

Issued August 24, 1912.

U. S. DEPARTMENT OF AGRICULTURE,
BUREAU OF SOILS—MILTON WHITNEY, Chief.

SOIL SURVEY OF GLYNN COUNTY, GEORGIA.

By DAVID D. LONG AND JAMES E. FERGUSON.

HUGH H. BENNETT, INSPECTOR IN CHARGE.

[Advance Sheets—Field Operations of the Bureau of Soils, 1911.]



WASHINGTON:
GOVERNMENT PRINTING OFFICE.

1912

BUREAU OF SOILS.

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SOIL SURVEY.

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LETTER OF TRANSMITTAL.

U. S. DEPARTMENT OF AGRICULTURE,
BUREAU OF SOILS,
Washington, D. C., November 11, 1911.

SIR: During the field season of 1911 a soil survey was made of Glynn County, Ga., for the purpose of securing such information relative to the individual characteristics of the soils and their crop adaptabilities as would lead to a further development of the agricultural resources of the county. The selection of this area bore the indorsement of Hon. W. G. Brantley, within whose district the county lies.

I have the honor to transmit herewith the manuscript report and map covering this work and to request their publication as advance sheets of Field Operations of the Bureau of Soils for 1911, as authorized by law.

Very respectfully,

MILTON WHITNEY,
Chief of Bureau.

Hon. JAMES WILSON,
Secretary of Agriculture.

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MAP.

Soil map, Glynn County sheet, Georgia.

SOIL SURVEY OF GLYNN COUNTY, GEORGIA.

By DAVID D. LONG and JAMES E. FERGUSON.

DESCRIPTION OF THE AREA.

Glynn County lies in the southeastern part of the State of Georgia and has an area of 437 square miles, or 279,680 acres. It is bounded on the north by McIntosh County, from which it is separated by the Altamaha River; on the south by Camden County, the Little Satilla River being the boundary line; on the west by Wayne County; and on the east by the Atlantic Ocean.

The area surveyed embraces the islands lying within the boundaries of the county—St. Simon, Jekyl, Blythe, Colonels, Crispen, Hermitage, and Visavis.

The topography of the county as a whole is flat, the elevation ranging from sea level to 40 feet, Sterling being 21 feet above tide level and Everett City only 16. Although the latter town lies to the west of Sterling, it is lower. The land rises

inland in a series of benches. The rise from tide level to the upland level takes place rapidly. Once on the upland, however, it remains nearly level across the county nearly to the western boundary, where there is a sharp but not precipitous rise of 6 to 10 feet. In this flat upland valleys have been cut. In the eastern part of the county they are well defined, with low bluffs flanking them. Going westward the valley floors rise, while the upland remains nearly level. Before the

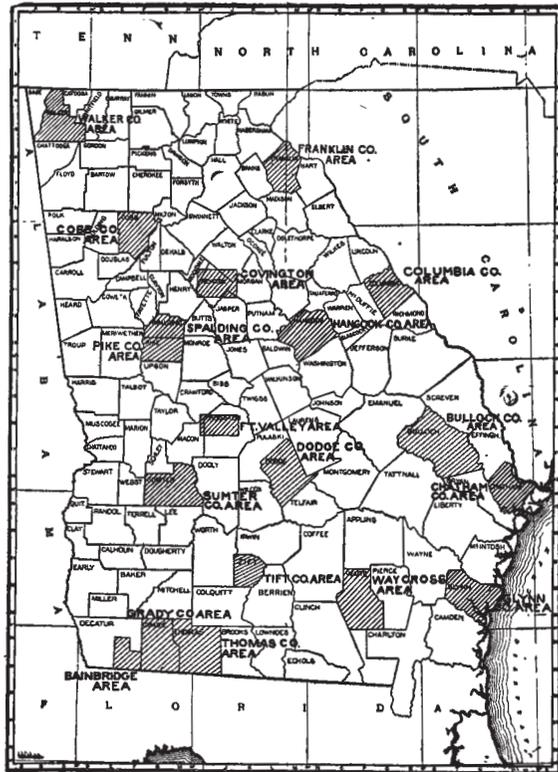


FIG. 1.—Sketch map showing areas surveyed in Georgia.

western boundary of the county is reached the river-valley floors have risen practically to the upland level. This condition of surface relief exists in a belt of country lying parallel to the coast and at a distance from it dependent upon the grade of the rivers. In Glynn County this belt is followed by the Seaboard Air Line Railway. East of this belt the country is faintly dissected. West of it, along the western boundary of the county, we reach the rise to a higher level and the topography becomes again somewhat as it is in the eastern portion. Topographically, therefore, there are three belts running across the county from northeast to southwest, the middle one being a very smooth one, the western one, a very narrow one.

The general trend of drainage in the southern section of the area is to the east, the waters being carried off by Little Satilla River, College Creek, Turtle River Swamp, Turkey Swamp, Green Creek, and Little Buffalo Swamp, all of which ultimately drain into Turtle River. There are numerous intersecting swamps connecting the Altamaha and Little Satilla Rivers.

Between the Buffalo Swamp and the Altamaha River a different condition of drainage exists. In this section the swamps and cross swamps connecting the Buffalo Swamp and Altamaha River are very numerous and form many islands. The drainage may be either to the river or swamp or to both, depending upon local topography. When the river is high, as in the case of a freshet farther inland, the water from the river runs through these swamps to the Buffalo Swamp and when the river is low and water high in this section the drainage is toward the river. Under normal conditions the drainage is in both directions, but no one is able to draw a dividing line where the water runs one way or the other. However, Cow Pen Swamp slopes more to the river than to Buffalo Swamp, as it crosses the Barrington Road. It is noticeable that only two streams between the Altamaha and Little Satilla Rivers rise west of the western county boundary.

Owing to the low topography of the county only the tidal streams have well-defined channels. These tidewater streams are usually known as creeks, while the corresponding fresh-water section is known as Swamp.

Settlement of the area commenced in 1735, the early settlers being Scotch, Irish, and some French refugees. A census in 1830 showed a population of 597 whites and 3,968 slaves. The county, according to the census of 1910, had 15,720 inhabitants, as compared with 14,119 in 1900. The rural population, mostly colored, is very sparse, being confined to the neighborhood of the few sawmills found in the area.

Brunswick, the county seat, has a population of 10,182, or more than 60 per cent of the population of the entire county. It lies 57 miles

north of Jacksonville, Fla., and 69 miles south of Savannah. Built on a low peninsula and with an excellent deep-water channel to the ocean, the city is the center of an important trade in lumber and naval stores. It ranks third as a cotton port and fifth in importance for phosphate shipments.

The Seaboard Air Line Railway crosses the western part of the county, while the Atlanta, Birmingham & Atlantic, the Southern, and the Atlantic Coast Line roads enter Brunswick. The Clyde Line steamers make Brunswick a port of call.

The county roads are well kept and surfaced with sand and clay. Convict labor is used in road making and repair.

CLIMATE.

As no data covering the climatic features of Glynn County were available, the normal monthly, seasonal, and annual temperature and precipitation, and frost records for the Weather Bureau station at Jesup, in Wayne County, which adjoins Glynn on the west, are given in the following table:

Normal monthly, seasonal, and annual temperature and precipitation at Jesup, Wayne County, Ga.

Month.	Temperature.			Precipitation.			
	Mean.	Absolute maximum.	Absolute minimum.	Mean.	Total amount for the driest year.	Total amount for the wettest year.	Snow, average depth.
	° F.	° F.	° F.	Inches.	Inches.	Inches.	Inches.
December.....	50	80	16	2.8	1.7	2.5	Trace.
January.....	50	80	15	2.8	3.7	1.0	.....
February.....	52	83	1	5.4	7.0	12.4	0.4
Winter.....	51	.....	.....	11.0	12.4	15.9	0.4
March.....	61	91	20	4.6	2.2	4.3	.....
April.....	64	91	30	2.7	1.8	4.7	.....
May.....	74	102	47	3.3	2.8	1.7	.....
Spring.....	66	.....	.....	10.6	6.8	10.7	.....
June.....	79	101	49	5.7	1.5	8.2	.....
July.....	82	104	60	5.5	4.2	3.0	.....
August.....	82	102	62	8.8	4.6	6.5	.....
Summer.....	81	.....	.....	20.0	10.3	17.7	.....
September.....	76	102	42	4.2	1.2	9.6	.....
October.....	68	95	34	4.4	2.1	5.4	.....
November.....	58	86	18	2.8	0.8	0.8	.....
Fall.....	67	.....	.....	11.4	4.1	15.8	.....
Year.....	66	104	1	53.0	33.6	60.1	0.4

Average date of first killing frost in autumn, November 20; of last in spring, March 17. Date of earliest killing frost in autumn, November 4; of latest in spring, April 11.

For the sake of comparison the record of Eustis, Lake County, Fla., the center of the lettuce and celery-growing district,¹ is here given. Attention is called to the fact that to offset the milder climate of that district precautions must be taken during cold spells, such as covering growing vegetables and flowers with cloth, pine needles, or other available material.

Normal monthly, seasonal, and annual temperature and precipitation at Eustis, Lake County, Fla.

Months.	Temperature.			Precipitation.		
	Mean.	Absolute maximum.	Absolute minimum.	Mean.	Total amount for the driest year.	Total amount for the wettest year.
	° F.	° F.	° F.	Inches.	Inches.	Inches.
December.....	60	84	16	2.2	3.1	1.3
January.....	58	86	23	3.1	3.3	5.2
February.....	61	88	16	3.7	1.0	9.6
Winter.....	60			9.0	7.4	16.1
March.....	67	92	28	2.9	1.2	1.2
April.....	70	93	40	2.0	1.7	4.2
May.....	77	100	51	3.1	2.3	0.8
Spring.....	71			8.0	5.2	6.2
June.....	81	103	61	6.4	5.7	7.2
July.....	83	104	65	6.9	2.8	13.6
August.....	83	101	63	6.5	9.0	6.0
Summer.....	82			19.8	17.5	26.8
September.....	80	98	52	8.0	8.1	6.2
October.....	73	95	42	3.2	1.9	3.2
November.....	66	91	26	1.6	1.7	0.4
Fall.....	73			12.8	11.7	9.8
Year.....	72	104	16	40.6	41.8	58.9

Average date of first killing frost in autumn, December 28, and of the last in spring, February 18; date of earliest killing frost in autumn, November 18, and of the latest in spring, February 24.

It will be noted that the average date of the last killing frost in spring at Jesup, Ga., is March 17, and the first in the fall November 20. At Eustis the corresponding dates are February 18 and December 28. The growing season around Brunswick extends from about February 22 to December 1. Owing to oceanic influences, the growing season is somewhat longer than at Jesup. It is about a mean of the seasons at Savannah, Ga., and Jacksonville, Fla. There is a wide variation in the dates of early and late killing frosts within the county. Frosts killing unprotected vegetables 7 miles west of Brunswick are not felt in the city, while others have ruined the rice fields 12 miles north of the city without damaging local crops.

¹ See Circular 21, Bureau of Soils, U. S. Dept. Agriculture, p. 5.

The climate of the vicinity of Brunswick is characterized by delightful winters and hot summers, although the oppressive heat is moderated by sea breezes. Jekyll Island is a noted winter resort for northern people, while St. Simon Island is much frequented in summer by people living in Brunswick and other points in Georgia.

Flowers bloom the year round, and the more hardy vegetables grow unprotected during the winter months, but suffer from the heat during July and August.

AGRICULTURE.

The island of St. Simon was the first place settled in Glynn County, being occupied by Scotch colonists from Inverness, who reached the area by way of Darien, Ga., in 1735. Attracted by the mild climate, they planned to raise silkworms and engage in viticulture. Their plans were never fully realized, as almost from the first they engaged in stock raising, cultivating only sufficient land to produce grain and vegetables to meet their needs. Some attempt was made at growing indigo in the early days, and for a few years regular shipments were made of this product.

Plantation life dates back to 1740, when the English Parliament repealed the law prohibiting slavery. With the introduction of this institution silk culture languished, the labor being unsatisfactory in the delicate task of tending the silkworms.

Cotton supplanted indigo at the close of the Revolutionary War, the long-staple variety being grown. Sugar cane and rice were first grown on the large plantations near the coast, the cane being brought from Africa and grown on Sapelo Island (McIntosh County) and later on St. Simon Island.

The high prices of long-staple cotton (60 to 70 cents per pound for the product from Edisto Island, N. C., and 50 to 52 cents for that grown in Glynn County) made this a most profitable crop.

Olive culture was conducted in a small way only, the oil being grown for home consumption. All of the olive trees in the area were killed in the winter of 1886.

The present business in lumber and naval stores developed at the close of the Civil War, when the abandoned and ruined plantations forced the owners into industries where returns were rapid and certain. With the passing of the plantation life of the days before the war agriculture has dropped to second place in the industries of the area. The plantations have gradually returned to a forested condition.

The area at this time is in a transitional stage of development, as the turpentine and lumber are nearly exhausted, while the first signs of a new agriculture are appearing in the clearing of the land and use of improved implements. Henceforth it is believed that the agricultural resources will be increasingly relied upon in the develop-

ment of the county. The proposed drainage law now before the legislature will, if passed, be an important step in this direction.

The census of 1900 reported 77,933 acres in farms, of which 5,593 were improved, while the census of 1850 showed the total acreage in farms to be 106,249, with 20,472 acres of improved land. For the last 40 years the acreage of improved land has varied but little. About 2,000 acres of this land lies within the diked river bottoms.

The agricultural output of Glynn County for 1899, as shown by the census of 1900, was, rice, 1,150,460 pounds; corn, 21,570 bushels; cotton, 2 bales; sweet potatoes, 20,334 bushels; Irish potatoes, 5,331 bushels; peas, 991 bushels; oats, 2,651 bushels; peanuts, 110 bushels; beans, 5 bushels, and sirup, 4,485 gallons. Orchard products were valued at \$200, and miscellaneous vegetables at \$5,717. Products not fed to live stock were valued at \$100,150. The live stock value was given as \$67,384.

Drainage has been the ruling factor in the agriculture of the area, rather than the merits of the different soils. The Norfolk fine sand, by reason of its more elevated topography, supports a larger percentage of the population than any other soil type. As agriculture is not the main dependence as a means of livelihood, the methods in vogue are rather crude. This is further emphasized by the fact that the farms are nearly all from 5 to 20 acres in extent and for the most part owned and operated by colored people. Corn, sweet potatoes, and sugar cane are the principal crops. Corn yields from 5 to 15 bushels per acre, sweet potatoes from 50 to 75 bushels, and sugar cane from 50 to 100 gallons of sirup.

Where more advanced methods and a system of crop rotations are practiced, as is the case in the neighborhood of Brunswick, Anguilla, and Brookman, yields of 20 to 60 bushels of corn are obtained, one-half to 1 bale of cotton, and about 1 ton of oats hay. A rotation of cotton or corn, followed by crabgrass and velvet beans or cowpeas the second year, has been found beneficial. Selected seed is used in planting and the soil plowed to a depth of 6 to 12 inches. A fertilizer consisting of 200 pounds of cottonseed meal, 200 pounds of kainit, and 200 pounds of acid phosphate, applied in two applications, has been found beneficial for corn and cotton.

On account of the highly developed system of agriculture found in the river bottom section the different soils were recognized as far back as 1828, when it was known that the soil now mapped as Georgetown clay was superior for rice and cotton to the soils mapped as Altamaha clay and clay loam. On account of growing shallow-rooted crops, no difference is recognized to-day between the clay and muck subsoil phases of the Georgetown clay, although the sandy subsoil phase is recognized when the sand comes sufficiently near the surface.

The only available labor is colored, unskilled and scarce for farm work, owing to the fact that a living can be made easily in fishing

and oystering or by working intermittently at turpentine gathering or lumbering. Work is also plentiful on the docks, where higher wages can be secured than can be offered on the farms. Farm hands are paid from 75 cents to \$1 a day, depending on the kind of work. In order to get the cotton picked, as high as \$1 per hundred pounds of seed cotton is paid. The expenditure for farm labor in 1899, according to the census of 1900, was \$27,390.

Nearly 75 per cent of the farms of the area are worked by the owners. The average size as given in the census of 1900 is 346.4 acres. The largest farms are found on the bottom lands of the Altamaha River.

Land values range from \$2.50 in more remote parts of the county to \$50 an acre in the vicinity of Brunswick. The price of land is usually based on the quantity of timber on it. For agricultural purposes cleared land can usually be obtained throughout the greater part of the county at prices ranging from \$5 to \$15 an acre, although land values are steadily increasing.

The agriculture of the river-bottom district along the Altamaha River is quite distinct from that of the uplands. This section was cleared, drained, and diked as early as 1800. Cotton was the first crop, followed later by sugar cane and then by rice. On Hopeton plantation a record of rice crops for a period of 40 years shows an average yield of 54 bushels per acre.

The rice is planted with rice drills in rows 16 inches apart and is covered with a spike-toothed harrow. The season of planting extends from the latter part of February to the 20th of June, though no rice is planted from the 15th of April to the 15th of June, on account of its maturing at a time when the migration of birds is at its highest. The quantity of seed ranges from 2 to 3 bushels per acre. As soon as the rice is planted the land is flooded for a period of 3 or 4 days. This flooding, which is called the "sprout flow," hastens sprouting, protects the plants from birds, checks weed growth, and maintains an even temperature of the land.

After the rice is well up the "stretch flow" is turned on and allowed to remain for a period of 15 to 20 days. As soon as the land is dry, after this flow is turned off, cultivation begins. About 5 to 6 cultivations with the spring-tooth weeders and 1 with hand wheel-hoe is given to the crop. Cultivation continues until the rice reaches a stage known as the "hollow joint," when the "harvest flow" is turned on and allowed to remain until maturity. The rice is harvested with a sickle and placed in cocks until hauled off the land.

The depredations of the blackbirds at the time of planting and of the ricebirds at the time of harvest are very costly. "Careless grass" or "fire weed" is the chief weed pest in the spring, while the indigo weed is troublesome later in the season.

Yields at present range from 30 to 50 bushels per acre and show an increase since crop rotation has been introduced. The rice grown on these bottoms is of such good quality that the best grade of rice on the Charleston, S. C., market has taken its name "Broadfield" from the Broadfield plantation in this river bottom. The Golden Seed variety has been the favorite on these soils on account of its good milling qualities and heavy yield. It is subject to a disease called "rotten neck" and is subject to some loss through shattering. The White Carolina matures 10 days earlier than the Golden Seed, but is not so prolific. It shatters less and produces a better quality of straw. The Honduras variety has a large grain of excellent appearance, but the yield is relatively light. It has a vigorous growth of stalk and does not lodge. It is especially adapted to new land. Japanese rice yields better and weighs more per bushel, does not shatter, and produces a fine quality of straw, which sells readily at \$10 a ton. The main difficulty on these soils is that this variety matures at a time when the ricebirds are numerous, regardless of the time of planting.

Cotton is being planted to some extent in the area and is doing fairly well. Yields ranging from one-half bale to 1½ bales per acre are reported. A mixture of phosphoric acid and kainit in equal parts, applied at the rate of 400 pounds per acre, with a side dressing of 75 pounds of nitrate of soda, has proved very beneficial to this crop.

A chief difficulty in the production of cotton is the matter of securing labor. The farm laborers in this vicinity are acquainted only with the production of rice and must be taught every detail of cotton production.

After rice and cotton, oats for forage is the most extensively grown of general farm crops. On one plantation 112 acres was used for this purpose in 1911, the yield averaging from three-fourths ton to 1½ tons per acre. The cost of production is about \$10 an acre. Oats sown broadcast in January or February are cut in May.

Wheat has been grown in a small way and has yielded 20 bushels per acre. It is the intention of some of the planters to increase their acreage of wheat, as it affords a money crop in the earlier part of the year and is a good crop for rotation with rice followed by cowpeas, crabgrass, and cotton.

SOILS.

Glynn County is underlain by unconsolidated sediments of sand, silt, and clay, all of very recent geological age. Aside from the river deposits and the very recent tidal marshes, they probably all represent open-sea deposits laid down in shallow water.

The upland soils of the county have resulted from the weathering of these materials, the principal difference between the soil as it is

now and the material as it was originally probably having been brought about through oxidation processes and the action of vegetable matter upon the material.

The soils of Glynn County were differentiated into 30 types, exclusive of Muck, Swamp, Coastal beach, and Tidal marsh. These 30 soils were grouped in 11 series. Of these, 9 series are upland series and 2 bottom-land soils. The term "upland" is used to include all the soils that are not derived from river-deposited sediments. Some of these are barely above sea level.

The grouping of the soils into series is based upon the similarity of various types in points of color, drainage, character of the subsoil, and topography. All these factors are to a great extent the result of changes that have been brought about in the material subsequent to its deposition. They mainly express the relative stages which weathering has reached in different places, the variations being principally the result of variations in topography and drainage, both of which largely determine the degree of erosion and consequent oxidation of the water-deposited material. However, some of the types owe their peculiar characteristics probably to differences that have existed since the time of their deposition.

The type differentiation within any given series, however, is based on the fineness of the material, on differences that in most cases have existed in the material from the time of deposition and which are the result of conditions existing at that time rather than at some subsequent time. Some reduction in the size of the particles and breaking up of some of the less resistant mineral particles has been brought about by abrasion caused by the movement of the water since the deposition of the material as well as by weathering.

The Norfolk soils seem to represent the most advanced stage reached by the forces of weathering. These soils have a very striking distribution, being confined to those portions of the county having the strongest relief and best drainage—situations where oxidation has been able to reach into the subsoil. They are largely confined to a fringe following the drop off or bluff line between the uplands and the valleys, to the terracelike elevation along the western border of the county, and to the higher portions of the outlying islands. They are not found to any important extent in the smooth northeast-southwest belt followed by the Seaboard Air Line Railway. The Norfolk soils of Glynn County have a gray or grayish-brown color in the surface portion and faintly yellowish color in the subsoil.

The Leon soils are closely associated with the Norfolk, occurring in about the same topographic positions. These are lighter in color in the surface portion than the Norfolk and are further distinguished

from the Norfolk in having nearly always, somewhere in the soil section, a hardpan layer of brownish sandy material feebly cemented with organic matter and iron salts.

A less advanced stage of weathering, in which the subsoil appears to be only partially oxidized, is represented by the Coxville series. The soils of this series are confined almost exclusively to the northwestern part of the county, where they occupy the same position with relation to drainage lines that the Norfolk soils occupy farther east. They occur in irregular areas on both sides of the depressions, in positions, therefore, where drainage would be good if the stream depressions were deeper. Insufficient drainage seems to have prevented complete oxidation of the subsoil material, as indicated by its mottled yellow, gray, and red color.

A third group of upland soils, representing the least advanced stage in process of weathering, are the Plummer, Bladen, Portsmouth, and Hyde soils. These occur in those portions of the upland that have the poorest natural drainage, occupying to the practical exclusion of other soils the low, flat belt followed by the Seaboard Air Line Railway. They are elsewhere developed in flat upland watershed areas to which the drainage channels have not yet worked their way.

The Bladen soils, as will be seen in the detailed descriptions of these soils given at another place in this report, seem to stand next to the Coxville in respect to the degree of oxidation or weathering attained. They are frequently developed contiguous to and just above areas of salt marsh, in such a way as to suggest that they represent an advanced stage in the formation of a true soil from salt marsh. The Bladen soils are not quite so well drained as the Coxville and have a mottled gray and yellow subsoil with very rarely any evidence of red.

The Plummer soils in some respects seem to occupy an intermediate position between the Portsmouth and Bladen series, at least in character of material. The soils of the Plummer series are poorly drained and little oxidized. They have dark grayish soils more or less mottled with brownish colors, frequently characterized by the presence of crawfish mounds over the surface.

The Portsmouth and Hyde soils appear to hold a position very close to the original condition of the upland material, having been changed principally by accumulation of vegetable matter in the surface soil in the case of the Portsmouth and in surface and subsoil in case of the Hyde. The Portsmouth series is characterized by dark-gray to black soils and grayish or mottled gray and yellow subsoils, while the Hyde soils are black from the surface downward throughout the soil section and are very rich in vegetable matter.

The Scranton type belongs to a series of soils which is characterized by the dark color of the soil and yellow color of the subsoil, hav-

ing, in other words, soils like the Portsmouth and subsoils like the Norfolk series.

The type mapped Parkwood owes its distinguishing features to a subsoil of light-colored calcareous or marly material.

The bottom land or alluvial soils of the Altamaha River have been grouped into two series, viz, the Georgetown and Altamaha. These soils consist of material brought down by the river chiefly from the Piedmont Plateau and deposited near the coast, where they have been subjected to tidal overflow with fresh or brackish water of the river raised as backwater of the tide. Most of these soils in the past were diked and utilized in the production of rice. In places, however, the rice fields have been abandoned, the dikes broken, and the land again subjected to tidal overflow. The Georgetown soils differ from the Altamaha principally in point of color, as described subsequently.

The type mapped as Swamp includes principally dark-colored clayey material existing in drainage-way depressions where the land is covered with water throughout a considerable part of the year. There is considerable variation in material, especially in the depth of the mucky organic accumulation over the surface of the heavier clayey material.

The type mapped as Tidal marsh lies in a very low position and is daily subjected to tidal overflow by salt water.

Coastal beach embraces light-colored sands occurring along the coast. Much of this is subject to the influence of ocean water and is disturbed by waves, tides, and storms.

The following table gives the name and extent of the different soils mapped:

Areas of different soils.

Soil.	Acres.	Per cent.	Soil.	Acres.	Per cent.
Tidal marsh.....	67,776	24.2	Coastal beach.....	2,560	0.9
Leon fine sand.....	33,600	12.0	Leon sand.....	2,368	.9
Plummer fine sandy loam....	23,744	8.5	Plummer sandy loam.....	2,368	.9
Norfolk fine sand.....	22,400	8.0	Portsmouth fine sandy loam..	2,176	.8
Bladen clay loam.....	19,776	7.1	Bladen sandy loam.....	2,048	.7
Swamp.....	18,112	6.5	Norfolk sand.....	1,664	.6
Portsmouth fine sand.....	14,976	5.4	Bladen very fine sandy loam..	960	.3
Bladen fine sandy loam.....	14,592	5.2	Hyde sand.....	768	.3
Portsmouth clay.....	14,272	5.1	Altamaha clay loam.....	640	.2
Coxville very fine sandy loam.	6,848	2.5	Hyde clay.....	448	.2
Hyde loam.....	4,992	1.8	Altamaha clay.....	384	.1
Hyde fine sand.....	4,224	1.5	Scranton fine sand.....	384	.1
Portsmouth clay loam.....	3,840	1.4	Norfolk fine sandy loam.....	384	.1
Plummer fine sand.....	3,456	1.2	Parkwood fine sandy loam....	320	.1
Georgetown clay.....	2,048	1.1	Muck.....	320	.1
Mucky subsoil phase.....	768		Leon coarse sand.....	256	.1
Sandy subsoil phase.....	384		Portsmouth coarse sand.....	192	.1
Portsmouth loam.....	2,816	1.0			
Portsmouth sand.....	2,816	1.0	Total.....	279,680	.....

NORFOLK SAND.

The Norfolk sand occupies a relatively small proportion of the area surveyed. It is generally recognized as a dependable soil for crop purposes and preferred in many instances to the lower lying heavy soils on account of better drainage conditions. The bulk of the farming in the western part of the county is upon this type of soil.

The soil of this type consists of a gray to grayish-brown or yellowish-gray medium sand, varying in depth from a few inches to nearly 9 inches, the depth depending on topography. On the higher rounded ridges the soil is shallow, consisting of a thin layer of pure white sand, underlain by about 2 inches of darker-colored material. From this phase the western section of the county takes its name of "sand-hill land." It is well drained, and on account of excessive leaching there is little or no accumulation of organic matter.

The better phase of the type is represented by a gray medium sand, with a depth of 6 to 8 inches. Such areas are found on the level lower lying lands, where drainage is not so well developed and more favorable to the accumulation of organic matter, which imparts the grayish color and a slightly loamy texture to the soil. The soil is generally loose and incoherent and incapable of retaining moisture on account of its porous nature.

A pale yellow, loose, incoherent medium sand underlies the surface mantle to a depth of 3 feet or more, becoming lighter in color as the water table is approached. The subsoil is loose and porous and unable to retain moisture or to attract it from the water table by capillarity.

The Norfolk sand is found only along the very edge of the western county line, extending into the county for a distance of less than 1 mile. It is very irregular in development within the county, extending into Wayne County to the west. Several areas are found along the Post Road in the southwestern portion of the county as higher lying ridges on the line dividing the two counties. North of Lott the largest area occurs, representing the eastern edge of an extensive development.

The topography of the type varies from level or gently undulating to slightly ridgy. In the east there is always a slope toward the lower lying, heavier soils.

The mineral material of the Norfolk sand, as with the other sandy upland soils of the area, was washed down from the Appalachian Mountains and Piedmont Plateau and deposited in the ocean. Subsequently the material was brought above the ocean level and subjected to influences of the weather and to the activities of plant life, which processes have given rise to the present soil.

As the Norfolk sand varies in minor details with the topography, so does the native vegetation. On the higher portions, where the



FIG. 1.—CABBAGE PALMETTO, A COMMON GROWTH ON THE PLUMMER FINE SANDY LOAM.



FIG. 2.—RICE FIELDS IN ALTAMAHA RIVER BOTTOM (GEORGETOWN CLAY). BUILDINGS ON SANDY UPLAND.

surface mantle is shallowest, there is a scattered growth of stunted oak, locally termed "blackjack," which attains an average height of 8 to 10 feet. Stunted shortleaf and longleaf pine and scrubby oaks of other varieties are also found. On the lower lands liveoak is conspicuous. On this phase pine of considerable size is seen. The several varieties of oak also attain a larger size than on the higher phase. The undergrowth in the first instance consists of scattered wire grass, growing only in bunches, while on the lower phase it grows thicker and covers the surface more uniformly. Stunted saw palmetto and galberry bushes are also found. Most of the Norfolk sand is covered with native vegetation. The type is adapted to early trucking.

The areas under cultivation are devoted to the production of corn, sweet potatoes, cowpeas, and a little short-staple cotton. With an application of 150 pounds of fertilizer corn yields from 15 to 20 bushels per acre. Some sweet potatoes are grown, chiefly for home use. They yield from 75 to 150 bushels per acre. Cotton yields one-half bale or less per acre.

The Norfolk sand is low in organic matter, and for improvement of the type the first step should be the turning under of stable manure or green manuring crops, such as cowpeas, velvet beans, or oats. This will not only add nitrogen in an available form, but will also enable the soil to hold moisture better. Mixtures of cottonseed meal and kainit with some acid phosphate are apparently necessary to secure good yields on this loose sandy soil.

NORFOLK FINE SAND.

The Norfolk fine sand consists of a light yellowish-gray to dark-gray fine sand, ranging in depth from 2 to 14 inches, resting on a light-yellow fine sand of open porous structure. The surface material varies somewhat in structure from loose and incoherent in the higher better drained areas to compact and slightly loamy in places where the moisture conditions are more favorable. Its color likewise is governed by the organic matter content, which also depends upon the position which the various areas occupy. In the lower-lying areas of level topography there is a sufficient accumulation of organic matter to give the surface material a dark-gray to brownish-gray color to a depth of 8 to 14 inches. This phase of the type is found in the vicinity of Brunswick with other areas in other sections along the coast or near the marshes. Along the coast oyster shells are frequently intermixed with the soil and subsoil. The soil mapped as Norfolk fine sand on Jekyl, St. Simon, Blythe, and Colonels Islands is also of this phase.

In contrast to the low-lying phase the areas on the ridges or in the undulating to slightly rolling country have a loose and incoherent soil and contain little or no organic matter. In local areas where the vegetation is scattered the surface 2 or 3 inches is bleached to a glistening white. The ridge phase is found most extensively in the northeastern part of the mainland, the northern boundary of which forms the bluff line along the Altamaha River bottom. Other areas occur in the southeastern part of the county in the vicinity of Spring Hill Church.

The occurrence of the Norfolk fine sand is limited to the eastern part of the county and islands, where the fine sandy soils are found. The largest area begins about 2 miles north of Sterling and extends to the Altamaha River bottom. This area follows the river bottom from the Brunswick and Altamaha Canal to a point beyond Honey Gall Landing. A second area is found as a narrow strip extending along the marsh from Brunswick to Southern Junction. The type also occurs along the ridge from Laurel Grove Landing northward for a distance of 3 miles. Other small areas are scattered over the eastern part of the county.

The topographic features of the type vary from level to undulating, and the areas always lie above the surrounding soils. Excellent surface drainage is afforded by the surface run-off and percolation.

The type was originally covered by longleaf and shortleaf pine forests, valuable for turpentine and lumber. After a number of years of turpentine much of the timber has been cut. Here the native vegetation at present consists of a moderately thick growth of longleaf and shortleaf pine saplings, oaks, and in some localities on hammocks, hickory. Where lumbering has not yet been carried on, the level areas support a heavy growth of pine and an undergrowth of gallberry and saw palmetto, and the ridges and undulating areas a scattered and stunted growth of pine and a good growth of oak.

The greater proportion of the small area of land under cultivation is Norfolk fine sand. Corn, oats for hay, sweet potatoes, and vegetables for home use are the principal crops. Corn yields from 5 to 35 bushels per acre, depending upon the cultural methods employed. This crop has been found to produce the best yields when grown in rotation with oats and cowpeas or velvet beans and fertilized with a mixture of equal parts of cottonseed meal, kainit, and phosphoric acid, applied at the rate of 600 pounds per acre, one-half at time of planting and one-half at the second cultivation.

Oats cut for forage yield 1 ton per acre, crabgrass and cowpeas for hay from 1½ to 2 tons, and sweet potatoes from 75 to 200 bushels per acre, the better yields being secured with a liberal use of fertilizers.

In comparison with the Norfolk sand the Norfolk fine sand is more retentive of moisture, has greater power to draw water from below by capillarity, and on that account is a more productive soil. The type is not especially adapted to general farm crops, as the cost of production of these low-priced crops is too great. It is on the other hand one of the best soils in the Coastal Plain region for early truck crops, early peaches, and small fruits.

To obtain the most profitable returns from the cultivation of this soil it has been found necessary to plow under green manuring crops frequently and to apply fertilizers at intervals in small quantities, rather than the entire quantity at one time.

NORFOLK FINE SANDY LOAM.

The soil of the Norfolk fine sandy loam consists of a loamy fine sand to light fine sandy loam, about 10 to 16 inches deep, varying in color from a light yellowish gray or dark gray in the upper 6 or 8 inches to pale yellow below. The subsoil is a light yellow, friable, fine sandy clay, becoming heavier in texture with increasing depth. In several instances the lower subsoil is slightly mottled with gray.

The Norfolk fine sandy loam is not an extensive type, there being only five small areas. Two of these are located about $1\frac{1}{2}$ miles northwest of Southern Junction, near Gilsons Creek. A narrow strip is situated along the Seaboard Air Line Railway between Bladen and Thalmann, while the fourth body is located along the Sand Hills and Fancy Bluff Road and Glynco Swamp. The fifth area lies $2\frac{1}{2}$ miles north of Jenks.

The type occupies level areas which are higher than the surrounding soils. The drainage is well established.

The type is derived from deposits which probably originally contained more clay than those giving rise to the deep sand types.

The vegetation on the Norfolk fine sandy loam consists of longleaf and shortleaf pine and oak. Most of the type has been cleared and cultivated.

Corn is the chief crop and yields from 15 to 30 bushels per acre. Sweet potatoes are also grown for home use. This soil has not been found as valuable for early truck crops as the Norfolk fine sand. It is considered a good general farming soil and an excellent medium to late truck soil. It is deficient in humus, and crops should be so rotated as to include occasional crops for turning under, such as velvet beans.

LEON FINE SAND.

The Leon fine sand is the predominating type of the upland sandy soil section of the eastern part of the county. It is characterized by its light-colored surface soil and a brownish "hardpan" strata

beneath. The surface soil is a pure white to gray fine sand of a loose and incoherent structure, the gray color being due to the presence of organic matter. In the northeastern part of the county the first 3 inches is generally darker than the underlying portion, while in the southeastern section the immediate surface is white, gradually becoming darker with increasing depth. Generally the soil is darker as the low-lying, poorly drained areas of the Portsmouth and Hyde soils are approached. Exceptions were noted in which a dark-gray soil was found on a slightly undulating surface having good drainage, while the white color was conspicuous along the depressed or poorly drained areas. This latter condition exists along the Brunswick and Fancy Bluff Road several miles west of Fancy Bluff. The texture of the soil is somewhat finer in the southern part of the county. The surface soil varies from about 8 to 24 inches in depth, the average being about 15 inches.

The subsoil consists of a brown hardpan layer, underlain by a loose fine sand, varying in color from white to brown. This compacted stratum is composed usually of a coffee-colored loamy fine sand, and averages 8 inches in thickness. In the southeastern part of the county it is black to reddish-brown instead of the "coffee-grounds" color characteristic of the occurrence in the northeastern section.

The Leon fine sand is an intermediate type of soil between the Portsmouth fine sand of lower-lying topography and the Norfolk fine sand, which occupies a higher position. In grading from the Portsmouth fine sand this type becomes lighter in color, both in the soil and subsoil, while the gradation to the Norfolk fine sand is marked by a gradual decrease in thickness of the hardpan layer and a more pronounced yellow in the subsoil. The boundaries between the types follow topographic lines.

The Leon fine sand is confined to the sandy section or eastern part of the mainland, lying north and south of the marshes of Turtle River. In the vicinity of Brunswick and to the north and west is found one of the largest areas of this soil. Colonels, Blythe, and St. Simon Islands are covered chiefly by this type, and a considerable area occurs on Jekyl Island. Along the bluffs of these islands the brown hardpan layer in some places attains a thickness of 18 to 24 inches.

The topography of the Leon fine sand varies from level to gently undulating. In the vicinity of Brunswick and Southern Junction the surface is level, while south of Turtle River only a slight undulation is noticeable. The type is well drained. The water table lies below the 3-foot profile, although several exceptions were found where the subsoil was either moist or saturated.

The open structure of the soil has prevented accumulation of organic matter. Aside from the loss by rapid oxidation, some of the

vegetable matter has been leached out of the surface and seemingly deposited in the hardpan stratum.¹ The characteristic properties of this stratum are largely due to a concentration of iron and carbonaceous material, but just how this combination was brought about is not very clear.

The Leon fine sand² supports a scattered growth of longleaf and shortleaf pine. Wire grass attains a higher growth than on any other soil type. The saw palmetto is generally the most characteristic growth, and the type is often called "palmetto land." Gallberry bushes are also common.

In agricultural value the Leon fine sand is necessarily low on account of its open structure. By turning under large quantities of green manuring crops, such as cowpeas, beggarweed, or velvet beans, and by liberal applications of high-grade commercial fertilizers, sweet and Irish potatoes, lettuce, and a number of other vegetables could be successfully grown, especially with overhead irrigation. Where the brownish hardpan comes near enough the surface, in this as well as the other soils of the area in which it is developed, to be turned up by plowing, it is claimed throughout this general region that crops do very poorly. Applications of lime would likely remedy the damage caused by plowing up such material.³

The cost of clearing this type for agricultural purposes will vary from \$30 to \$60 an acre.

LEON SAND.

The surface of the Leon sand consists of a light-gray to white loose and incoherent sand, varying from 8 to 15 inches in depth. Over the greater part of the area the soil for the first inch or two is of a medium-gray color, owing to the presence of organic matter. The color becomes lighter with depth, pure white being characteristic of the subsurface. In the higher situations the soil is pure white from the surface downward, while in lower lying portions, where organic matter has accumulated to a greater extent, the soil is dark gray in the surface 2 or 3 inches and light gray below. The latter condition is generally found within the zone of gradation between this type and the Portsmouth sand or other dark-colored soils of lower topographic position.

¹ An analysis made by the Geological Survey of the State of Georgia shows this stratum to lose 2.98 per cent on ignition and to contain 0.7 per cent alumina (Al_2O_3), 1.65 per cent ferric oxide (Fe_2O_3), and 94.72 per cent silica (SiO_2). The soil portion carried 0.50 per cent ferric oxide (Fe_2O_3), while the lower subsoil (that below the hardpan stratum) showed a content of 0.84 per cent of ferric oxide (Fe_2O_3).

² For further discussion of this soil, see Soil Circular 21, Bureau of Soils, by Hugh H. Bennett.

³ The effect of fertilizers on the hardpan material of this soil was tested by growing wheat, corn, and cabbage in the hardpan material in paraffined wire pots. Lime added at the rate of 1 ton per acre caused a considerable increase in the growth of each of these crops. A mixture of phosphate, nitrate, and potash also produced a good increase in growth, but the improvement was not so great as with lime. Lime with phosphate, nitrate, and potash produced an increase of about 40 per cent—a greater growth than when lime was used alone.

The soil is very low in organic matter, and in cultivation every means for incorporating this important soil constituent should be adopted. The deficiency is most noticeable in fields that have been cropped for a few years, the soil of which becomes as white as beach sand.

Below the surface soil there is characteristically developed a dark-brown hardpan layer of compact fine to medium sand, 12 to 14 inches thick, the lower part less compact than the upper portion. This hardpan layer seems to owe its peculiar properties to the presence of organic matter and ferruginous compounds, acting as cementing material. This layer appears to be sufficiently impervious to check rapid percolation of water—rather an advantageous feature in view of the porous nature of the surface soil. The breaking up of this hardpan should be avoided, as it decreases the productiveness of the soil.

Beneath the hardpan the subsoil consists of a medium to fine sand, very loose and incoherent, rusty brown in color, becoming lighter with depth, until at 30 to 36 inches the sand is almost pure white.

The Leon sand is found only along the western edge of the county, where it occurs as gently undulating and flat land having a moderate slope toward the lower lying soils. It is found adjoining the Norfolk sand in the southwestern and northwestern parts of the county. Between Coleridge and Lott the terracelike land form swings westward, allowing the Leon sand to occupy the greater part of this physiographic feature as developed in the county. Between these two stations is found the most extensive development of the type, which here occupies practically the entire upland section of the western part of the county. Its outline is irregular, the boundaries generally following noticeable topographic lines. Drainage is well established, and during dry seasons plants suffer from drought.

The native vegetation consists of a scattered growth of shortleaf and longleaf pine, most of the merchantable timber having been cut. Wire grass, growing to a height of 18 to 20 inches, forms a moderately thick undergrowth. Small saw palmetto grows scatteringly. In contrast to the adjoining Norfolk sand, the trees are larger, the wire grass thicker and higher, and the black-jack oak wanting.

Only a few acres of the Leon sand are under cultivation. With applications of 300 pounds of commercial fertilizer corn yields from 15 to 30 bushels per acre and sweet potatoes from 100 to 150 bushels. As the soil consists almost entirely of pure quartz sand it is necessary to employ such agricultural methods as will provide organic matter in liberal amounts. Liberal applications of complete commercial fertilizers (probably in small quantities at a time) should be made and crops, such as cowpeas and velvet beans, should be plowed under. Barnyard manure is also beneficial. Under proper methods of cul-

tivation and fertilization the soil would yield good returns from early truck crops or crops grown during the cooler months with plenty of rainfall, such as early cabbage, English peas, Irish potatoes, radishes, salsify, spinach, lettuce, and turnips.

LEON COARSE SAND.

The Leon coarse sand differs little from the Leon sand and Leon fine sand, except in texture. The surface soil consists of a loose, incoherent coarse sand of light-gray color with a depth of 4 inches, below which it gradually fades into white. The hardpan stratum is found at 18 inches and consists of a compact, rusty brown coarse sand similar to that of the other Leon soils. Beneath the hardpan layer, at a depth of 28 to 36 inches, occurs a loose coarse sand, slightly stained with iron and shading to white with depth.

There are only two small areas of this type. One lies about 1 mile due north of Everett City, the other about the same distance west of this town. The areas occupy small, low knolls or hummocks. Its open and porous structure permits rapid drainage of rain water by percolation. The water table is generally found at a depth of about 30 inches.

The type supports a scattered growth of scrubby longleaf and shortleaf pine. The prominent plant species in the undergrowth are wire grass, saw palmetto, and gallberry. None of the type is under cultivation. It is of very low agricultural value.

The following table gives the results of mechanical analyses of samples of the soil and subsoil of the Leon coarse sand:

Mechanical analyses of Leon coarse sand.

Number.	Description.	Fine gravel.	Coarse sand.	Medium sand.	Fine sand.	Very fine sand.	Silt.	Clay.
		Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	<i>Per cent.</i>
251940.....	Soil.....	2.1	21.2	25.7	40.5	6.0	3.3	0.9
251941.....	Subsoil.....	2.6	15.9	19.9	42.5	8.6	5.2	5.4

BLADEN FINE SANDY LOAM.

The Bladen fine sandy loam is one of the most extensively developed soils in the county. The surface soil consists of a loamy fine sand to light fine sandy loam, usually gray to drab in color, and extending to a depth of 8 to 15 inches, the shallower soil being found as the heavy Bladen clay loam is approached. In the eastern section, in the vicinity of Anguilla and Jamaica, the soil averages 12 to 15 inches in depth, being of the loamy fine sand texture in the upper 8 inches and a fine sandy loam in the subsurface portion, while the areas in the section east of Thalmann is a fine sandy loam to a depth

of 8 inches. A very gradual merging of this soil into the Bladen clay loam is noted along the Sand Hills and Fancy Bluff Road, just west of the Seaboard Air Line Railway. In this neighborhood the zone is about one-fourth to three-eighths of a mile in width and the change so gradual that it is difficult to determine the line of separation. As a general rule in those districts where the clay loam soil is found the texture of the soil gradually becomes heavier and the depth to the subsoil decreases.

In some cases the subsoil consists of an upper stratum of fine sandy clay of a friable to slightly sticky nature, varying in thickness from 8 to 12 inches, beneath which is found a heavy, plastic, sticky clay to a depth of 36 inches, the sand content decreasing with depth. In other cases the heavy, sticky, plastic clay extends from the surface soil throughout the profile. This difference has an important bearing on cultivation, for where the soil is shallow and the heavy clay close to the surface plowing must be restricted to the surface soil or gradually deepened. With the sandy clay substratum deep plowing and subsoiling can be practiced more advantageously.

Areas of Bladen fine sandy loam are found scattered throughout the western part of the county, the most extensive development being near Thalmann, Bladen, Jamaica, and Anguilla. A second large area occurs along the Seaboard Air Line Railway, between College Creek swamp and the Little Satilla River swamp. Smaller areas occur within the Bladen clay loam type, existing chiefly as higher portions of the gently undulating surface of the latter soil. The type grades into the Plummer fine sandy loam on the east and the Bladen clay loam to the west.

A level to gently undulating surface is characteristic of this soil, the relief being insufficient to afford good drainage and the areas being covered with water after each rainfall, which remains standing for some time. The higher undulating areas are the better drained, but even here the crops are impaired by excess surface water. Depressions varying from 1 to 3 acres in extent and supporting growths of gum and cypress are scattered throughout the area. Around these depressions, which usually contain water, the soil is of a darker gray color and extends to a depth of 24 inches or more.

The Bladen fine sandy loam is apparently derived from the weathering of the sands and clays laid down under brackish or salt water conditions when this section of the country formed an arm of the sea. The type is really an intermediate type between Tidal marsh and the Coxville soil. With further weathering it is believed the Bladen fine sandy loam will eventually assume the characteristics of the Coxville very fine sandy loam. The vegetation at present consists of a scattered growth of shortleaf and longleaf pine, with an occasional oak. The

surface is covered with a luxuriant growth of sedge grass, which forms a thick matting over the surface and reaches a height of 2½ to 3 feet.

A very small acreage of this soil is under cultivation. During seasons when the rainfall is not too heavy corn yields as much as 35 bushels per acre and sweet potatoes from 100 to 150 bushels. Sirup from sugar cane is of good quality and the yields are good. In order to improve the drainage, the soil is bedded to a height of 10 or 12 inches and the seed planted on the ridges. Portions of this soil were being drained at the time of examination and will be used for the production of cotton, corn, and truck crops. The type is now used mainly for pasture. No definite value can be placed on the land for agriculture. The price at present is determined by the stand of timber.

With thorough drainage, proper cultivation, and fertilization the Bladen fine sandy loam will be adapted to medium early to medium late truck crops. Small gardens found on the soil point to especially good yields of cantaloupes, cucumbers, beets, beans, English peas, tomatoes, and Irish potatoes. Fair to good yields of the general farm crops, especially forage crops of cowpeas and velvet beans, may also be expected.

Below are given the results of mechanical analyses of samples of the soil and subsoil of the Bladen fine sandy loam:

Mechanical analyses of Bladen fine sandy loam.

Number.	Description	Fine gravel.	Coarse sand.	Medium sand.	Fine sand.	Very fine sand.	Silt.	Clay.
		Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	<i>Per cent.</i>
251974.....	Soil.....	0.3	1.0	2.3	46.0	29.6	14.6	6.2
251975.....	Subsoil.....	.0	.4	1.0	24.7	15.1	12.1	46.2

BLADEN SANDY LOAM.

The soil of the Bladen sandy loam varies from a loamy sand to sandy loam, gray in the upper portion and grayish yellow below, with an average depth of 6 inches. Occasionally the subsoil comes very near the surface and frequently outcrops. As a rule, the nearer the subsoil comes to the surface the heavier and more nearly yellow the soil portion becomes. The subsoil varies from a friable, mottled-yellow and gray sandy clay in the upper 5 or 6 inches to a plastic heavy clay, mottled yellow and gray, beneath. This heavy subsoil material is very sticky when wet, but on drying becomes hard and brittle. The subsoil often contains some lime concretions.

Areas of this type are confined to the western part of the county. A number of bodies lie in the vicinity of Thalmann, Jenks, and

Everett City and a small area south of Anguilla, near Green Creek. The topography is level, or practically so, and the drainage poor.

A scattered growth of shortleaf, slash, and longleaf pine, with a luxuriant growth of sedge grasses, form the characteristic vegetation.

As drainage conditions are poor, little of the type is cultivated. With drainage, it is well adapted to the general farm crops, sugar cane, and vegetables.

The following table gives the results of mechanical analyses of samples of the soil and subsoil of the Bladen sandy loam:

Mechanical analyses of Bladen sandy loam.

Number.	Description.	Fine gravel.	Coarse sand.	Medium sand.	Fine sand.	Very fine sand.	Silt.	Clay.
		Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	<i>Per cent.</i>
251945.....	Soil.....	4.1	16.2	14.7	34.0	8.0	15.4	7.4
251946.....	Subsoil.....	.7	2.5	4.1	23.6	6.0	16.4	46.3

BLADEN VERY FINE SANDY LOAM.

The Bladen very fine sandy loam is an intermediate type between the Bladen clay loam and the Bladen fine sandy loam. The surface soil consists of a very fine sandy loam, with an average depth of 10 inches. The color varies from a light-gray to gray, with a yellowish cast, the intensity of the last depending upon the depth of the subsoil, being more pronounced where the subsoil lies at shallow depths. The light-gray color is characteristic of areas of deep soil. In lower situations sufficient organic matter has accumulated in the soil to give it a dark color. The subsoil is a grayish, friable, very fine sandy clay, changing at a depth of 18 to 24 inches to a plastic heavy clay mottled with yellow and gray. Lime concretions are encountered throughout the subsoil and occasional small beds of marl occur.

The Bladen very fine sandy loam is not very extensive, the largest area being along the Brunswick and Waycross Road just east of Bladen and extending from Turkey Swamp on the north to Turtle River Swamp on the south. A second area lies along the south side of College Creek swamp, beginning just east of the Seaboard Air Line Railway and extending to the Massie Causeway. Several smaller areas are found in the vicinity of Zuta, between the Barrington Road and the Southern Railway.

The surface is flat and in places slightly depressed. The drainage is poor, the condition approximating Swamp. Those areas lying north of Zuta occupy slight elevations within areas of swampy Portsmouth soils. Rain water stands on the surface longer than on any other of the Bladen soils.

Shortleaf pine, slash pine, water oak, gum, bay, ash, and cabbage palmetto are conspicuous tree species. Sedge grass, with some wire

grass, is found only where this soil grades into the Bladen clay loam or Bladen fine sandy loam. Scattered clumps of saw palmetto form the chief undergrowth.

None of the type is under cultivation. When cleared and drained good results may be had with sugar cane, corn, oats, and forage crops.

The results of mechanical analyses of samples of the soil and subsoil of the Bladen very fine sandy loam are given in the following table:

Mechanical analyses of Bladen very fine sandy loam.

Number.	Description.	Fine gravel.	Coarse sand.	Medium sand.	Fine sand.	Very fine sand.	Silt.	Clay.
		Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	<i>Per cent.</i>
251972.....	Soil.....	0.1	0.6	0.8	27.7	37.4	21.8	11.6
251973.....	Subsoil.....	.0	.3	.6	25.4	16.3	29.8	27.4

BLADEN CLAY LOAM.

The Bladen clay loam is the heaviest member of the Bladen series. The surface soil varies considerably, ranging from fine sandy loam through very fine sandy loam and loam to clay loam. In some places the underlying clay of the subsoil appears at the surface. All these variations may be found within areas of 1 acre. The predominant soil consists of a dark-brown to grayish-brown or gray, compact, heavy fine sandy loam to loam, underlain at 3 to 4 inches by a heavier material, containing less organic matter and having a lighter grayish color, with mottlings of yellow. At 4 to 6 inches the subsoil consists of a mottled gray and yellow, friable fine sandy clay or clay loam, which quickly grades into heavy, plastic, mottled gray and yellow clay. Some brownish shades are also noticeable in the subsoil in places. Yellow is the predominant color below 18 inches until the lower depths are reached, where gray or drab and yellow are equally prominent.

South of Turtle River Swamp some areas have a yellowish-gray color, while other areas lying slightly lower are dark brown, and the areas mapped along the Seaboard Air Line Railway north of Jenks show small knolls where the clay subsoil is exposed. Here the soil is yellow to a depth of 10 to 14 inches.

The cultivation of this type is difficult, as the soil is hard when dry and sticky and plastic when wet. It is easily puddled by the tramping of cattle.

Extensive areas of this soil are found in the western part of the county. The Seaboard Air Line Railway passes through the largest areas, which extend from the northern to the southern boundary of the county. There are several smaller areas farther to the east in the neighborhood of Penton Hill and Brookman.

The topography of the Bladen clay loam is generally level, with gentle undulations. The general slope of the type is toward Buffalo Swamp. The drainage is poor, the water after ordinary rains remaining for several days on the surface of lower lying areas. This condition is due in part to the plastic nature of the subsoil, which prevents downward movement of water.

On areas of this soil there occur scattered groves of shortleaf and slash pine, and a thick growth of sedge grass. None of the type is under cultivation, but it is used as pasture, the sedge grass being burned off each spring to give the cattle the advantage of the more succulent new growth which follows.

The Bladen clay loam is too stiff and too late to be utilized in the production of truck crops. It should be devoted to the growing of oats, grass, corn, and forage crops, or, in general, to shallow-rooted crops. Better drainage is the first requirement of this soil. The incorporation of vegetable matter by plowing under green crops or barnyard manure would improve the physical condition of the soil, thereby making cultivation easier. Applications of lime would also help secure better structural conditions.

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

Mechanical analyses of Bladen clay loam.

Number.	Description.	Fine gravel.	Coarse sand.	Medium sand.	Fine sand.	Very fine sand.	Silt.	Clay.
		Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	<i>Per cent.</i>
251909.....	Soil.....	1.4	5.8	5.3	26.0	16.5	30.2	14.4
251910.....	Subsoil.....	1.1	3.8	3.6	17.5	17.8	33.5	22.2

COXVILLE VERY FINE SANDY LOAM.

The soil of the Coxville very fine sandy loam consists of a gray to yellowish-gray, loamy, very fine sand, grading into very fine sandy loam at lower depths. The color varies somewhat with the topography. On the higher knolls the yellow color predominates, while on the edges of the areas, where the type grades into the lower-lying soils, the Plummer fine sandy loam or Bladen fine sandy loam, the gray color extends to a depth of 10 to 15 inches. On the higher situations the subsoil clay comes nearer the surface, while in the intervening lower positions the loamy very fine sand may extend to a depth of 30 inches.

The subsoil, as typically developed, consists of three distinct layers, the line of contact between each being well defined. The upper layer, from 15 to about 22 inches, consists of a yellow fine to very fine sandy clay of a very friable nature. Below this the sand content decreases, and the color becomes mottled yellow and red, the yellow

predominating. As the depth increases the red color becomes more conspicuous. At about 26 inches the yellow color abruptly gives way to a gray or drab, and the material becomes decidedly more plastic. This mottled gray and brick-red plastic clay continues to a depth of 36 inches or more, although yellow mottling again appears at about 30 inches.

There is a phase of this type in which the depth to clay is much greater than usual. Here the surface soil consists of a gray very fine sand to fine sand with a depth of 6 to 8 inches, where the texture begins to become heavier and the color yellower, the material grading into a very fine sandy loam. The subsoil of this phase is a yellow fine sandy clay, with a mottling of brick red and gray. In a few small areas the subsoil is just reached with the 3-foot auger. This development is found along the Southern Railway between Belle Vista and Zuta, and also to a limited extent southeast of Everett City.

Areas of the Coxville very fine sandy loam are confined to the north and northwestern part of the county. The type follows in a general way Cow Pen Swamp and its branches. Three of the largest bodies are found south of Everett City, the most southern approaching the borders of Buffalo Swamp. With the exception of these three areas, the type is found in small bodies of irregular outline generally following topographic lines. The areas are more irregular than shown on the map, owing to small depressions consisting of other types of soil cutting in and through the type, which can not be shown on the map of this scale.

The topography of the Coxville very fine sandy loam is distinctly undulating. Under no other condition is the type found, for in adjoining areas of level land the distinguishing features of the type are lost, the type grading into soils of the Bladen or Plummer series. Even small depressions within the bodies of this type lack the yellow color of the upper portion and the red mottlings of the lower portion of the subsoil.

The Coxville very fine sandy loam was probably formed in the same way as the Bladen soils, the essential difference being in the more advanced stage of weathering of the Coxville material. The red mottling of the subsoil is probably due to more thorough oxidation, brought about through better conditions of drainage and aeration.

This type of soil supports a good growth of longleaf and shortleaf yellow pine, with an undergrowth of wire grass, some gallberry, and an occasional clump of saw palmetto. The longleaf pine attains its best development in the county on areas of this soil. Along the edges of the various areas, where the type grades into adjoining poorly drained soils, the slash pine is found. Oak attains good growth.

Very little of this soil is under cultivation at present. Fields ranging in size from 5 to 15 acres are found scattered over the type. In these corn is the chief crop, yielding 5 to 15 bushels per acre. Sweet potatoes form the crop of second importance, yielding from 75 to 150 bushels. The agricultural methods employed, rather than the qualities of the soil, keep crop yields low, for the Coxville very fine sandy loam is one of the best agricultural soils in the county. The friable surface soil gives a good seed bed and easy cultivation, while the yellow, friable fine sandy clay of the upper portion of the subsoil affords a good zone for root development, especially when loosened by the use of a subsoil plow. The plastic mottled clay of the lower portion of the subsoil is sufficiently deep not to interfere with deep plowing, is retentive of moisture, and prevents the rapid leaching of fertilizers.¹

The following table gives the results of mechanical analyses of samples of the soil and subsoil of the Coxville very fine sandy loam:

Mechanical analyses of Coxville very fine sandy loam.

Number.	Description.	Fine gravel.	Coarse sand.	Medium sand.	Fine sand.	Very fine sand.	Silt.	Clay.
		Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	<i>Per cent.</i>
251927.....	Soil.....	0.3	0.4	0.5	26.9	46.2	20.0	5.8
251928.....	Subsoil.....	.0	.0	.0	22.8	28.7	7.9	40.3

PLUMMER SANDY LOAM.

The Plummer sandy loam is closely associated with the more extensive Plummer fine sandy loam, the difference in texture being the basis for the separation. The soil varies in texture from a loamy sand in the upper portion to sandy loam below. The first 6 inches are usually loamy sand, faintly mottled with shades of brown, grading below that depth into light-gray sandy loam, faintly mottled with streaks of yellow. The subsoil, beginning at an average depth of 20 inches, consists of a friable sandy clay, mottled yellow and gray to drab in color. The quantity of yellow mottling varies, as does the shade of yellow. The sand content decreases with depth, until at 36 inches or more the material becomes stiff and sticky.

This soil is limited to the western section of the county, no areas being found east of the line of the Seaboard Air Line Railway. Small bodies are found along the various swamps, as the type usually grades into the Portsmouth soils along its lower margins and into the Bladen soils at the higher elevations. Prominent areas are found along the Waynesville Road west of Bladen, along the New Fish Hole Road west of Jenks, and in the vicinity of Everett City.

¹ For further discussion of this type, see Circular No. 21, Bureau of Soils, "Soils in the vicinity of Brunswick, Ga.," p. 16.

The Plummer sandy loam occupies flat or depressed areas and rarely has an undulating surface. The drainage is poorly established. After every rain the water remains on the surface for several days. Crawfish mounds are abundant over most of the type.

The Plummer sandy loam seems to be an intermediate type between the Portsmouth and Bladen soils.

Broom sedge, with some wire grass and a scattered growth of slash pine and shortleaf pine, forming open woods, are the characteristic vegetation of this soil. Pitcher plant or trumpet flower flourishes in the lower, poorer drained areas. When the type occurs near the streams the vegetation is more like that of swampy lands, and here consists of gums, slash pine, cabbage palmetto, and a scattering of saw palmetto.

At present none of the Plummer sandy loam is under cultivation, it being used for open range. The areas must be thoroughly drained before any extensive agricultural development can take place. The type is easily cultivated and is one of the lightest desirable soils for general farming and medium early truck crops. With fertilization oats, corn, and sugar cane should do well.

The following table gives the results of mechanical analyses of samples of the soil and subsoil of the Plummer sandy loam:

Mechanical analyses of Plummer sandy loam.

Number.	Description.	Fine gravel.	Coarse sand.	Medium sand.	Fine sand.	Very fine sand.	Silt.	Clay.
		Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	<i>Per cent.</i>
251943.....	Soil.....	4.6	13.4	12.5	35.6	17.7	10.4	5.5
251944.....	Subsoil.....	4.9	12.8	10.8	32.5	16.5	9.5	12.8

PLUMMER FINE SANDY LOAM.

The soil of the Plummer fine sandy loam consists of a loamy fine sand to loamy very fine sand, ranging in depth from 18 to 30 inches, with an average depth of about 24 inches. The soil has a smooth, velvety feel and in color is of an undecided gray to grayish drab, with brownish or dingy-brown mottling, although the general impression in the field is gray. The color is not due to an intermixture of dark-colored organic matter and white quartz sand grains, as in case of the other gray soils of the area—the Portsmouth and Leon series—but seems to be due to a covering of the sand grains by a grayish silty sediment. Small spots in the soil, which have become washed or leached, are of a white color and small patches of darker gray color are found where organic matter has accumulated in the usual way.

The subsoil from an average depth of 24 to a depth of 30 inches is a grayish-drab fine sandy clay. Below this is encountered a friable

fine sandy clay of a mottled drab, gray, and yellow color. The yellow forms a small percentage of the mottling and appears mainly as streaks. In a very few instances, in the neighborhood of Buffalo Swamp, a bluish-drab clay is found at a depth of 36 inches. Between the Brunswick and Fancy Bluff Road and the marsh of Turtle River the soil is underlain at 12 to 18 inches by a mottled gray and yellow heavy friable fine sandy clay.

Although extensive, the areas of the Plummer fine sandy loam are rather irregular, being interrupted by areas of other soils. The main area extends from the swamp of the Altamaha River to the swamp of the Little Satilla River, gradually running out as the heavier soils are encountered to the west. A line passing through Belle Vista, Jamaica, and the junction of the Seaboard Air Line and Sand Hills and Fancy Bluff Road would form the western limits of the type, with a few exceptions. This soil is also found on the small islands in the marsh areas near Crispen Island.

The topography of the Plummer fine sandy loam is generally flat or level, and as the areas are basinlike the drainage is poor. Ponds of small size are scattered through the type and small streams head within it. The water table, even in a very dry season, lies at depths varying from 12 to 24 inches, while after heavy rains both the surface and subdrainage waters of the surrounding higher lands affect this soil, raising the water table to within a few inches of the surface. There are higher areas having slightly better drainage, but they are small.

Flat areas support a scattered growth of shortleaf and slash pine. Sedge and wire grass form a dense covering. North of Buffalo Swamp the timber growth is somewhat heavier, especially in the vicinity of Frazers Crossing. Ponds in which gum, ash, and cypress are growing dot the surface. On the shallow phase is found a thick growth of slash, longleaf and shortleaf pine, with an undergrowth of gallberry and palmetto (see Pl. I, fig. 1) the absence of which is characteristic of the deeper phase.

The Plummer fine sandy loam is not at present extensively cultivated. Small fields are found on the higher ridges, where sufficient corn and sweet potatoes are grown for home use. The scattered growth of pine, with the undergrowth of wire and sedge grass, gives large areas of open woods used as open range.

On the higher ridges or where the land is ditched and well drained corn yields 10 to 30 bushels per acre, sweet potatoes 50 to 200 bushels, crabgrass and cowpea hay 1 to 2 tons, and cotton 1 bale per acre. Only a few acres of cotton have been planted, this crop being still in the experimental stage. Crops are always exposed to danger of loss through drowning at times of heavy rains.

Once this type is drained it will be suited for medium early to late truck crops and the general farm crops, such as cotton, corn, oats, and cowpeas.

The following table gives the results of mechanical analyses of samples of the soil and subsoil of the Plummer fine sandy loam:

Mechanical analyses of Plummer fine sandy loam.

Number.	Description.	Fine gravel.	Coarse sand.	Medium sand.	Fine sand.	Very fine sand.	Silt.	Clay.
		Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	<i>Per cent.</i>
251921.....	Soil.....	0.2	0.6	2.7	53.9	26.7	9.6	6.0
251922.....	Subsoil.....	.0	.5	2.0	47.2	21.1	9.1	20.4

PLUMMER FINE SAND.

The Plummer fine sand is closely associated with the fine sandy loam of this series. The type consists of a gray or brownish-gray to grayish-brown loamy fine sand to very fine sand with a depth of 36 inches. The surface 6 to 8 inches varies in color from dark gray in the lower situations to lighter gray in the higher areas. Below the surface 6 inches the material shades to a brownish-gray color, and the lower subsoil is a little heavier than the material nearer the surface. Small, easily broken clods are formed in plowing when the soil is wet.

The largest area of the Plummer fine sand is found about 2½ miles north of Sterling. Here a strip about one-half mile wide and 2 miles long occurs as a depression surrounded by higher and better-drained land. Small ponds and a number of streams head in this area. It also includes small, high-lying tracts of Leon fine sand. The areas mapped in the vicinity of Zuta and Everett Store represent a soil gradation between the well-drained Norfolk and Leon and poorly-drained soils, as, for instance, the lower lying Plummer fine sandy loam. Two small, more typical bodies are shown in the vicinity of Brookman, one on each side of College Creek. The type occurs as flat, depressed, or basinlike areas. The water table usually lies at a depth of 18 to 24 inches, and as a rule artificial drainage is essential for successful crop production. In times of continued rains crops are ruined by standing water.

A scattered growth of slash pine and shortleaf yellow pine, with a thick undergrowth of sedge grass, is found on the Plummer fine sand in general. In the small depressions gum, swamp maple, cypress, and other water-loving trees occur.

A very small acreage of the Plummer fine sand is under cultivation. Corn is the chief crop, yielding from 10 to 30 bushels per acre. The

better yields are secured where the drainage is better and cultural methods more thorough. Sweet potatoes, grown for home use, yield from 50 to 75 bushels per acre. Early truck crops can be recommended for this soil when properly drained.

The following table gives the result of a mechanical analysis of the soil of the Plummer fine sand:

Mechanical analysis of Plummer fine sand.

Number.	Description.	Fine gravel.	Coarse sand.	Medium sand.	Fine sand.	Very fine sand.	Silt.	Clay.
		<i>Per cent.</i>						
251923.....	Soil.....	0.1	0.3	0.4	53.8	31.6	9.1	4.5

PORTSMOUTH SAND.

The soil of the Portsmouth sand consists of a very dark gray to black loose sand, about 10 inches deep, resting on a compact brown hardpan stratum, 8 inches thick, below which is a loose, incoherent sand, usually saturated with water. The subsoil is brown and stained with iron in the upper part and lighter below, white sand often occurring at 30 to 36 inches.

The Portsmouth sand is found along the western edge of the county as a strip varying from one-fourth to one-half mile in width. The main development begins about 2 miles south of Coleridge, and except where broken by the occurrence of other types of soil extends north to the county line.

The topography is level, with a very gentle slope to the lower-lying soils to the east, which, however, is insufficient to effect proper drainage. The water table is generally found at a depth of 18 to 30 inches.

The Portsmouth sand owes its characteristic dark color to an accumulation of organic matter in the soil under poor drainage conditions. The hardpan stratum is like that of the Leon soils. On the east the type grades into the Hyde sand or Swamp, while to the west it gradually merges into the Leon. These gradations are due to poorer or better drainage conditions, respectively.

The vegetation of the Portsmouth sand consists of scattered slash and shortleaf pine, with a heavy undergrowth of wire grass, gallberry, and palmetto. On the lower portions of the type gum, bay, magnolia, and titi are found.

None of the type is under cultivation. When well drained, good yields of early truck crops, especially cabbage and onions, may be expected. This soil does not warm up in the early spring as soon as the Norfolk and Leon types, but the larger yields will recompense the grower for the later maturity of the crops. Of the general farm

crops to which it is adapted, corn stands first. The Portsmouth sand, however, is too light in texture to be considered a general farming soil. Applications of marl or lime are decidedly beneficial.

PORTSMOUTH FINE SAND.

The Portsmouth fine sand comprises those areas of dark-colored sandy soils found in the depressions of the eastern part of the county. The surface soil to a depth of 8 to 15 inches is a dark-gray to black fine sand, containing considerable organic matter. The type is uniform in texture, but varies more or less in color with the content of organic matter. In the southeastern part of the county, near Timber Landing, the soil is light gray, resembling the Leon fine sand, but owing to the low position and poor drainage this was not included with the latter type.

Underlying the greater proportion of this type a brownish to reddish-brown hardpan layer is developed, varying from 4 to 12 inches in thickness and averaging about 8 inches. In some places it may be found within a few inches of the surface, while in others it lies at a depth of nearly 2 feet. In small ponds and depressions, slight drainage courses, or seepage ways the hardpan is lacking. It occurs only in the extensive level areas or where the type grades into the Leon. Underlying the hardpan light-brown or iron-stained brown loose fine sand, generally saturated with water, is encountered. The color becomes lighter with depth.

The Portsmouth fine sand is limited to the sandy upland section of the county, occurring in areas ranging from a few acres to several square miles in extent. A large area is found in the southeastern part of the county, extending from Timber Landing to the Sand Hills and Fancy Bluff Road. Large areas also occur along the Brunswick and Altamaha Canal and in the vicinity of Brobston. Other areas of irregular outline and smaller extent are scattered throughout the eastern part of the county.

The area northeast of Sterling comprises ponds, heads of streams, and slight elevations of light-colored soils. The separation of the various soils here was impractical owing to the complexity and small size of the areas, and the body was mapped as Portsmouth fine sand—the predominant soil.

The Portsmouth fine sand occupies a low-lying position and pre-vaillingly has a flat surface. The drainage is poor, the water table being found at a depth of 8 to 24 inches. The type has, in fact, resulted from poor drainage conditions, favoring the accumulation of much organic matter in the soil.

Over the more extensive areas of this soil the native vegetation consists of shortleaf and slash pine, while in the ponds and along the stream courses there is found cypress, gum, bay, and other

water-loving plants. Sedge grass occurs in the low areas, while in addition to this grass in the slightly higher areas there is found wire grass, gallberry, and saw palmetto. None of the type is cultivated, but it has some value as pasture.¹

The following table gives the results of mechanical analyses of samples of the soil and subsoil of the Portsmouth fine sand:

Mechanical analyses of Portsmouth fine sand.

Number.	Description.	Fine gravel.	Coarse sand.	Medium sand.	Fine sand.	Very fine sand.	Silt.	Clay.
		Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	<i>Per cent.</i>
251966.....	Soil.....	0.3	0.8	2.3	78.2	8.7	4.6	5.0
251967.....	Subsoil.....	.1	.5	2.4	83.5	7.0	3.1	3.0

PORTSMOUTH FINE SANDY LOAM.

The surface soil of the Portsmouth fine sandy loam consists of a dark-gray to black loamy fine sand, ranging in depth from 12 to 30 inches and averaging 18 inches. The surface 6 inches generally has a loamy feel, on account of the high content of organic matter. Beneath this surface material the texture changes to a fine sand and the color becomes lighter, though some areas were found where the surface soil was a fine sand and gradually became heavier with depth. The subsoil consists of a fine sandy clay, friable in the upper portion, but sticky and more plastic at lower depths. The color varies from gray or drab, with yellow mottlings, to brownish drab, with a deep yellow and brownish-yellow mottling.

Areas of this type occur chiefly along the stream courses and in interstream areas in the vicinity of Anguilla. An important area is found along the Brunswick and Altamaha Canal, about 5 miles northwest of Brunswick. This includes patches of both the heavier and the lighter textured soils. A few small bodies of typical sandy loam occur along the western edge of the county. The largest body is found as a narrow strip along Little Buffalo Swamp and the Atlanta, Birmingham & Atlantic Railroad. Two small bodies occur about 1½ miles west of Jenks. Had these areas been of sufficient extent they would have been mapped as Portsmouth sandy loam.

The surface features are level to flat and the type occupies low-lying positions or depressions. Drainage is poor, the water table lying from 18 to 36 inches beneath the surface.

Forests chiefly of shortleaf, slash, and longleaf pine, with gum, bay, water oak, and other trees and shrubs which in the wetter areas cover much of this soil.

¹ For a further discussion of this soil see Circular No. 21, Bureau of Soils, p. 14.

The Portsmouth fine sandy loam where properly drained has been found to be a very productive soil. In trucking it is adapted to the production of medium late crops. Onions, cabbage, potatoes, lettuce, and similar crops give good yields. Celery should do well. The type may also be used for corn and forage crops. Applications of lime are decidedly helpful. An acreage application of 1 ton of burnt lime has been found to improve the soil markedly in other sections of the Coastal Plain.

PORTSMOUTH CLAY LOAM.

The surface soil of the Portsmouth clay loam consists of a dark-gray to black heavy loam to clay loam, with a depth of 8 to 12 inches. The texture is heavier where the soil grades into the Portsmouth clay, and lighter in those areas adjoining the lighter associated soils. The soil contains considerable organic matter, making it generally friable, although when wet there is a tendency to stickiness.

The subsoil of the Portsmouth clay loam is uniformly a clay of heavy plastic and sticky nature, though 2 miles south of Jamaica the subsoil contains a gradational stratum of fine sandy clay from 2 to 8 inches thick. The color of the upper portion of the subsoil is dark drab to dark slate, becoming lighter with depth until it is a light drab or gray in the lower portion, mottled in places with yellow. Lime concretions are found in the subsoil in various areas.

The Portsmouth clay loam occurs in scattered areas in various sections of the northwestern part of the county. Several bodies lying only slightly above the swamp are found west and southwest of Everett City. Narrow strips also border Buffalo, Cow Pen, and smaller swamps. A large area occurs about 2 miles south of Jamaica.

The type occupies a low position and is practically level. Several areas occur in drainage ways, where they are usually associated with the Portsmouth clay. The original material was probably formed as estuarine or brackish-water deposits.

In the swampy or stream areas the vegetation is typical swamp growth, while along the borders of streams there is found a scattered growth of pine, gum, ash, water oak, and an occasional cedar. A somewhat different growth is found in those interstream areas mapped between Everett City and Jenks, where the trees are scattered and the surface is covered with sedge grass, a few reeds, rushes, and water-loving annuals.

None of the type is under cultivation. When drained it will be adapted to the production of corn, oats, and forage, of the general farm crops, and to late maturing onions, lettuce, spinach, and cabbage, of the truck crops. Heavy applications of lime would prove beneficial to all crops and increase the friability of the soil.

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

Mechanical analyses of Portsmouth clay loam.

Number.	Description.	Fine gravel.	Coarse sand.	Medium sand.	Fine sand.	Very fine sand.	Silt.	Clay.
		Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	<i>Per cent.</i>
251970.....	Soil.....	0.4	1.1	2.3	44.9	13.0	20.0	18.3
251971.....	Subsoil.....	.0	.5	1.5	32.4	15.9	25.3	23.1

PORTSMOUTH CLAY.

As the soil survey of Glynn County was made during a dry season the greater part of the swampy land was accessible, allowing it to be mapped in detail. A heavy clay soil was found in the swamps of the western part of the county, which was mapped as Portsmouth clay. The surface 3 or 4 inches consists of black clay loam to clay. Beneath the surface a heavy, plastic clay of a black or bluish-black color is encountered. The color becomes lighter at lower depths. Along the margin of the areas and in narrow areas the color is noticeably lighter and a yellowish mottling is conspicuous. Concretions of lime are found in these areas at various depths. In the wider areas where water stands longer the color of the surface ranges from black to slaty blue, finally becoming dark-drab at 24 to 30 inches. This phase is chiefly developed in the larger swamps north of Buffalo Swamp. In the central part of these areas the soil gradually grades into a strip of black clay (Hyde clay) or where water stands the entire year into Swamp. It was impossible to map all these variations on account of the small areas in which they occur.

Several miles south of Anguilla an area was included under this head consisting of a dark-gray to black sandy clay, underlain at 10 to 12 inches by a drab to gray clay of sticky and stiff structure. This area supports practically no trees and is known as Savanna land.

The Portsmouth clay is restricted to the swamps of the western and south-central portions of the county, or where the swamps occur within or in close proximity to the heavy types of soil. In these same swamps, as they pass into lighter textured soils, there is found a correspondingly lighter soil. Several areas of very small extent occur along the southern portion of the Brunswick and Altamaha Canal, but these are not shown on the map on account of their irregularity and small extent. They are found in depressions within the area mapped as Portsmouth fine sandy loam.

The vegetation of the Portsmouth clay areas consists of gum, bay, cypress, shortleaf pine, ash, water oak, and other water-loving species. The cabbage palmetto is abundant, especially along the boundary

zones. The timber growth is thick and typical of swampy and semi-swampy areas.

None of the type is cultivated. When cleared and drained corn, oats, and forage crops may be expected to yield fair returns. On account of the heavy texture of the soil, heavy plows and other cultural implements will be required to handle it satisfactorily. In order to improve the physical condition of the soil, vegetable matter should be turned under frequently. Heavy applications of lime will also increase its friability and correct conditions of acidity.

PORTSMOUTH LOAM.

The Portsmouth loam consists of a black, rather mucky loam, underlain at 12 to 18 inches by a subsoil of gray to dark-drab sandy clay, mottled with yellow, and becoming heavier and more plastic as the depth increases. Occasionally a thin stratum of sandy material is encountered in the subsoil.

The type occurs in small areas in incipient drainage ways and other depressions. Much of the type is developed in irregular areas in the southern part of the county in the vicinity of Union settlement and Black Swamp School. A narrow strip is also found along the Twin Ditches. The drainage is poor. This has much to do with the dark color of the soil, which is the result of accumulation of decaying vegetable matter representing the remains of a rank water-loving vegetation. On account of imperfect aeration, oxidation has been slow in such situations, and the organic matter is added faster than it disappears. Corn, cabbage, celery, onions, spinach, and oats should do well on reclaimed areas of this type.

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

Mechanical analyses of Portsmouth loam.

Number.	Description.	Fine gravel.	Coarse sand.	Medium sand.	Fine sand.	Very fine sand.	Silt.	Clay.
		Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	<i>Per cent.</i>
251968.....	Soil.....	0.1	0.6	1.3	25.6	31.7	21.2	19.3
251969.....	Subsoil.....	.0	.7	2.1	37.6	16.2	16.2	27.1

PORTSMOUTH COARSE SAND.

The surface soil of the Portsmouth coarse sand consists of a dark-gray to black, loose, incoherent sand, 8 inches deep. Below this the texture remains the same but the color is dark gray until a compact stratum of dark-brown medium to coarse sand is encountered at 14 to 20 inches. Beneath this hardpan layer lies a loose and incoherent yellow to gray or white coarse sand. The subsoil is generally saturated with water.

Only one small area of the type, lying $1\frac{1}{4}$ miles northeast of Penton Hill, is found in the county. It is covered with a growth of shortleaf, slash, and longleaf pine, with an undergrowth of palmetto, gallberry, and wire grass.

The Portsmouth coarse sand has a low moisture-retaining and capillary power, and could only be used for very early truck crops. At present none of it is under cultivation.

HYDE SAND.

The Hyde sand consists of a black medium sand, 36 inches deep, with little change in structure throughout except that the surface few inches is more loamy as the result of a higher organic content. The color of the soil is due to included organic matter. When wet the soil stains the fingers black, but in drying some of the larger sand grains lose their coating of carbonaceous matter, and a thoroughly dried sample has a grayish cast.

The largest single area of the Hyde sand extends north and south for a distance of about 2 miles near the Post Road in the southwestern part of the county. Another small area is found southwest of Coleridge at the head of a small stream. Near the western county line, about 3 miles north of Lott, the second largest area occurs. Locally these areas, together with adjoining swamps or low areas, are called bays. The type is found along the eastern edge of the "sand-hills." There are other areas of less importance, but owing to the gradation from one soil to another and the small size, they could not be mapped.

Springs or seepage water from higher situations keeps the soil permanently saturated, the type occurring only on slopes where springs are common. These springs form the heads of many branches which flow eastward across the county. Surrounding these stream heads are found titi ponds or bays, the soil of which, in many instances, consists of this type. Areas adjoin the Portsmouth sand, Leon sand, or Norfolk sand. The Hyde sand originally supported a scattered growth of shortleaf pine, most of which has been cut. A few longleaf pines and water oaks are found, while in the titi bays are gum, bay, magnolia, and other water-loving plants. Over the less swampy areas a thick undergrowth of barberry and saw palmetto is found.

Poor drainage is a characteristic of the areas mapped as Hyde sand. Although the grade of the slope is sufficient to carry off water rapidly, springs keep the soil continually soggy and saturated. To reclaim the soil it will be necessary to make use of tile drains. This would be expensive. If reclaimed, the soil would be especially adapted to such truck crops as celery, lettuce, onions, cabbage, corn, spinach, and probably oats. None of the Hyde sand is under cultivation at present.

A mechanical analysis of a sample of soil gave the following results:

Mechanical analysis of Hyde sand.

Number.	Description.	Fine gravel.	Coarse sand.	Medium sand.	Fine sand.	Very fine sand.	Silt.	Clay.
		<i>Per cent.</i>						
251920.....	Soil.....	1.5	18.3	19.3	48.5	5.1	4.4	3.0

HYDE FINE SAND.

The Hyde fine sand consists of a black fine sand to a depth of 36 inches. The upper 8 inches has a loamy feel on account of the high content of organic matter. Beneath the surface covering the material is more incoherent. The water table is usually encountered at 28 inches. In the lower part of the section the color of the material is generally brownish black, though where the type grades into adjoining lighter-colored soils, such as the Leon fine sand, the subsoil is frequently a very dark gray.

Areas of this soil are confined to the northeastern section of the county where bodies ranging from a few acres to a square mile or more in extent are found. Between the Cartwright Road and Railroad Avenue the soil is found in bodies of irregular outline. These roads are built on higher-lying land, with depressed areas between. In these lower or basinlike areas the soil is extensively developed. A larger and more continuous body is found in a depressed area northeast of Southern Junction. A similar body is also found crossing the Grants Ferry Road, about 3 miles north of Sterling. The type occurs in various relations to other soils of the area. In some places there is a gradation from this type to the better drained Portsmouth, and in others it lies contiguous to the Norfolk fine sand, which is the best drained soil of the area. The latter condition is found $3\frac{1}{2}$ miles north of Sterling.

With the exception of the loam member of this series, the Hyde fine sand is the poorest drained type of soil within the section of the area in which it is found. The type occurs in areas which receive drainage and seepage water from surrounding soils. Water accumulates and remains standing on the surface after each slight precipitation for a considerable period of time. When not covered with water the water table may be found at depths of 6 to 36 inches.

The Hyde fine sand supports a scattered growth of slash pine and shortleaf yellow pine. Small ponds in which cypress and gum occur are common. In general the type may be distinguished from surrounding soils by the sparseness of tree growth, the scarcity of palmetto and gallberry, and the preponderance of sedge grass.

None of the type has been reclaimed. By draining and with applications of commercial fertilizers, chiefly potash and phosphoric acid

and lime, the type can be made to yield good returns from truck crops, such as cabbage, onions, lettuce, turnips, radishes, celery, Irish potatoes, and strawberries. It would also be well suited for sugar cane, corn, oats, and forage crops.

The following table gives the results of a mechanical analysis of a sample of soil of the Hyde fine sand:

Mechanical analysis of Hyde fine sand.

Number.	Description.	Fine gravel.	Coarse sand.	Medium sand.	Fine sand.	Very fine sand.	Silt.	Clay.
		<i>Per cent.</i>						
251965.....	Soil.....	0.1	0.9	3.6	82.2	4.4	3.8	5.3

HYDE CLAY.

The Hyde clay is developed in the swamps of the western part of the county. The type consists of a surface covering of black, plastic, silty clay, with a depth of 3 inches or less, underlain to 36 inches by black plastic clay, containing a few lime concretions and becoming more sticky with depth. It is a difficult soil to handle, except under the most favorable moisture conditions.

The development of the Hyde clay is limited and is confined chiefly to the swampy areas along Green Creek. A small area is found between Thalmann and Bladen, where the Seaboard Air Line Railway crosses Green Creek Swamp. A second area occurs in the same swamp about 1½ miles farther east. This type of soil will likely be found as narrow strips in the central portions of the swamps in other sections of the county when they are drained. Owing to their small width, the areas could not be shown on the map. There is no doubt that the Hyde clay exists in small areas in the lower-lying portions of the type mapped as Portsmouth clay, where water stands longest.

The Hyde clay is among the lowest and poorest drained of the upland soils. Under ordinary conditions it would be classed with swamp, as it is covered by water nearly the entire year, but owing to the dry season at the time the present survey was made access to the several bodies mapped was possible.

A swamp vegetation exists on the Hyde clay areas. The characteristic larger growth consists of gum, ash, cypress, swamp maple, water oak, and an occasional cabbage palmetto, the last along the margins of the areas. Bay and magnolia are also found. The undergrowth consists of the various briers, titi, and on the higher portions scattered clumps of saw palmetto.

The Hyde clay at present is uncultivated. For utilization a thorough system of drainage must be established, when fair returns of corn, oats, and forage crops may be expected.

Below are given the results of a mechanical analysis of a sample of soil of the Hyde clay:

Mechanical analysis of Hyde clay.

Number.	Description.	Fine gravel.	Coarse sand.	Medium sand.	Fine sand.	Very fine sand.	Silt.	Clay.
251912.....	Soil.....	<i>Per cent.</i> 0.0	<i>Per cent.</i> 1.4	<i>Per cent.</i> 1.7	<i>Per cent.</i> 19.4	<i>Per cent.</i> 10.7	<i>Per cent.</i> 28.7	<i>Per cent.</i> 37.8

HYDE LOAM.

The Hyde loam consists in general of a black, mellow loam to a depth of 36 inches. The surface 12 inches contains sufficient fine sand to make it easily friable, while from 12 to 30 inches it is more silty and mucky. A brown fine sand is encountered within the last 6 inches. As the type is found in depressions and along stream channels, it is very variable. In some portions a black silty clay is found at a depth of 18 to 30 inches, while in other places the type approaches a heavy fine sandy loam.

This soil occupies the greater proportion of the small depressions or basinlike areas occurring in the eastern or sandy part of the county. It is only found in very poorly drained localities. The type is usually covered with from 6 to 18 inches of water, while in dry seasons the water table may sink as low as 10 inches below the surface. The largest body is found about 1 mile northwest of Southern Junction. It comprises drainage-way, pond, and stream-head areas in a swampy condition. North of Brunswick it is developed in a chain of small, irregular bodies.

Gum, cypress, bay, magnolia, ash, and some pine are the prominent tree species on the Hyde loam. Other water-loving trees occur and bushes abound. When drained this soil will be found to be one of the most productive in the county. The crop adaptation and the required fertilization are practically the same as for the Portsmouth loam. Corn, oats, cabbage, lettuce, spinach, and celery would give best results. For trucking it will be a later type than the lighter-colored soils, but the yields should be larger.

A mechanical analysis of a sample of soil of Hyde loam gave the following results:

Mechanical analysis of Hyde loam.

Number.	Description.	Fine gravel.	Coarse sand.	Medium sand.	Fine sand.	Very fine sand.	Silt.	Clay.
251983.....	Soil.....	<i>Per cent.</i> 0.4	<i>Per cent.</i> 0.7	<i>Per cent.</i> 2.4	<i>Per cent.</i> 61.8	<i>Per cent.</i> 5.4	<i>Per cent.</i> 10.0	<i>Per cent.</i> 19.2

PARKWOOD FINE SANDY LOAM.

The Parkwood fine sandy loam, although very limited in extent, is one of the most productive soils of the county. The soil to a depth of 6 to 8 inches consists of a grayish-brown loamy fine sand, the color being somewhat lighter in higher lying areas and darker in the lower positions, as, for instance, in the zone of gradation between this soil and the Hyde loam of Dixon Swamp. In a second area near Georgetown the soil to 12 inches is a dark-gray or gray sandy loam to loam, mottled with white, and the surface 2 inches is often lighter than the material below.

The subsoil begins abruptly at an average depth of 8 inches, and to 18 inches is a heavy clay loam to light sandy clay. The material usually becomes heavier with increase of depth, and from 18 to 22 inches is a heavy sandy clay. Lime concretions are also found in this zone, giving the subsoil a crumbly appearance. At an average depth of 22 inches white marl¹ is encountered. The entire subsoil is friable when moist and hard and brittle when dry. The color ranges from drab to grayish brown in the upper portion to grayish yellow below. The shades become lighter or darker according to the factors which influence the color of the surface soil.

Only two areas of this soil occur within the county—the largest about 1 mile northwest of Southern Junction, the second near Georgetown along a stream emptying into Turtle River. For the greater part of the year the latter area is covered with water.

Topographically the type is flat and lower than the surrounding soils, excepting the Hyde loam of Dixon Swamp, and on account of this the drainage is poor. Cultivated portions are ditched at frequent intervals to carry off the surface water. After continued rains of several days' duration the entire area may be covered with water for sufficient time to drown the crops planted. This disadvantage is remediable by a more comprehensive system of drainage.

Very little of the type remains in native vegetation, as it has been largely cleared and used for farming. Shortleaf pine, water oak, sweet gum, and ash are the varieties of trees found. These form a dense growth and attain good size. A very heavy undergrowth occurs on some areas formed by the saplings of the different trees mentioned, with myrtle, water-loving shrubs, and some palmetto.

As the Parkwood fine sandy loam is a poorly drained soil and the crops are subject to loss by drowning, special methods of cultivation must be employed. The land for corn is bedded up, with water furrows 6 feet apart, and seed planted on the beds. For sweet potatoes the tops of the beds are 16 inches high. No cotton is planted.

¹ An analysis made by the Geological Survey of the State of Georgia shows this marl subsoil to contain 14.48 per cent lime (CaO), 1.46 per cent alumina (Al₂O₃) and ferric oxide (Fe₂O₃), and 66.85 per cent silica (SiO₂).

Corn, oats, and sweet potatoes are the chief crops grown upon this type. Corn averages 30 bushels per acre, with 75-pound applications of 8-1-5 fertilizer. Without fertilizer oats yield about 3 tons of hay per acre. Sweet potatoes average 150 bushels per acre with an application of 500 pounds of an 8-1-5 fertilizer. Cowpeas and crab-grass hay yield 4 tons per acre. Cabbage, turnips, and Irish potatoes are also grown to a limited extent.

The yields of crops planted upon this type of soil could be materially increased by an application of barnyard manure in quantities ranging from 1 ton to 5 tons per acre, followed by an application of the underlying marl. The soil is badly in need of organic matter. Deeper plowing and subsoiling would also be beneficial to this type. In subsoiling the clay should not be brought to the surface, but only loosened by the plow.

The following table gives the results of mechanical analyses of samples of the soil and subsoil of the Parkwood fine sandy loam:

Mechanical analyses of Parkwood fine sandy loam.

Number.	Description.	Fine gravel.	Coarse sand.	Medium sand.	Fine sand.	Very fine sand.	Silt.	Clay.
		Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	<i>Per cent.</i>
251904.....	Soil.....	0.1	0.8	1.7	52.7	23.6	15.5	5.5
251905.....	Subsoil.....	.0	.7	1.2	36.4	19.1	25.5	17.1

SCRANTON FINE SAND.

The surface soil of the Scranton fine sand consists of a dark-gray to black very fine sand to fine sand with an average depth of 12 inches. The soil is loose, but contains sufficient organic matter to make it slightly loamy. The line of demarcation between soil and subsoil is abrupt at a depth of about 12 inches. The subsoil consists of a yellow very fine sand to fine sand of a loose and incoherent structure. At lower depths the color fades to a very light yellow, becoming in some places almost white. Throughout the soil and subsoil oyster and other marine shells are encountered, which with cultivation gradually accumulate on the surface.

The Scranton fine sand is found in a narrow strip along the western coast of Jekyll Island and nowhere else in the county. The surface is level to very gently undulating, with a slight slope along the eastern boundary toward the lower-lying soils. Ample surface drainage is thus afforded while movement through the subsoil is free. The soil was probably cast up by the tides and waves, though the wind has assisted to some extent.

The type supports a good growth of longleaf and shortleaf yellow pine, liveoak, and cedar, with a thick, dense undergrowth of saw palmetto.

Jekyl Island is a popular winter resort, and no agriculture is carried on on this soil. It is well adapted naturally for the production of early truck crops, although they would mature somewhat later than on the closely associated Norfolk fine sand.

ALTAMAHA CLAY.

The heaviest and most difficult soil to cultivate found within the levee districts of the Altamaha River is the dark-colored bluish clay mapped as Altamaha clay. On account of its heavy, intractable nature, it is considered an inferior agricultural soil as compared with the other soils of the river bottom.

The type consists of a heavy, plastic clay, with the exception of the surface inch or so, which contains sufficient organic matter and silt to give a noticeable degree of loaminess. In the main the texture is quite uniform, but slight depressions occur where the surface is slightly lighter than the typical soil. The clay is very plastic and sticky when moist and upon drying becomes hard and stiff. The color of the upper portion of the soil is a dark drab to dark slaty blue, becoming gradually lighter with depth, until at 18 inches the difference in color becomes quite noticeable. Below 18 inches the color grades into a light bluish drab to bluish gray.

The Altamaha clay grades into the Georgetown clay toward the river and as this soil is approached the structure of the Altamaha clay becomes more friable and the mottlings less blue, finally giving way to yellowish colors.

Cultivation is difficult, owing to the sticky nature of the wet soil and its hard, intractable structure when dry. Finding the two conditions within a few inches, the one overlying the other, increases the difficulty, for when the surface 2 inches may be in condition to plow the underlying portion is wet and sticky, and when the latter is in good condition the surface is usually hard. This is especially true when the land is to be broken after lying idle for some time. Cultivation should be attempted only when the soil is moderately dry. Applications of lime and the incorporation of vegetable matter would establish a more desirable structure and enable earlier plowing.

The Altamaha clay is developed in the southwestern part of the rice field district of the Altamaha River bottom. It occurs in one large body, comprising nearly one-half of the Hopeton Plantation.

The type occupies a higher position than the other soils of the river bottom, although it is low enough to be classed with these soils. The surface is flat, with a gentle slope toward the river. On the south a perceptible bluff separates it from the upland soils. Under natural conditions the type would be poorly drained to swampy, but a complete system of ditches, laid out in 1801, gives ample drainage.

From its association with the other bottom soils the type would seem to represent the alluvial material of the Altamaha River. Occurring

at a somewhat higher level and having more of the characteristics of the Portsmouth clay, there is a possibility of the material having been formed somewhat as the Portsmouth clay—perhaps under marine conditions.

The type originally supported a typical swamp growth of cypress, swamp maple, ash, pine, bay, and magnolia, with other water-loving trees and shrubs. As it is uncultivated at present there is a scattered growth of shortleaf pine, and a luxuriant undergrowth of sedge grass. Cedar, bay, and gum trees occur along the old ditches. The type is probably best suited to rice and corn.

The following table gives the results of a mechanical analysis of a sample of soil of the Altamaha clay:

Mechanical analysis of Altamaha clay.

Number.	Description.	Fine gravel.	Coarse sand.	Medium sand.	Fine sand.	Very fine sand.	Silt.	Clay.
		<i>Per cent.</i>						
251955.....	Soil.....	0.2	0.8	0.9	10.0	13.4	35.6	38.6

ALTAMAHA CLAY LOAM.

The soil of the Altamaha clay loam consists in general of a friable clay loam with a depth of about 8 inches, dark bluish gray in the upper part and the same color mottled with dark yellow below 4 inches. The first inch or two consists chiefly of decaying vegetable matter and the texture varies, in some places the clay of the subsoil outcropping. The subsoil is a clay of an extremely sticky and plastic nature and variable color.

Areas of this type occur along the Barrington Road in the Clay Hole Swamp, extending from the Altamaha River to some distance south of the road, where they grade into the Portsmouth clay.

The type is developed in a drainageway depression and is poorly drained and subject to overflow. In times of high water in the Altamaha River it is covered to a depth of 10 feet.

None of this land is under cultivation, and it is covered with a growth of native timber, the growth consisting of gum, ash, slash pine, cypress, water oak, bay, and magnolia. The saplings of the various trees form a very thick undergrowth. A few clumps of saw palmetto are also found.

A phase occurs in the southwestern corner of the Altamaha River rice-field district consisting of a friable clay loam, becoming heavier below until the subsoil is reached at an average depth of about 14 inches. The soil varies in color from a brownish black to white, changing to dark drab in the lower portion. It contains considerable organic matter and is easily cultivated.

The subsoil from 14 to 18 inches is a dark drab silty clay. From 18 to 24 inches the clay becomes plastic, the color changing to gray or drab with mottlings of an orange color. In this section the clay is sticky and tenacious, becoming more so with depth. At 24 inches the mottling of yellow or orange disappears, the material coming lighter with depth and gradually changing into a bluish drab.

The topography is level, with a gentle slope away from the bluff line, which forms the southern and western boundaries of the type. The natural drainage is poor, although the type is well drained at present by a system of open ditches.

This phase of the Altamaha clay loam area is cleared, but under natural conditions a growth of swamp vegetation was supported. Along the ditches at present is found a growth of cedar, shortleaf pine, gum, ash, and water oak. The phase occupies an old artificial lake bed. The sediment of silt and sand deposited by changing the water of the lake, with the accumulated organic matter, gave rise to the clay loam surface soil. Rice, corn, grass, oats, and forage crops should do well on this type.

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

Mechanical analyses of Altamaha clay loam.

Number.	Description.	Fine gravel.	Coarse sand.	Medium sand.	Fine sand.	Very fine sand.	Silt.	Clay.
		Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	<i>Per cent.</i>
251949, 251953.....	Soil.....	0.4	1.5	2.1	22.5	13.7	33.9	25.4
251950, 251954.....	Subsoil.....	.3	1.1	1.2	18.2	12.9	29.9	35.6

GEORGETOWN CLAY.

The Georgetown clay is the predominant soil of the lower Altamaha River flood plains. It is one of the most productive soils of the county, having been farmed for more than a hundred years, mainly in the production of rice. Owing to differences in the subsoil, several phases were mapped. These differences are recognized in part by the plantation owners, and must be recognized to a greater degree as scientific practices advance.

The soil of the typical Georgetown clay to a depth of 6 to 15 inches consists of a yellowish to chocolate-brown silty clay, mottled with drab and reddish-brown streaks. When moderately dry the soil is fairly friable and works up into a very good tilth under proper cultivation. Those fields that have been under cultivation longest have a lighter yellowish-brown color and the structure is more dense, and the soil is apparently heavier than in case of the less severely used areas.

The subsoil is a sticky, plastic, silty clay, becoming softer and more sticky with depth, as a result of increase in moisture content. The color of the upper portion is drab or gray to bluish gray with occasional mottlings of dark brown. Bluish colors usually become more pronounced as the depth increases. In places soft, mucky material is encountered at a depth of 30 inches or more, in which case the lower part of the subsoil is dark brown to reddish brown in color. Decaying logs and stumps are frequently encountered in the subsoil.

The typical Georgetown clay is developed chiefly near the stream channels. The surface is flat and lower than the level of the river at high tide. The typical areas also lie somewhat lower than the phases of the type.

The Georgetown clay is formed from the silt and clay washed down principally from the Piedmont section of the State and deposited by the waters of the Altamaha River. The deposition is greatly increased at this point by the influence of the tides, which act as a dam in checking the velocity of the river. The type grades into Tidal marsh as the mouth of the river is approached. It is possible that some of the lower subsoil material was formed just as the Tidal marsh is being formed at the present time.

No distinction has been made by the plantation owners between this and the mucky subsoil phases, but the two have been recognized as the best land in the Altamaha River bottom for rice since 1818 (see Pl. I, fig. 2). Rice yields at present about 40 bushels per acre. The agriculture of the river bottoms in the chapter on agriculture is almost entirely confined to this soil and its mucky subsoil phase.

Georgetown clay, swampy phase.—Portions of the Georgetown clay have not been under cultivation for years. Through neglect the dikes have broken down, subjecting large areas to constant overflow. As a result, vegetation, principally reeds and brush, has encroached upon the old fields. This phase is shown in the map by swamp symbols. Repairing the ditches and dikes would be the first step in the reclamation of these areas, the removal of the reed growth now covering the land to follow. The tree growth is scattered and its removal would not entail any great expense.

Georgetown clay, mucky subsoil phase.—The mucky subsoil phase of the Georgetown clay is similar to the typical soil, consisting of a yellowish-brown friable clay, mottled with reddish-brown in the first few inches and grading below into a gray plastic clay, slightly mottled with yellow. At from 12 to 18 inches the first change in material is noted. Here the clay assumes a dark-brown color from the stain of the organic matter below. As depth increases the color becomes darker with the increase in organic matter content. At about 18 inches almost pure muck is found, which extends to a depth

of 36 inches or more. Decayed logs and stumps are frequently encountered throughout this lower section.

This phase is most extensively developed in the eastern and western portions of the Altamaha River rice field district. It is typically developed between the true Georgetown clay and Muck and represents an intermediate soil between these types. As the Georgetown clay is approached the muck lies at lower depths, while toward the areas of Muck the depth of clay gradually decreases. Where the phase does not lie between the Muck and the typical Georgetown clay the surface clay is deeper near the river.

This phase has a flat surface and lies very slightly higher than the Georgetown clay. It is also subject to overflow by the breaking of the dikes. The phase represents the sediments of the Altamaha overflow water laid down over muck.

Georgetown clay, salt marsh phase.—Along the eastern edge of the rice fields is a narrow strip of the salt marsh phase of the Georgetown clay which has been abandoned to the encroachment of salt marsh. The vegetation consists of the typical marsh grasses and the area must be reclaimed by ditching and diking. This phase is shown on the map by marsh symbols.

Georgetown clay, sandy subsoil phase.—Of the various phases of the Georgetown clay, the sandy subsoil phase is most distinct in its features and agricultural value. The surface is similar to the typical clay of the bottoms, except that a slight quantity of fine sand is found with the clay. The surface covering of clay persists to an average depth of 15 inches, ranging from a mere surface coating to about 36 inches in thickness. Throughout the phase occur knolls of fine sand, which vary in extent up to about one acre. As these knolls are approached the clay overlying the sand gradually grades from a thin layer of clay to fine sandy clay, which finally gives way entirely to the fine sand. This condition is found in all the areas mapped except near the bluff marking the boundary between the bottoms and uplands.

The sandy subsoil of this phase consists of white to gray fine loamy sand, ranging from dark-brown to black between 24 and 30 inches. This sandy material is very compact and hard to penetrate with the soil auger.

This soil occupies a slightly higher position in the river bottoms than any of the other phases. After removal of the flood water used in rice irrigation this land can be worked quicker than the other bottom soils.

Apparently the phase represents former islands of sand that existed within the old swampy bottoms, over which clay has been deposited by the Altamaha River. As these sandy areas were slightly higher than the surrounding soils subject to overflow, the

silt and clay apparently covered them only in part, leaving the higher points or knolls as they now exist, without a clay covering.

In one of the areas near the river there is found a surface covering of sand overlying the clay, which in turn is underlain by fine sand. The surface sand in all probability is due to deposition by the river. Along the bluffs the phase occurs in an entirely different manner, the clay being deposited over the fine sand which formed the lower slope of the bluff.

The sandy subsoil phase of the Georgetown clay is recognized as a distinct soil by the farmers, especially where the sand approaches the surface. Rice yields some 25 per cent less than on the other phases of the type, and on some plantations is not planted at all on this phase. When it is planted it starts earlier and matures earlier than on the heavier soils. This phase is well adapted to the production of Boston head lettuce and sweet potatoes, and is considered the best bottom soil for Irish potatoes, two crops a year being produced in the same field, the fall crop being the better. As high as 900 bushels of white Bermuda onions are reported to have been produced on one acre of this phase. The onions were planted in September and October and harvested the latter part of March and the first week in April. String beans have produced 200 bushels per acre when planted in August as a fall crop. This vegetable requires 6 to 8 weeks for maturity. Cotton starts earlier and is more prolific on this phase, yielding from two-thirds of a bale to 1½ bales per acre.

The following table gives the results of mechanical analyses of samples of typical soil and subsoil and of the sandy subsoil phase of the Georgetown clay:

Mechanical analyses of Georgetown clay.

Number.	Description.	Fine gravel.	Coarse sand.	Medium sand.	Fine sand.	Very fine sand.	Silt.	Clay.
Typical:		<i>Per cent.</i>	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.
251956.....	Soil.....	0.0	2.9	2.5	15.4	4.3	35.2	39.1
251957.....	Subsoil.....	.0	1.1	.7	11.3	5.1	31.9	50.0
Sandy subsoil phase:								
251962.....	Soil.....	.0	5.0	3.3	25.9	2.9	22.5	40.3
251963.....	Subsoil.....	.3	3.5	7.2	70.2	8.8	7.2	2.8

MUCK.

In the areas mapped as Muck the surface 6 inches contains a slight quantity of clay and silt intermixed with the mucky material, forming a more stable and solid surface layer. With increase in depth the mineral matter content decreases, being replaced by a soft, light-weight, dark-brown to black layer of decomposed vegetable

matter, which extends to a depth of 36 inches or more. In boring into this type partly decomposed stumps and logs are invariably found. The type grades into the Georgetown clay, mucky subsoil phase, as the Altamaha River is approached. The gradational features consist of an increasing quantity of silt and clay in the surface material until there is a sufficient quantity to give rise to a surface covering of clay to a depth of 8 to 15 inches.

Muck is mapped along the front of the bluff bordering the Altamaha River bottom. The largest area is found in the eastern part of the rice-field district, extending westward for a distance of four-fifths of a mile and averaging about one-fourth of a mile in width. A second, smaller area, occurs as a narrow strip about $1\frac{1}{2}$ miles west of the first body. The surface is practically level and slightly depressed as compared with the soils nearer the river channel. Natural drainage is lacking. Where drained by ditches the water table is found at a depth of 12 to 18 inches. The general level of the surface lies below high-water mark.

Muck is the product of accumulated vegetable matter, thoroughly decomposed and disintegrated, with the addition of a small quantity of mineral matter. The organic matter is derived from the remains of water-loving trees and plants deposited in this formerly swampy area, while the mineral matter is derived from the silts and clays carried down by the Altamaha River from the Appalachian and Piedmont sections of the State.

The larger part of the Muck area has been cleared, the remainder supporting a heavy growth of gum, cypress, pine, bay, and water oak. It is well adapted to corn, cabbage, celery, onions, lettuce, and, in a general way, to most all truck crops. Heavy applications of lime (from 1 to 2 tons of burnt lime per acre) usually benefit crops adapted to this type.

TIDAL MARSH.

Tidal marsh varies in different parts of the county. The most extensive phase consists of dark-brown or black soft mud. Certain portions of the marsh are known as "hard marsh" land. This phase is usually slightly higher than the oozy phase, although it is covered each day by the tides. The material consists of a gray to bluish-gray fine sandy clay, becoming mottled with yellow. The surface is firmly held by the tightly woven roots of the marsh grasses.

The Tidal marsh of Glynn County covers extensive areas. The type occurs chiefly between the mainland and St. Simon and Jekyll Islands, extending far back into the interior of the county to Anguilla. Tidal marsh reaches inland from the coast as far as the streams are influenced by the tide.

The Tidal marsh was formed by the deposition of sediment by tides and inland streams in the quiet waters of sounds or bays. The

marsh condition probably represents the first step in the formation of some of the higher, better drained soils such as are represented by the Bladen series. The islands of St. Simon and Jekyll have formed a barrier along the coast, behind which these sediments have been deposited. Off the east coast of St. Simon Island an extensive area of Tidal marsh has been formed in the same manner, Little St. Simon and Isle of Palms in this case acting as the barrier.

Marsh grass is the typical growth on the areas mapped as Tidal marsh. On the hard marsh near the land the cabbage palmetto forms locally named "Palm Groves," while as the gradation to land occurs the next growth consists of cedar, quite an extensive growth of which is found on Little St. Simon Island.

The areas of Tidal marsh are nonagricultural under present conditions. Reclamation by diking, ditching or tiling, and pumping, and then by leaching the salt from the soil, by artesian or rain water, is possible in certain areas. Sugar cane and rice are the crops that would be likely to succeed best after the land is sweetened.

There were no reclaimed areas of the typical Tidal marsh from which positive information could be secured in regard to the agricultural worth of the material.¹

COASTAL BEACH.

The Coastal beach consists of a white fine sand of a loose and incoherent nature from the surface to 3 feet or more in depth. This material occurs just back of the hard and compacted beach proper. In a few instances on Jekyll Island it assumes the characteristic topography of Dunesand, but such areas were not separated on account of their small extent. The type occupies a narrow fringe along the coast of St. Simon and Jekyll Islands. The sands of the Coastal beach support an occasional bush or tree. The type is non-agricultural land.

SWAMP.

The type mapped as Swamp comprises those low-lying areas where the surface waters accumulate and slowly moving toward the tidal streams form the drainage system of the county. Such areas are found in every part of the county. Buffalo Swamp is the largest, averaging about 1 mile in width and extending from a point in the northwestern part of the county, about 1 mile west of Everett City, southeastward to about 1 mile east of Anguilla where it connects with

¹ A sample of salt marsh collected near Brunswick, which was of the "hard marsh" phase and contained approximately 5 per cent of organic matter and 2.65 per cent of water soluble salts (principally chlorides) was leached in a circular pot 8 inches in diameter with 8 liters of water (5 liters passing through) during a period of 10 days and the soluble salt content thereby reduced to 0.12 per cent. In 14 days with 14 liters of water (8 liters passing through) there was a reduction to 0.08 per cent; and in 30 days with 24 liters (16 liters passing through) to 0.05 per cent. Cabbage, wheat, and corn without other treatment than lime failed to grow to any considerable extent on the leached material. This method of getting at the crop value of salt marsh would not necessarily give the same results as field tests and conclusions should be based only upon the results secured from the reclaimed land in the field.

Tidal marsh. The next largest area of Swamp is that adjoining the Altamaha River. The following rivers or drainage ways are also bordered by Swamp: Little Buffalo, Cow Pen, College, Little Satilla, and Turtle.

The soil material of Swamp consists in the main of a bluish to black clay of a very sticky and plastic structure and rather impervious to water. Concretions of lime are occasionally encountered through the soil section. Upon the surface of this clay there usually rests a layer of dark-colored decaying vegetable matter, often containing enough mineral soil particles to constitute a mucky loam. In some places this muck accumulation is 3 feet or more in depth. Also some patches of the Portsmouth and Hyde soils are included with the Swamp type, but where these were of sufficient size and could be reached they were shown in the map.

The areas of Swamp support a dense growth of water-loving plants. Gum, ash, cypress, swamp maple, swamp pine, bay, and magnolia comprise the principal tree growth, while the undergrowth consists of saplings of the various trees and water lilies, water hyacinths, reeds, and briers. The growth in general is very dense and practically impassable. The type at present is of no agricultural importance, being valued for the timber and to a certain extent for pasturage. It would be costly to drain these lands. Canals and large lateral ditches would be necessary, and in places protection from overflow would have to be provided by diking. Properly drained, corn, rice, and a number of vegetables could be successfully grown on the Swamp areas.

SUMMARY.

Glynn County is situated in the southeastern part of Georgia, and has an area of 437 square miles or 279,680 acres. Brunswick is the chief town and county seat.

The climate is mild, with a mean annual temperature of 66° F. The winter mean is 51° and the summer mean 81°. The influence of the ocean tends to modify extremes of heat and cold. The precipitation, 53 inches, is ample for annual crop production.

Excellent shipping facilities are afforded by the railroads within the county and the steamship lines touching at Brunswick.

The early agriculture was confined to St. Simon and Jekyl Islands and the Altamaha River bottoms. After the Civil War farming was abruptly abandoned, naval stores and lumbering occupying the attention of the people. It is being rejuvenated at present, but development has only begun. The rice field district of the Altamaha River is the center of agricultural operations. Rice of fine quality has been produced on these fields since early in the nineteenth century.

The soils of the county range from coarse sand to heavy clay. Thirty-four types were recognized and mapped. Only eight of these are naturally well drained.

The Norfolk soils are well-drained upland soils adapted especially to early truck crops. Most of the agriculture in the upland section of the county is found on soils of this series.

The Leon soils are upland soils thoroughly if not excessively drained. They are of low agricultural value. The cost of clearing these soils will range from \$30 to \$60 an acre.

The Coxville very fine sandy loam is an excellent soil for general farm crops and vegetables coming upon the market in midseason.

The Scranton fine sand should prove to be a desirable soil for trucking purposes.

The Bladen soils are extensive, but must be drained before they can be developed. The clay loam member is difficult to handle on account of its heavy, plastic nature. Good yields may be expected from these soils when drained.

The soils of the Plummer series excepting the fine sand are poorly drained and undeveloped. When drained, they will make good soils for the production of truck crops.

The more sandy members of the Portsmouth series, when drained, have been found well adapted to trucking. The heavier members should be devoted to corn and oats. These soils are found in low, poorly drained places and contain large quantities of organic matter.

Of the poorly drained soils the Parkwood fine sandy loam has been found to be most productive. With surface ditches or bedding good yields of corn, oats, and late truck crops have been produced.

The sand, fine sand, and loam of the Hyde series are well suited for corn and late truck crops. The clay should be utilized for corn and oats and possibly late cabbage.

The soils of the Altamaha series are found within the levee districts of the Altamaha River. Forage crops as well as rice, oats, and corn should do well. The clay member of the series is difficult to handle.

The Georgetown series includes the lands of the diked districts of the Altamaha River which have long been in cultivation. These areas have produced good yields of rice and sugar cane. Several different phases of this type are shown in the map. Some areas have been abandoned and are now tidal marsh and swamp.

Muck is a valuable soil for corn, celery, cabbage, and onions. It occurs within the Swamp and river bottoms and requires drainage.

Tidal marsh, Coastal beach, and Swamp are nonagricultural types.

Improvement of the poorly drained soils depends mainly upon drainage and thorough cultivation. The chief need of the well-drained upland soils is organic matter. A thorough drainage system should be established for the county as a whole. With this Glynn County will have a promising future, especially as a truck-growing district.

[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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