soil is open and friable, and responds readily to cultural operations. The surface is somewhat inclined to form a crust following a soaking rain. When wet the material shows some adhesiveness, standing up well in exposures.

The type is fairly extensive in this county. It occurs principally in the southern part of the county. A few small areas are found elsewhere.

Most of it occurs along the upper slopes of the deeper stream valleys. Usually the tops of the divides are occupied by the Greenville sandy loam, and the lower slopes by the Norfolk fine sand. The surface varies from level to gently rolling, including some fairly steep valley slopes.

The drainage is ample at all times, and in dry seasons is inclined to be excessive.

This is one of the most important of the lighter types of soil. The type is largely cleared and a considerable part of it is under cultivation. The native growth was mainly longleaf pine, but most of this has been cut. The type is devoted to cotton, with some corn for the work stock. Cotton yields from about one-fourth to one-half bale per acre under present methods, and corn 10 to 15 bushels. The soil is very easy to cultivate, even with light one-horse implements. The soil does not need to be plowed very deeply and the shallow cultivation given to the cotton is adequate for that crop. Fertilizers are generally used for cotton, and to a less extent for corn.

Present land values range from about \$5 to \$20 an acre, according to improvements and the character of the surface.

The soil is only fair for general farm crops. It is better suited to cotton than to corn and oats. It should yield one-half bale of cotton to the acre with moderate care. It is a fair soil for peanuts and is well adapted to leguminous crops such as cowpeas and velvet beans, and a more extensive use of these would benefit the soil and tend to keep up its productive power. It is one of the soils upon which sugar-

cane yields sirup of fair quality. It is also one of the soils upon which pecans have been grown successfully in other parts of the State.

This soil could well be used for special crops. In various parts of the Southern States it has been shown to be fairly well adapted to early Irish potatoes and very well adapted to sweet potatoes. It is also recognized as very well adapted to watermelons and cucumbers and many of the early truck crops. It is a more productive soil generally than the Norfolk sand, and matures crops about the same time. The use of this soil for special crops of this kind will, of course, require a more intensive form of agriculture and more thorough handling of the soil, with very much heavier applications of manure and commercial fertilizers. This would only be justified when economic conditions are favorable.

#### GREENVILLE LOAMY COARSE SAND.

The Greenville loamy coarse sand, shown on the map by inclusion symbol with the Greenville loamy sand, is a brown to dark reddish brown loamy coarse sand or coarse sand which grades at about 6 to 8 inches into reddish-brown loamy coarse sand and this into red loamy coarse sand to sticky or clayey coarse sand.

When wet the material is somewhat coherent, but under ordinary conditions the soil has a rather open friable structure, though, owing to the small content of organic matter, it tends to pack and form a slight crust after heavy rains.

The subsoil is similar to the soil, except that the color is more uniformly red, and the structure somewhat more coherent, owing possibly to a slightly larger clay content. The subsoil is sufficiently compact to stand in vertical walls in road cuts.

Only a small extent of this type is found in the county. A few areas lie about 3 miles northwest of Bluffton. They occupy high upland divides and slopes, the surface features varying from level to rolling, with some fairly steep slopes.

The drainage is ample at all times, and in dry seasons is inclined to be excessive. Conditions of drought tend to lower crop yields, while in wet seasons low yields are said to result from leaching out of the fertilizer.

The Greenville loamy coarse sand ranks rather high in crop-producing power. In normal seasons, under good cultural methods, a bale of cotton per acre has been obtained. On such areas other crops also yield well. The usual yield of cotton, however, is one-third to one-half of that noted.

Small fruits, sweet and Irish potatoes, and other truck crops produce well on this soil under good cultural methods, though with present methods low yields are usual.

Land values of the Greenville loamy coarse sand at the present time range from about \$5 to \$20 an acre.

#### GREENVILLE SANDY LOAM.

The Greenville sandy loam consists of a reddish-brown sandy loam 8 to 12 inches deep, underlain by red, moderately friable sandy clay extending to a depth of 3 feet or more. There are places where the immediate surface soil is a loamy sand, and frequently the subsoil clay lies deeper, in some places being 10 to 18 inches deep.

Under ordinary moisture conditions the structure is open, and the soil responds easily to cultural operations. There is a tendency for the soil to assume a compact structure following any extended rainfall, on account of the fine material present and possibly to some extent on account of the low organic content.

The upper part of the subsoil is somewhat more sandy, open-structured, and friable than the lower section, which in places is rather compact and sticky when wet. Where exposed in road cuts, the subsoil material stands up in hard, vertical walls. Exposed clay spots in the fields, if plowed too wet, give rise on subsequent cultivation to clods that are slow to weather back into friable condition.

The type is quite extensively developed in scattered areas throughout the southern half of Clay County. The size of the areas varies from a few acres up to about 600 acres.

The Greenville sandy loam occurs in the uplands. On the broader divides the surface varies from level to gently rolling, while on the narrower divides there is a somewhat greater proportion of sloping land.

The Greenville sandy loam probably is one of the most important soils of the area in point of productiveness and possibilities of use. Although originally forested, mainly with longleaf pine, it is practically all under agricultural occupation at the present time, and is used almost exclusively for the production of cotton and corn.

Dairying is not practiced, nor are cattle or hogs raised to any important extent. Cotton yields, under the methods followed, about one-third to one-half bale per acre and corn about 10 to 15 bushels.

The soil is very easily cultivated. It requires only light implements and light teams and can be cultivated throughout a wide range of moisture conditions.

Fertilizers are very generally used in connection with the cotton crop and to a less extent with corn. The value of the land at present ranges from \$20 to \$40 an acre, depending on improvement, location, and topography.

The methods used on this soil could readily be improved, and the yields of the staple crops, cotton and corn, materially increased. Deeper preparation of the soil occasionally and the introduction of oats and leguminous crops, such as cowpeas, velvet beans, bur clover, and vetch, would give variety to the cultivation and would tend to add organic matter to the soil, at the same time producing a larger amount of forage and keeping the soil in better physical condition. The growing of peanuts also would tend to improve the physical condition of the soil, and this crop provides a valuable feed for hogs.

As markets and transportation facilities improve, the peach industry, which has been successfully developed on this type of soil in other parts of Georgia, could be advantageously developed here. Pecans have also been grown successfully on this soil in other parts of the State.

More live stock should be raised for the resulting benefit to the soil, although under present conditions it would not be advisable to attempt stock raising on a large scale. Hogs can be provided with ample feed by growing peanuts and pasture crops. Dairying should be developed, at least to supply home demands.

Experience shows that commercial fertilizers can be profitably used on the Greenville sandy loam, and that satisfactory results are obtained with smaller applications than are required on the Orangeburg sandy loam.

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

*Mechanical analyses of Greenville sandy loam.*

Number.	Description.	Fine gravel.	Coarse sand.	Medium sand.	Fine sand.	Very fine sand.	Silt.	Clay.
		<i>Per cent.</i>						
253305.....	Soil.....	2.7	17.6	20.6	34.2	4.7	9.9	9.9
253306.....	Subsoil.....	1.6	9.4	12.1	22.4	4.0	10.2	40.2

GREENVILLE GRAVELLY SANDY LOAM.

The surface soil of the Greenville gravelly sandy loam, which type is shown on the map by gravel symbol in areas of Greenville sandy loam, consists of a reddish-brown gravelly sandy loam 8 to 12 inches deep, underlain by a red clay subsoil less gravelly than the soil. The gravel consists largely of quartz, the fragments varying from one-fourth to 1 inch in diameter. Some ferruginous pebbles and angular chert fragments also are present. The content of gravel is sufficient to interfere somewhat with cultivation. The soil has a tendency to form a crust after rains, but a good mellow tilth is easily maintained by cultivation.

A few scattering areas of the Greenville gravelly sandy loam occur in the uplands of the southern half of the county. The areas vary in size from a few acres to 200 acres. The type is not extensive.

The topography varies from level to gently rolling, with occasional areas of a more steeply sloping character near drainage lines. The natural drainage is good.

Originally the type was covered largely with longleaf pine, but at the present time most of it is cleared and farmed. It is a moderately productive soil, but, as is the case with the other soils, the methods used are not such as would result in maximum yields. With good management the yields could probably be doubled.

#### GREENVILLE CLAY LOAM.

The Greenville clay loam consists of a reddish-brown heavy sandy loam or fine sandy loam, underlain at about 3 to 5 inches by a red sandy clay of a moderately friable character. With fairly deep cultivation, sufficient heavy material is turned to the surface to produce a clay loam when mixed with the present surface material.

The soil tends to form a hard, compact surface crust, following any soaking rainfall. Clods formed when wet are slow in weathering to a friable condition.

The type is quite extensive in Clay County, having a total area of 6,208 acres. It occurs in scattered areas in the uplands throughout the southern half of Clay County, usually adjoining its related type, the Greenville sandy loam. The size of the areas varies from a few acres to about 800 acres.

The surface varies from level to gently rolling over the broader areas. In the vicinity of the deeper drainage valleys a somewhat greater proportion of the surface is sloping.

This is an important soil for general farm crops. Originally it was largely covered by longleaf-pine forest, but at the present time nearly all of it is cleared and in cultivation.

Cotton is the principal and almost exclusive crop, with some corn and oats for the work stock. Cotton yields about one-half bale to the acre. Corn is more likely to suffer from drought on this soil than on the sandy loam type and the average yield is low. Ordinarily, plowing is about 3 or 4 inches deep, not deep enough to bring the clay subsoil to the surface and thus form a clay loam. Fertilizers are generally used in the production of cotton, and in some cases for corn.

Present land values range from about \$20 to \$40 an acre, according to improvement and location.

One of the great needs of this soil is deeper plowing and the gradual incorporation of the clay subsoil with the sandy surface soil. Plowing should be done in the fall and the soil allowed to weather through the winter or cover crops can be seeded to prevent erosion

and to add organic matter to the soil. Cultivation on this soil is limited to a much narrower range of moisture conditions than on the Greenville sandy loam, and the soil can not be stirred safely when excessively wet nor easily when very dry. In order to handle the Greenville clay loam efficiently, it is necessary to have a heavier equipment of implements and teams than is required to handle the Greenville sandy loam, for the soil is more difficult to turn and requires deeper plowing.

With more efficient preparation of the soil, corn and oats would both do well, and by using leguminous crops, rotations could be introduced that would improve the soil and increase the yields of all crops. This is a soil which would be adapted to an intensive form of dairying in which forage crops are raised and fed from silos, if market and transportation conditions justified. It is also a soil which, with proper methods and under favorable economic conditions, would be adapted to the fattening of cattle. Under present methods of farming it is not a good grazing soil, because it compacts so easily and puddles if trampled when wet.

#### GREENVILLE GRAVELLY CLAY LOAM.

The Greenville gravelly clay loam consists of a reddish-brown to dark reddish brown gravelly sandy loam, underlain at about 3 to 6 inches by red sandy clay, containing little gravel. The gravel consists of quartz fragments ranging from one-fourth to 1 inch in diameter, together with considerable ferruginous pebbles the size of a pea and larger. These gravel particles are plentifully strewn over the surface and disseminated through the soil.

The type is found in scattered areas in the southeastern part of the county, varying in extent from a few acres up to about 200 acres. It characteristically occurs on knolls and slopes. Owing to its small total area it is shown by gravel symbol, in Greenville clay loam color.

The Greenville gravelly clay loam is a good soil, but under prevailing methods of cultivation the average yields are much lower than they should be.

#### SUMTER SERIES.

The soils of the Sumter series are gray or light brown to yellowish, and the subsoils are yellow in color and carry large quantities of partially weathered rock fragments and chert from the Vicksburg-Jackson limestone, from which the soils are derived. This series is represented by only one type, the stony loam, in this county.

#### SUMTER STONY LOAM.

The surface soil of the Sumter stony loam varies in color from grayish through light brown to reddish brown and in texture from a sandy loam to clay. The type is separated on the basis of its

content of stone, consisting of angular fragments of chert and occasionally of limestone. The fragments range in size up to 10 inches in diameter and in quantity from a mere scattering to quantities large enough to make plowing difficult. The subsoil is uniformly a moderately stiff clay to silty clay, ranging from yellow in the upper part to red or mottled red and yellow at greater depths, though the latter colors may not appear within the 3-foot section. Occasionally the deeper subsoil is somewhat less compact than the upper, on account of the occurrence of partially decomposed cherty limestone.

The soil is closely related to the Greenville and Orangeburg soils and has been derived in part at least from cherty calcareous rocks of the Coastal Plain.

It occurs in the neighborhood of Bellville and Oakland in areas ranging from a few acres up to 200 acres in size.

It is considered a naturally productive soil though its stone content prevents its use to some extent. Like the other soils of the county, it is used for growing cotton and corn.

#### ORANGEBURG SERIES.

The Orangeburg soils are predominantly gray, ranging to reddish brown and are underlain by bright-red friable sandy clay subsoils. This series is confined to the uplands of the Atlantic and Gulf Coastal Plain, being most extensively developed in a belt extending from southern North Carolina to central Texas. The materials forming the soils were originally washed from the Piedmont and Appalachian regions.

#### ORANGEBURG LOAMY SAND.

The Orangeburg loamy sand is a grayish-brown loamy sand, underlain at about 8 to 20 inches by reddish loamy sand, which grades into red loamy sand, having frequently a rather sticky character below a depth of about 30 inches. The loamy nature of the material makes it more retentive of moisture than the looser Norfolk sand and the Orangeburg sand found in other sections.

The type occurs mainly in the southern part of the county and covers an area of 4.4 square miles.

It occupies the upland divides and upper slopes. The surface is level to rolling, with a rather larger proportion of sloping land, some of which is fairly steep:

The drainage is thorough to excessive. The greater part of the type has been cleared and is or has been in cultivation. Originally, the type was covered with longleaf pine and some oak, and a portion is still forested.

The Orangeburg loamy sand is used for the same purpose and is adapted to the same crops as the Greenville loamy sand. It is not quite so productive and requires somewhat heavier applications of fertilizer for satisfactory yields.

Cotton is the principal crop. Little corn is grown. A large number of early vegetables, including Irish potatoes, sweet potatoes, melons, cucumbers, tomatoes, and others, could be grown successfully, as shown by experience in small patches, and under favorable conditions of transportation and marketing trucking could be practiced. Trucking would require a much more intensive type of agricultural practice than now prevails anywhere in the area.

#### ORANGEBURG SANDY LOAM.

The surface soil of the typical Orangeburg sandy loam consists of a grayish loamy sand underlain at 5 or 6 inches by reddish loamy sand. The subsoil, beginning at about 8 to 15 inches, is a red, friable, sandy clay, which extends to a depth of 3 feet or more. In places the type grades into the Greenville sandy loam in such a way that it is difficult to establish sharp boundaries.

Under ordinary moisture conditions the top soil is loose and responds readily to cultivation.

The type is found in the southern part of the county. It occurs mainly on the high divides and the surface ranges from level to gently rolling.

The Orangeburg sandy loam is used for the same purposes and is adapted to the same crops and industries as the Greenville sandy loam, but it is not so productive and requires heavier applications of fertilizer to maintain satisfactory crop yields.

Cotton is the principal crop grown. Some corn and oats are grown for use on the farm. Irish potatoes can be grown successfully, maturing at a medium early date. Cowpeas, velvet beans, peanuts, vetch, bur clover, and a number of other crops do well on this type of soil, but as yet have no important places in the agriculture of the county. This type is valued at about \$20 to \$30 an acre.

#### ORANGEBURG GRAVELLY SANDY LOAM.

The Orangeburg gravelly sandy loam, shown on the map by gravel symbol with the sandy loam type, consists of a brownish loamy fine sand or gray loamy sand to sandy loam or fine sandy loam, underlain at 6 to 15 inches by a red friable sandy clay. Gravel consisting chiefly of small ferruginous concretions is abundant over the surface and throughout the soil mass. The amount is sufficient to interfere somewhat with cultivation, but never to prevent it. Some quartz

gravel is present. A few small areas having a reddish gray to red color and really comprising a distinct soil are included with this type.

The Orangeburg gravelly sandy loam is found in the southeastern part of the county in rather close association with the Greenville and Tifton series, and with other Orangeburg types. The topography is like that of the associated sandy loam soil.

This soil is retentive of moisture and where properly handled gives fair yields of the ordinary farm crops. It is a comparatively friable soil and easily kept in good tilth.

#### ORANGEBURG FINE SANDY LOAM.

The Orangeburg fine sandy loam differs from the Orangeburg sandy loam chiefly in its finer texture. The typical soil is a grayish loamy fine sand, which quickly grades into reddish fine sandy loam, and this, from about 8 to 15 inches, into red, friable fine sandy clay. In some places along lower slopes and in saddlelike situations the depth to clay is 20 inches or more. The type includes small patches of Greenville fine sandy loam, too small to map separately.

This type occupies the same relative position as the Orangeburg sandy loam, is used for the same crops, and under present methods gives about the same yields. It is limited to a few small areas of nearly level to gently rolling topography.

Owing to its finer texture it is susceptible, with improved methods and the incorporation of organic matter, of being made somewhat more retentive of moisture and somewhat more productive than the Orangeburg sandy loam, and in crop yields it should compare favorably with the Greenville sandy loam.

Cotton occupies the largest part of the cultivated area, the other crops grown, chiefly corn and oats, being unimportant, both from the standpoint of yield and of acreage. Among the crops which have proved successful on this type in many parts of the South, but which are of no especial importance here, are: Peaches; the common southern legumes, as cowpeas, velvet beans, and vetch; Irish potatoes; peanuts; and pecans.

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

*Mechanical analyses of Orangeburg fine sandy loam.*

Number.	Description.	Fine gravel.	Coarse sand.	Medium sand.	Fine sand.	Very fine sand.	Silt.	Clay.
		<i>Per cent.</i>						
253357.....	Soil.....	3.0	12.0	12.0	42.6	10.5	15.2	4.4
253358.....	Subsoil.....	1.3	6.9	8.1	32.6	9.6	12.6	28.3

## NORFOLK SERIES.

The surface soils of the Norfolk series are prevailingly gray, ranging from light to grayish yellow. The subsoils are yellow and have a friable structure. These soils occupy nearly level to rolling uplands throughout the Atlantic and Gulf Coastal Plain. They are derived mainly from Piedmont-Appalachian material.

## NORFOLK SAND.

The Norfolk sand consists of a grayish, loose sand, underlain at an average depth of 5 or 6 inches by pale-yellow, loose sand, which extends to a depth of 3 feet or more. There are some included patches which show a reddish color in the subsoil; these are areas of Ruston material which are not mapped, because of their small size.

Under field conditions the subsoil is leachy, rendering the type somewhat droughty, and allowing the rapid leaching of fertilizers. In some cases a distinct clay substratum is encountered at about 3 to 6 feet, and in others at greater depths. The greater the depth to the clay substratum the quicker the crops suffer from drought. In wet seasons the yields are often as low on this type as in dry seasons because of the rapid disappearance of the fertilizer that is applied.

The type occurs in several areas in the northern part and in two rather large areas in the southern part of the county.

The surface of the type varies from level to rolling. A large part occupies steep slopes. The drainage is thorough to excessive

Cotton is the principal crop grown, with some corn for the work stock and for meal, which is ground locally. Cotton yields from about one-sixth to one-third bale per acre, and corn gives correspondingly low yields. The soil is very easily handled. Fertilizers are used for cotton and to a less extent for corn.

The land is now held at about \$3 to \$10 an acre, depending on improvements, topography, etc.

The soil is in need of organic matter, which can be added to good advantage by growing legumes, especially velvet beans and cowpeas. It is not a very desirable soil for general farm crops. Its true place in the agriculture of the county, if economic conditions were favorable, would be, under intensive methods of cultivation and with large applications of fertilizer and manure, for the production of very early truck crops. The yields would be light, but this would be compensated for by the early maturity and higher prices obtained. Watermelons, sweet potatoes, very early potatoes, cucumbers, peas, radishes, and beans might be produced successfully under such conditions. On account of the necessity for heavier applications of fertilizers, the cost of production will be greater on this than on other soils.

*Norfolk sand, loamy phase.*—The surface soil of the Norfolk sand, loamy phase, consists of a gray loamy sand 10 to 18 inches deep, underlain by a yellow loamy sand subsoil to a depth of 3 feet or more.

At lower depths the clay admixture seems greater. At depths of 3 to 5 feet or more a more or less distinct clay substratum is encountered which doubtless indirectly helps to give the type a greater crop-producing power.

The phase is found in small bodies in the northern part of the county, stretching from the vicinity of Fort Gaines to near the northern line of the county.

The drainage is excessive and in dry seasons crops suffer, not so much, however, as on the typical Norfolk sand, which is less retentive of moisture.

The Norfolk sand, loamy phase, is used principally for cotton and corn. The yields are low, but with good treatment they are satisfactory. As much as one bale of cotton per acre has been produced on this soil under good cropping practice.

Most of the other crops grown in the region can be successfully grown on this type with liberal fertilization. Sweet potatoes and watermelons do well.

#### NORFOLK GRAVELLY SAND.

Several small areas of Norfolk gravelly sand, lying between Fort Gaines and Patula Creek, are shown on the map by gravel symbol with the Norfolk sand. These consist of Norfolk sand to loamy sand, with a high content of rounded quartz gravel. The quantity is never sufficient to prevent the cultivation of the soil. Crops on these gravelly areas are said to suffer somewhat more from drought than on the loamy phase of the Norfolk sand, though no more probably than on the typical Norfolk sand. Where cleared such gravelly areas are used for growing cotton and corn. The total area of this soil is small.

#### NORFOLK FINE SAND.

The Norfolk fine sand is a gray, loose fine sand, which grades at an average depth of about 5 inches into yellowish-gray or pale-yellow, loose fine sand. In cultivated fields the organic-matter content appears to be lower than in the forest, and the soil shows some tendency to compact with heavy rains. Its becoming compact, however, is not an unfavorable condition of much importance.

The subsoil is rather more compact than the soil. In some places a clay substratum is encountered at 3 to 5 feet, but usually such material lies much deeper. This substratum seems to affect the moisture of the type, crops doing better in dry seasons where the clay is not so deep.

The Norfolk fine sand is extensively developed in the northern part of the county, where it occurs on the slopes and ridge tops; it is less extensively developed in the southern part, where it occurs mainly on the slopes and in strips along the stream valleys.

The surface varies from level to rolling, the greater part of the type occupying moderately steep to steep slopes. The soil has thorough drainage, and often excessive on some of the ridges.

This is the most extensive type in the county, covering 44.8 square miles. Most of it is still in native forest, consisting chiefly of long-leaf pine and oak. The timber is being removed and cut into lumber by small, portable sawmills, but the area in cultivation is not being rapidly extended.

Cotton and some corn are the principal crops grown on this soil. Cotton yields from about one-sixth to one-fourth bale per acre, and the yields of corn are correspondingly low. The soil is easily handled with one-horse plows. Fertilizers are generally used in the production of cotton and to some extent in the production of corn.

Land under cultivation is worth about \$3 to \$5 an acre; forested land is valued higher, depending upon the timber.

Much can be done through the improvement in methods of agriculture to increase the yields of the present staple crops, cotton and corn, particularly through the introduction of leguminous crops to add organic matter to the soil and to supply nitrogen. Velvet beans do well, and cowpeas fairly well. This type, however, can not be economically used for the heavier farm crops. It is a type which in other parts of Georgia and in other Southern States, with good transportation and market facilities, has proved particularly adapted to watermelons, sweet potatoes, early Irish potatoes, and other truck crops, where earliness of maturity counterbalances the low yields and the higher cost of production. In the raising of these special truck crops intensive methods are required and heavy applications of manure and fertilizer are necessary, and it is only with rapid and efficient transportation and good markets that such industries can be successfully developed. Sugar cane produces light crops, but a very superior quality of sirup of bright color. All crops require liberal applications of fertilizer or manure for good yields.

This type includes some of the low, mucky areas described in connection with the Kalmia sand. Their location is shown on the soil map by the swamp symbol.

#### NORFOLK FINE SANDY LOAM.

The surface soil of the Norfolk fine sandy loam consists of a gray fine sand to a depth of 5 or 6 inches, underlain by a pale-yellow loamy fine sand to fine sandy loam. The subsoil, beginning at about

8 to 15 or 20 inches, is a yellow, friable, fine sandy clay. There is some included Ruston fine sandy loam which, on account of its small extent, is not mapped. Some of this Ruston carries ferruginous concretions, but not in sufficient quantities to interfere seriously with cultivation. The soil is loose and the subsoil is quite friable.

The type occurs mainly in the northern half of the county, with a few small areas in the southern and southeastern parts. The surface varies from level to rolling, and the drainage is good.

This is one of the best of the lighter types of soil for general farm crops, but its area is small. At present most of it is in cultivation.

Cotton is the principal crop grown, with some corn and oats. Cotton yields upward of one-half bale per acre, corn 10 to 20 bushels, and oats from 10 to 25 bushels.

The soil is easily handled, but requires a somewhat heavier farm equipment than the lighter soils. Fertilizers are generally used for cotton and corn.

The land is valued at about \$20 to \$40 an acre, depending mainly upon location and improvement.

The soil is easily cultivated, but it would be benefited by deeper and more seasonable preparation of the seed bed and by the use of a heavier farm equipment than is in general use at the present time. With better preparation and a change in the system of farming, including the introduction of leguminous crops, especially cowpeas, velvet beans, and vetch, to add organic matter and nitrogen to the soil and to improve its physical condition, there seems to be no reason why at least three-fourths bale of cotton per acre could not be produced and the yields of corn and oats materially increased.

The soil is very well adapted to peanuts, which furnish excellent field forage for hogs. It is also very well adapted to sweet potatoes and to sugar cane. Heavy yields of the latter can be obtained with proper fertilization, giving a light, bright-colored sirup. This is one of the soils on which pecans have been grown successfully in other parts of the State. In various sections of the South this type of soil is used for the production of cantaloupes.

This is a soil upon which the raising of hogs could be successfully carried on, owing to its adaptation to peanuts and a variety of valuable hog forage crops.

#### RUSTON SERIES.

The Ruston series includes types having gray to grayish-brown soils and reddish-yellow to yellowish-red or dull-red, moderately friable, sandy clay subsoils. Occasionally the lower subsoil is mottled with gray and shades of yellow. In point of subsoil structure

this series is intermediate between the Orangeburg and Norfolk on the one hand and the Susquehanna on the other. The Ruston soils are closely associated with the Orangeburg and Susquehanna.

#### RUSTON SAND.

The Ruston sand is a gray loose sand, underlain at about 5 or 6 inches by pale-yellowish sand which grades into reddish-brown or reddish-yellow sand, frequently a little loamy in the lower part of the 3-foot section. Some quartz pebbles are present in places.

The organic content is obviously low, as shown by the gray color of the soil. The subsoil is open enough to make crops suffer from the effects of droughts, while on the other hand yields are low in wet seasons—a fact generally believed to be due to rapid leaching away of the fertilizer.

The principal area of this type occurs at Cotton Hill, along the county line.

The surface of the type is for the most part undulating to rolling, with some steep slopes. The natural drainage is excessive, and in dry seasons crops suffer from lack of moisture. A clay substratum occurring at 3 to 8 feet below the surface prevents even greater leaching. A large part of the type is in cultivation.

The Ruston sand is less productive than the Ruston loamy sand, and it is very much less productive than the types having clay subsoils, but under good cultural methods fair crop yields can be obtained. The common cropping practices are such as to reduce the producing power instead of bettering conditions. The clean culture necessarily involved in the growing of cotton and corn, and the leaving of bare fields exposed to washing and leaching action of winter rains, are not conducive to good yields. From one-sixth to one-third bale of cotton per acre is obtained, and other crops give similarly low yields. Newly cleared lands of the type, or old fields that have lain idle for a few years, sometimes produce better crops for a few years, but such fields soon run down under the existing cropping system. Under more improved methods, including the growing of leguminous crops, such as cowpeas, peanuts, and velvet beans, better yields can be obtained.

Melons, sweet and Irish potatoes, and other truck crops do fairly well on this type with proper fertilization.

Present land values of the type range from about \$3 to \$15 an acre.

#### RUSTON LOAMY SAND.

The Ruston loamy sand consists of a gray loamy sand, underlain at about 8 to 12 inches by reddish-yellow or yellowish-red loamy sand. It is found in both the northern and southern parts of the county, and is shown on the map by inclusion symbol with the Ruston sand.

The surface varies from level to rolling, including in places fairly steep slopes. The drainage is rather excessive, but the soil is considerably more retentive of moisture than the Norfolk sand.

This is not an important type in point of extent. Most of it is under cultivation. It is used in the production of cotton and corn, principally cotton.

Cotton yields from about one-fourth to one-half bale per acre, corn from about 10 to 15 bushels. The soil is light and easily cultivated with a light farm equipment. Fertilizers are very generally used for the production of cotton and to a less extent for corn. Land ranges in value from about \$10 to \$20 an acre.

The soil is fairly well adapted to cotton and rather poorly adapted to corn and oats. Legumes should be grown to a greater extent than at present to improve the soil. Sugar cane yields a good quality of sirup on similar soils in other parts of the State, and the soil is very well adapted to sweet potatoes. The proper place for this soil in any future development, if transportation and market facilities and other economic conditions are favorable, is for special use in the production of early truck crops, particularly early potatoes, watermelons, cucumbers, peas, radishes, beans, and other, lighter truck crops. If the trucking industry is developed it will, of course, require more intensive practices and much heavier manuring and fertilizing than is the practice with the farm crops now grown.

On account of the greater moisture-holding capacity, the yields from this soil under intensive culture may be expected to be somewhat heavier than those obtained from the Norfolk sand with similar treatment.

#### RUSTON FINE SANDY LOAM.

The surface soil of the Ruston fine sandy loam consists of a gray fine sandy loam 8 to 12 inches deep, underlain by a reddish-yellow or buff fine sandy clay subsoil which extends to a depth of 3 feet or more.

The surface soil includes some coarse sand and ferruginous pebbles, but the medium to fine sand is larger in amount, with sufficient silt and clay to give it a loamy character. Under ordinary moisture conditions the structure is open and friable, and the type responds well to cultural operations. The low organic-matter content, however, causes the soil to form a compact structure following a soaking rain.

The subsoil includes more or less fine sand with the clay, and it is moderately compact and friable; with depth the structure becomes more compact and the material more clayey. The subsoil material where exposed in road cuts stands up in vertical walls.

This type is not extensively developed in the county, the largest areas occurring in the northern part. A few scattered areas are also found in the southern half of the county. The surface of the type varies as a rule from level to gently rolling; only small areas occupy steep slopes. The natural surface drainage is good as a rule, and where ditching may be necessary, outlets into stream valleys and draws are easily provided.

Originally this type was covered with longleaf pine, but at present most of it is cleared and in cultivation.

The Ruston fine sandy loam is naturally a productive soil, but leaving bare fields exposed to the washing and leaching of winter rains has lessened the organic content. Only one-third to one-half bale of cotton, 10 to 15 bushels of corn, and 10 to 20 bushels of oats per acre are obtained. New land of the type, having a high organic content, has produced 1 bale of cotton per acre and yields of other crops in proportion, but under the common cropping practice yields have steadily declined.

Under improved methods, including deeper plowing, crop rotation, and the growing of leguminous crops, such as cowpeas, peanuts, and velvet beans, as well as winter cover crops consisting of small grain, hairy vetch, bur clover or crimson clover following cotton, much larger yields should be obtained.

Small fruits, sweet and Irish potatoes, and other truck crops do well on this soil with good cultural methods, but under present conditions the yields are rather low.

Land values of the Ruston fine sandy loam range from about \$20 to \$40 an acre.

#### RUSTON GRAVELLY SANDY LOAM.

Areas of Ruston gravelly sandy loam are shown on the map by gravel symbol in Ruston fine sandy loam color. The fine-earth material consists of a gray fine sand, or sand underlain at about 6 inches by yellow loamy sand to sandy loam, which passes at a depth of about 8 to 12 inches into yellowish-red friable sandy clay. In some places, particularly on slopes, the lower subsoil is somewhat plastic. Gravel, principally quartz, is very abundant on the surface and throughout the soil mass. Ferruginous nodules are common in places. The gravel content varies considerably from place to place, but as a rule it is high enough to interfere somewhat with cultivation.

There are only a few scattered areas of this type in the county. These occur mostly on knolls and slopes in the uplands, although there are some nearly level areas. The drainage of the type is good to excessive.

The Ruston gravelly sandy loam is inherently a productive soil, but under the cultural methods used the crop yields are low. The

growing of cotton and corn at present constitutes the principal use of this type.

#### TIFTON SERIES.

The Tifton soils are prevailingly gray, ranging to brownish gray. The subsoils consist of bright-yellow, friable sandy clay. Small iron concretions occur on the surface and throughout the soil section. The topography varies from flat to gently rolling, and drainage is good. The Tifton series extends through southern South Carolina and across Georgia into Alabama. The soils are sedimentary from the sandy clays of the Coastal Plain region. The Tifton series closely resembles the Norfolk. Its main characteristic is the presence of small iron concretions. The subsoil is a deeper yellow, being more of a cottonseed-meal color, and is firmer and more compact than that of the Norfolk. The Tifton series includes a single type in Clay County, the fine sandy loam.

#### TIFTON FINE SANDY LOAM.

The Tifton fine sandy loam is a brownish-gray to light-brown loamy fine sand to fine sandy loam, underlain at about 6 to 12 inches by friable fine sandy clay having a characteristic bright-yellow color. Small ferruginous pebbles (concretions or accretions) are abundantly distributed over the surface and throughout the body of this soil. The quantity of these pebbles varies from place to place. The type is locally known as "pebbly land." When very dry it is fairly compact, and a thin surface crust usually is formed by soaking rains.

The subsoil is quite friable in the upper part, but is more compact at lower depths. On the average it is freer from pebbles than the soil, but they are very abundant in places. Some local variations are included where the subsoil has a reddish-yellow to reddish-brown color or is mottled with these colors.

The type is quite extensively developed in the southeastern part of the county, in the vicinity of Bellville and Oakland.

This is an upland soil, the surface of which varies from level or undulating to gently rolling. The drainage is good, and the soil conserves a good supply of moisture. Most of the type is under cultivation.

Cotton is the principal crop, with some corn and oats. Cotton yields from about one-half to 1 bale per acre, corn from 15 to 30 bushels or more, and oats about 30 bushels. The soil is easily handled, but it requires a heavier equipment than the sand types, and the pebble content makes it more difficult to handle than a similar soil free from pebbles. Fertilizers are generally used in the production of cotton.

The present value of land ranges from about \$20 to \$40 an acre, depending chiefly upon location and improvement.

This is one of the best upland soils of the area for general farm crops. It is not quite so productive as the Greenville sandy loam, but it seems to be slightly more productive than the Norfolk fine sandy loam. It requires a somewhat heavier farm equipment than is now in use. It should be plowed deeper and would be greatly benefited by the introduction of leguminous crops, particularly cowpeas, velvet beans, and vetch, in a system of rotation. It is well adapted to corn and oats, and sweet potatoes do very well. Sugar cane yields well, but the sirup is said to be not quite so clear and bright colored as that produced on the Norfolk soils.

This is one of the soils upon which pecans are grown successfully in other parts of the South. The soil is very well adapted to peanuts and other crops which furnish valuable field forage for hogs, and the extension of hog raising on this type offers good opportunities.

Within areas of the Tifton fine sandy loam and associated types in the southeastern section of the county are small and occasionally elongated areas, varying in size from about 5 to 100 acres and indicated on the soil map by swamp symbols, in which the surface soil is a gray to dark-gray silty clay to clay loam, underlain at 3 to 6 inches by a mottled gray, compact, silty clay. The soil is in need of lime. These areas are usually 2 to 8 feet below the general level of the surrounding upland. As a rule they are wet and poorly drained. Where properly drained and cultivated the soil is somewhat friable. Some of the areas have a growth of longleaf pine, but most of them support a native growth of swamp grasses and brush, haw, gum, poplar, and some cypress. They are not cultivated to any important extent, but the drained areas are productive and are well suited to oats and other staple crops.

#### SUSQUEHANNA SERIES.

The Susquehanna soils are gray, ranging to reddish. The subsoils are mottled gray and red or gray, red, and yellow, and consist of plastic heavy clay. The color of the subsoil varies, often being red, white, drab, yellow, and sometimes purple, although red practically always predominates, the other colors appearing only as mottlings in the lower part of the section. The Susquehanna series is developed in the Coastal Plain from the vicinity of Chesapeake Bay to central Texas.

#### SUSQUEHANNA FINE SANDY LOAM.

The surface soil of the Susquehanna fine sandy loam consists of a grayish to pale-yellowish fine sandy loam about 8 to 15 inches deep, the subsurface material being yellowish and more compact. The

subsoil is a stiff, plastic clay, mottled red, gray, and yellow. After a soaking rain the soil assumes a compact structure on drying out. By reason of the impervious nature of the subsoil, and the occurrence of the type largely on slopes, most of it is subject to destructive erosion. About three-fourths of the type, as mapped, might be classed as Rough gullied land; that is, land which can not be satisfactorily cultivated. There are included some patchy areas of Ruston and Orangeburg material.

This type occurs in the belt of rough country along the line of separation between the uplands and valley lands. Its surface varies from gently sloping to steeply sloping, and is mainly badly eroded.

The drainage is good. Owing to the impervious nature of the subsoil, the underdrainage is slow, and there is a rapid run-off from the surface.

Owing to the unfavorable surface configuration and impervious nature of the subsoil, this land is of very little importance for agriculture. Its best use is for forestry and pasturage.

#### KALMIA SERIES.

The surface soils of the Kalmia series are gray, ranging to grayish yellow, and the subsoils are mottled gray and yellow. The series is developed along streams of the Coastal Plain region on terraces lying largely above overflow. It occurs most extensively in Mississippi and Alabama. The soils are composed largely of material washed from Coastal Plain soils, although along the larger streams issuing from the Appalachian Mountains and Piedmont Plateau more or less sediment from these regions is mixed with the deposits. In the better drained situations the subsoils are yellow, the soils of such areas resembling very closely the corresponding members of the Norfolk series.

#### KALMIA SAND.

The Kalmia sand consists of a gray, loose sand, underlain at about 5 inches by pale-yellow, loose sand, which continues to a depth of 3 feet or more without important change, except that the color is somewhat more yellowish in the lower subsoil. A part of the type is gravelly, the gravel consisting mainly of quartz. A clay substratum is commonly present at depths of 6 to 8 feet.

The type occurs on the high terraces of the Chattahoochee River. The surface is level to gently rolling, some of the gravelly areas occurring as ridges and knolls. The drainage is thorough to excessive.

The areas west of Days Cross Roads and south of Credille Mill, as well as those along the western side of the county from Fort Gaines southward, have a higher content of silt and clay than the rest of the areas and should be considered as loamy sand rather than typical sand.

The total area of this type is slightly greater than that of the Kalmia fine sand. Probably about one-half of the area is forested; the remainder is either in cultivation or "lying out" in old fields.

Cotton is the principal crop grown, with some corn for the work stock. Cotton produces about one-fourth bale per acre, and correspondingly low yields of corn are obtained. The soil is very easily handled with light farm equipment. Fertilizers are very generally used for cotton and to a less extent for corn.

The Kalmia sand is used for practically the same purposes as the Kalmia fine sand. With favorable conditions its best use is for the production of early truck, especially the lighter truck crops. The yields may be somewhat lower than on the Kalmia fine sand, but the maturity of crops may be hastened somewhat, and there is therefore a chance for the increased price received to compensate for the lower yields. The type is well suited to early potatoes, as well as water-melons, garden peas, and other light truck crops.

This type and associated types in the northern part of the county comprise a few small areas in which the surface material, to a depth of about 4 to 8 inches, is a black, peaty muck. This is underlain by a black, plastic muck which grades into a dark-gray, plastic clay. These areas are low, pondlike depressions. They occur on both the low and high terraces, and their location is indicated on the soil map by the swamp symbol. The surface is about 2 to 8 feet below the general level of the surrounding land, and the areas are generally inundated. They support a native growth of swamp grasses, cane, and brush, with some trees around the edges. Their best use is for grazing. No attempt at drainage has been made.

#### KALMIA GRAVELLY SAND.

The Kalmia gravelly sand is shown on the map by gravel symbols with the Kalmia sand. The surface soil consists of a gray gravelly sand 10 to 15 inches deep, underlain by yellow gravelly sand to a depth of 3 feet or more. The amount of gravel is not sufficient to interfere seriously with cultivation, but the quantity is large enough as a rule to make the soil a little less retentive of moisture and fertilizer than the Kalmia sand, except where the interstitial material is somewhat loamy. A substratum of sandy clay a little more than 3 feet below the surface is of some effect in preventing excessive leaching.

The type occurs in a few small areas in the northwestern part of the county. The topography is smooth.

The Kalmia gravelly sand is not a very productive soil. Liberal applications of fertilizer are necessary to obtain even a fair yield in ordinary years. Like the other soils of the county, this type is

deficient in organic matter. The effects of this deficiency are greater here than in soils with a heavier texture and their greater power to conserve moisture.

Small fruits, sweet and Irish potatoes, and other truck crops produce fairly well on this type under good cultural methods, but under the conditions prevailing in the county the yields are low.

#### KALMIA FINE SAND.

The typical Kalmia fine sand is a gray, loose fine sand, underlain at a shallow depth by pale-yellowish sand, which also is of an incoherent nature. Some included areas are rather loamy in the subsoil and some patches are lighter colored in the subsoil owing to imperfect drainage.

The type occurs on the high terraces of the Chattahoochee River. The surface varies from level to undulating for the most part, with some areas occupying slopes adjoining the stream valleys.

The drainage is thorough. Those areas having a more loamy subsoil are somewhat more retentive of moisture.

This is one of the most important of the light-textured high terrace soils. A considerable part of the type has been cleared and put into cultivation. Some old fields are lying idle.

Cotton is the principal crop. Some corn is grown for the work stock. Cotton yields about one-third bale per acre and corn yields are proportionately low.

The soil is easily handled with light teams and equipment. Fertilizers are very generally used in the production of cotton and to a less extent in the production of corn.

Present land values range from about \$5 to \$15 an acre, the higher values obtaining in the loamy areas. The most valuable areas are those in the vicinity of Fort Gaines.

The proper place for this soil in the agricultural development of the county, with favorable transportation, market, and other economic conditions, is in the production of special early truck crops, particularly early potatoes, sweet potatoes, watermelons, and peas, radishes, beans, and other light truck crops. Sugar cane grown on this soil produces a good quality of sirup.

#### KALMIA FINE SANDY LOAM.

The Kalmia fine sandy loam is typically a grayish fine sand or fine sandy loam, underlain at about 3 to 6 inches by pale-yellow fine sandy loam or loamy fine sand which extends to about 10 to 20 inches where a yellow, friable fine sandy clay is encountered.

This type occurs in the northern half of the county, the largest areas being found north of Fort Gaines, in the neighborhood of Days Cross Roads, and near the northwestern corner.

The surface varies from level to undulating and somewhat rolling near the bluffs and stream valleys. The drainage is good.

This is one of the most important of the terrace soils. The greater part of it is in cultivation. Cotton is the chief crop, with some corn and a small acreage of oats. Cotton yields upward of one-half bale, corn from 10 to 20 bushels, and oats from 15 to 25 bushels per acre. The soil is very easily handled. Fertilizers are commonly used on cotton. Corn also is sometimes fertilized.

The soil is generally valued at about \$10 to \$15 an acre, but the better improved lands are held for \$20 to \$25.

The soil needs deeper plowing in the preparation of the seed bed, and somewhat heavier farm teams and implements than are now used. Cotton could readily be made to yield at least three-fourths bale per acre, and the yields of corn and oats could be very materially increased. Their cultivation should be extended to insure adequate rotations, which should include also such leguminous crops as cowpeas, velvet beans, and vetch to improve the condition of the soil.

The type is very well suited to sweet potatoes and sugar cane, and in other parts of the State has been used successfully for pecans. It is well adapted to peanuts, which constitute a good field forage crop for hogs. Similar soil is used elsewhere in the southeastern States for the production of cantaloupes and cucumbers.

#### CAHABA SERIES.

The surface soils of the Cahaba series are brown, ranging to reddish brown, and the subsoils are yellowish red to reddish brown. The Cahaba soils occupy old stream terraces. They are largely above overflow and comprise the best drained lands of these terraces. They are most extensively and typically developed in the Gulf coastal plain region of Alabama and Mississippi. The soil material consists of wash from the coastal plain soils, with some admixture along the larger streams from the Appalachian Mountains and Piedmont Plateau of material from the soils of those regions.

#### CAHABA FINE SAND.

The Cahaba fine sand is a brownish-gray fine sand, underlain at about 6 to 10 inches by yellowish-brown to reddish-brown fine sand, and at about 20 inches by yellowish-red or dull-red loamy fine sand. As mapped, there are some included patches of Cahaba fine sandy loam.

The type is found principally on the "second bottoms" of the Chattahoochee River.

Some areas are comparatively level; others occur as elongated ridges or swells and on slight knolls. The natural drainage is good, and in dry seasons somewhat excessive.

This is one of the less extensive of the terrace soils, and for this reason it has relatively little agricultural importance. The greater part of the type is either in cultivation or is "lying out" as old fields.

Cotton is the principal crop and yields of upwards of one-third bale per acre are obtained. Some corn and oats are grown, the former producing 10 to 20 bushels, and the latter 15 to 25 bushels per acre. The soil is very easily handled. Fertilizers are generally used on cotton, and to a less extent on corn and oats.

This is a fair soil for cotton, corn, and oats. It is in need of organic matter, which could be supplied by growing velvet beans, cowpeas, and other leguminous crops. The acreage in corn and oats should be increased, so as to permit the establishment of needed rotations.

The proper place for this soil in the agricultural development of the county is for special purposes, particularly for the production of early vegetables, such as Irish potatoes, sweet potatoes, watermelons, cucumbers, and other lighter truck crops. Developments along these lines would prove successful only under favorable economic conditions and would involve a much more intensive system of agriculture than that at present followed.

#### CAHABA FINE SANDY LOAM.

The surface soil of the Cahaba fine sandy loam consists of a brownish-gray fine sand to brown fine sandy loam, 10 to 15 inches deep, while the subsoil is a dull-red or yellowish-red, moderately friable fine sandy clay, containing a noticeable amount of micaceous particles. There are many included spots of Cahaba clay and clay loam too small to map. Also there are some patches where the surface material is coarser and others in which the depth of the surface sandy material is considerably greater than in the typical soil. The substratum below 3 feet has in places a lighter color and a more sandy and friable character. The mica content of the subsoil is rather prominent, giving a smooth, greasy feel to the material of some areas. Several large bodies and elongated strips occur throughout the lower terrace (second bottom) of the Chattahoochee River.

The surface is comparatively level to gently undulating. The natural drainage of the type is good, although in some of the level areas the underdrainage is deficient.

This is one of the most important terrace soils, both in point of extent and in agricultural value. At present most of the land is cultivated, except such few areas as are found "lying out" in old fields. Originally the type was in forest consisting of white oak, pine, sweet and black gum, tupelo, poplar, hackberry, beech, bay, and sycamore.

The Cahaba fine sandy loam is perhaps the oldest type in point of agriculture in the county. On it some of the older plantations were located about 75 years ago.

Cotton is the principal crop grown, with some corn and oats. Cotton yields about one-third to one-half bale, corn from 15 to 25 bushels, and oats from 15 to 30 bushels per acre.

The soil is easily handled. Fertilizers are generally used for cotton and less frequently for corn and oats.

The greater part of the soil is valued at about \$15 to \$25 an acre, but in some more favorable localities, and with better conditions of topography and improvement, it is held at about \$30 to \$50 an acre.

The soil needs deeper plowing and preparation of the seed bed, and a more substantial farm equipment, including heavier work animals and implements. It is one of the best of the terrace soils for general farm crops. The type is deficient in organic matter. Leguminous crops, such as cowpeas, velvet beans, and vetch, should be grown more extensively, and the acreage of corn and oats should be considerably extended and rotations practiced. Cotton should produce upward of 1 bale to the acre, and the yields of corn and oats could be correspondingly increased. Medium early Irish potatoes and cabbage and the heavier truck crops could be produced successfully if economic conditions warranted. There might be a considerable development of the dairy industry, depending upon local demands and local markets. The abundance of forage crops and green crops that could be grown would seem to justify the fattening of a considerable number of cattle. The soil is very well adapted to peanuts, and this with other field forage crops could be used in raising hogs.

#### CAHABA CLAY LOAM.

The surface soil of the Cahaba clay loam consists of a reddish-brown or dull-red fine sandy clay loam to clay loam, about 3 to 6 inches deep. The subsoil is a dull-red fine sandy clay which is moderately friable and contains enough mica to impart a slightly greasy feel. In a good many places the deeper subsoil has a somewhat lighter red color and more friable structure.

This type occurs throughout the area of the lower terrace (second bottom) of the Chattahoochee River. The surface is gently undulating to level and the drainage is fair.

This soil is of small importance in point of extent, but of considerable importance in point of agricultural use. At present much of it is in cultivation. Cotton is the principal crop produced, with some corn and oats. Cotton yields upward of half a bale per acre, and corn about 10 to 20 bushels.

The soil is rather difficult to handle, and care must be exercised in cultivation, since it can not be worked safely when wet, and it is

difficult to break when dry. Cultivation is limited to a narrower range of moisture conditions than in the case of the sandy soils. Fertilizers are generally used for the production of cotton, and less often for the production of corn and oats.

The soil requires much deeper plowing than is generally practiced, and requires a much heavier farm equipment—heavier teams and implements—than are now used. It is in need of organic matter which should be supplied by growing crops, such as cowpeas, velvet beans, and vetch; and there should be a considerable extension of the acreage of corn and oats. Systems of efficient rotation, instead of the almost exclusive use of the land for cotton, should be practiced. With proper management cotton should yield upward of 1 bale per acre, corn 30 bushels or more, and oats about 40 bushels.

Dairy farming could be developed, within the limits of local demand for dairy products, under an intensive system where the corn and forage are fed, with a minimum area for pasture, since the soil becomes compact where grazed. Dairying could be extended if there were satisfactory markets. Cattle could be fattened on the heavy yields of forage crops which this land is capable of producing.

This type includes a large number of small, poorly drained, pond-like or elongated depressions in which the surface soil, although subject to some local variations, is mainly a silty clay, black to drab in color with some yellow and red mottling. The subsoil is a gray silty clay with some yellow and red mottling. The native vegetation consists of red and black haw, willow, various bushes, and some cane. Where properly drained this soil is fairly productive of the staple crops.

In a few small elongated areas along the second bottoms of the Chattahoochee River this type is subject to some variation due to the admixture of alluvial materials, the areas being subject to occasional overflow. This soil has a high crop-producing power.

The following table gives the results of mechanical analyses of samples of the soil and subsoil of the Cahaba clay loam:

*Mechanical analyses of Cahaba clay loam.*

Number.	Description.	Fine gravel.	Coarse sand.	Medium sand.	Fine sand.	Very fine sand.	Silt.	Clay.
		<i>Per cent.</i>						
253321.....	Soil.....	0.6	3.4	3.0	21.4	21.2	33.8	16.6
253322.....	Subsoil.....	.1	.3	.3	10.3	12.0	29.7	46.8

LEAF SERIES.

The surface soils of the Leaf series are light gray to gray. The subsoils characteristically consist of gray or mottled gray and yellow, compact silty clay, which grades downward into mottled red

and gray or red and yellow, plastic clay, through which water and air move slowly. Iron concretions are common on the surface. These soils are developed on stream terraces in the Coastal Plain region. One member of this series is encountered in Clay County, the Leaf fine sandy loam.

LEAF FINE SANDY LOAM.

The Leaf fine sandy loam consists of a grayish loamy fine sand to fine sandy loam, underlain at about 10 to 15 inches by mottled reddish and yellowish plastic clay.

The type occurs mainly on the second bottoms, often adjoining the high-terrace bluff line. It occurs in swales and as flat, low areas, and the drainage is poor. Water stands on the surface of much of it for considerable periods after heavy rains. Its drainage could be improved by ditching.

This is a soil of only moderate importance in point of extent and agricultural use. At present a fairly large proportion is in cultivation. Originally the type was forested with white oak, water oak, bay, shortleaf pine, sweet and black gum, tupelo, poplar, hackberry, beech, and sycamore.

Cotton is the principal crop grown, with some corn and oats. Cotton yields about one-fourth to one-half bale and corn 10 to 20 bushels per acre.

The land is not easily kept in as good condition of tilth as the better drained fine sandy loams, since it is more inclined to compact. All of it requires artificial drainage. A rather heavy equipment of teams and implements is necessary for its proper tillage. The soil is in need of organic matter, which should be supplied by growing leguminous crops. It is only a fair soil for corn and oats, but these are important and their production should be extended in the interest of efficient crop rotations. Similar soils in other parts of the South have been used successfully for the production of strawberries, cabbage, and other heavy truck crops. The commercial production of these must depend upon the economic conditions. They can be grown successfully only under intensive cultivation and with large applications of stable manure or commercial fertilizers.

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

*Mechanical analyses of Leaf fine sandy loam.*

Number.	Description.	Fine gravel.	Coarse sand.	Medium sand.	Fine sand.	Very fine sand.	Silt.	Clay.
		<i>Per cent.</i>						
253355.....	Soil.....	1.6	11.6	14.0	40.4	16.0	13.6	2.8
253356.....	Subsoil.....	1.3	7.5	8.0	27.4	12.4	16.8	26.1

## AMITE SERIES.

The Amite soils are prevailingly brown. They range from brown to chocolate brown or reddish brown, and the subsoils vary from reddish brown to red. A substratum of water-rounded gravel is frequently encountered at a considerable depth. These soils occur on stream terraces, and the material from which they are derived is thus of alluvial origin. The areas lie above overflow. The Amite series is represented in this county by two types, the loamy sand and fine sandy loam.

## AMITE LOAMY SAND.

The surface soil of the Amite loamy sand consists of brown or reddish-brown loamy sand 10 to 15 inches deep, underlain by red loamy sand to depths of 3 feet or more.

When wet this material is more or less coherent, but under ordinary moisture conditions it is loose and friable and is easily cultivated. Owing to its small content of organic matter it compacts somewhat after heavy rains.

The upper part of the subsoil is more friable than the lower part, and contains a higher percentage of clay. The conditions for absorbing and conserving the rainfall are fairly good. The type is essentially the same as the Greenville loamy sand, differing from it in having a smoother topography and a position on river terraces.

Only a few small areas of the type were identified. With a single exception these are found in the western part of the county north of Fort Gaines. It is a soil of moderate productiveness, being somewhat droughty, and is used for growing the general crops of the region. The topography is smooth and the drainage good. The native vegetation was longleaf pine but the greater part of the type is now cleared and under cultivation.

## AMITE FINE SANDY LOAM.

Areas of the Amite fine sandy loam are shown on the map by inclusion symbol in loamy sand color. The soil consists of a brown to reddish-brown loamy fine sand to fine sandy loam, 8 to 12 inches deep, underlain by red friable fine sandy clay. The texture of the surface soil tends to make it loose and friable, but the very low content of vegetable matter is not sufficient to prevent the compacting of the surface by heavy rain or the tendency to form a crust by baking after rain. The subsoil is always friable and has good moisture-holding capacity.

Only a few small areas occur in the county, most of these lying on the west side north of Fort Gaines.

The soil is in physical character the same as the Greenville sandy loam, but has been differentiated from the latter because of its

derivation from river-terrace deposits. In topography it is smoother than the latter and for that reason is somewhat more desirable. Its surface drainage and subdrainage as well as its water-holding capacity are good.

The native vegetation was longleaf pine, but the type is practically all cleared and in cultivation. It is used for the production of the prevailing farm crops.

#### CHATTAHOOCHEE SERIES.

The Chattahoochee series is characterized by the grayish color of the surface soils and by the red color and friable structure of the subsoils. The series is derived from old alluvium forming terraces. The material consists largely of wash from Coastal Plain soils, with admixture along some of the larger streams issuing from the Piedmont and Appalachian regions of some materials washed from the soils of these regions. The series is well drained. It holds the same relation to the Cahaba among the terrace soils as the Orangeburg does to the Ruston among the upland series.

#### CHATTAHOOCHEE FINE SANDY LOAM.

The surface soil of the Chattahoochee fine sandy loam consists of a gray fine sandy loam, 10 to 15 inches deep, underlain by red friable sandy clay subsoil to a depth of 3 feet or more. The upper subsoil or subsurface is often yellow in color. This soil is very much like if not identical with the Orangeburg fine sandy loam as far as the general physical character of the soil is concerned. It occurs on old river terraces, however, rather than on the still older Coastal Plain upland, and its topography is smooth to gently undulating. Its cultivation is somewhat easier because of this fact, making it a somewhat more desirable soil than the corresponding Orangeburg type.

There are only 3.4 square miles of this soil in the county, occurring in a few areas of small size, all, with two exceptions, in the northern part of the county. Most of the type is in cultivation, but originally it was covered with longleaf pine, like the Orangeburg fine sandy loam. It is used for the ordinary farm crops and is one of the more desirable soils of the county.

#### GRADY SERIES.

The surface soils of the Grady series are generally dark colored, with mottled yellow and gray or yellow, gray, and red, plastic, heavy clay subsoils resting upon a limestone substratum. These soils are characteristically developed in low, flat situations in the Coastal Plain. They are poorly drained. The subsoil is partly residual in

places from the underlying limestone. The Grady silty clay loam is the only representative of this series in Clay County.

#### GRADY SILTY CLAY LOAM.

The typical soil of the Grady silty clay loam consists of a gray to dark-gray or ashy-gray silty clay loam about 3 to 6 inches deep. This is underlain by a brownish plastic clay of a creamy-yellow to mottled drab and yellow color. In places the surface soil is mottled drab and brownish, while yellowish-brown and reddish mottlings are occasionally seen in the subsoil.

There are some included patches of Grady clay which differ from the silty clay loam in being more compact.

On areas under cultivation a crust forms after heavy rains, but with proper cultivation the well-drained soil can be maintained in a fairly friable condition.

The type is found mostly in the southeastern and northwestern parts of the county, occurring mainly in small areas in pondlike depressions and occasional elongated areas known as "lime sinks." These areas vary in size from about 5 to 10 acres up to 100 acres or more. The surface of the type is characteristically level or nearly level and normally lies from 2 to 8 feet below the general level of the surrounding land.

Some of the areas have drainage outlets, but most of them are surrounded by higher land. On this account and because of the impervious subsoil the drainage is very poor. After heavy rainfall, water stands on the type for a long time. The total area of the Grady silty clay loam is small and little of it has been drained and put under cultivation. It can not be cultivated until drained.

Some areas of the type support a forest of longleaf pine, but the larger part is covered with a growth of gum, poplar, and some cypress, with an undergrowth of haw and other shrubs and swamp grasses.

Some patches have been cultivated. This gives good results with oats and some of the other crops of the region. Grass and grain are the crops which generally do best on soils of this nature.

#### MUCK.

Muck is shown on the map by inclusion symbol in Grady silty clay loam color. It consists of black decaying particles of vegetable matter mixed with some mineral matter, underlain by dark-gray plastic clay.

Muck is found in low pondlike depressions within both the high and low terrace areas of the county. The areas are small, not very numerous, and aggregate only about 128 acres.

The surface lies about 2 to 8 feet below the general level of the surrounding soils. The areas do not have drainage outlets, and water stands on the surface of many of them throughout the year. No attempt to drain the areas was noted.

The native growth includes swamp grasses, cane, and various shrubs, with some larger trees along the edges.

The best uses of the type for the present seems to be for pasture. Reclaimed Muck is especially suited to the production of corn, cabbage, celery, and onions. Applications of lime are usually beneficial.

#### MISCELLANEOUS MATERIAL.

##### MEADOW.

Meadow includes poorly drained strips of alluvium, most of which occurs along the creeks and smaller streams where it is subject to overflow. The material is variable in texture and color. Much of it is a grayish silt loam to sandy loam, underlain by grayish sand to sandy clay, mottled with rusty-brown, drab, and yellowish colors. Fine sand, sandy loam, sand, and other variations of texture are encountered.

Meadow is extensively developed in Clay County. It is found as narrow bottoms from a few feet to about one-eighth mile wide along the various streams.

The surface is nearly level and but slightly elevated above the normal flow of the streams. Much of the type remains wet throughout most of the year.

This land is largely forested with white oak, water oak, pine, sweet and black gum, bay, magnolia, tupelo, poplar, hackberry, beech, sycamore, and cypress, with an undergrowth of shrubs, swamp grasses, and switch cane.

About half the total area of Meadow could be cleared for cultivation, and the remainder could be used for crops if protected from overflow and drained. Protection from overflow would require expensive drainage operations in the case of those areas subject to heavy inundation, but much of it could be used simply by clearing and ditching.

The soil is very well suited to corn. It produces good yields of forage crops, and its best place in the agriculture of the area is for the raising of cattle and hogs on cheap pastures and for the production of corn and hay.

##### CONGAREE LOAM.

Areas of Congaree loam are shown on the map by inclusion symbol with Meadow. The surface soil of this type, as mapped, varies considerably in texture. The dominant soil is a brownish loam, under-

lain at about 10 to 15 inches by dull-red plastic silty clay, carrying some mica flakes. In places the reddish material grades into yellowish-brown or yellowish-red plastic clay. There are some spots of black loam or clay loam in which the soil extends to a depth of 2 feet or more, without change. In places there is a slight natural levee, where the texture is a heavy fine sandy loam or very fine sandy loam. There are also some included areas of Muck occurring in small depressions.

The type is not extensively developed in this county. It is limited to some low elongated strips a few feet to about one-fourth mile in width, fronting the Chattahoochee River. The type lies from 15 to 25 feet or more above the normal flow of the river. The surface is level to gently rolling, with occasional slight ridges.

As a rule this type is naturally well drained, though subject to overflow when the floods of the Chattahoochee River are high. This does not occur every year. The overflows coming as they do usually in early spring cause little damage except to oats or other winter crops, which are seldom grown. Summer crops are benefited by the sediments deposited during the floods.

The Congaree loam includes areas of high productiveness. Land of this kind ranges in price from about \$30 to \$50 an acre. Some less desirable areas are much lower in price. The average yields are high. Cotton yields as much as 1 bale per acre. Corn is not grown as commonly as cotton, but the yields are said to be satisfactory.

#### ROUGH GULLIED LAND.

The areas mapped as Rough gullied land comprise steep slopes that can not be cultivated on account of the danger of destructive erosion. The areas of this land occur chiefly along the sides and around the heads of draws which have cut into the main high upland near the bluff line between the uplands and terraces of the Chattahoochee River.

Practically all of the area mapped as Rough gullied land is in forest cover of some kind, mainly longleaf pine. It is probably best kept in forest and any open places well covered with grass to prevent further erosion. It is valued chiefly for forestry and pasture.

The soil included within the area mapped as Rough gullied land consists in part of clay loams and sandy loams of the Orangeburg and Ruston series, but the larger part seems to be formed of soil similar to the Susquehanna fine sandy loam.

#### SUMMARY.

Clay County is situated in the southwestern part of Georgia, on the Alabama line, about 130 miles from the Gulf of Mexico. It contains 209 square miles, or 133,760 acres.

About three-fifths of the county is within the Coastal Plain, and the remainder lies within the old valley of the Chattahoochee River. The surface is generally level or gently rolling, with deep, narrow valleys along the streams. A strip runs north and south through the county, where the Coastal Plain borders the old valley, which is very badly eroded and has a rough topography. The Coastal Plain portion is 200 to 300 feet above the level of the Chattahoochee River, and the high terraces are some 50 to 150 feet lower in elevation. About half of the old valley of the Chattahoochee River is made up of high terraces and the other half consists of low terraces, mainly second bottoms.

The drainage is carried by the Chattahoochee River. The drainage system is quite complete, reaching into every part of the county, although the streams are still actively cutting.

The county has a population of about 9,000. There are no large towns, and one branch railroad crosses the county.

The agriculture has been based upon the almost exclusive culture of cotton, with some corn and a small quantity of oats for the work stock.

The methods in use, including the equipment used, cultivation, and fertilization, have been and are well adapted to cotton growing. Labor is plentiful.

The average size of farms is 93.5 acres.<sup>1</sup> About 20 per cent of the farms are operated by the owners and 80 per cent by tenants, usually under the share system.

The soils of the Coastal Plain are derived from unconsolidated material, including gravels, sands, loams, and clays, and the soils of the valley portion are derived from these same materials and others brought from a greater distance by rivers and streams. There are no soils of sufficient extent or agricultural value to dominate the agriculture of the region. The Norfolk fine sand, the most extensive soil, is not of sufficient importance to give a particular form of agriculture to the locality. There are a large number of other types which, while smaller in extent, are of more importance in agriculture, some for general farm crops and some for special purposes, principally the production of truck crops.

Improvements in agricultural methods can and should be made in the use of practically all the soil types. Suggested changes are given in the discussion of the soil types, predicated upon the present economic conditions or upon future changes in or improvements of these conditions.

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<sup>1</sup> Each tenancy is tabulated as a farm. The average holding is larger than this.

[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.]

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