

SOIL SURVEY OF BALDWIN COUNTY, ALABAMA.

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DESCRIPTION OF THE AREA.

Baldwin County is located in the southwestern part of Alabama. The Gulf of Mexico touches it on the south, while Mobile and Perdido bays form, respectively, the southwestern and southeastern limits. North of Mobile Bay the Alabama and Tensaw rivers mark the greater portion of the western boundary, Monroe County bounds the area on the north, and Escambia County, Ala., lies on the east above the Florida-Alabama state line. Below the latter Escambia County, Fla., forms the eastern border as far south as the head of Perdido Bay.

The length of the county from north to south is about 72 miles, while the extreme width is nearly 32 miles. It contains approximately 1,585 square miles, or 1,014,400 acres.

With the exception of the Alabama River Valley, practically all of this area is an elevated plain, with a general inclination toward the south. The following elevations are taken from the Louisville and Nashville Railroad surveys:

Foley, 80 feet; Sumnerdale, 115; Robertsdale (Silverhill), 148; Loxley, 170; Bay Minette, 268; Perdido Station, 213. In the northwestern part the decline to the Alabama River Valley is rather abrupt, gravelly bluffs and hills forming most of the western escarpment of the uplands. The northeast part of the county is a con-

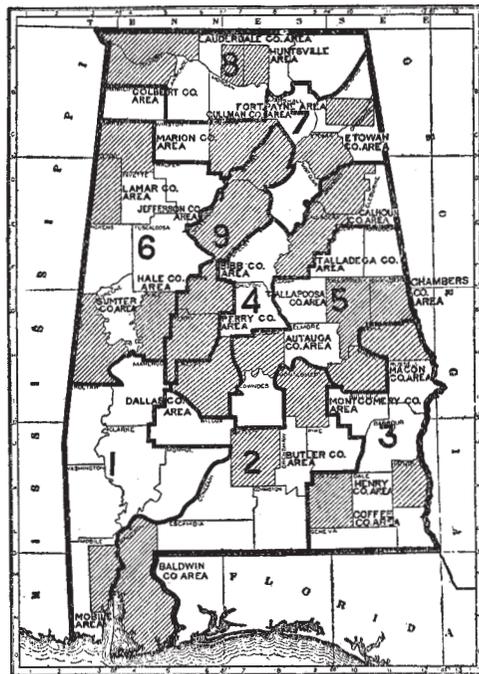


FIG. 25.—Sketch map showing location of the Baldwin County area, Alabama.

tinuation of the highlands of the adjacent counties with no natural boundary intervening. Farther south, however, the valley of the Perdido River is a marked topographic feature. It widens and deepens to the head of Perdido Bay, leaving the eastern border of the uplands in well-defined relief.

In the southern end of the county the slopes toward the coast are moderate, but in most places the general elevation of this part of the uplands is well maintained to within a mile or two of tide water. On each of the bays there are occasional bluffs from 20 to 50 feet high, where the interior highlands extend to the water's edge. A border of low sandy land skirts the Gulf coast and there are also numerous strips of marshy land on the inlets and bays, but their total area is comparatively small.

Most of the county is drained by tributaries of the Alabama and Perdido rivers. In the north part the direction of the drainage is chiefly toward the west, although there are a few north-flowing creeks of inferior size. Little River, Turkey Creek, and further south Majors and Pine Log creeks receive most of the waters of this region and discharge into the Alabama River. Bay Minette and White House creeks are minor streams draining much of the rough territory northwest of Mobile Bay.

Fish River, the principal stream of the southwestern part of the county, has a nearly north-south course and empties into Weeks Bay. Between this river and Mobile Bay there is a very wide divide, whose surface is broken by but few drainage lines.

From parallel 31 northward there is much rough land around the heads of the west-flowing streams. Between their lower courses the central divides widen into areas of rather moderate relief, with frequent level stretches covering several hundred acres each. Some of these areas of highly desirable farm land extend well up to the crest of the hills overlooking the Alabama Valley, but toward the east they become more broken, often forming gravelly ridges or steep knolls covered with iron crusts. Horseneck Creek flows through a very rough region, but south of the headwaters of that stream comparatively level land extends along the eastern boundary nearly to Perdido Station.

South of parallel 31 the drainage of the eastern part of the county is toward the southeast. Between Perdido Station and Bay Minette the topography is characterized by long divides that generally decline with moderate slopes to the semiswampy ground bordering Dyas Creek and its larger tributaries. Styx River rises just below Bay Minette and joins the Perdido River a few miles above the head of Perdido Bay. The heads of its western tributaries extend well back into the central divide of the area. Its largest eastern tributary is Hollinger Creek.

The surface of most of the land drained by these streams is rolling to moderately hilly, the more broken areas generally being formed at the extreme heads of the minor branches. The divide between the Styx and Perdido drainage systems is a broad, high ridge of somewhat varied relief. The surface in general is rolling to moderately hilly where the fine sandy loams occur, while longer slopes and less abrupt surface changes are observable where the deeper sands prevail.

The Blackwater River drains a considerable area south and west of the Styx River. These streams have comparatively narrow valleys. On the lower Styx and Blackwater the valleys are a mile or more wide in some places, but along their upper and middle courses the bottom lands are of limited extent, frequently little more than a narrow strip of swampy ground.

All of these streams, as well as scores of smaller ones, maintain their flow the year round. In all the hilly sections springs are numerous, affording an abundance of excellent water for stock and domestic use.

As previously mentioned, the central divide from Bay Minette northward includes some very broken country. South of this town the watershed is a comparatively flat-topped ridge. The Bay Minette and Fort Morgan Railroad is located on this divide, and a view from the car windows conveys the impression that the country is level. At a distance of a mile or so on each side, however, the surface is hilly, the relief increasing as the crest lines above the valleys are approached. From Summerdale southward the central divide widens. Around Foley and for several miles to the south the surface is comparatively level, but is undulating or moderately rolling near the small streams that empty into the bays.

In general all that part of the area south of a line drawn from Daphne to the Blackwater River has relatively mild relief, and includes but little land topographically unfit for farming.

A characteristic feature of the level areas of the upland is the small but dense groves of cypress and black gum. They mark the shallow depressions where water stands most of the year.

Approximately 222 square miles of the county are included in the Alabama Valley. Of this area about 47 square miles consist of second bottoms lying from 10 to 20 feet above the overflow land. The latter are popularly termed "the Swamp," but this is a misnomer with regard to most of that part above Stockton. Most of the surface has an elevation of several feet above the usual level of the river and is comparatively dry during the summer and fall. South of the thirty-first parallel much of the flood plain is lower and it is more frequently inundated by slight rises of the river or by high tides. Most of this lowland is heavily forested with oak, gum, maple, poplar, and other deciduous trees.

The second bottoms and practically all the uplands of the entire county were originally covered with longleaf pine, but this magnificent forest has been almost completely removed in most sections, and has everywhere suffered the ravages of fire and wasteful methods of lumbering. Over many square miles in the central and southern parts of the area the blackened stumps and dead pine trees give the landscape a dreary and uninviting aspect. The scene is relieved to some extent by the younger growth of pine, which forms an uneven and scattering forest, usually heaviest where in recent years the seedlings have not all been destroyed by the annual burning of the grass by stockmen and turpentine gatherers. In most places the upland woods are now so open that the view along the ridges and toward the drainage lines on each side is comparatively unobstructed.

There is generally a dense growth of swamp pine, bay, gum, and other water-loving trees. The savannas occur throughout the eastern half of the county but are characteristically developed in the southeastern part.

The earliest white settlements were made on the Mobile Bay coast by people of French origin. The Creole settlements on Weeks Bay and Bon Secours River are more than 100 years old. Very early in the nineteenth century there were some white people located in the Alabama Valley above Montgomery Hill Landing. From the latter class of pioneers gradually came the early agricultural development of the choicest lands in that section. For many years before the war there were fine plantations on the Alabama River, the homes of the owners being on the uplands to the east. Corn and cotton were the chief crops, raised entirely by slave labor. The river afforded a convenient outlet for the cotton, and Stockton became a shipping point of considerable importance until 1860, when the Louisville and Nashville Railroad was built across the county.

There were comparatively few farms in the "piny woods," as the interior uplands were called, before the war. Until within the last 20 years there were miles of unbroken forest in most parts of the area. There yet remain extensive tracts in the northern and eastern sections, which are very sparsely settled.

After the war the gradual increase in population—up to a few years ago—was largely due to the lumber interests. In the last decade large tracts of cut-over land have been acquired by capitalists or passed under the control of colonization companies. These large holdings have been divided into smaller pieces—40 acres being a favorite-sized subdivision—and are offered to settlers on very favorable terms with regard to time of payment. Vigorous efforts have been made to induce immigration, and several well-established colonies are located in the southern part of the county. In addition,

hundreds of individuals have recently purchased land either for present occupancy or as an investment.

The new towns of Foley, Summerdale, Robertsedale, and Loxley owe their origin and growth chiefly to the agricultural development of the surrounding country. The population is somewhat cosmopolitan in character. While the majority of the new settlers are from the North Central States, there is a considerable number of foreign-born people among them. There are also several settlements of distinct nationalities in the southern part of the county.

Silverhill is a Swedish colony founded in 1894. It now numbers about 150 families. Nearly all are engaged in farming and own the land occupied.

Elberta is a German town, and people of that nationality form a large proportion of the population in that immediate section of the county.

There are many well-improved farms in both colonies, as well as in other sections where farmers have been located a sufficient length of time to clear a considerable acreage and erect suitable buildings.

The Fairhope colony was founded about fifteen years ago by some Iowa people who wished to put into actual practice the single-tax ideas of Henry George. The original membership was about 80, not all of whom, however, were ever actual residents. The society, now organized under state laws as the Fairhope Single-Tax Corporation, owns about 4,000 acres of excellent land fronting on Mobile Bay. It leases to individuals, whether members or not, land for residential, business, or agricultural purposes, the lessee making all improvements thereon at his own expense. The corporation virtually stands between the lessee and the State and county with regard to payment of taxes on both land and buildings. In actual practice the renter pays the taxes, but receives credit for the full amount in discharging his obligation to the corporation. The rates on town lots are low, depending upon location. Land for cultivation may be rented at rates ranging from 55 cents to \$1.25 an acre. Between one-fifth and one-fourth of the colony's holdings are now improved. Fairhope is a well-built town having about 400 inhabitants.

There are very few colored people in the southern part of the county.

The small towns on Mobile Bay are winter resorts and attract many tourists. There are also many cottages and some handsomely improved country residences on the water front and along the tide-water portion of the small streams entering Mobile and Perdido bays. The latter is a beautiful body of water with numerous indentations. Most of its shore line is comparatively high, affording fine residence sites.

Fishing and oyster dredging are industries of considerable local importance on lower Mobile Bay.

There is a regular boat service between Mobile and the towns on the "eastern shore." The Alabama River steamers also touch at all of the landings on that stream in the northern part of the county.

The main line of the Louisville and Nashville Railroad crosses the county, affording direct communication with northern cities. The branch line from Bay Minette, the county seat, extends as far south as Foley, and is the outlet for the products of the interior towns in the lower part of the county. Additional transportation facilities are greatly needed in many sections.

Throughout the county the main highways are located for the most part upon the ridges and are maintained in good condition with but little expenditure for repairs. The roads that cross the divides are very hilly and many of the streams are not bridged. In the southern part of the county many of the old roads as well as new ones are located on section lines.

There are only a few routes where rural delivery of mail is made daily, but star routes reach practically all settled portions of the area.

The population of the county has increased considerably during the last decade, the census of 1900 giving 13,194 and that of 1910, 18,178. There is a relatively large floating population in the bay-front settlements.

CLIMATE.

The climate of this area may be described as warm temperate. The winters are mild, the weather much of the time being clear and pleasant. The summers, while long, are not unpleasant, being agreeably tempered by the Gulf breezes. The effect of the latter is more observable in the extreme southern part than in the northern section. The general elevation also favors an air movement conducive to human comfort and confines the depressive effect of continued high temperature as experienced on flat lands to the comparatively limited areas of marsh and swamp.

The mean temperature during the summer months is about 81° F. There are only a few days on which the thermometer registers above 90° F. The nights are invariably cool.

The departures from the winter mean of 52° show a considerable range, but the absolute minimum of -1° F. is very exceptional. The surface of the ground where unprotected freezes a few times each winter to a depth of perhaps one-half inch. Snow occasionally falls, in a few instances having been deep enough to cover the ground and remain for a few hours.

The average annual precipitation of 62 inches is fairly well distributed. As a rule the excess of rainfall in occasional short periods

in the summer causes more inconvenience to farmers than any deficiency. The precipitation during the summer of 1909 occurred chiefly as short, hard thunderstorms.

The average date of the last killing frost in the spring is February 24. The earliest in the fall may be expected about November 30. The growing season for all crops is thus long and for the hardy plants and vegetables it is almost continuous. With a little protection many of the latter grow almost all winter. In the extreme southern part of the county the proximity to the Gulf and the sandy nature of the soil tends to equalize the minor changes in temperature so that tender fruits and shrubs sometimes escape injury from frosts that may cause damage on the uplands.

The appended table has been compiled from the records of the Weather Bureau station at Mobile, a station located about 20 miles west of the south-central part of the county. Observations covering the last fifteen years have been made at Daphne. The mean monthly temperature of the latter place is slightly higher than that of the former, but the difference is slight.

Normal monthly, seasonal, and annual temperature and precipitation at Mobile.

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.....	53	79	14	4.6	1.6	4.7	T.
January.....	50	78	11	4.8	0.6	4.1	T.
February.....	54	80	- 1	5.3	3.0	10.1	T.
Winter.....	52			14.7	5.2	18.9	T.
March.....	59	85	25	7.4	2.2	6.8	0.0
April.....	67	90	32	4.5	2.0	7.2	0.0
May.....	74	98	46	4.2	5.5	10.1	0.0
Spring.....	67			16.1	9.7	24.1	0.0
June.....	80	101	50	6.1	4.2	26.7	0.0
July.....	81	102	64	6.7	9.2	4.3	0.0
August.....	81	101	57	6.9	4.8	4.7	0.0
Summer.....	81			19.7	18.2	35.7	0.0
September.....	77	96	49	4.9	3.6	4.0	0.0
October.....	63	93	34	3.2	5.6	4.6	0.0
November.....	58	83	25	3.5	0.3	3.8	0.0
Fall.....	68			11.6	9.5	12.4	0.0
Year.....	67	102	- 1	62.1	42.6	91.1	T.

AGRICULTURE.

Until within recent years lumbering has been the chief industry in this county. Even in the northwestern part, where there are some old and well-improved plantations, the owners were generally as much interested in sawmills or turpentine stills as in farming. The same was true with regard to the smaller landowners, who usually depended quite as much upon employment in the woods as upon the returns from the limited acreage cultivated. The native population has been rather reluctant to make farming the chief business, but present conditions are causing the people to do so. The depletion of the forests, the higher prices of all staple commodities, and also the infusion of new ideas through increased immigration are creating a new sentiment regarding agriculture. New methods are being introduced, and there is a general recognition of the fact that old practices must in a measure be abandoned and others adopted more in accord with present conditions and the requirements of more expensive habits of living.

In the northern part of the area and on all the older farms in general, cotton and corn continue to be the principal crops. Not much attention is given to other products, except what may be needed for home use. On the larger farms colored labor is employed to a considerable extent, both as wage hands and tenants, and the methods of tillage are similar to those in vogue throughout the South, where negroes do most of the field work.

On the smaller farms, where the cultivated land does not usually exceed 25 or 30 acres, the work is done principally by the owner and his family. Labor-saving implements are coming into more general use, and more attention is devoted to corn and forage crops than formerly. Many of these smaller farms are well kept and attractive in appearance. The majority of the old homesteads, however, have unpainted log or frame buildings, and the acreage of cleared land is usually small.

Most farmers own cattle and hogs which range the woods the year round. In many instances no provision is made for winter feed, except possibly for a few milch cows and the younger stock. A few men have introduced new breeds of cattle, but since all stock runs at large, and no effort has been made to eradicate the ticks, there is little incentive for the introduction of high-grade animals.

In the southern half of the county agriculture is in its formative period. A few settlers, who have been here a number of years and are fairly well established, are finding what crops are most profitable or best adapted to their particular location. The majority of the recent settlers are from the northern States and many have had little previous experience in farming. The latter class especially

are attracted by the possibility of large profits that trucking frequently affords. They are also in most instances in need of immediate returns from the limited acreage it is possible to clear during the first year or two of their residence.

During the last few years Irish and sweet potatoes have been extensively grown, and the acreage is increasing. The former are planted about the middle of February and are ready for digging the last of April or first part of May. Northern-grown seed is used, mostly from Tennessee, but some is obtained from Michigan. Different methods of preparing the ground are followed, but most of the growers "flat break" the land, plowing pretty deep. Two-horse implements are in common use in preparing a seed bed and giving subsequent cultivation. A few planters and improved diggers are also in use. A high grade of commercial fertilizer is applied before planting at the rate of 1,000 or 1,200 pounds per acre. The brands now in favor with the growers analyze about 10-4-8.^a

Sweet potatoes are usually planted immediately after the Irish potatoes are off the ground, without additional fertilization. The ridge method of culture is practiced exclusively.

Both Jersey sweets and "Dooley yams" are grown, but preference is shown the former. The average yield may be placed at about 200 bushels per acre, although this estimate is frequently exceeded by careful growers. The earliest shipment of sweet potatoes is made about July 1, but the crop planted after Irish potatoes is dug in September and October.

Foley is the chief center of the potato-growing district. In 1909, 68 cars of Irish potatoes were shipped to northern cities. The average yield, as reported by the Baldwin County Producers' Corporation, was 122 bushels per acre, and the average net returns were 88 cents per bushel.

Watermelons and cantaloupes are most successfully grown, but the market facilities are unfavorable. The low, sandy lands of the coast district are too far from railroads, although some watermelons are grown and shipped by boat to the Gulf ports.

In one instance cantaloupes were grown near Elberta, and the small shipments sent to Chicago gave very poor returns; but this is said to have been due to faulty sorting and packing. They were planted about the middle of February, and the first picking was made June 8.

A very great variety of fruits may be grown in this county. That it has contributed such a small amount to the markets is due chiefly to the lack of transportation and the indifference of the older settlers to any opportunities that may have existed for the development of such a business.

^a 10 per cent phosphoric acid, 4 per cent nitrogen, 8 per cent potassium.

In recent years some disastrous attempts in peach raising have practically destroyed all interest in that line of fruit growing. A number of orchards varying in size from 5 to 40 acres each were planted, but now nearly all the trees are dead. The San Jose scale was the chief cause of the loss, but there were other unfavorable conditions. Many of these orchards received but little cultivation and fertilization, and no systematic efforts were made to combat the scale. In the selection of varieties little attention was given to their probable adaptability to the soil and climatic conditions of this locality. It would seem advisable to choose stock grown upon and which has successfully fruited on the Orangeburg or Norfolk soils of the coast region rather than that propagated for years past upon the limestone or shale lands several hundred miles to the north.

The small sand pears are easily grown and the trees are nearly blight resistant, but the fruit is not held in such favor as the Keiffer.

Figs are most easily raised, the trees requiring but little care. Japan persimmons and also loquats are quite commonly grown, chiefly as novelties or ornamental trees. A few English walnut trees have attained a size sufficient to bear fruit. Many varieties of grapes have been recently planted and some careful growers have secured limited quantities of fine fruit, but the industry is largely experimental. The banana, so commonly grown as a lawn ornament, occasionally bears, although the fruit is rather small.

Considerable attention has been given to pecan planting. Most of the old orchards are located on the Norfolk sand or fine sandy loam. If well fertilized the trees make a good growth, but where no special attention in this respect is given the trees do not thrive and bear rather sparingly. Pecan trees require a good soil, their native habitat being the Mississippi Valley. It should therefore seem advisable to select alluvial or semialluvial loams rather than the upland soils for this tree. The fine specimens seen on the best phases of the Kalmia fine sandy loam indicate the suitability of such soils for the pecan.

Orange and grapefruit trees grow well in the southern part of the county. The Satsuma and the large native oranges have been produced in sufficient quantities during the last few years to partially supply the local demand for such fruit. On the coastal beach and the Kalmia soils very favorable locations for orchards may be found. The Satsuma oranges are also planted upon the uplands, small orchards being frequently seen on the new farms.

Both the orange and grapefruit trees are severely injured by a temperature of 10° or 15° below freezing, but usually sprout again and in two or three years bear fruit. The liability to permanent injury is lessened by banking earth around the lower part of the trunks.

Not much attention has been given to the cultivation of small fruits. Blackberries and dewberries grow wild in abundance. Strawberries have heretofore been grown only in gardens or in a small way for shipment from some of the towns on Mobile Bay. Excellent locations for the field culture of this crop may be found near the railroads. Well-drained fine sandy loam not more than 6 to 8 inches deep with sandy clay subsoil should be selected. The moisture conditions in such a phase, if of an Orangeburg or Norfolk type, is generally better than in lighter soils. It would be well to grow and turn under some leguminous crop the previous year, then after it is well decayed give frequent tillage before considering the ground ready for the plants or for applications of commercial fertilizer. On most soils a pretty heavy application of a complete fertilizer will be necessary and should be put on at intervals during the early growth of the plants. Early varieties in gardens occasionally ripen in the latter part of February. In field culture it is probable that shipments could be made about March 15.

The manufacture of sugar-cane sirup is an industry of great promise in this county. The Norfolk sand and the Norfolk fine sand, especially the loamy phases, are well adapted to the growing of a cane that will make a clear and delicately flavored sirup. The heavier soils of the Norfolk series and the Orangeburg soils make even better yields than the light soils, but the color and flavor of the sirup is not so good. The question as yet is hardly considered, however, for the local trade is not critical and practically takes all that is offered by the few manufacturers who produce any considerable quantity. The home demand is largely supplied by farmers who make a comparatively small amount of sirup in open kettles. The retail price is about 50 cents a gallon.

The present average yields of sirup range from 200 to 400 gallons per acre, but the latter is frequently exceeded. In southern Georgia, where considerable attention is given to this industry, much heavier applications of fertilizers are considered necessary than are usually given in this county. On light soils a ton of medium grade commercial fertilizer, analyzing about 8-2-2, is used in addition to 25 to 50 bushels of cotton seed and several tons of well-rotted manure.^a

A good grade of shade-grown Sumatra tobacco has been produced in this county. Its culture was on a very limited scale and undertaken chiefly as an experiment. In one instance it was grown on a rather loamy phase of the Orangeburg sand,^b in another place the Norfolk fine sandy loam was selected for an experimental plot.

^a For details concerning fertilization and culture of sugar cane see Soil Survey, Grady County, Ga., Field Operations of the Bureau of Soils, 1908.

^b Four miles west of Muscogee, Fla.

The culture of tobacco is being taken up on an extensive scale near Summerdale.

A light phase of the Norfolk fine sandy loam and the Norfolk fine sand, loamy phase, correspond quite closely with the favorite "wrapper leaf" soils of Florida and Georgia. Similar phases of the Greenville sandy loam and Orangeburg fine sandy loam—that is a loamy sand 15 to 20 inches deep, underlain by a moderately heavy sandy clay subsoil, are desirable for the shade-grown tobacco. A somewhat heavier phase of the Orangeburg is better for the Cuban-filler varieties.^a

The profitable production of corn, oats, hay, and other forage crops depends so much upon individual management that no general statement covering these crops can be made. On suitable soils and with proper cultivation all may be raised in sufficient quantities to supply the home necessities, even if the number of head of live stock were increased. Owing to the limited acreage cleared on the average upland farm there is not much opportunity for a rotation of crops, although the advantage of such a plan has not generally been appreciated. Dependence has been placed upon the easily applied commercial fertilizers, combined with a limited use of manure and cottonseed meal.

The present average yield of corn for the entire county is less than 20 bushels per acre. If from this estimate the production upon the Cahaba soils were subtracted, the yield from the uplands type would probably be less than 15 bushels.

There is a disposition on the part of the more prosperous farmer to give more attention to the cultivation of corn, oats, and forage crops and engage in stock raising, rather than to attempt the production of special crops requiring intensive cultivation. The price of all grain, hay, meats, dairy products, and poultry products is comparatively high. Much that is consumed in the county now comes from outside sources.

The chief limitation in the production of beef and pork is the lack, on most farms, of suitable feed, especially during the winter months. By the use of fall-sown oats, rye, or vetch it is possible to have green pasture during most of the winter. Cowpeas, velvet beans, soy beans, and sorghum are summer crops which with proper management can be made to give a long succession of green crops or excellent hay. Some difficulty is experienced in curing hay, owing to the frequency of rains, but with improved machinery and better barns for storing it this crop can be handled with good success.

^a For details concerning the culture of Sumatra and Cuban filler tobaccos see Soil Survey reports of Gadsden and Jefferson Counties, Fla., and Thomas County, Ga. Also Bulletin No. 37, Bureau of Soils, and Farmers' Bulletins, Nos. 60, 82, and 83.

On any well-drained land that has been cultivated a year or two Bermuda grass will form a good sod and furnish pasture six or seven months in the year. Carpet grass, which prefers rather low land, also appears whenever the native vegetation is destroyed. Japan clover is well distributed over the county, but has not generally spread into cultivated fields. Crab-grass and "Florida clover" come up thickly in fields after the corn is laid by. One or the other of these plants invariably covers the ground after an early crop has been removed unless the land is plowed again. These are frequently cut for hay, and the "clover" forms a very nutritious winter feed. All these grasses have heretofore been regarded as pests by the cotton growers, but their value is being appreciated by men interested in the possibilities of dairying and stock raising.

Several thousand bushels of upland rice are produced each year near Elberta and Foley. The yield is upward of 25 to 30 bushels per acre, and the quality excellent. The methods of raising this cereal are about the same as for spring-sown oats. The unhulled grain and the straw are quite commonly used as feed for live stock.

Creameries have been built at Fairhope, Silverhill, and Foley. A number of farmers are collecting dairy herds preparatory either to patronizing these creameries or for the production of butter on their own farms.

Pork can be produced here as cheaply as in other sections of the South where hog raising has proved to be a profitable business. The cheap feeds—soy beans, cowpeas, chufas, peanuts, and tuber crops—with a very little grain are sufficient for production of a rather light weight hog. Animals of this class are in good demand in the local markets and neighboring cities.

In the suggestions regarding stock growing due consideration is given the fact that a larger acreage of cleared land is required and more fencing and better buildings are needed than with the old cotton-and-corn system of farming, also that much more capital and time of preparation is necessary than in truck growing. But the demand for the staple meat and dairy products and the certainty that they can be produced justify considerable effort toward the adoption of such a system of farming. Unfortunately the majority of new settlers have not the capital to make necessary improvements. Most of them buy uncleared land, and therefore must spend a year or more in simply beginning to farm.

The clearing of the pine land is a laborious process. The usual method consists in gathering the felled timber into piles and burning it, after utilizing some of it for fence posts. The stumps are generally burned, but stump pullers are used by some of the land companies in clearing considerable acreages. The cost of clearing

new land ranges from \$10 to \$20 an acre. All fields must be securely fenced, for stock of all kinds runs at large.

Intending settlers should bear in mind that two years or more are required to get new land in satisfactory condition for farming. The cost of keeping teams, buying seed and fertilizers, and making necessary improvements requires considerable outlay of money before any returns can be expected. The lack of local markets for the more easily grown products has been a serious obstacle in the development of the new lands, but this condition is improving through the organization of shippers' associations.

There has not been much opportunity for employment except at sawmills and turpentine stills, where negro labor is generally preferred. At present there is a good demand for labor on the larger farms. White farm labor commands about \$1.50 a day; colored, \$1, but the rate by the month for hands is about \$20 and board. Not many white men, however, are so employed. On the larger plantations colored help is commonly used.

The average size of farms, according to the census of 1900, was 220 acres. This is too high an estimate for the present, for all the farms opened up since that time are much smaller. Taking the tax assessors' returns for 1909, the total area under cultivation is nearly 16,000 acres. The total valuation of farm lands and improvements is about \$3,500,000.

All improved land has rapidly advanced in value during the last few years. It is assessed at about \$5 an acre, which represents roughly about one-fourth the actual value. The price of uncleared land depends very much upon location and the character of the standing timber. It is assessed for taxation at values ranging from \$1.25 to \$10, the last being rather exceptional. The more desirable uncleared farm lands offered by the colonization companies now (1909) range from \$20 to \$30 an acre. In sections remote from towns the price varies from \$5 to \$15 an acre.

SOIL IMPROVEMENT.

Practically all the tillable soils are deficient in humus and low in their content of lime. The highly siliceous nature of the material from which most of the upland types are derived indicates a relatively smaller proportion of the minerals that supply potash and phosphorus than commonly exists in soils of alluvial or glacial origin.

This conception of the general characteristics of the soils is sustained by observations in the field and the experience of farmers. The latter are almost unanimous in the opinion that the cultivated lands are inherently poor and require artificial fertilizers. The majority of the settlers from the Northern States take this view after

a few years' experience, and fall into the habit of depending largely upon commercial fertilizers to maintain crop yields.

The requirements of special truck crops and the necessity of securing immediate returns renders the use of complete fertilizers unavoidable in many instances. It is desirable, however, to consider economical methods of increasing the average yields of the ordinary farm crops without a continual expenditure for imported fertilizers.

The high value of barnyard manure and cotton seed is so well appreciated that a discussion of their use is hardly necessary. Under present conditions, and doubtless for a long time to come, the amount of either or both of these fertilizers produced on the average farm will be insufficient to maintain the fertility of the cultivated land. To bring the soil up to a reasonably high state of productivity, recourse must be had to crop rotations so arranged that liberal amounts of vegetable material will be returned to the land.

For this purpose the legumes—peas, beans, and clovers—are most valuable, for they directly add to the soil available nitrogen, besides increasing the humus content. Any kind of vegetation is beneficial, for the desired object is the incorporation of as much organic matter with the soil as possible. The list of available plants which can be profitably used includes the usual forage crops, besides the introduced grasses and weeds that are becoming more numerous as the acreage of cleared land is increased. Nothing should be burned.

If a forage crop is pastured, about the same result is obtained as if it were plowed under, provided the cattle or other stock remain on the land, so that there is no loss of manure. In actual practice it is the better plan. If a heavy cover of vegetation is plowed under, time must be allowed for decomposition; otherwise the succeeding crop may be more injured than benefited.

Plants are richest in the nutritive elements a little before the period of maturity. Their return to the soil at this stage undoubtedly contributes more of the elements of fertility than if they are permitted to become dead and suffer more or less waste through weathering before being plowed under.

In many cases a sharp disk could be used to advantage in chopping up a heavy growth of vegetation so that it may be turned under. The plowing should be shallow in order to give free access of air and moisture. Decay is thus hastened, and the actual preparation of the seed bed may be made later.

Humus has several distinct values in soil improvements. Its presence improves the physical condition of a soil type of any kind, rendering it loamy and mellow and therefore more easily kept in good tilth. The capacity to maintain an equable moisture content is greatly increased. The latter is a factor of great importance in plant growth.

The nitrate-forming bacteria are most active in a soil well filled with organic matter, provided the drainage conditions are good. To these microorganisms is due in large measure the available nitrogen supply of cultivated ground. It is also true that in a soil well supplied with humus more of the mineral elements—phosphates and potash—become available. Therefore the presence of organic matter is of direct advantage with regard to the essential mineral elements. The cause of this is obscure, but the fact seems well established.

The climatic conditions of this region tend to a comparatively rapid exhaustion of the organic matter in the soil. The high average temperature and humidity hasten the processes of decomposition, and there is no season during which they are checked as in northern latitudes. This is the chief cause of the scanty amount of vegetable matter in the virgin soils, rather than the frequent burning of the woods as is so generally supposed. The character of the native vegetation of the uplands, moreover, does not favor an accumulation of humus in the soil that supports it. A larger amount may be added to cultivated land by means of quick-growing herbaceous crops than exists in new land. The presence of such a cover crop also checks to a considerable extent the rapid oxidation of the organic matter that takes place in a bare soil and prevents loss through surface washing. Even in a field where gullies do not form there is frequently a loss of fertility through the removal of the finest soil particles during heavy rains.

The volunteer crops of crab grass, "Florida clover," and other weeds are beneficial in this respect, but fall-sown oats, rye, and vetch are recommended as winter cover, with catch crops of cowpeas or velvet beans or any other quick-grown plant during the summer when a piece of ground may otherwise be bare.

In connection with an increase of the vegetable matter content of soils the application of lime is advised. This mineral should not generally be used, except with manure or green crops; in the latter case it hastens decomposition and corrects acidity. Lime should be applied to the poorly drained spots in all types, for the latter are frequently acid.

It is highly probable that floats, or finely ground rock phosphate, could be profitably used where the foregoing recommendations concerning the humus supply are observed. The raw rock phosphate goes into solution slowly and results would be apparent during a term of years. Of course, the acidulated form is best where quick returns are wanted, but as a permanent soil improver and an economical means of increasing the phosphoric acid the use of the raw rock can be advised. The cost at the mines is but a few dollars a ton, to which would be added the freight.

A crop rotation which seems well adapted to the conditions on many farms in the county, excepting the few larger plantations where negro labor is employed, may be outlined as follows: Fall-sown oats, rye, vetch, or crimson clover, either used as winter pasture or turned under as green manure; second year, cowpeas, soy beans, velvet beans, for pasturage and green manure, or sweet or Irish potatoes followed by either of the above crops; third year, cotton, corn, or potatoes.

The potash requirements have usually been met by direct application of complete fertilizers. In the above scheme rather light applications of either the muriate or sulphate of potash mixed with manure or cotton-seed meal should be used, if a high grade is desired. The kainit is a lower grade and could be used any time. The cost of these materials would probably be more important than other considerations.

The plan here outlined looks to the improvement of the soils with regard to the better adaptation to all crops generally grown, rather than the specific requirements of particular crops. On the latter point the publications of the state experiment station and literature relating to the particular product should be consulted. But the poverty of the cultivated lands with regard to humus and consequently the low supply of available nitrogen renders an increase in this essential element a matter of prime importance with all crops.

As the development of the agricultural interests advances, more of the rolling and hilly land will be cleared, and the necessity of terracing will become apparent. The methods of tillage which must be followed on terraced land are not generally favored by settlers from the northern States, accustomed to the use of heavy implements and straight rows for all cultivated crops. The frequent heavy rains and the light nature of the soils render the latter method exceedingly injurious on hilly land. Some modification of the terrace plan of laying out fields should be adopted before gullies begin to form. As far as practicable, all plowing and cultivation should be parallel to the line on which terraces would be laid out by an experienced "hill farmer." Such land should be used for grass and sown crops as much as possible.

It is doubtful if ground having an inclination of more than 15° from the horizontal should be cleared and kept in cultivation. The character of the soil should be considered; the loams with heavy subsoils are more susceptible to injury than the deep sands.

SOILS.

With regard to their general origin the soils of Baldwin County fall into two well-defined divisions of very unequal areal extent. The smaller one includes all the "overflow" land and the second

bottoms of the Alabama River. The larger division comprises all the soil types derived from the Lafayette formation. The latter embraces not only the upland soils—which are essentially the weathered surface of the original deposits—but the alluvial and semialluvial types along the smaller streams and the sandy lands that skirt the southern coast. The last-named types as found in neighboring areas have usually been referred to the Columbia formation, but in this county they are so limited in extent and of such direct derivation from the Lafayette deposits that it seems reasonable to consider the coastal sands as a subdivision of the latter.^a

The Lafayette material in this area has the same general characteristics that it presents throughout the Gulf coast region of Alabama and northern Florida. Most of it, excepting the superficial weathered layer, is a red or reddish-brown sand and sandy clay. In the northern part of the county and on the slopes facing the Alabama Valley it carries a great deal of waterworn gravel. Toward the south there is a gradual diminution of coarse material and an increase in the relative proportion of the finer constituents. The coarsest phases are in some instances stratified, but in general the formation is a homogeneous mixture of sand, silt, and clay. As a rough estimate from one-third to one-half of the deposit, where undisturbed by subsequent changes, consists of particles finer than fine sand. This adds immeasurably to its value as a soil-forming material and accounts for the prevalence of types with comparatively heavy subsoils. Exception may possibly be made regarding the upland region south of the Blackwater River, where the surface layer is a fine sand, with a low but remarkably uniform content of silt and clay.

The maximum thickness occurs on the wide central divides and on the gentle slopes around the indentations of the coast. On the former it ranges from 20 to 40 feet. On the flanks of ridges and wherever erosion is vigorous the thickness is extremely variable. In the hilly sections the sand and clay of the underlying Grand Gulf formation is frequently exposed; and the weathered surface material is largely from that formation.

The deposits of Grand Gulf age have locally contributed much material to the Lafayette formation. The lower portion of the latter often includes a good deal of micaceous sand, more frequently it is highly argillaceous and rapidly graduates with increase of depth into a heavy sedimentary clay. This light-colored clay stratum is not generally more than a few feet thick, often it is only a few inches, but it is nearly impervious and has greatly influenced the drainage

^a This agrees with Dr. E. A. Smith's published statement regarding Columbia in Baldwin County. See *Underground Water Resources, Alabama Geological Survey*, p. 25.

of all the soil type developed upon the thinner portions of the Lafayette. The outcrops of this clay give rise to the innumerable springs occurring in the rougher sections of the country. The beds of undurated sand associated with or underlying this clay are the source of an inexhaustible supply of pure water reached on the central divides by wells driven through the Lafayette.

At the contact between the Lafayette and underlying Grand Gulf beds iron crusts varying from thin plates to masses weighing many tons have been formed. The latter are usually a brown conglomerate rock, very hard and durable. In the northern part of the county fragments of this ferruginous material are abundant on the narrow ridges and local elevations. They generally indicate the presence of a heavy clay subsoil. In like manner the occurrence of the small, reddish-brown iron concretions is dependent in part upon the nature of the subsoil. They are most abundant where the latter is the weathered upper portion of the Grand Gulf clay.

The Lafayette formation is highly siliceous, containing comparatively little material that is easily soluble. It has suffered a good deal of leaching, due perhaps to conditions attending its deposition, but its permeability and the heavy rainfall of this region also tend toward this result. The iron content has also undergone a high degree of oxidation, red being the normal color, while the gray and light-brown tints of the surface zone are the results of secondary or recent processes.

The differentiation of the Lafayette deposits into nearly twenty soil types is chiefly the result of solution, erosion, and redeposition of the superficial materials. The effect of these processes is determined by the local character of the materials acted upon, the degree of surface relief, and also is influenced by the nature of the vegetal covering. Erosion is a comparatively unimportant factor on the level land, but of greatest influence in soil changes where the topography is more varied.

Where erosion has been and still is especially vigorous, much of the original Lafayette covering has been removed. In such localities the soils are of variable depth and composition, while the subsoils are generally a heavy clay.

The Susquehanna clay represents the extreme degree of erosion, while the Norfolk fine sandy loam, broken phase, is the result of a more moderate measure of denudation.

On the broad divides the Lafayette material remains in about the same physical condition as when deposited. Erosion has affected it very little, but there is a tendency for the clay particles of the soil to be carried downward into the subsoil, leaving the former a little coarser and causing the latter to become somewhat more compact than in the original condition. Such translocation of soil grains is

most observable in sandy material, and is one cause of the predominance of fine sandy soils with comparatively heavy subsoils.

On the more moderate slopes, where the silt and clay particles are being removed faster than the coarser ones, sands and sandy loams have been formed; on the lower slopes, where conditions are favorable for its accumulation, deeper sand is found as a result of surface creep and wash. Over much of the upland area the surface sand is not removed to lower levels quite so fast as the grains are loosened by solution and interstitial erosion from the clayey matrix of the substratum. Therefore sandy loams of moderate depth with sandy clay subsoils are of very common occurrence.

The results of this process, however, are modified by local differences in the composition of the material as originally deposited. There are innumerable places ranging in size from mere spots of a few acres to areas of several square miles where the upper portions of the Lafayette formation consists chiefly of sand. The erratic occurrence of these arenaceous spots and the results of the processes just outlined combine to produce a constant succession of changes in the physical character of the soils, especially where the surface is rolling or hilly.

The difference between the red and yellowish-brown soils of the uplands—the Orangeburg and Norfolk series, respectively—is doubtless a result of differences in the average water content of each and the consequent effect upon aeration and oxidation.

In general, that phase of the Lafayette material giving rise to the Orangeburg and Greenville types has such a physical structure that it maintains a good moisture content regardless of considerable variations in rainfall. If the latter is excessive, the subsoil and underlying material, instead of remaining saturated for a considerable time, is generally soon relieved by the downward escape of the surplus. It also retains moisture well, and evidently is thoroughly aerated. These conditions give the high degree of oxidation of the iron content of this material, resulting in the characteristic red color of the subsoils.

Those types having the yellow or brown subsoils do not seem to possess the power of maintaining quite such uniform moisture conditions. They are more generally affected by extremes of precipitation, remaining wet longer after heavy rains, and also becoming drier in periods of drought, although the friable fine sandy surface that the yellow soils so generally have acts somewhat as a natural mulch and frequently offsets careless cultivation. The lower subsoil is frequently rather heavy, and it influences the underdrainage. While by no means poorly drained, the yellowish soils have not quite such effective underdrainage and aeration as have the red soils.

The light color of some of the coarsest alluvial soils is simply the characteristic tint of comparatively clear quartz grains, but in many

instances the light bluish gray, or "water-soaked gray," of the subsoils may indicate the presence of ferrous salts in considerable quantities.

In the Alabama Valley there is not such a diversity of types as upon the uplands. Over the entire area where sedimentation is now in progress the materials are remarkably uniform in color and general composition. The deposits, although derived from widely varied sources, are so recent and the surface conditions so nearly alike everywhere that there has been but little differentiation, from the standpoint of soil classification.

On the second bottoms several types occur, chiefly as the result of different drainage conditions, although the division of the Cahaba series into three types represents textural distinctions.

In general, the various soil types in each of the two physiographic divisions—the Alabama Valley and the interior uplands and coastal regions—are the results of processes, most of which are now in operation, rather than to inherent differences in mineralogical composition, although the latter is a factor of importance in comparing the soils of one section with those of the other.

The transition from one soil type to another is usually gradual, especially if the types are closely related. In many places where the surface is hilly the variability in the depth of the soil and character of the subsoil give rise to conditions not possible to represent upon a map of the scale used. In such cases the general average of the area is indicated.

The actual and relative extent of the various types is given in the following table:

Areas of different soils.

Soil.	Acres.	Per cent.	Soil.	Acres.	Per cent.
Norfolk fine sandy loam.....	146,368	28.3	Orangeburg sand.....	9,535	0.9
Norfolk fine sandy loam, broken phase.....	140,544		Norfolk loamy sand.....	9,216	.9
Norfolk sand.....	190,784	18.8	Kalmia sand.....	9,088	.9
Norfolk fine sand.....	74,624	13.9	Tidal marsh.....	6,656	.7
Norfolk fine sand, loamy phase.....	67,008		Cahaba loam.....	6,016	.6
Ocklocknee clay.....	70,464	6.9	Portsmouth sand.....	5,824	.6
Myatt fine sand.....	46,144	4.5	Susquehanna clay.....	5,312	.5
Meadow.....	32,128	3.2	Kalmia coarse sand.....	5,184	.5
Swamp.....	31,680	3.1	Chastain fine sand.....	4,672	.5
Norfolk gravelly sand.....	25,152	2.5	Myatt sand.....	4,352	.4
Orangeburg fine sandy loam..	22,784	2.2	Myatt fine sandy loam.....	2,816	.3
Muck.....	20,672	2.0	Cahaba fine sandy loam.....	2,816	.3
Coastal beach.....	18,368	1.8	Greenville loam.....	2,752	.3
Norfolk loam.....	15,808	1.6	Portsmouth loam.....	1,472	.1
Kalmia fine sandy loam.....	14,656	1.4	Cahaba fine sand.....	320	.1
Greenville sandy loam.....	11,264	1.1	Sandhill.....	256	.1
Norfolk sandy loam.....	9,664	1.0	Total.....	1,014,400	.....

SUSQUEHANNA CLAY.

The soil of the Susquehanna clay is of such variable depth and composition that no concise description is possible. It usually consists of rather coarse quartz sand and well-rounded gravel, with a greater or less admixture of iron-cemented material of various kinds. On the narrow ridges there is an abundance of hard ironstone and gravelly conglomerate, besides small concretions. On the lower slopes and in those sections where the topography is less broken the relative proportion of sand is greater and the depth to the clay subsoil varies from a few inches to 1 or 2 feet.

The subsoil, in most places, is the heavy tenacious clay described elsewhere as the upper member of the Grand Gulf series. Its characteristics are modified by recent weathering. The upper portion is generally some shade of red or purple, often quite brilliant. The lower part of the subsoil is more or less mottled with lighter gray, and streaks of nearly white "pipe" clay are observable in most of the deep gullies.

Where the soil is chiefly a medium sand the subsoil is generally mottled red and white clay, too impervious to admit of underdrainage or to maintain anything like a constant moisture content. On many of the bald knobs, which are of frequent occurrence where this type prevails, the clay has a purplish color and the surface is literally covered with dark-red iron concretions of various sizes and degrees of hardness. In some places heavy masses of ironstone occur, but they are not more abundant than in rough, broken areas of other types.

In general this type covers areas of extreme denudation on the central divide, from the thirty-first parallel northward. It has most frequently been developed on the heads of the westward flowing creeks, but some of the largest areas a few miles east of Stockton are interstream divides where the very heavy subsoil is overlain by sand, without so much gravel or ferruginous material.

The type has little value except for pasture. As a rule the original forest cover is scanty, both the longleaf pine and oak avoiding this heavy soil.

ORANGEBURG SAND.

The Orangeburg sand represents the lightest soil of the Orangeburg series occurring in the area. It consists chiefly of the medium sized grains and evidently does not differ greatly in mineralogical composition from the Norfolk sand. It is distinguished from the latter by the red or reddish-brown color and the higher percentage of finer interstitial material. To the latter is due in considerable measure the superior agricultural value of this type when compared with sands of similar texture but of lighter color. There is associated with this material a loamy character and a certain degree of

coherency not commonly found in other sands, though they may contain an equal amount of silt and clay. The finer constituents are well distributed among the coarser grains, adhering to them with considerable persistence. Since the red oxide of iron—the form in which much of the ferruginous material occurs—is a little more sticky or adhesive than the brown oxides, the tendency of the finer particles to adhere to the larger ones or collect in minute granules may be attributed to the condition of the comparatively high percentage of iron. This peculiarity in its physical structure greatly increases the moisture holding power of this sand and gives it the properties of a light sandy loam. In the lightest phases the coarsest grains collect after each rain in light red or pinkish-colored patches upon the surface, but the latter never assumes the bleached or weathered appearance common to many coarse sands.

The first few inches usually contain some humus, but as a rule the total amount of vegetable material is meager. It affects the color, however, to a depth of 10 or 12 inches, imparting a dull-brown tint to the soil, which with increase of depth assumes a light-red color, changing to brick red in the lower subsoil. The latter in most instances is a light sandy loam. On the level uplands, where the type is occasionally found, the underlying material is a sandy clay, resembling the subsoil of Greenville sandy loam. Such phases of the type are very similar in agricultural value to the last-named soil.

Small areas of this sand are found on the margins of the upland, where the surface declines toward the larger valleys or the shore line. They are also of frequent occurrence in the Norfolk sand, appearing as red or reddish-brown spots in the gray soil of the latter type.

In general agricultural value the Orangeburg sand is above the Norfolk sand, but it is not so desirable as the Greenville sandy loam. However, it is easily susceptible of improvement, a very moderate amount of manure increasing its fertility to a marked degree. It is a warm, early, easily tilled soil that may be utilized for cotton, early potatoes, and garden truck. A good quality of shade-grown Sumatra tobacco was produced on a loamy phase of this type a few miles west of Muscogee, Fla. Most of the areas are rolling or slightly hilly land covered with pine woods. Very little has been cleared and cultivated.

Mechanical analyses of samples of the soil and subsoil of this type give the following results:

Mechanical analyses of Orangeburg 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>
22942, 22985.....	Soil.....	0.8	11.8	25.9	34.1	8.8	10.9	7.7
22943, 22986.....	Subsoil.....	.8	8.7	23.7	38.1	8.3	10.8	9.3

ORANGEBURG FINE SANDY LOAM.

The soil of the Orangeburg fine sandy loam is a grayish-brown fine sand or sandy loam. It contains little or no coarse sand, and the proportion of the medium grades is comparatively low. In most instances it is very friable, or just coheres when a sample is pressed in the hand. At a depth of a few inches it is much heavier, there usually being enough clay to make it slightly sticky when wet. Below the influence of the organic matter—usually at a depth of 6 to 8 inches—the material is a light-red, crumbly, fine sandy loam. It possesses excellent capillarity, and if brought to the surface and mixed with a little vegetable matter becomes identical in color and appearance with the soil. At a depth of 18 or 20 inches the subsoil is a brick-red fine sandy clay, uniform in color and composition to depths varying from a few feet to many yards. This material is hard and firm, but never impervious.

In general, this type closely resembles the Greenville sandy loam, the chief difference being in the texture of the soil. It also has practically the same agricultural value. In some instances where the surface is nearly level and the soil contains more than the usual amount of clay it is inclined to pack after heavy rains. Most of it yields readily to cultivation, and is especially benefited by a slight increase in the content of organic matter. In the virgin soils the humus is not abundant, but is well distributed, and it seems to be exhausted slowly, as its effects are observable after many years of cultivation.

As yet only a small acreage of this type is cleared. It usually occurs in small areas on the undulating divides between the larger creeks. It is most commonly associated with the loamy phase of the Norfolk fine sand and the Norfolk fine sandy loam. Patches of this red soil are of frequent occurrence in the latter type, though usually too small to be shown in the map.

In other areas in Alabama and Florida the Orangeburg fine sandy loam is a favorite soil for the production of Cuban filler and Sumatra wrapper tobacco. For the latter the lightest phases, with the soil 10 to 15 inches deep and rather loamy, are desirable. A good deal of the type on the undulating uplands is of heavier texture than this, the soil grading into a clayey fine sandy loam at a depth of a few inches. Such phases will be found better adapted to the Cuban filler tobacco.

The type is well adapted to cotton, oats, and forage crops. Irish and sweet potatoes do well, although the latter are more easily grown on soils of lighter texture. It is well adapted to strawberries, especially the heavier phases, and some of the small areas convenient to the railroads should prove particularly valuable for the crop if its cultivation is attempted.

The price of the rather limited areas occurring in the southern part of the county is determined chiefly by the value of the adjoining lands. The offerings by the colonization companies range from \$20 to \$30 an acre in the localities where the Orangeburg fine sandy loam most generally occurs.

The analyses of samples of this type are given in the following table:

Mechanical analyses of Orangeburg fine sandy loam.

Number.	Description.	Fine gravel.	Coarse sand.	Medium sand.	Fine sand.	Very fine sand.	Silt.	Clay.
		Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	<i>Per cent.</i>
22954, 22983...	Soil.....	0.4	7.3	12.8	28.9	19.1	20.1	11.1
22955, 22984...	Subsoil.....	.3	5.4	10.6	24.7	17.6	15.7	25.1
22956.....	Lower subsoil...	.3	1.9	5.7	29.9	23.1	11.3	28.0

GREENVILLE SANDY LOAM.

The soil of the Greenville sandy loam is a reddish-brown or dark-red sandy loam, with a depth of 8 or 10 inches. There is usually a rather high percentage of fine sand, but all grades are well represented. The proportion of coarse and medium grains is sufficient to impart a coarse feel to a hard sample and gives the surface or virgin soil an open, loamy structure. In cultivated land, where the various constituents are more thoroughly commingled, the soil is friable and may be kept in excellent tilth with but little labor. This is especially true wherever there is even a moderate amount of humus present. As a rule the content of the latter in virgin soil is not high, but it is well distributed throughout the first few inches, nor is it so rapidly exhausted under continuous cultivation as in some light-colored soils.

The content of silt and clay increases with depth, and the subsoil is a brick-red sandy loam, considerably heavier and more compact than the soil. In many instances the lower subsoil is a sandy clay, but the percentage of sand is always high enough to give the material a "grainy" structure and a degree of porosity highly favorable to good capillarity and effective aeration. A comparatively uniform moisture content is maintained during dry periods, while in rainy seasons much of the excess of ground water sinks away in a comparatively short time.

This desirable physical structure is not confined to the subsoil proper, but is characteristic of the deeper strata. On the level divides the dark-red sandy loam frequently extends to a depth of 30 or 40 feet, with no change that materially affects its water-holding properties. On the hillsides the depth is less, but as a rule the subsoil maintains its characteristic red, "grainy" appearance to a depth of

several feet before it changes to the heavy semi-impervious clay of the underlying Grand Gulf strata.

The excellent physical structure of this material, of which the Greenville sandy loam is the slightly altered surface zone, gives the type the desirable properties that it possesses. It is not affected so much by seasonal extremes as some of the lighter-colored sandy loams.

This type is rather closely associated with the Norfolk fine sandy loam, occurring most frequently on the broad divides where the surface is comparatively level or slightly rolling. It occasionally extends down the hillsides or is developed on the somewhat broken areas at the heads of the drainage lines. In such locations the soil is likely to be less uniform in texture and depth, while the subsoil is less permeable, containing more clay and less sand than in the normal phase of the uplands. Iron concretions are also much more numerous on the hillsides than on the level land. Many of the small areas in the northern part of the county are the comparatively level tops of local elevations. While the type is not confined to any particular topographic situations, it attains its best development upon the widest ridges. In the northern and western parts of the county it averages somewhat coarser in texture than in the central part.

The Greenville sandy loam is recognized throughout the Gulf coast region as one of the best cotton soils. Good yields are obtained with proper culture on land that has been tilled for many years. It readily responds to fertilization, very moderate amounts of barnyard manure or cotton-seed meal giving good results. Commercial fertilizers may be economically used, especially in combination with the above materials, for there is comparatively little danger of loss through leaching or failure of crops on account of unusual seasonal conditions.

With increase of the humus content the adaptability to corn is greatly improved. Sugar cane gives excellent yields, but the color of the sirup is likely to be darker than that from cane grown on lighter-colored soils. The type has not generally been used for truck crops, but its value for these is hardly inferior to the Norfolk soils, except that the latter are somewhat earlier on account of their relatively light color and free drainage. Excellent results with practically all garden crops may be expected. Strawberries do well, but the heavier phases—that is, the areas with not more than 6 or 8 inches of sandy loam over comparatively heavy sandy clay—should be selected. The lighter phases will produce a good quality of shade-grown Sumatra tobacco.

The present price per acre of this land depends much upon location and character of the improvements. Some old homesteads, and also newer farms, consisting largely of this type, may be bought at prices ranging from \$15 to \$30. Uncleared land near the railway is fre-

quently held at about the same price, but farther from the towns the prices are very much lower.

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

Mechanical analyses of Greenville 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>
20827, 22946, 22949.	Soil.....	0.9	14.5	20.2	32.3	6.8	14.3	10.8
20828, 22947, 22950.	Subsoil.....	1.0	10.6	19.9	32.4	7.2	13.8	14.9
20829, 22948, 22951.	Lower subsoil.	1.5	9.9	17.0	29.7	7.3	12.3	22.3

GREENVILLE LOAM.

The soil of the Greenville loam, to a depth of 8 or 10 inches, is a dark reddish brown loam or heavy sandy loam. In the heaviest phases the clay content is sufficiently high to render the material rather heavy and compact, so that it is quite sticky and somewhat difficult to work when wet. The immediate surface in most places is quite sandy, and in all cases, if even a moderate amount of humus is present, it is loamy and friable, with every indication of being a fertile soil easily kept in excellent tilth. At a depth of a few inches the material is much heavier and more compact than at the surface. It is crumbly rather than friable, and inclined to become cloddy if plowed when wet. The content of sand, however, is generally high enough to give the heaviest phase the properties of a loam.

The subsoil is a brick-red sandy clay. It is decidedly heavy and rather close in structure, but by no means impervious. The "grainy" appearance of the subsoil is not so pronounced in this material as in the lighter Orangeburg types, but there is considerable fine sand present. There is also a slight tendency to assume a granular structure, quite noticeable in the clayey material adhering to the upturned tree roots. This property improves the physical condition, rendering the mass more permeable to air and moisture, and giving better under-drainage than some clayey subsoils possess. Iron concretions occur in both soil and subsoil, but are not abundant.

The Greenville loam has a limited development in this county. The largest area is found on the flat top of the divide, between Fish River and Mobile Bay, some 4 or 5 miles southeast of Daphne. A few other small areas occur in the northern part of the county in similar topographic positions. As a rule the surface of the latter are slight depressions, with occasional cypress ponds in or near them. The surface is a black, loamy, friable soil, underlain by fine textured

material of deep-red color. When drained these small areas are very productive.

The principal native vegetation is longleaf pine, but several varieties of oak, as well as other deciduous trees, seem to find this a congenial soil. Near the old homesteads exceptionally fine specimens of water oak are seen on this type or the heavier phases of the Greenville sandy loam. No very close line can be drawn between the two soils with regard to the character of the natural vegetation or their adaptation to cultivated crops.

Some of the loam requires artificial drainage, and such places usually have a comparatively high content of organic matter. The type as a whole is the heaviest soil of the uplands. It is much better adapted to cotton, corn, oats, and forage crops than to truck, although suitable for strawberries. The rather limited extent of the type renders its utilization for these products advisable. A comparatively slight increase of vegetable matter gives the soil a high value for corn, provided, of course, that the drainage is good. Small applications of mineral fertilizers would be necessary. With heavier applications of a complete fertilizer exceptional yields should be secured.

Farmers observe that crops on this type are affected by dry weather sooner than on some lighter soils. This is caused in part by the superior capillarity of the heavier material, the soil moisture moving upward promptly when evaporation at the surface is rapid. It is also true that fine-textured material does not deliver water to plants—as its moisture content becomes low—as well as do the coarser grained soils. Therefore, to maintain a higher water content the surface should be well pulverized to prevent the loss of water that occurs if the soil is compact.

The type is given about the same valuation as other red soils. It is recognized as valuable land for cultivation, but owing to the limited extent few farms consist entirely of this soil.

The results of mechanical analyses of samples of a rather light phase of this type give the following results:

Mechanical analyses of Greenville 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>
22952.....	Soil.....	0.6	6.9	8.6	26.7	18.0	24.4	14.7
22953.....	Subsoil.....	.0	5.3	8.7	21.8	17.4	15.7	31.1

NOFOLK FINE SANDY LOAM

The soil of the Norfolk fine sandy loam to a depth of 5 or 6 inches is a rather dark gray or brownish-gray fine sandy loam. It usually

contains a low percentage of medium and coarse sand and a few small iron concretions, but the material as a whole is fine textured, loamy, and slightly coherent at the ordinary moisture content. It yields easily to tillage, and in well-cultivated fields which have been plowed to moderate depth the first few inches are loose to friable, with a tendency toward compactness at 6 to 10 inches.

The upper portion of the subsoil is a heavier fine sandy loam, light yellowish brown in color. It is much more coherent than the soil, but is not compact, being somewhat open in structure, and crumbly rather than plastic. At a depth of 15 to 20 inches it grades to a fine sandy clay, closer in structure and with a rather high degree of plasticity. The lower portion of the subsoil is occasionally streaked with red or assumes a reddish-yellow tint. On some of the more rolling areas the lower subsoil is a reddish-yellow fine sandy clay and contains a good many iron concretions. In such locations a few small quartzose gravel occur, and rarely some iron-cemented sandstone fragments, but as a rule the soil is free from all coarse material.

This type has an extensive distribution throughout the county. From the south-central portion to the northern end it is the dominant type on the crests of the broader divides. It also occurs on the secondary elevations between Stockton and Little River, which lie well above the second bottoms of the Alabama River, but are not so elevated as the central watershed. The small areas a mile or two south of Little River are coarse in texture and not so well drained as that farther east.

The large area on the central divide between Stapleton and Foley includes much land that is nearly level, and occasional areas require artificial drainage. The texture of the soil is finer than that of the more rolling phases of the type. On the divide between Fish River and Mobile Bay the surface is generally undulating, with some comparatively level areas, where the soil is heavier than on the slope, the latter usually containing a higher percentage of fine sand.

In the southern part of the county the transition between the Norfolk fine sandy loam and the loamy phase of the Norfolk fine sand is very gradual. Whenever the subsoil is comparatively heavy, a crumbly or plastic yellowish sandy clay, the soil has been included with the fine sandy loam. Near Foley and Magnolia Springs iron concretions are frequently numerous in the areas of heaviest texture, and a hard substratum is found at a depth of 4 or 5 feet. These latter features are seldom observed in the loamy phase of the Norfolk fine sand.

Some of the oldest upland farms in the county consist of the Norfolk fine sandy loam. Good crops of cotton, sweet potatoes, and sugar cane are produced. Rather liberal fertilization is required. For corn, barnyard manure or cotton-seed meal gives best results,

since all old fields are very deficient in humus and consequently low in available nitrates.

On the recently cleared land along the Bay Minette and Fort Morgan Railroad a considerable acreage is devoted to Irish and sweet potatoes, while rice, sugar cane, tobacco, and various truck and fruit crops have been successfully grown. For potatoes rather heavy applications of a complete fertilizer are considered necessary. A deep seed bed such as this crop requires may be prepared with little difficulty. The texture of the soil is improved by deep plowing. If the ground is thoroughly pulverized and allowed to settle before being ridged up for planting it will not become dry, as is the case in some instances where it is not well worked. The capillary connection between the lower subsoil and soil is excellent and good moisture conditions may be secured by proper tillage.

The type is well adapted to these special crops and also to general farming. The recommendations suggested in the chapter on soil improvement are especially applicable to this type, as well as the loamy phase of the Norfolk fine sand. Both respond readily to any increase in the humus content and may be permanently improved by crop rotation and rather limited application of mineral fertilizers.

Near the towns the uncleared land is held at prices ranging from \$15 to \$30 an acre. Improved farms are offered at prices varying from \$20 to \$50. In those sections remote from shipping points the valuation is extremely variable, depending upon the character of the timber and size of the tract.

Broken phase.—The broken phase of the Norfolk fine sandy loam is characterized by the rough topography, the abundance of iron concretions, and the generally heavy nature of the lower subsoil. While all of these features are not noticeable at every point, two of them, at least, are usually observable and a brief survey of any particular section will show these three characteristics to be the salient ones.

The phase has an extensive distribution throughout the county, occurring in areas of varying size in all parts, except the river valleys and the southern townships. It is typically developed on the flanks of the major divides, where erosion is vigorous and denudation is favored by the high gradients and the rather impervious nature of the underlying material.

The surface of most of this phase of the Norfolk fine sandy loam is hilly, in many cases decidedly broken. Frequently low, rounded elevations rise somewhat above the general elevation, their summits usually being covered with iron concretions.

The largest areas consist, for the most part, of narrow divides between the tributaries of the minor streams. The crests of these ridges are frequently covered with fragments of rock—iron-cemented

sand and gravel—while small hard concretions and occasionally quartz pebbles are very numerous. The type is of common occurrence also on the steep slopes around the ravines that head in the flank of the main divides. Uniformity in the depth and structure of the soil is not to be found in a type of such varied relief. On the steepest slopes much of the fine surface material has been removed, leaving but a thin loam over the more resistant clay. On the lower slopes there is usually a greater depth of sand or sandy loam, and the subsoil is a sandy clay of colluvial origin. In many instances, however, the heavy sedimentary clay of the Grand Gulf deposits is found at a depth of a few feet.

A representative section consists of 5 to 10 inches of fine sandy loam, the upper part of which may be medium dark gray or brownish gray in color, while the lower portion is a light yellowish brown fine sandy loam. Between 10 and 18 inches the content of clay increases with depth, but the material is usually rather open and crumbly, and unless exceptionally sandy has good capillarity.

The lower subsoil is yellow or reddish-yellow sandy clay, becoming more compact with increase of depth. A few feet or in many places almost immediately below the surface it graduates to a mottled red and gray or white streaked clay, which is the upper part of the Grand Gulf deposits more or less altered by partial exposure and by oxidation of the included iron salts. This clay is frequently exposed at the surface. It outcrops on the steep slopes that flank the wide divides, and is but thinly covered on the points where the ferruginous material is most abundant. The iron concretions are most numerous upon its surface, but as a rule occur at all depths, the quantity varying in different localities.

On the crests of the less broken divides in the large areas of this phase the entire soil section approaches the typical soil in color, texture, and structure, but the areas are very narrow and the phase characteristics are in view on each side.

In the northern part of the county the areas of the loamy phase carry a good deal of quartz gravel and are closely associated with areas of Norfolk gravelly sand. In the central and southern townships there is usually but little quartz gravel.

Another variation of limited extent occurs between some of the tributaries of the Styx River. Occasional areas are found here intermediate in elevation between the second bottoms and the main ridges. These areas consist of low, gently inclined hills, with surface features resembling those of the typical soil. The subsoil is a heavy, tenacious clay or clay loam, which gives the soil a rather low agricultural value that seems to warrant its classification with the broken phase of the Norfolk fine sandy loam rather than with the typical soil.

The characteristic vegetation of the phase is longleaf pine, with oak as an undergrowth on the sandy areas.

On the clayey hillsides the pine trees were scattering, and now some of these slopes and rocky points are almost bare. Much of the best timber has been removed, and considerable areas are of little immediate value except for pasture.

Occasionally a field or clearing is found on this phase, but as a rule they are located on the crest of a ridge or hillside where the type approaches the Norfolk sand or fine sandy loam. Most of the soil is better adapted to forestry or grazing than to agriculture.

The price per acre has usually been determined by the value of the standing timber. The present acreage valuation—remaining timber included—is between \$2.50 and \$10 an acre. Where portions of this type are included in small holdings of better land the value of the latter usually determines the price of the whole tract.

The average results of mechanical analyses of representative samples of the Norfolk fine sandy loam and its principal phase are given in the following table:

Mechanical analyses of Norfolk fine sandy loam.

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.
20820, 22866, 22869, 22877.	Soil.....	0.6	4.5	6.1	23.9	23.3	31.6	9.6
20821, 22867, 22870, 22878.	Subsoil.....	.5	3.3	6.1	21.6	23.6	23.3	21.2
22868, 22871...	Lower sub-soil.	.7	3.3	6.2	18.1	21.9	27.6	22.0
Broken phase:								
22931, 22940...	Soil.....	1.3	2.1	4.0	26.6	41.0	15.6	10.2
22932, 22941...	Subsoil.....	.5	3.5	7.8	20.1	20.1	24.2	23.4
22933.....	Lower sub-soil.	.0	.3	.4	8.0	26.0	24.0	41.3

NORFOLK SAND.

The soil of the Norfolk sand to a depth of 5 or 6 inches is a grayish quartz sand. It consists in part of the medium and finer grades, but there is a considerable amount of coarse sand and usually some small gravel. In instances it is incoherent, having an open loose structure and a decidedly coarse, gritty feel when rubbed between the fingers.

The color varies from a moderately dark gray to light brownish gray. Where the texture is unusually coarse and the soil mass has suffered considerable leaching the surface is often very light colored. The soil of some of the level areas of the uplands is a dull grayish brown, tending to reddish brown with increase of depth. This is most

noticeable in the vicinity of the Orangeburg soils. On the moderately rolling areas there is usually a larger amount of humus in the soil than on the long slopes, where the sand has greater depth and is generally looser.

The subsoil is similar in general composition to the soil, consisting chiefly of sand with a variable amount of the finer constituents. The percentage of the latter depends to a certain extent upon topographic position and the character of the underlying material. Where the latter is a sandy clay occurring at a depth of 4 or 5 feet the lower subsoil is frequently a light sandy loam. On some of the hillsides along the creeks in local depressions, where this type represents the accumulations of loosened material from the higher ground, the subsoil may be a comparatively loose sand to a depth of many feet. On the flanks of the larger divides, particularly in the northern part of the county, the deep subsoil is frequently seen to be a coarse red sandy material with considerable gravel. Some of the small areas north of Turkey Creek and on the heads of Pine Log and Majors creeks are either coarse reddish sands or underlain by such material. In the southern part of the county the larger areas of this type are generally underlain by finer textured material. In many cases at least it is a yellowish-brown sandy clay.

With the exceptions noted the color of the subsoil is usually a light brown or grayish brown, tending to yellowish tints at lower depths. The color depends much upon texture and underdrainage. Where the subsoil includes considerable fine sand and the moisture conditions are comparatively uniform the color is generally a rich yellowish brown. If the subsoil is rather coarse, duller tints prevail, the material having a somewhat bleached appearance.

The type occurs in all parts of the county, except the Alabama Valley and the narrow strip of sandy land that borders the Gulf coast.

The topography is varied. On some of the wider ridges the type occurs in comparatively large areas, the central portion of which may be comparatively level or, more frequently, a gently rounded ridge declining on one or both sides to rather long slopes that seldom have such uneven contours as the broken phase of the Norfolk fine sandy loam presents. The type is frequently found in the swales at the heads of drainage lines forming loamy areas well adapted to cultivation. From these locations the sand may extend down the stream on each side, forming narrow and usually very irregular strips between the meadow and the steeper upper portion of the hillside. On the latter the sand covering is generally so thin and patchy that the red or yellowish colored subsoil is frequently exposed.

The original timber cover consisted chiefly of longleaf pine, with a scattering scrubby growth of oak, among which is some "Turkey"

oak. In many places where the pine has been largely removed the small oaks are the characteristic vegetation, with some dogwood. Several species of grass grow on this type, but they do not form so continuous a sod as on heavier soils, and also became dry and dead earlier in the summer. Broom sedge is a characteristic plant on abandoned fields. In the southern part of the county wire-grass forms most of the herbaceous vegetation.

The greater proportion of this type is uncultivated. There are numerous small abandoned clearings in the woods, the soil of which is quite easily brought under cultivation, and also soon exhausted of its scanty supply of humus. Such land is usually covered with broomsedge or goldenrod or occasionally where buildings formerly stood there are patches of Bermuda grass.

Some old fields of the better phases of this sand still produce fair crops of cotton, sweet potatoes, and sugar cane. The owners are usually careful to apply as much barnyard manure and compost as the farm affords, with additional amounts of commercial fertilizers. The latter are generally brands carrying 10 to 14 per cent phosphoric acid and about half as much potash. Wherever the land has been carelessly farmed the soil assumes a very light gray color and crop yields are extremely poor.

In a type of such extensive occurrence and having so many topographic variations there are differences in texture and depth of material that obviously can not be shown on a map. Some of these type phases are of great importance whenever the cultivation of the soil is attempted. In the selection of land a sand of fine texture is to be preferred to one that is coarse. This applies especially to the subsoil, where texture determines to a large extent capillarity or water-holding properties. In a fine sand humus is more easily accumulated and does not waste so fast as in coarse leachy sand. If the subsoil is immediately underlain by a sandy clay or is loamy enough to be "sticky" when wet, so much the better. This heavier material must be depended upon to act as the water reservoir, for practically all of the Norfolk sand is too open in structure to endure much dry weather. Sand with a red or reddish-brown tint is to be preferred to that which is brown, although the latter is in some cases quite loamy. Light-gray soils, with patches of bleached sand upon the surface, are not desirable for cultivated crops, unless the subsoil contains much more than the usual amount of fine material.

Considerable areas of the Norfolk sand, convenient to shipping points, will doubtless be brought into use for trucking, and also for general farming, after more desirable types are occupied. Some of this type can be purchased at low prices, especially where the timber is of little value. From \$5 to \$10 an acre is about the usual price for lands situated at some distance from the towns. Nearer the railroads

the price is much higher. The actual value for trucking depends mainly upon the location, but the topographic position and particular phase of the type are also important.

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

Mechanical analyses of Norfolk 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>
22848, 22850, 22858.	Soil.....	1.2	22.2	23.7	28.1	7.9	12.7	4.7
22849, 22851, 22859.	Subsoil.....	1.1	20.8	23.7	28.9	8.8	11.6	4.8

NORFOLK GRAVELLY SAND.

This type, Norfolk gravelly sand, is a sandy soil of variable depth and texture, in which there is usually a high percentage of crystalline gravel. In most instances the first few inches of the finer material is weathered to a dull, grayish color while the coarser grains are bleached white. The gravel consists principally of small, light colored, quartzose pebbles, smooth and well rounded. Iron concretions also occur, though these are not usually abundant. Where the material as a whole is exceptionally coarse, or where the pebbles constitute the greater proportion of the soil mass there is practically enough vegetable matter to give the surface a slightly loamy character.

At a depth of 1 or 2 feet the material is less weathered, and the colors range from dull brown to red. In composition it does not differ materially from that at the surface, consisting chiefly of medium and coarse sand with gravel scattered through it. As a rule it is too coarse to retain moisture well, but the condition with respect to the water content depends also upon topographic position and the depth to the underlying clay. Some of the deeper phases of this type show traces of stratification. This is observable along some of the streams where the gravelly sand is outwash material from the sedimentary deposits of the uplands. Exposures on the flanks of the high divides frequently show layers of gravel in the coarse reddish sands of Lafayette age. The soil in the vicinity of these exposures is usually gravelly and in most instances has been mapped as the Norfolk gravelly sand.

The deep subsoil is the heavy reddish clay so frequently exposed in all the rougher sections of the area. In some localities especially on the shoulders or convex portions of the hills near the creeks, the clay is but a foot or two below the surface. On the lower part of the slopes, where conditions are more favorable for sand deposition, the clay is found at a greater depth. These variations in the occur-

rence of the gravelly sand along the creeks and ravines can not be shown on a map of the scale used, and since most of this type consists largely of coarse material to a depth of 30 inches or more it has all been classed as gravelly sand.

The type is confined to the northern and northwestern parts of the county. It occurs in areas of considerable size on the high divides south of Little River and on the main watershed east of Stockton. From these elevated locations the type has a rather irregular distribution along the streams that flow toward the west or the north. It is also of common occurrence on the bluff that overlooks the east side of the Alabama Valley.

The "Red Hills" west of Horseneck Creek are a coarse phase of the Lafayette deposits. This rough area includes some narrow ridges capped with gravelly conglomerate. The slopes are covered with sand on which there is a variable amount of quartzose gravel, iron concretions, and fragments of iron cemented sandstone.

The Norfolk gravelly sand has little agricultural value; it is better adapted to forestry. It affords fair pasturage, although the undergrowth on the extremely gravelly phases is very thin. Springs are numerous and many of the small streams in this type maintain their flow the entire year.

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

Mechanical analyses of Norfolk gravelly 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>
22844, 22846.....	Soil.....	3.9	17.1	18.9	28.1	11.9	15.7	4.4
22845, 22847.....	Subsoil.....	4.0	19.4	17.0	24.9	11.3	16.1	7.1

NORFOLK SANDY LOAM.

The soil of the Norfolk sandy loam is a gray or light yellowish gray medium to fine sand. Below 8 to 12 inches there is usually an increase in the amount of fine material, so that the middle part of the soil sections is a light sandy loam. The lower subsoil is a moderately heavy sandy clay, possessing fair moisture-holding properties. The depth to this clayey stratum is extremely variable, so that the type as a whole is not well defined, grading on one hand to the Norfolk sand and on the other to the Norfolk loamy sand.

The type has a limited development in this area, owing chiefly to the fact that most of the light-colored soils with clay subsoils are fine enough in texture to be referred to the fine sandy loams. The largest areas are found near Fish River, occurring on the upper slopes of

the long inclines between that stream and the wide divides. On the shoulders of the steeper hillsides the soil is shallow, but on the longer slopes, or where the surface is comparatively level, this sandy loam generally passes to some better defined type.

A few small areas have been indicated in other parts of the area. They usually represent a transition between the Norfolk fine sandy loam and the Norfolk sand.

The agricultural value is about the same as that of the Norfolk loamy sand.

NORFOLK LOAMY SAND.

The soil of the Norfolk loamy sand consists chiefly of grayish-brown medium sand with a variable amount of finer material. The content of the latter, especially in the first few inches, is usually low, but it increases with depth, imparting a somewhat loamy character to the soil even where there is but little humus.

Between the depths of 10 and 25 inches the subsoil is usually a lighter yellowish sand, coarser in texture, with enough included clay and silt to render it slightly sticky when wet or even quite coherent. Below 25 or 30 inches the percentage of fine material is much greater, and this part of the soil section is a sandy loam sufficiently heavy and close in texture to insure the maintenance of good moisture conditions. In most instances the middle zone and the upper layers contain considerable moisture, for the capillarity is much better than in sands of similar grade where less finer material is present.

The lower subsoil is generally reddish yellow and grades downward to a heavy red sandy clay identical with the basal material of the Orangeburg types.

There are numerous variations in the relative depth of the sand and the light sandy loam which constitute the soil and subsoil, respectively. There is also a decided tendency for the soil described above to pass into the lighter phases of the red types. In many places small areas of reddish-brown sands or light sandy loams have been included in this type. In the area north of Lillian a heavy sandy clay is found in places at very moderate depths.

The type as a whole may be considered a broad transition between the Greenville sandy loam and the Norfolk sand. The general agricultural value of any particular field may be estimated by a comparison of its physical features with the description of the above-mentioned types.

Most of this type is well adapted to cotton and also early truck crops, its excellent drainage and light structure rendering it warm and easily cultivated. The lightest phases have a tendency to be droughty. This can be corrected to a considerable extent by an increase of the humus content. Those phases which have a reddish-

brown clayey sand at less than 30 inches from the surface are desirable for most cultivated crops, and notwithstanding the generally coarse texture should maintain a good moisture content.

The type has about the same character of topography and vegetation as the Norfolk sand. The value of cleared land is generally higher than that of similarly located farms consisting of the latter type. The value of uncleared land may be estimated at \$5 to \$15, depending upon the location and amount of standing timber. The latter usually includes considerable oak, superior in size to that on the lightest phases of the sand.

The following table gives the average results of mechanical analyses of the soil and subsoil and a single analysis of the lower subsoil of this type:

Mechanical analyses of Norfolk loamy 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>
22879, 22881...	Soil.....	0.7	11.3	20.8	32.2	10.6	15.3	8.8
22880, 22882...	Subsoil.....	1.1	10.2	21.5	29.3	11.6	16.6	9.4
22883.....	Lower subsoil...	1.4	13.1	21.3	21.1	13.2	19.0	11.6

NORFOLK FINE SAND.

The soil of the Norfolk fine sand, to a depth of 5 or 6 inches, consists chiefly of fine and very fine sand with a moderate amount of silt and clay. These finer constituents, with the humus usually present, give the first few inches a medium dark-gray color and a somewhat loamy character. There is very little coarse sand present, although some small gravel occurs and iron concretions are usually found where the lower subsoil is a sandy clay.

The subsoil is a light yellowish-brown fine sand. The yellow tint becomes more pronounced with increase of depth, especially where the deep subsoil is a fine sandy clay. The latter usually resembles the subsoil of the Norfolk fine sandy loam. Where the substratum is a loose sand with a depth of many feet the lower subsoil is pale yellow or a light mottled grayish sand quite loose and incoherent.

The Norfolk fine sand is closely associated with the Norfolk sand in origin and distribution. It is derived from the Lafayette deposits and as a rule consists of material which has not suffered much local transportation. It is found throughout the greater part of the county, occurring in rather smaller areas than the Norfolk sand. On the central uplands and along the smaller streams it has about the same topography as the latter type. The largest areas in the southern part of the county form rather long and gently inclined

slopes near the streams. On the Perdido and Blackwater rivers and near the inlets of the bays the type occurs on some of the comparatively level areas, resembling terraces, that occur in those localities.

The finer texture of this type compared with that of the Norfolk sand gives it better capillarity and insures a more equable moisture content than the coarsest phases of the latter can maintain. This is doubtless the cause of the uniform color of the subsoil—the iron content having suffered about the same degree of oxidation throughout. It also greatly reduces the leaching effect of heavy rains, although the subdrainage is ample. In the examination made during the survey the subsoil was generally found to be moist enough to pack when pressed in the hand. The exceptions were confined to hillside areas where the sand was unusually deep and coarser than the average.

Many of the older farms in the county consist entirely or in part of the shallow phases of the Norfolk fine sand. It is easily tilled and responds to fertilization. Fair crops of cotton and good yields of potatoes and sugar cane are secured wherever the humus content is reasonably well maintained or even where cotton seed or barnyard manure is sparingly used. Watermelons and various garden crops are grown with good success. It has not been generally devoted to such products because other types have been easily available.

This soil is adapted to the production of a good quality of sugarcane sirup. The yield may not average as high as on the fine sandy loams, but on the upland phases, where a clayey subsoil is found at about 30 inches, there would probably be but little difference in the production.

Such phases of the type are best adapted to watermelons, sweet potatoes, and all the common garden crops. On the lower slopes, where the depth to the underlying clay is more variable, the moisture conditions are not so uniform, and there is also more liability to injury by late frosts.

The original vegetation consisted chiefly of longleaf pine with more or less scrub oak and dogwood, especially on the deepest sand. Its pasturage value is about the same as that of the Norfolk sand. The price of cleared and uncleared land is about that of the latter type.

Loamy phase.—The soil of the loamy phase of the Norfolk fine sand, to a depth of about 6 inches, is a moderately dark gray fine sand. It contains an appreciable amount of silt and clay, which with the humus of the first few inches gives the virgin soil a decidedly loamy character. When plowed it breaks into a light, friable condition, forming an excellent seed bed with but little further preparation.

The subsoil is a light yellowish brown fine sand. The upper lower subsoil may be very light.

On most of the upland areas the underlying material at a depth of several yards is a light-red or red and yellow mottled fine sand containing a good deal of silt and numerous mica flakes. In some places thin layers of tough, light-colored clay occur, but they do not seriously affect the subdrainage.

This loamy phase of the Norfolk fine sand is the dominant type on all the uplands between Blackwater River and Perdido Bay. The holdings of the German settlement of Elberta consist chiefly of this kind of land. A large area of irregular outline extends from Summerdale almost to Oyster Bay and Portage Creek. Many smaller detached areas are found near these larger ones, usually separated from them by drainage lines along which the Norfolk and Myatt fine sand are developed. The phase also occurs to a limited extent north of Styx River and at various other points in the southern part of the county. The surface is usually undulating, consisting for the most part of gently rounded ridges and low swells. The central part of shallow depressions is frequently a small cypress pond, although many of these swampy spots occur on comparatively high ground. They are a characteristic feature of the loamy phase, but with regard to soil characteristics should be classed with the Portsmouth loam, and have been so mapped where of sufficient size.

South of Foley a considerable proportion of the phase is nearly level. In places water stands upon the surface until it escapes by a downward or lateral movement through the subsoil or is dissipated by evaporation. These flat areas frequently merge imperceptibly into the smaller ones of the Portsmouth loam. Practically all of this flat land could be drained without great expense.

With regard to its mineralogical composition, this type is similar to other soils of the Norfolk series, being derived entirely from a light-brown phase of the Lafayette formation. Its rather open physical structure readily admits of thorough internal drainage and aeration. It yields to cultivation, and with moderately deep plowing the soil tends to improve in structure. With the exception of the flat areas, which are in need of ditching, practically all is tillable as soon as cleared of stumps and pine trees.

A considerable portion of the loamy phase of the Norfolk fine sand near Elberta and Lillian has been recently brought into cultivation. A wide range of field crops have been raised with good success. Corn, peas, rice, and sugar cane, as well as garden crops and small fruits do well. It is well adapted to sweet and Irish potatoes, and good yields of exceptionally fine quality have been secured.

Commercial fertilizer is used on truck crops, but good yields of forage, as millet, sorghum, and oats for hay, are secured with but little or no application of manures. Corn planted on the low, dark-colored areas of this phase, where the drainage is good, makes a fine

yield without soil amendments of any kind, but on the higher ground this crop requires nitrogenous fertilizers.

Most of the land near Foley and Elberta, which has not been sold to settlers, is included in two or three large holdings which are laid out in 40-acre tracts. The present price ranges from \$20 to \$30 an acre for uncleared land. Near Elberta there are many well-improved farms whose valuation ranges from \$40 to \$50 an acre.

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

Mechanical analyses of Norfolk fine sand.

Number.	Description.	Fine gravel.	Coarse sand.	Medium sand.	Fine sand.	Very fine sand.	Silt.	Clay.
Typical soil:		<i>Per cent.</i>	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.
22921, 22927...	Soil.....	0.3	4.4	8.9	43.1	22.0	16.0	4.7
22922, 22928...	Subsoil.....	.3	4.7	9.9	45.9	19.2	12.8	7.0
Loamy phase:								
22862, 22864...	Soil.....	.2	2.0	4.0	44.1	28.0	15.4	6.2
22863, 22865...	Subsoil.....	.1	2.9	3.5	43.0	26.1	15.7	9.1

NORFOLK LOAM.

The soil of the Norfolk loam is a dark-colored fine or very fine sandy loam containing a high percentage of silt. The color is due to the large amount of humus. In many places the surface is nearly black and resembles a silt loam, since silt and very fine sand constitute such a considerable proportion of the mineral constituents. It is generally finer in texture, and also more mellow and yielding under foot in cultivated fields, than the soil of the associated types.

The contact between the soil and subsoil is generally well marked by the difference in color. Below the surface of the organic matter the color is much lighter and the material at a little greater depth is bright brownish yellow, in some instances approaching a "cotton-seed-meal yellow." As a rule the coloration is more uniform than in the associated upland types. There is but little tendency toward reddish mottling in the lower subsoil. Iron concretions are not numerous, or if present consist largely of soft, yellowish nodules of feebly cemented earth.

The subsoil is a moderately compact clay loam. It contains a good deal of clay, but there is usually enough fine sand to give a slightly crumbly nature to the material. While plastic if wet, it is not very adhesive and seldom so close in structure that the underdrainage is inefficient.

The Norfolk loam is found only in the wider divides where the original plain has not been invaded by the heads of the drainage

lines. The surface is nearly level, or very slightly undulating, with occasional cypress ponds at the lowest points. The areas are small and pass by insensible gradations into the somewhat coarser textured type—the Norfolk fine sandy loam.

The natural drainage of some of this type is good, but some of it requires ditching before it can be safely cultivated. The physical structure renders it highly desirable for general farming wherever drainage is well established. The silty texture and exceptionally large content of humus gives it a closer resemblance to the best corn soils. It will prove valuable for this cereal as well as other grains and tame grasses.

This type has not generally been given much attention on account of the necessity of drainage and the preference for light soils. A limited acreage is in cultivation near Bay Minette, also in the vicinity of Fairhope, but the most of the type is uncleared.

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

Mechanical analyses of Norfolk 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>
22886, 22890.....	Soil.....	0.2	1.8	4.3	26.2	26.4	26.1	14.4
22887, 22891.....	Subsoil.....	.3	1.7	4.6	21.1	18.1	28.0	25.9

PORTSMOUTH SAND.

The Portsmouth sand is represented by a coarse, black, poorly drained sand varying from a few inches to a foot or more in depth. The dark color is due entirely to the large admixture of decomposing plant remains, mostly in the form of muck. The mineral matter is the quartz sand common to the alluvial types of Lafayette origin. With the organic material this sand forms a mechanical mixture rather than a true soil. There is but little clay and silt present, so that the coherency, or loaminess, which the material possesses in some degree, is due chiefly to the organic matter. The surface is firm, seldom being miry or yielding underfoot.

The subsoil is usually lighter colored, the lower portion at least consisting of relatively pure sand. In some places the dark color extends to a depth of 30 or 40 inches, the organic matter being in a very finely divided state and in a somewhat different condition with regard to decomposition. It may have a dark brownish tint suggestive of the brown stratum of ferruginous sand that occurs in the typical Portsmouth subsoils of other areas in this and adjoining States. So far as observations could be made, in the semiswamp

areas in this county the brown stratum is wanting, and therefore little, if any, "hardpan" is to be found. Its presence or absence is a matter of considerable importance should the drainage of any of this type be attempted.

It is probable that in most instances the deep subsoil is a clean gray sand. In some of the smaller areas of the type occurring at the foot of long slopes there is evidence of a clayey substratum, the water table standing near the surface, and the slow escape of storm water indicating poor underdrainage. On the large flat areas the level of the ground water is but little below the surface.

The largest body of Portsmouth sand occurs in the south part of the swampy area between Lillian and the mouth of Blackwater River. The coarse black sand supports a thick growth of swamp pine, with more or less saw palmetto as undergrowth. In the low swales the soil is a muck and the type merges on the north into the muck and peat beds that form most of the inner margin of the swamp.

The small areas on the Blackwater and Styx rivers are more variable in texture, consisting generally of finer sand, with more or less included vegetable material, according to local conditions. Swamp pine, gallberry, and titi bushes form most of the vegetation. The small bodies in the vicinity of Weeks Bay are flat, benchlike areas, having a slight elevation above tidewater.

The type has little present value except for the timber and pasturage afforded. Soils of this kind, when well drained, are adapted to a variety of truck crops, such as onions, cabbage, and celery. Corn and cotton have also been grown with considerable success on the heavier types. With the present prices of land the reclamation of any of this type is impracticable. It should remain in forest, being more useful in this way than some of the light upland types, for the swamp pine grows very rapidly on the low land.

The analyses of samples of the soil and subsoil of this type gave the following results:

Mechanical analyses of Portsmouth 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>
22959.....	Soil.....	2.8	22.8	21.3	35.0	5.3	7.4	5.3
22960.....	Subsoil.....	3.8	27.1	20.9	32.5	5.0	6.5	4.3

PORTSMOUTH LOAM.

The soil of the Portsmouth loam is a black silty loam containing a high percentage of organic matter. In many instances the proportion of decomposed vegetable material is so large that the first

few inches is true Muck. At depths varying from 4 or 5 inches to a foot or more the fine mineral particles constitute most of the soil, forming a heavy silty or clayey loam that becomes more compact with increase of depth.

The subsoil is usually a stiff silty clay loam containing considerable fine sand. The basic color is light gray, the shade depending chiefly upon the drainage conditions, the most impervious clay generally being the lightest. In some places it is almost white, with numerous bright yellowish brown iron stains and occasional streaks of red. This clay, in most cases where it was practicable to make borings, was found to be a stratum 2 or 3 feet thick grading downward to a sandy material identical in composition with the deep subsoil of adjoining types. In some of the ponds the clay stratum is underlain by a coarse, light-colored sand. There is considerable variation in the relative depth of the soil and subsoil owing to the mode of origin.

The type occurs chiefly in the small, shallow depressions of the uplands—usually cypress and black-gum ponds, which are such noticeable features of the cut-over lands in the southern part of the county. The most of them have a very limited catchment area, and owing to the low gradient of the surrounding land and its grassy covering have received, through surface wash, only the finest sediments. Thus there was formed in the bottoms of these low places a clay stratum that is nearly impervious. As the filling slowly continued the pond became so shallow that conditions were favorable for the accumulation of Muck or the formation of a mucky soil of variable depth. This is the present stage of development in most instances.

The surface of most of the small areas indicated upon the map are covered with water during rainy periods. In these ponds, where the growth of cypress is particularly dense, water may be found the entire year. In the vicinity of Foley some of the larger depressions are open grassy areas with comparatively few trees. In the loamy phase of the Norfolk fine sand scores of these small ponds occur, most of them too small to be shown upon the map. Some of the lowest and most poorly drained portions of the Norfolk loam closely resemble the Portsmouth type, but usually do not have so heavy and impervious a subsoil.

Practically none of the Portsmouth loam has been reclaimed. It is probable that some of the smaller areas underlain by a sandy stratum could be drained by simply digging "wells" through the clay. In most cases ditches would be required, but the distance to an adequate outlet is short—usually less than a quarter of a mile.

If drained most of this type is well adapted to onions, celery, cabbage, and other garden crops requiring a rich soil. It has the

high degree of fertility required for corn. In case the latter crop failed to do well on very mucky phases that had been but recently drained, a light dressing of stable manure probably would be beneficial. This introduces into the soil bacteria essential to the growth of the cultivated plants. The soil would be benefited by applications of slaked lime. Finely ground raw rock phosphate could be used to advantage on such land. It seems easily practicable to introduce redtop and carpet grass on such areas as are now open grassy swales.

The mechanical analyses of a sample of the soil, subsoil, and lower subsoil, taken one-fourth mile west of Foley, give the following results:

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>
22961.....	Soil.....	0.0	0.3	0.6	21.6	23.6	29.7	24.2
22962.....	Subsoil.....	.0	.8	2.5	24.4	30.3	17.4	24.3
22963.....	Lower sub-soil.	.0	.7	2.7	23.9	29.9	16.8	25.8

MYATT FINE SAND.

The Myatt fine sand includes those light-colored, poorly drained areas of common occurrence in all parts of the county, except the northern townships and the Alabama Valley. In the middle section, where the surface is more generally hilly, the areas are small, but in the southern townships, where the relief is milder, the type has a relatively greater extent and the individual areas are usually larger.

The latter are the so-called "savannas" of the lower end of the county. They are grassy openings in the pine woods where the trees are scattering, and many of them stunted in appearance. The larger ones, in many instances, are inclined at various angles, while fallen trunks become nearly buried in the soft earth, where they resist decay almost indefinitely.

The dominant vegetation is the rather short grass, giving these lowlands in the early spring the appearance of mowing land. The red pitcher plants (*Sarracenia rubra*) are numerous, preferring this soil to any other wet land. Later in the season the white "button topped" plant (*Eriocanlon decangulare*) is very abundant, succeeded a little later by a species of goldenrod.

This soil is usually a light-colored fine sand. A hand sample is feebly coherent and has a rather sharp, gritty feel, although there may be but little medium and no coarse sand in it. This is due in

part to the relatively clean condition of the grains, for the finest particles do not adhere to them so closely as in soils subject to less frequent saturation.

In most instances the organic matter content is low. In the first few inches the sand grains are loosely bound by the grass roots, but below this the influence of the meager content of humus is hardly sufficient to make any perceptible difference between the soil and subsoil. Such vegetable material as is present, other than the roots of the living plants, consists chiefly of brown, fibrous particles resembling peat.

The color of most of the soil may be described as "water-soaked gray;" that is, while much lighter gray than any upland type, it has not the bleached appearance of a beach sand. It is slightly mottled with brown iron stains, except in very poorly drained spots, where enough muck may be present to give a very dark color.

The upper part of the subsoil is a sand similar to the soil, but with increase of depth the percentage of silt and clay increases. Below 25 or 30 inches the material is usually a sticky fine sand, or it may be a saturated clay with a large amount of very fine sand. At a little greater depth it grades to a tenacious white clay.

The composition varies considerably at different depths even in the same locality. In the smaller areas at the heads of drainage lines the outer portion may be a fine sand to a depth of several feet while the central part has a clayey subsoil. In the larger areas the texture is more uniform—generally a fine sand to a depth of 3 feet.

The color ranges from light to dull gray, occasionally approaching drab in the lower subsoil. Brown iron stains occur, but are not generally so numerous as to give the subsoil a mottled appearance.

In most places the Myatt fine sand is underlain at 3 to 5 feet by a stratum of clay, nearly, if not quite, impervious. It prevents effectual underdrainage and is the chief factor in the development of the type. This substratum corresponds quite closely with the surface configuration. There is usually a rather broad depression bounded on three sides, at least by higher ground, draining toward the Myatt. This excess water, as well as that belonging to the lowland itself, escapes chiefly by a slow lateral movement through the sandy soil to the nearest open drainage. Very frequently the adjacent strip of Meadow receives this water, the nearly constant saturation and different texture of the latter giving rise to conditions favorable to the denser and more varied vegetation which distinguishes the Meadow from the Myatt soil.

In the last-named type there is a slow alternation of wet and comparatively dry conditions, depending upon the rainfall, the area of the catchment basin, and the thickness of the sandy material. Very little true humus or vegetable remains of any kind accumulate, except

in some of the lowest and most swampy spots, where the soil is not typical Myatt.

The light color is due to a change in the iron content. Most of the latter is probably in the form of ferrous salts, common to poorly drained and nonaerated soils. Numerous tests with litmus paper showed both soil and subsoil to be acid. An odor similar to that of iodoform is a peculiarity of this type. It is especially noticeable on calm summer evenings and is probably due to the presence of some kind of marsh gas.

By this alternation of wet and dry conditions the physical properties are also changed in certain respects. Where the subsoil is a clayey material it lacks granulation; that is, there is but slight tendency on drying to assume the crumbly structure which gives many clay loams the "openness" or permeability necessary for good underdrainage and aeration. The subsoil of the Myatt on becoming dry, as may be observed in the material adhering to the upturned roots of trees, forms a light-colored, hard clod that under pressure breaks to a fine dust. If moistened, it forms a pasty mass somewhat different from the mud of a normal soil.

Some of the small areas of Myatt fine sand occurring in or near the loamy phase of the Norfolk fine sand evidently have somewhat better underdrainage than the average of the type. In such cases the subsoil is brown rather than gray, and the soil contains considerable humus. Occasionally it is a fine black sand to a depth of a foot or more. Such phases are found near Elberta, most frequently occurring at the heads of small branches.

In some of the areas near Perdido Bay the margin near the water has a dark-colored soil, due to the semimarshy conditions occasioned by the tides. A little way back from the shore the usual Myatt characteristics prevail.

In nearly all the larger areas there are spots which are permanently wet, and consequently are either "mucky" or are cypress and gum ponds. The intermediate conditions with regard to drainage are usually indicated by more than the average content of vegetable matter in the soil. Obviously all such variations can not be indicated upon the map.

The small areas of Myatt fine sand in the hills are generally "spoon shaped" in outline and contour. They are oval depressions with considerable surface slope near the outer margin. The boundary in many instances is a "break" or sharp drop of a foot or so in the surface, along which water seeps from the hillside.

From these comparatively elevated locations the Myatt usually extends down one or both sides of the stream, widening wherever the hillside has a moderate gradient and is underlain by clay and disappearing where the slopes are steeper or the soil is a deep sand. The

limits of larger areas in the southern part of the county are not generally so well defined, the soil merging more gradually into the surrounding type. The surface, however, usually has an inclination easily apparent to the eye. It may be toward the center, or in one direction, some hillsides with a decided slope consisting largely of Myatt soil. The large area between Oyster Bay and Portage Creek is essentially a part of the general decline from the interior uplands to the coastal sands. Along Muddy Creek there are numerous cypress ponds, but throughout most of this tract as well as the one north of the mouth of Portage Creek the characteristic Myatt features prevail.

In most instances the drainage of any particular area of this soil is feasible. The effectual drainage and aeration of the subsoil to the depth required for the best development of corn, potatoes, sugar cane, and other crops might be somewhat difficult where the subsoil is heavy or where the impervious substratum is within 3 feet of the surface. As already stated, the latter is the chief cause of the saturated condition of the soil. Since much of the water comes from the surrounding land, ditches should be so located as to cut off seepage from this source. In all cases the depth to and the general direction of slope of the understratum should be ascertained in planning a system of drains. The water table should be lowered to about 3 feet from the surface, admitting of comparatively free access of air to that depth. This will be indicated by a gradual change in color from gray to some shade of brown. In heavy material this process will require considerable time, and therefore ditches should be kept open at all seasons.

The condition of the soil would be greatly improved by the incorporation of as much vegetable material and stable manure as possible. This is needed to supply humus and also to increase aeration—a process that in the virgin soil is almost entirely lacking.

Lime should be liberally used to correct acidity and hasten decomposition of the organic matter. It is thought that in soils of this kind the phosphorus is largely in an unavailable form, and therefore fertilizer high in this element should be used.

The few small patches of this type that have been drained are good locations for gardens, and small truck does well, but liberal fertilization has been given. No considerable areas have been reclaimed, nor is it probable that any such improvement will be undertaken until most of the better-drained soils are utilized. In general the reclamation of the dark-colored phases promises better immediate results than the light ones, and the sandy soils will drain better than those containing more clay, although the latter will prove more durable under cultivation.

No definite statement concerning the average value of this type can be made. The older settlers considered such land of no value except

for pasture. The small areas included in other types have usually been regarded as so much waste land. In many instances, however, on recent land transfers no reduction is made for the proportion of the tract consisting of Myatt soil.

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

Mechanical analyses of Myatt 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>
22913, 22915.....	Soil.....	0.7	4.1	6.0	46.8	23.9	12.5	5.7
22914, 22916.....	Subsoil.....	.5	4.6	7.4	48.1	21.4	12.7	5.1

MYATT SAND.

The Myatt sand closely resembles the Myatt fine sand except in texture. It generally consists of the medium and coarse grades of sand. In places the larger grains collected upon the surface are clean, angular fragments of quartz, and there may be some very fine gravel.

Several areas occur on the second bottoms near the Styx and Blackwater rivers, and these are essentially poorly drained portions of the Kalmia coarse sand. The vegetation and general drainage conditions resemble those features of the Myatt fine sand. In their present state they have but little value except for pasture.

Mechanical analyses of samples of the soil and subsoil of this type give the following results:

Mechanical analyses of Myatt 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>
22911.....	Soil.....	2.2	17.9	24.2	40.2	6.2	4.9	4.2
22912.....	Subsoil.....	2.0	18.9	22.9	40.9	7.2	5.0	3.1

MYATT FINE SANDY LOAM.

The soil of the Myatt fine sandy loam to a depth of about 4 inches is a black fine sandy loam, the organic-matter content being very high. The included sand consists chiefly of the finer grades, so that the soil, if not excessively wet, has a fine loamy feel when handled, and the surface of the drier portions is loose and friable. Where the drainage is not good the content of vegetable material is greater and the soil is essentially a mixture of fine sand and muck.

The contact between the soil and subsoil is sharply marked by the change in color. To a depth of 15 or 20 inches the latter is a yellow or yellowish-gray fine sandy loam, becoming heavier with depth. The lower part of the subsoil is a close, tenacious clay, difficult to penetrate with an auger. In most places it is nearly impervious, and everywhere so dense that any movement of water through it must necessarily be very slow. The dominant color is light gray, but it is in most places streaked with light brown and yellow, and iron stains. Very little of the iron is in the form of concentrations.

This type occurs on the second bottoms of the Alabama River. The surface is flat, or slightly depressed, and the salient characteristics are the result of poor drainage. As a factor in the drainage conditions the heavy subsoil is quite as important a factor as the levelness of the surface.

Southeast of Dixie Landing portions of this type are a silty loam rather than a fine sandy loam. The texture is so fine and structure so close that the material holds water persistently. In certain small areas, through which the old tramway ditches have been dug, the surface water escapes, but the soil remains cold and soggy during most of the year. The soil and subsoil of this phase somewhat resemble putty, and it will be found more difficult to drain than the areas of typical soil.

Nearly all of this land is covered with grass and affords good pasture. There is comparatively little bushy undergrowth and the pine timber is generally scattering, except in some places east of Montgomery Hill Landing where the forest is comparatively heavy. The present value is determined almost exclusively by the amount of timber remaining on the land.

Most of this type possesses a rather high potential fertility, judging from its alluvial origin; but to make this available for cultivated crops good drainage to a depth of at least 3 feet will be necessary. The heavy, mottled subsoil requires effective aeration. The water table, which now stands close to the surface, must be permanently lowered to the depth mentioned above. It is probable that ditches or tile drains will need to be placed rather close together, for in a subsoil of such close structure the lateral movement of water is extremely slow.

The agricultural value of any part of this type depends almost entirely upon the effectiveness of its drainage. For cotton, corn, or other grain thorough reclamation is a necessary preliminary step. A system of rather shallow open ditches will allow some of the more open areas of this type and the associated *Kalmia* fine sandy loam to be cultivated sufficiently to kill the native grass and establish red-top, Johnson grass, or other varieties more valuable for forage than the wild varieties.

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

Mechanical analyses of Myatt 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>
22892, 22895.....	Soil.....	0.2	2.9	3.6	18.6	30.8	34.6	10.0
22893, 22896.....	Subsoil.....	.2	1.0	2.5	13.1	32.8	31.0	19.4
22894, 22897.....	Lower subsoil.	.0	1.3	2.3	11.0	24.1	27.3	34.0

KALMIA COARSE SAND.

The Kalmia coarse sand is a medium to coarse gray quartz sand. In most places it is loose, there being hardly enough fine material to cause it to pack. The scanty amount of humus is usually confined to the first few inches. In some instances it is apparently disseminated through the upper 6 or 8 inches, imparting a rather dingy gray tint to the quartz grains, which otherwise may have a decidedly bleached appearance. Where the surface is flat or slightly depressed there is more than the average quantity of fine material mixed with the sand and a considerable increase in the content of vegetable matter. Such phases of the type approach a coarse sandy loam in their general character.

The subsoil, which consists chiefly of rather coarse sand, is too open in structure to have more than a moderate capillary power, and the general moisture conditions are governed chiefly by local elevation. On the flat land at the foot of the slopes, and also in depressions, the average height of the water table insures a fairly good moisture content to within a few inches of the surface. The color of the subsoil in such cases is usually a light brown. On the slight elevations and low ridges where the sand is deep and leachy the color is generally lighter—light brown or pale yellow.

The type occurs in the second bottoms of the Blackwater River and a few other streams. The surface of these areas is comparatively level and sufficiently elevated to make good sites for farm buildings. While the soil is poorly adapted to field crops, most of the tree fruits and ornamental shrubs grow well. In the more loamy phases garden truck and sweet potatoes as well as all the usual forage crops can be grown, although heavy fertilization is required.

A few areas are found along the bay front, where they form low terraces, ranging in elevation from 10 to perhaps 30 feet above tide. The soil is usually a light gray sand, with a more bleached appearance than that found along the rivers. It is probably deeper, and has

also been subject to greater transportation and assortment, some of it resembling the Coastal beach. These areas also afford some very desirable building sites overlooking the water. Oranges and grapefruit as well as early vegetables do well. A few fields of cotton are grown on this phase of the type, with good results.

The small areas of Kalmia coarse sand in the south end of the county between Oyster Bay and Portage Creek are essentially "outliners" of the body of Coastal beach to the south. The surface is sufficiently elevated above the adjoining Myatt fine sand to admit of fair drainage, and some of these small areas are cultivated to corn and cotton. The higher ridges are dry and differ but little, except in color, from the Coastal beach. They are usually covered with scrubby oak and a scattering growth of longleaf pine, which are the characteristic vegetation of all phases of the type.

The price of this land is governed almost altogether by location, its agricultural value being of little consideration. The areas on the bay front are held chiefly as sites for cottages. The interior uncultivated lands are valued generally according to the amount of standing timber.

The average results of mechanical analyses of samples of this type are given in the following table:

Mechanical analyses of Kalmia 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>
22964, 22966.....	Soil.....	2.1	41.5	24.3	18.0	3.6	6.9	3.6
22965, 22967.....	Subsoil.....	.7	48.6	30.6	10.2	1.6	5.2	3.3

KALMIA SAND.

The largest areas of this type are fairly well-drained portions of the second bottoms, where the sand is of fine or medium texture and more than 3 feet deep. In general the surface resembles that of the Kalmia fine sandy loam or the better drained phases of the Chastain fine sand. It is comparable with the latter type, inasmuch as it is of alluvial origin and local variations in color and adaptability to certain kinds of vegetation are determined chiefly by drainage conditions.

In most instances the soil is a light brownish gray fine sand. The rather fine texture gives the material a slight degree of coherency, which is increased by the presence of some organic matter. In the virgin soil there is not usually much humus, except in the first few inches.

The subsoil is a light-brown or yellowish-brown fine sand. The depth varies greatly. In some places it is underlain by clay or sandy clay at a few feet, while in other instances the sand is of great depth.

In the large area of Myatt fine sand east of Bon Secour there are a number of slight elevations where the better drainage has caused changes in the material, so that it resembles the Kalmia sand. The original timber consisted of longleaf pine of good size, with a scattering undergrowth of scrubby oak.

There is very little of this type cultivated. The agricultural value of any portion depends chiefly upon the character of the lower subsoil. If this is a loose sand the soil is liable to be leachy and crops will suffer in dry periods. In many places the clayey subsoil is near enough the surface and the subsoil is sufficiently fine in texture to afford good capillarity and thus form a light soil similar to the Norfolk fine sand. Rather heavy fertilization would be required for cotton, potatoes, sugar cane, and corn. It is better adapted to melons and some early truck crops. It also affords favorable locations for small orange orchards, as well as some desirable sites for country residences.

The price per acre is determined by the value of the timber and the location with regard to frontage on the water. Some of the interior areas may be purchased at a few dollars an acre, while well-located land is held much higher.

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

Mechanical analyses of Kalmia 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>
22968, 22970	Soil.....	0.6	10.6	18.0	35.9	22.2	8.7	4.0
22969, 22971.....	Subsoil.....	.4	8.4	15.5	36.9	24.9	9.4	4.3

KALMIA FINE SANDY LOAM.

This is an anomalous type occurring on the second bottoms of the Alabama River and also along the lower course of some of the tributary creeks.

The soil differs so much in texture and color in different places and the relative depth of soil and subsoil shows such frequent changes that no very concise description is possible. In most cases the soil is a fine sandy loam, gradually changing with increase of depth to a yellow fine sandy clay. At the foot of the hillsides the soil is inclined to be coarser and the clayey subsoil is found at a greater

depth. This general description is applicable to much of the type in the vicinity of Stockton.

Farther north the greater proportion of the area mapped as *Kalmia* fine sandy loam is nearly level—some of it quite flat. With regard to topography and general characteristics it is a broad transition between the well-drained *Cahaba* soils and the low *Myatt* fine sandy loam.

In most instances the soil, to a depth of 4 or 5 inches, is a dark gray fine sandy loam. It usually contains a good deal of vegetable material, which in many cases is so black and nearly in the condition of fine muck that it suggests poor drainage, regardless of the present moisture content.

The upper part of the subsoil is a bright yellowish fine sandy loam. The lower portion is usually a fine sandy clay, being considerably more plastic and somewhat less pervious. In places it is quite heavy and compact, but as a rule the deep subsoil is not impervious. It contains too much fine sand to have the closeness of structure that marks the lower subsoil of much of the *Myatt* fine sandy loam. While the underdrainage and aeration are not so effective as desirable, it seems probable that the wet condition is more frequently due to lack of surface gradient than to imperviousness of the subsoil. Where the reverse is true the subsoil will be found to be some shade of gray with more or less mottling. In most cases the subsoil is yellow with bright brown iron stains.

Most of this type is forested, longleaf pine being the most common tree, but in low places there is a mixed growth of swamp pine, bay, gum, and other moisture-loving species. The characteristic undergrowth is gallberry. These low bushes are so generally abundant that much of this land is known as "Gallberry Flats."

On the large area northwest of Blacksher the longleaf pine forms a rather open forest with a grassy undergrowth. The gallberry bushes are not especially abundant nor are there many swampy spots.

Practically all of this type requires artificial drainage before it can be cultivated. Those areas which have a bright yellowish colored subsoil with more or less sand in the material would respond to drainage better than those having a light-colored clayey subsoil. The lateral movement of water in the former would be freer than in the latter and aeration would be effective to a greater depth.

A few low ridges or mounds in the larger areas are cultivated by negroes—the fields being little more than the highest patches of land. Very good returns, considering the methods of farming, are secured in dry seasons. Most of this typical phase of the type has little present value except for timber and pasturage.

Along the lower course of the *Styx*, *Blackwater*, and *Bon Secours* rivers occur small areas which vary from a loamy fine sand, with

yellowish-brown subsoil of similar texture, to a fine sand with a heavy subsoil. This phase, locally known as "hammock" land, is usually distinguishable from the typically developed *Kalmia* fine sandy loam by the greater variety of forest growth which it supports. Several species of oak, one of hickory, besides sweet gum, magnolia, maple, dogwood, and occasionally beach prefer this land to the higher sands which generally occur along the streams.

The soil of the heaviest portion of this phase usually consists of 5 or 6 inches of dark-gray loamy sand, with considerable humus. The subsoil is a yellowish-brown fine to medium sand, in which the percentage of silt and clay increases with depth. At 30 to 40 inches the material is a stiff loam and occasionally contains some iron concretions. Its moisture-holding properties are excellent, and to this is largely due the comparatively high degree of fertility which the soil possesses.

In other places the clay substratum occurs at a somewhat greater depth, but it favorably affects the sand above it. The latter has the dark yellowish-brown color which such material assumes where an equitable moisture content is maintained with adequate underdrainage and aeration.

The limited areas of this phase of the *Kalmia* fine sandy loam on the Bon Secours River are mostly occupied as homes or winter resorts, and the gardens belonging to the houses are almost the only portion of the land now cultivated. Many kinds of vegetables, watermelons, and canteloupes, and a considerable variety of fruit find these well-drained loamy hammock lands to be a congenial soil. Pecan trees do especially well and fine specimens upward of 100 years of age are found on the old homesteads near Bon Secours River.

Most of this land is held at a rather high price, determined largely by location with respect to the water front and desirability as a place of residence.

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

Mechanical analyses of Kalmia 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>
22972, 22975...	Soil.....	0.5	6.3	12.6	30.9	27.1	15.4	6.9
22973, 22976...	Subsoil.....	.5	6.3	12.2	29.9	26.2	16.0	8.7
22974, 22977...	Lower subsoil...	.4	5.4	10.9	27.4	20.3	19.6	15.8

CHASTAIN FINE SAND.

Along the lower course of the larger creeks there are occasional areas of bottom land more elevated with reference to the stream

channel than the Meadow, although not entirely free in all instances from danger of inundation during exceptionally high floods. The drainage is rather poor, due in some places to seepage from the adjoining higher ground, and in others to a lateral movement of water through the sandy soil from the neighboring swamps and strips of meadow.

The timber consists chiefly of pine, forming a rather open forest, in most instances with a grassy undergrowth. There are occasional level areas, varying from a few acres to possibly 20 or 30 acres in extent, where there are very few trees, and the grass-covered land has the appearance of cultivated mowing lands. In the depressions the timber growth is denser and more varied, being similar to that on other poorly drained land. At the base of the hills there are frequently found swampy spots filled with titi bushes. In some cases cypress ponds are found.

There are numerous traces of old stream channels, and, in larger areas, many low ridges and broad swales, plainly indicating in their general appearance that this alluvium is of comparatively recent deposition.

The soil and subsoil consist chiefly of fine quartz sand derived, for the most part, from the Lafayette covering of the neighboring uplands. The material varies somewhat in texture, occasionally including considerable proportions of the medium grades of sand. Most of the soil, however, is finer and the sand grains more rounded than in the recent white drifts along the banks of the lower Styx.

The soil of the small, flat areas on the middle course of the creeks is usually very light colored; the humus supply is scanty and affects the soil to a depth of a few inches only. Below the influence of the organic matter the sand is "water-soaked gray" in color, and has a cold, lifeless appearance comparable with an arable soil of similar texture.

On the slight elevations the surface is grayish brown, containing more organic matter in the first few inches, while the subsoil assumes a light-brown tint. This better-drained phase predominates on the lower Styx and Blackwater rivers. These larger areas have more varied relief, and wherever local drainage is effective the material resembles the Kalmia sand.

In general a progressive change may be noted in this bottom land as one travels from the head of either of the above-mentioned streams toward the mouth. The small areas found along their middle courses are usually flat and the soil is light colored, forming a rather broad transition between the Meadow and Myatt fine sand. Farther down where the valley widens a larger proportion of the bottoms is comparatively dry and the timber consists largely of pine. In these larger areas, however, there are many depressions where the surface

conditions vary with the rainfall and the stage of water in the streams.

The type as a whole has little value, except for the timber upon it and the pasture it affords during six or eight months of the year.

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

Mechanical analyses of Chastain 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>
22957.....	Soil.....	0.3	2.6	4.5	35.3	29.8	22.7	4.7
22958.....	Subsoil.....	.4	3.1	5.6	33.6	27.9	21.1	4.9

CAHABA FINE SAND.

The soil and subsoil of the Cahaba fine sand consists chiefly of a dark-brown or reddish-brown fine sand. The total percentage of fine constituents is not generally very high, but the soil has a more loamy character and its general appearance suggests a somewhat higher degree of fertility than is usually apparent in fine sands derived entirely from the Lafayette deposits. This impression seems to be justified by the crop yields on the few patches now cultivated. The type represents the coarsest sediment deposited by the Alabama River in comparatively recent times.

The areas of this soil occur on low swells rising a little above the general level of the surrounding land. Good cotton, corn, and garden truck are grown. The limited area near the mouth of Turkey Creek was the only one mapped, the other small patches being included with the Cahaba fine sandy loam.

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

Mechanical analyses of Cahaba 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>
22898.....	Soil.....	0.1	0.6	3.1	60.7	18.5	10.5	6.4
22899.....	Subsoil.....	.0	.4	2.5	62.0	20.2	10.1	4.7

CAHABA FINE SANDY LOAM.

The soil of the Cahaba fine sandy loam is a fine sandy loam varying from a few inches to 2 feet in depth. The characteristic color is brown tending to reddish brown where the sand is of slight depth,

and a light brownish gray with slightly bleached surface color where the depth is greater. All of it has a rather soft, silty feel when handled, due in part to the absence of coarse grains and the comparatively high percentage of minute mica flakes. With increase of depth the content of silt and clay increases and the material gradually changes to a red fine sandy clay, similar to that which forms the subsoil of the Cahaba loam. This material varies more or less in color, ranging from light red to reddish yellow or frequently mottled in the lower subsoil.

The capillarity of both soil and subsoil is good and the general physical structure highly favorable to ease of tilth and the maintenance of good moisture conditions. The humus content of the cultivated land is generally low, also that of virgin soil, where it is very sandy. The heavier phases of the forested land have a dark reddish-brown surface and the native vegetation includes a considerable variety of deciduous trees, longleaf pine, and shrubs.

The type is closely associated with the Cahaba loam, and no sharp boundary is ever found between them. As a rule, the fine sandy loam prevails on the higher ground, and on the more pronounced undulations occurring along the margin of second bottoms. In such localities the soil in the rather broad depressions may be a light-brown sand to a depth of 2 or 3 feet, while on the slopes the light-red clay is covered with a few inches of loamy reddish-brown sand.

In a few instances the surface is a dull yellowish brown fine sandy loam with an abundance of small, round iron concretions. The subsoil is a rather loamy, silty clay, and the drainage is not so good as that of the light phases.

The Cahaba fine sandy loam is the "hammock land" of the Alabama River bottoms. A good deal of it is included in some of the large plantations cultivated by negro tenants. Cotton is the principal crop. The rather low yields—from one-half to 1 bale per acre—are largely the result of primitive methods of tillage. Some cottonseed meal and commercial fertilizers are used, but the needed humus is not supplied.

The heavier phases of this type, as well as all the Cahaba loam, offer exceptionally good opportunities for the introduction of systematic rotation, with corn as the principal crop. Improved machinery could be used to good advantage, provided sufficient reliable labor could be secured. Much of these soils is cleared, and large fields are immediately available for farming.

The price of this type depends so much upon the character of the standing timber and the acreage involved in any sale that no definite statement can be made. It may be said to range from \$8 to \$15 an acre when considerable tracts are sold, with no reduction for included areas of less valuable land.

Most of this type is farmed by negro tenants. A few of them give about 25 pounds of lint cotton per acre for the use of the land, but the majority are furnished seed, implements, use of mule, and one-half the fertilizer, the owner receiving one-half the crop.

Mechanical analyses of representative samples of the soil, subsoil, and lower subsoil of this type gave the results shown in the following table. The figures given for the soil and subsoil are averages for two samples.

Mechanical analyses of Cahaba 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>
22902, 22904...	Soil.....	0.1	0.6	0.8	30.9	38.9	22.0	6.4
22903, 22905...	Subsoil.....	.0	.3	.5	24.8	33.5	20.1	20.9
22906.....	Lower subsoil...	.0	.4	.4	18.2	36.5	16.4	28.2

CAHABA LOAM.

The soil of the Cahaba loam is usually a silty clay loam, friable at the surface but much more compact at a depth of 6 to 8 inches. The color varies from a dark reddish brown to reddish yellow. The darker shade is most common to those phases which contain a little more sand than the average with numerous minute iron concretions. The latter phase is particularly friable and under cultivation is a loose loamy soil easily kept in excellent tilth. The soil of a light yellow or reddish tint is generally heavier. The effect of even a moderate amount of humus is especially noticeable in any phase of this type, imparting a loamy friable character even where it may not greatly affect the color.

In most instances the subsoil is a red or reddish-yellow clay, tending to become more compact with depth. It usually contains very little sand, but has a granular structure, so that it is more or less crumbly, and the material is not so impervious to moisture as some clays which do not show this tendency to break into cubical fragments. To this property of the subsoil must be attributed in some measure the desirable properties which the type shows under cultivation. The interstitial drainage and the aeration are much better than in those highly plastic clays which underlie some of the associated types.

The deep subsoil in many instances is a much lighter-colored clay and more nearly impervious, but it does not usually occur close enough to the subsoil proper seriously to affect the underdrainage. A considerable part of the area east of Dixie Landing is a light-reddish-yellow silty loam with yellowish-brown clay subsoil. The character-

istic red color is limited to the best-drained portions of this section, while the lighter colors occur as the type graduates to the Myatt fine sandy loam on the flat lands farther from the river.

The Cahaba loam is found on the outer margin of the second bottoms of the Alabama River. The elevation is from 10 to 25 feet above the general level of the Ocklocknee clay or first bottom. The boundary between the two in most places is a sharp slope. Short drainage lines have cut back into the higher ground from the river, and the broad undulations of the old-flood plain are somewhat accentuated by the comparatively recent erosion. Farther back the surface is nearly level, with the exception of occasional low swells rising a few feet above the general surface. The soil of the latter is generally fine sandy loam with a very red clay subsoil.

The Cahaba loam represents the heaviest well-drained soil of the second bottoms, and is locally termed "heavy hammock" land. The material is an old alluvium and doubtless it originally resembled the Ocklocknee clay, but in the course of time the material has assumed the red and yellowish-brown tints characteristic of the type.

Before the war much of this land was cultivated and excellent yields of cotton and corn were secured. The limited areas now farmed by negro tenants produce well, and under more skillful management the results would be much better. The soil if better supplied with humus would be admirably adapted to corn. The preference of grass crops for a soil of such heavy structure is indicated by the persistence with which the Bermuda grass and Japan clover grow near old homesteads and cabins.

The type is highly desirable for general farming, especially where grain and forage crops for stock feeding are desired. It also gives good yields of cotton. Little commercial fertilizer is now used upon the soil, and by crop rotation and stock raising the productiveness could be increased without resorting to mineral fertilizers of any kind.

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

Mechanical analyses of Cahaba 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>
20825, 22900...	Soil.....	0.8	3.4	2.6	6.8	10.1	59.1	17.1
20826, 22901...	Subsoil.....	.0	.4	.4	1.3	4.1	36.4	57.0

OCKLOCKNEE CLAY.

The Ocklocknee clay includes all of the soils of that part of the flood plain of the Alabama and Mobile rivers above the Middle and Tensaw rivers. It represents the latest deposit of the former streams and consists of material derived from various sources. The superficial portion of this alluvium is so recent that it has undergone comparatively little change in color or other characteristics of importance in soil classification. With regard to texture and the relative depth of the soil and subsoil in some places several soil classes are recognizable, but the marked uniformity in the general character of the material renders these distinctions of less importance than in the case of upland types.

In most places the soil is a brown silty clay containing a small percentage of fine sand. There is almost invariably enough fine mica to be easily observed in a hand sample, and the proportion of this mineral increases with the sand content. As a rule the material has a soft, fine feel when rubbed between the fingers, for the sand grains are evidently well rounded and very seldom coarse. The heaviest phases of the type frequently have a dark chocolate-brown color and are rather compact. As a rule the color becomes lighter with depth and the material is not so compact, often grading into a micaceous fine sand.

After each overflow the surface is covered with a soft, brown mud that on drying becomes very friable, a characteristic that is somewhat increased by the admixture of vegetable debris over which or with which the sediment is deposited.

Near the stream channels, especially on the lower side of the curves, the sediments in many instances consist chiefly of sand. It is rather dark colored, contains more or less silt and clay, and usually is a fertile, easily tilled soil of very light texture. In many cases there is so much mica in it that it is locally termed "isinglass land."

Throughout the most of the interior areas the subsoil is a little lighter colored than the soil and usually becomes sandy with increase of depth. Sometimes there is a sharp transition at some depth from the clayey soil to a fine brown silty sand. More frequently, however, the material between the depths of 6 and 18 inches is heavier and more compact than the soil, while at 30 or 40 inches there is a decided increase in the sand. The latter, generally consisting of the finer grades, is rounded rather than angular and includes much mica.

In those portions of the extensive area of Ocklocknee clay which were accessible at the time this survey was made, very few borings to a depth of 40 inches failed to reveal evidence of a sandy sub-

stratum. This is important as affecting drainage, for it permits the escape downward of excess water whenever the stage of the water in the rivers is low enough. After the floods much of this land dries quite rapidly as the rivers return to their normal stage. The height of the water table is determined chiefly by the condition of the main stream and the numerous "cut-offs" and minor channels.

The general elevation of much of this overflow land varies from 2 to 5 feet above the usual level of the water in the rivers. The elevation is greatest and the relief most pronounced along the main channel, where natural levees have been developed. There are low ridges elsewhere and occasional sandy elevations near the lagoons or "lakes," but much of the interior is flat. Toward the north the general elevation is greater than in the southern part of the area. Below the thirty-first parallel the higher land is largely confined to the immediate river banks, while the flat portions merge into permanent swamps and canebrakes that are subject to overflow during storms and high tides in Mobile Bay.

Most of the Ocklocknee clay is heavily timbered. Several varieties of oak—water oak being very common—tupelo and sweet gum, poplar, ash, maple, and cypress, with some sycamore, willow, ironwood, and a few other varieties of deciduous trees and some pine form the forest. There are canebrakes on the lowest ground and a few grassy openings along the streams. The undergrowth is sparse, for most of the surface is constantly shaded by the large trees.

Before the war a number of large plantations were cleared on the better portions of this type. Corn was the chief crop, and a considerable part of the 131,000 bushels credited to this county in the census of 1860 was raised on this bottom land. Most of these old fields have reverted to forest; a limited acreage is now cultivated and in favorable seasons good yields are secured.

On some of the old plantations levees were built strong enough to protect the fields against minor overflows. These have all disappeared.

It is stated by the older settlers that while high floods occurred in early times, the rise and fall of the water was generally slower than in recent years. This is doubtless true, since the clearing of such a large proportion of the land in the catchment basin of these rivers accelerates the run-off of the surface waters. It is also probable that the present rate of deposition of sediment is faster than formerly.

A number of old cypress ponds near Lake Tensaw are known to have filled up level with the surrounding ground in the last twenty-five years. In the same vicinity, where the winter flood of 1908-9 was not higher than usual, and no other exceptional conditions prevailed, the new sediment ranged from one-fourth to one-half inch

in thickness. This can not be taken as a measure for the entire area, but is indicative of the rapidity with which certain portions are being built up.

It is hardly probable that any plan of diking the best portions of this low land is practicable. A more feasible means seems to be in the utilization of such portions as may be cleared in the production of corn and grass. Corn planted as late as the last week in July has matured before frosts came in the fall. As a rule much of this land is dry enough to plow before this date, and the winter floods do not usually come before the crop can be harvested. In the summer of 1909 the lowlands were more or less flooded during May, June, and July, but this was exceptional. Usually the most of the "Swamp," as it is commonly called, is dry and easily accessible during the summer and fall.

No attempt has ever been made to seed any of the cleared areas to Johnson grass or any other forage crop, but the unlimited demand for hay in the Mobile market seems to justify the assertion that such crops could be profitably grown, provided they were handled with labor-saving machinery.

The scarcity of labor since the war has been the chief cause of the abandonment of these rich lands. Until recent years only the choicest timber was of much value, so that no consideration could be given the idea of clearing any considerable acreage. The rapid increase in the value of all kinds of lumber found in this forest now indicates that the time will soon come when all the timber from extensive tracts of land adjoining navigable water may be cleared at a profit and the ground left in condition for cultivation. The stumps of deciduous trees rot rapidly in such a soil and the land could be put in condition for the use of the latest labor-saving implements now in use in corn-growing sections. With such machinery and heavy teams a few hands could handle large areas of this soil.

Much of this land is now owned by descendants of the pioneer families. Considerable tracts of this and the second bottoms were included in the old Spanish grants. Until recently the returns from the land were simply what the owners were able to realize from the sale of the best timber and from pasturage, which is of some importance. Lumber companies are now acquiring large holdings, the price in some instances being as high as \$10 an acre.

While the development of this type offers little opportunity for men with limited means, it seems feasible to develop certain portions on a rather extensive scale and thus to utilize this inexhaustible soil in the production of corn and hay.

The average results of mechanical analyses of samples of the soil, subsoil, and lower subsoil are given in the following table:

Mechanical analyses of Ocklocknee clay.

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>
20822, 22978, 22981.	Soil.....	0.0	0.3	0.6	5.1	12.4	41.4	40.2
20823, 22979, 22982.	Subsoil.....	.0	.2	.3	3.4	14.6	41.9	29.5
20824, 22980.....	Lower subsoil.	.1	.6	.8	3.7	17.4	36.2	40.7

COASTAL BEACH.

The Coastal beach is a coarse white quartz sand found bordering the Gulf. Immediately along the shore it presents the usual appearance of a beach sand, with clean angular grains, among which are fragments of shells. Back of the beach the surface consists of low, parallel ridges of bleached wind-blown sand, from which nearly all shell fragments have disappeared. From one-half to three-fourths of a mile inland the surface irregularities are not so pronounced, there being areas that are moderately undulating, with some shallow basins in which the sand is quite dark and somewhat loamy on account of the organic matter present. In most places, however, the surface consists of a loose, white sand that yields easily under foot, rendering travel over it particularly tiresome.

The subsoil consists of practically the same material to a great depth. In most places the sand grains are stained a light brown. The depth to this colored sand is variable, depending evidently on the fluctuation of the ground water as influenced by capillarity and seepage from higher ground, or, as in the flat areas near the lagoons, by the tide.

The low ridges back of the beach are scantily covered with scrubby oak and pines. Farther inland the trees are larger; water oak, long-leaf pine, and magnolia are the most common species. Near the fresh-water lakes the ridges are covered with a dense thicket of low oaks (*Quercus mystifolia*), with a few large pines. The depressions are more or less marshy and in places contain muck. The larger ones are in many instances titi swamps.

The area between Oyster Bay and Mobile Bay lies so little above the tidal marsh on each side that the water table stands quite near the surface, and much of the 3-foot soil section is a brown sand with a gray sand containing some humus as the surface layer.

The old settlement of Shell Banks is located on a rather fine textured and loamy phase of this sand. Its agricultural value is enhanced by the abundance of oyster shells mixed up with the soil. The

lime has perceptibly darkened the soil wherever a little humus is present. In this locality, as well as in a few other places, early garden truck and some sugar cane, as well as Irish and sweet potatoes, are raised. Oranges, grape fruit, and many semitropical plants and shrubs grow well, the warm sand and proximity to water affording considerable protection from frosts.

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

Mechanical analyses of Coastal beach.

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>
22907.....	Soil.....	0.0	9.6	51.6	37.6	0.1	0.4	0.4
22908.....	Subsoil.....	.0	17.5	51.1	25.2	.3	3.6	2.2

SANDHILL.

On Majors Creek, near the Stockton road bridge, there are several low ridges of loose sand. They rise 10 or 15 feet above the surrounding land and the general appearance suggests a local accumulation at some previous period in the valley history. The material resembles the Kalmia sand, but it is much deeper and has practically no agricultural value.

MUCK.

Many areas of Muck are found in this county. Most of them occur along the small streams in portions of the valleys where the general gradient is low and the water table stands constantly near the surface. On a few of the tributaries of Styx River practically all of the low land consists of Muck. The area on Bee Tree Creek is perhaps the largest, but along some of the other branches these boggy deposits extend for several miles, with but few places where a crossing is practicable.

The Muck is a soft, yielding, densely black material consisting almost exclusively of vegetable matter. This has been greatly changed since its accumulation, being in a finely divided condition, all traces of the original plant fiber having disappeared. In most instances there has been but slight admixture of earthy matter by surface wash, the dense vegetable covering preventing such deposition except upon the extreme edges or near the channel of the streams. The depth of the Muck varies from a few inches to several feet, with an occasional extreme depth of 6 or 8 feet. The underlying material along the streams is usually a heavy loam or a sandy clay. The numerous areas of Muck within or near areas of Coastal beach are underlain by coarse sand.

The Muck bodies along the streams support a dense forrest of bay, black gum, and swamp pine, with more or less titi and other undergrowth. On some of the deepest and most boggy places there is a rank growth of cane.

None of the Muck has been utilized in any way. There are some small areas which could be reclaimed by cutting a ditch around the upper side to cut off the seepage water. It is also highly probable that in some such instances the water supply could be controlled without great expense, and an ideal plat of ground secured for celery culture.

Muck has some value as a fertilizer for sandy soils, chiefly on account of the nitrogen content and the effect upon the physical condition of such soils. It has also been used as a filler for commercial fertilizers and as an absorbent in stables. Under present conditions in this area it could hardly be used with profit. For all crops Muck underlain by clay or sandy clay is to be preferred to that resting upon sand.

MEADOW.

This type embraces the low land along the streams which is frequently overflowed, though at other times the surface is comparatively dry. In most places the soil is a black, humus-laden sandy loam, underlain by much lighter colored sandy clay or clay loam. The relative depth of the soil and subsoil as well as the texture of the mineral constituents varies so much that no definite classification is possible. A considerable proportion of the area mapped as Meadow is really Muck, for in places the conditions are favorable for the formation of such deposits, but such areas were mapped as Muck only where the boundaries were definite or the areas were of considerable extent.

Most of the Meadow is covered with a mixed growth of moisture-loving trees and various kinds of shrubs and vines. There is but little grass and the value for pasturage is low.

A considerable portion could be reclaimed sufficiently to be suitable for grass by removing the timber and straightening the stream channels. Along some of the old log flumes in the northern part of the county the Meadow is now comparatively firm, well-drained ground.

SWAMP.

The areas mapped as Swamp are those flat, timbered lands that are wet and swampy the greater part of the time. A considerable portion of the surface is covered with water, and the interior of the larger areas is difficult of access on account of the sluggish streams and the soft, mucky nature of the soil.

The soil consists chiefly of vegetable debris, while its mineral constituents and that of the subsoil is determined to a considerable extent by physiographic position. The substratum of the coastal

swamps is generally a coarse beach sand, that of the large area above Mobile Bay is a fine mud. The smaller areas along the rivers usually have a sandy subsoil. The last are not essentially different from the Meadow, but as a rule the soil is wetter and the undergrowth more dense.

The large area of Swamp north of Mobile Bay has about the same surface features as the Ocklocknee clay, except that most of the surface is so low that it is frequently flooded during high tides and storms. The area northeast of Lillian consists in part of peat bogs near the coast with more or less titi covered mucky soil on the inner side. It includes a few low sandy ridges where the timber consists chiefly of small oak. Toward the south the soil merges into the dryer and more accessible Portsmouth sand. The forest covering the latter type consists mostly of pine, but on the Swamp it includes a great deal of cypress, swamp pine, and juniper, with a dense undergrowth of briers and vines.

The chief value of the Swamp lies in the timber. In all of the areas there is more or less cane and occasional grassy openings which afford some pasture, but most of the surface is too densely forested to be of much value for this purpose.

TIDAL MARSH.

The Tidal marsh embraces those low coastal flats that are more or less subject to tidal overflow. Most of them are narrow strips found at frequent intervals on the bay shores and the inner side of the lagoons. These brackish marshes are also of common occurrence at the heads of the inlets and along the lower courses of some of the streams. The largest continuous area surrounds Oyster Bay, and another of considerable size lies between the mouth of Ben Secours River and Mobile Bay.

The surface is densely covered with rushes, which on the most marshy portions grow to a height of 3 or 4 feet. Where the ground is slightly elevated the growth is less rank and a coarse grass forms a part of the vegetation. The latter affords some pasturage, which is about the only value that can be assigned to the type.

The soil is a brown peat formed from the rushes. This spongy saturated material varies from a few inches to several feet in thickness. The underlying sand is usually bluish gray in color. Much of the Marsh on Oyster Bay has a subsoil of blue mud, and the lower part of the surface layer is a soft, bluish-black, decomposing mass of vegetable remains with a disagreeable sulphurous odor.

SUMMARY.

Baldwin County is situated in southwest Alabama, on the Gulf of Mexico and Mobile Bay. It is about 72 miles long, from 20 to 30 miles wide, and has an area of 1,585 square miles.

The surface of the greater part is rolling to hilly and has an elevation ranging from 75 to 250 feet above sea level. About 222 square miles is included in the Alabama Valley, consisting chiefly of low alluvial land with a considerable area of second bottoms. The surface of the northern half of the county is generally more hilly than that of the southern. The divides in the latter section are wide undulating areas embracing much land on the widest ridges in the northern part of the county, and also in the Alabama Valley.

In most sections the original pine forest has been cut off; on the low lands a comparatively heavy growth of mixed timber remains.

The county as a whole is thinly settled. In the northwestern part there are some old settlements and a few large plantations. The population of the southern part consists largely of settlers recently from the northern States, and the farms are usually small. Large tracts of cut-over land are held by lumber and colonization companies.

The Louisville and Nashville Railroad crosses the middle of the county. A branch line extends from Bay Minette, the county seat, to Foley, a town in the southern part. The coast towns have boat service to Mobile, and steamers touch at points on the Alabama River.

The climate is mild, and attracts many visitors to the winter resorts on the Gulf coast. The mean temperature of the winter months is 52° F., of the three warmest months 81° F. The average rainfall is about 60 inches per annum.

Until recently lumbering has been the chief industry, but agriculture is now receiving more attention. On the old farms cotton, corn, sugar cane, and sweet potatoes are the principal crops. Little consideration is given forage crops, since the live stock range the woods the year round.

In the southern part of the area agriculture is more diversified. Not much cotton is raised, but corn, Irish and sweet potatoes, rice, and some other minor products are cultivated. Some attention is being given fruit and early vegetables. Oranges are produced in sufficient quantities to supply part of the home demand.

On most of the farms the limited acreage cleared tends to confine the cultivated crops to the same land year after year. Little consideration can be given crop rotation, and commercial fertilizers are relied upon to keep up the crop yields.

For the permanent improvement of the tillable lands a rotation with forage crops—especially the legumes—for pasture and green manure is advised. Lime and finely ground rock phosphate can be used advantageously. Potash can be most economically obtained by purchasing kainit or the mineral separately and composting it with stable manure on the farm. More live stock should be kept and the opportunity to do so with profit is excellent, for a strong home demand exists for meats and dairy products.

The total area under cultivation in 1909 was about 16,000 acres. The value of farms and farm implements thereon was about \$3,500,000.

The soils of this county fall into two divisions. The greater one comprises the soils derived from the Lafayette deposits, which form the surface practically everywhere, except in the Alabama Valley and on limited areas of upland, from which it has been removed by erosion. This large group includes the Orangeburg, Norfolk, and Myatt soils, besides some miscellaneous types.

The Orangeburg sand is fairly well adapted to cotton, sweet potatoes, and early truck. A good quality of wrapper-leaf tobacco has been grown on a moderately heavy phase of this type.

The Greenville sandy loam and Orangeburg fine sandy loam are types well adapted to general farming. They are better adapted to the Cuban filler types of tobacco than to the Sumatra, being a little heavy in texture for the latter. The lighter phases, where the clayey subsoil is not closer to the surface than 15 or 20 inches, are to be preferred for the Sumatra.

The Norfolk sand has an extensive distribution. Much of it is too light to be of value for any crops, except early truck and some kinds of fruit. Where the underlying clay is not more than 4 or 5 feet below the surface, and there is considerable fine sand and interstitial material, fair yields of cotton, potatoes, sugar cane, and vegetables are secured.

The Norfolk fine sand is a light easily tilled soil better adapted to early truck than to the usual farm crops. With fertilization, however, it produces good cotton, sugar cane, watermelons, and sweet potatoes. Upon the loamy phase of this type, extensively developed in the southern part of the county, sweet and Irish potatoes are grown for market shipment.

The Norfolk loamy sand and the Norfolk sandy loam are rather coarse light-textured soils. Their value locally depends upon the depth to a subsoil sufficiently heavy to retain moisture. With good culture the best phases of this soil produce good cotton, potatoes, sugar cane, and forage crops, but are not well adapted to corn.

The Norfolk fine sandy loam is a comparatively heavy soil, somewhat more drought resistant than the previously mentioned types. It is readily improved and may be considered one of the best types for mixed farming to be found on the uplands. A broken phase of this type is generally too rough and the soil too variable in depth to be valuable for farming.

The Norfolk loam has a limited development on the level uplands. It usually requires drainage, and if so improved is a valuable type for corn, oats, and grass.

The Norfolk gravelly sand is a coarse open type of little agricultural value.

The Susquehanna clay is a nonagricultural type found in the northern part of the county.

The Myatt fine sand and Myatt sand are light colored, poorly drained types locally called "savannas." Most of these areas are grassy openings in forested land, the timber being small and scattering.

The Portsmouth soils are poorly drained black land. If reclaimed they are valuable types for many kinds of truck. The loam type is well adapted to corn.

The land along the smaller streams that is frequently overflowed is classed as Meadow. If cleared, much of it could be farmed and practically all would be valuable for cultivated grasses.

The Chastain fine sand is a flat, poorly-drained type of the minor stream valley. Most of it lies above the average high-water stage. It is of little value except for pasture.

Considerable areas of Muck occur on many of the streams. There are a few large tracts of Swamp and many small swampy areas in all the lowland types. A fringe of Tidal marsh skirts the coast of the bays and lagoons in many places.

The Gulf coast is bordered by a belt of light-colored sands mapped as Coastal beach. The topography varies from comparatively level to wind-drifted ridges 10 to 25 feet high. The soil has little agricultural value. On the finer textured phases oranges and very early truck are produced in a limited way.

The Kalmia coarse sand, sand, and fine sandy loam are alluvial types derived from materials washed from uplands. They form second bottoms on the rivers and bench lands along the bay shores. The finer textured and best drained soils have considerable value for early truck, watermelons, potatoes, cane, and cowpeas. The areas of Kalmia fine sandy loam afford good locations for pecan orchards. On the sand many oranges and a considerable number of grape fruit trees have been planted.

Six types, besides Swamp, are found in the Alabama Valley.

The Ocklocknee clay consists of brown, silty clay, the recent sediments of the annually overflowed land. The area in Baldwin County is extensive and its fertility is inexhaustible. Some of this land farmed before the war gave heavy yields of corn.

The Cahaba fine sand, fine sandy loam, and loam are second bottom soils having a high value for corn and cotton.

The Myatt fine sandy loam is closely related to the Cahaba soils but is poorly drained, as a result of the heavy subsoil and flat surface.

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