

SOIL SURVEY FROM RALEIGH TO NEWBERN, N. C.

By WILLIAM G. SMITH.

INTRODUCTION.

The area mapped extends from Raleigh to Newbern, along the line of the Southern and the Atlantic and North Carolina railways, a distance of 105 miles, about 9 miles wide, and contains approximately 1,000 square miles, or 640,000 acres. (See fig. 18.)

The State department of agriculture paid all the field expenses of the survey party, as well as all expenses incident to the making of a good base map showing wagon roads, railroads, houses, towns, and streams, and proposes to follow up the survey and locate test farms on the more important soil types revealed by the soil survey, the object being to study further the fertilizer problems as well as the cultural methods and crops adapted to the different soil types. Two

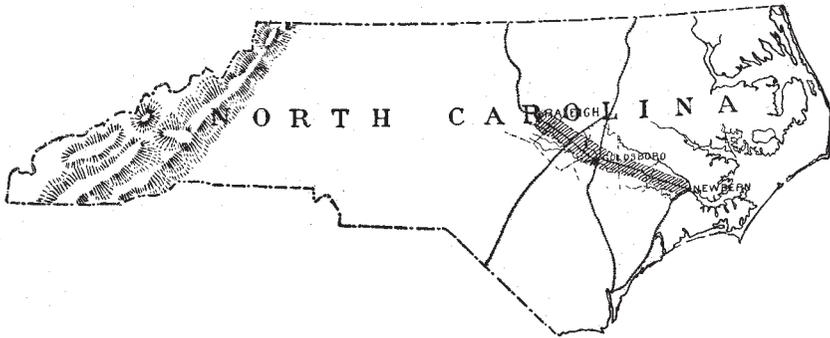


FIG. 18.—Sketch map of North Carolina, showing area surveyed.

test farms are already located, one at Tarboro, in Edgecombe County, and the other at Red Springs, in Robeson County. The farm at Tarboro was visited by the survey party and its soil correlated with a similar soil type of the area surveyed.

Credit is due the State geological survey for aid furnished through the State Department of Agriculture in securing competent traverse men to make the base map.

TOPOGRAPHY.

From Raleigh to Newbern there is a gradual change from the rolling uplands of the Piedmont Plateau to the low, level country of the Coastal Plain region. Raleigh is situated near the eastern edge of

the Piedmont Plateau, so the greater portion of the area surveyed lies within the Coastal Plain.

The Piedmont Plateau extends about 25 miles east of Raleigh, and is characterized by rough, hilly country, with narrow stream valleys in which the streams have considerable fall. The greatest development of the Piedmont Plateau lies west of Raleigh, extending to the foot of the mountains. In the vicinity of Raleigh the elevation above sea level is about 300 feet, and a few miles southeast, at Garner Station, on the Southern Railroad, the elevation is 383 feet. From Garner eastward there is a fall of about 7 feet per mile to Selma, where the elevation is 175 feet and where all trace of the plateau region is lost and the flat or gently rolling Coastal Plain area proper begins. The fall from Selma to Newbern, which has an elevation of 16 feet, averages about 2 feet per mile. From Selma to Newbern the country is generally low and flat and in the eastern portion are swamps. The largest swamp is located about Dover and is known as the Dover Pocoson, while the next largest is near Newbern. They are depressions of from 2 to 10 feet below the surrounding, generally flat land, and represent about 200 square miles in extent. The elevation at Dover is 65 feet, making an average of less than 2 feet fall eastward to Newbern.

The streams possess but few branches, are generally in deeply cut beds with abrupt banks, slow flowing, and subject to several feet rise during heavy rainfall. The Neuse River, the largest occurring in the present survey, is navigable as far as Smithfield except when the water is excessively low.

CLIMATE.

The following table¹ shows the mean monthly temperatures and rainfall during the growing seasons at three stations in the area surveyed. The figures are normals made up from seventeen to twenty-seven years' records.

Mean monthly temperature and rainfall.

Month.	Raleigh.		Goldsboro.		Newbern.	
	Temperature.	Rainfall.	Temperature.	Rainfall.	Temperature.	Rainfall.
	° F.	° F.	° F.	° F.	° F.	Inches.
April	59.1	3.22	60.6	4.76	59.6	3.72
May	68.2	5.45	69.6	4.99	68.4	4.44
June	75.7	4.32	77.2	5.18	75.9	4.75
July	78.0	6.44	79.8	6.08	78.9	7.07
August.....	76.4	6.24	78.3	7.27	77.3	8.08
September	71.1	3.22	72.8	4.80	72.9	5.45
Annual.....	59.6	50.21	61.5	53.56	61.3	56.08

¹ Climatic Conditions Affecting Water Power in North Carolina, 1899, by C. F. Von Herrmann.

The average temperature and rainfall for the Coastal Plain section for the seasons are as follows:

Average seasonal temperature and rainfall.

Season.	Temper- ature.	Rainfall.
	° F.	Inches.
Spring	59	12.85
Summer	77	17.04
Autumn	62	13.10
Winter	45	12.24
Year	60.8	55.23

CONDITIONS OF AGRICULTURE.

From Raleigh eastward to Newbern there is a gradual increase in the size of the farms. In the hilly regions east of Raleigh the farms contain about 110 acres; in the middle portion of the area surveyed the farms contain on an average about 140 acres, while in the level country about Newbern there are many large plantations of more than 1,000 acres, and the average farm contains 225 acres.

The improvements on these farms vary greatly in the different sections of the area. Usually they possess a dwelling house, barns for stable purposes, and wagon sheds, and in the tobacco area curing sheds are always found. The tenant houses for the colored laborers form a part of the farm equipment, especially on the larger plantations. Fences are maintained at a minimum expense, for the stock laws in most of the counties are such that protection against stray cattle and other stock is unnecessary.

There are several systems of cultivating the farms. Where the farms are small they are usually farmed by their owners, but where they are larger the owners may manage the entire farm and employ labor necessary to carry on the operation. Again, portions of the farm may be rented for a cash rent or on the share system. A favorite system is to rent portions of a large farm to a tenant on shares provided he buys his provisions, etc., from the plantation owner, who conducts a large general store. In the entire area the labor is both white and colored, and frequently both kinds are employed on the larger farms. For such crops as cotton and tobacco, the negro labor is as capable as white labor. Fig. 19 shows a typical cabin of a negro family in this section.

As the area surveyed follows so closely the railroad throughout the entire distance, transportation by rail is very good, and some of the industries, as, for example, the trucking industry, have been made possible by the advantage which comes from rapid transportation. In the eastern part of the area water transportation is available and has been utilized to a considerable extent in developing the resources

of the country. The wagon roads of the area are not good. While some of the roads have been constructed at considerable expense and can be easily traveled, by far the larger number of roads have received no attention whatever, and are consequently in poor condition for either light or heavy hauling.

The principal crops are corn, cotton, tobacco, and truck. Corn has always been one of the staple crops of the entire area and occupies a prominent place in the various crop rotations used in the different sections of the area. Cotton is also one of the important crops grown, and the yield per acre shows the beneficial results of improved methods of culture and of the attention given to fertilizers. The effort is

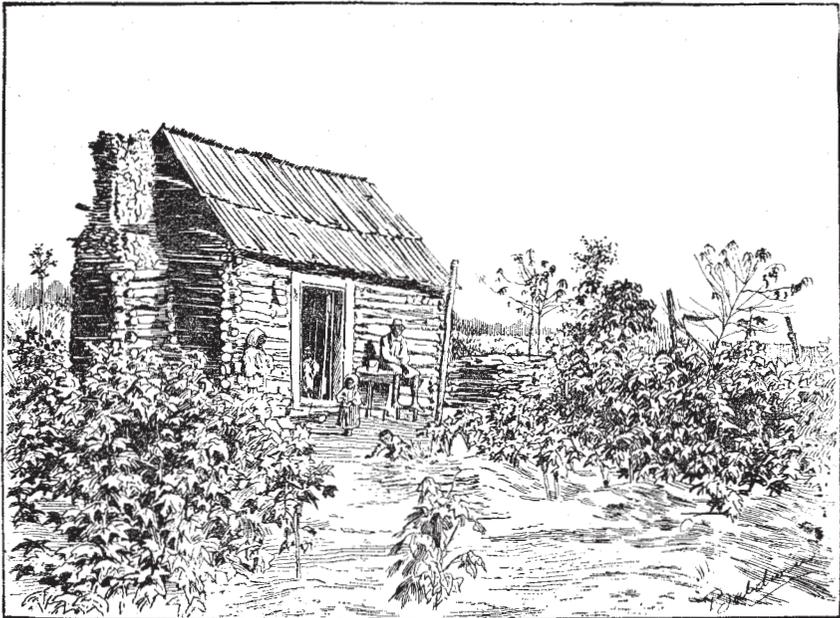


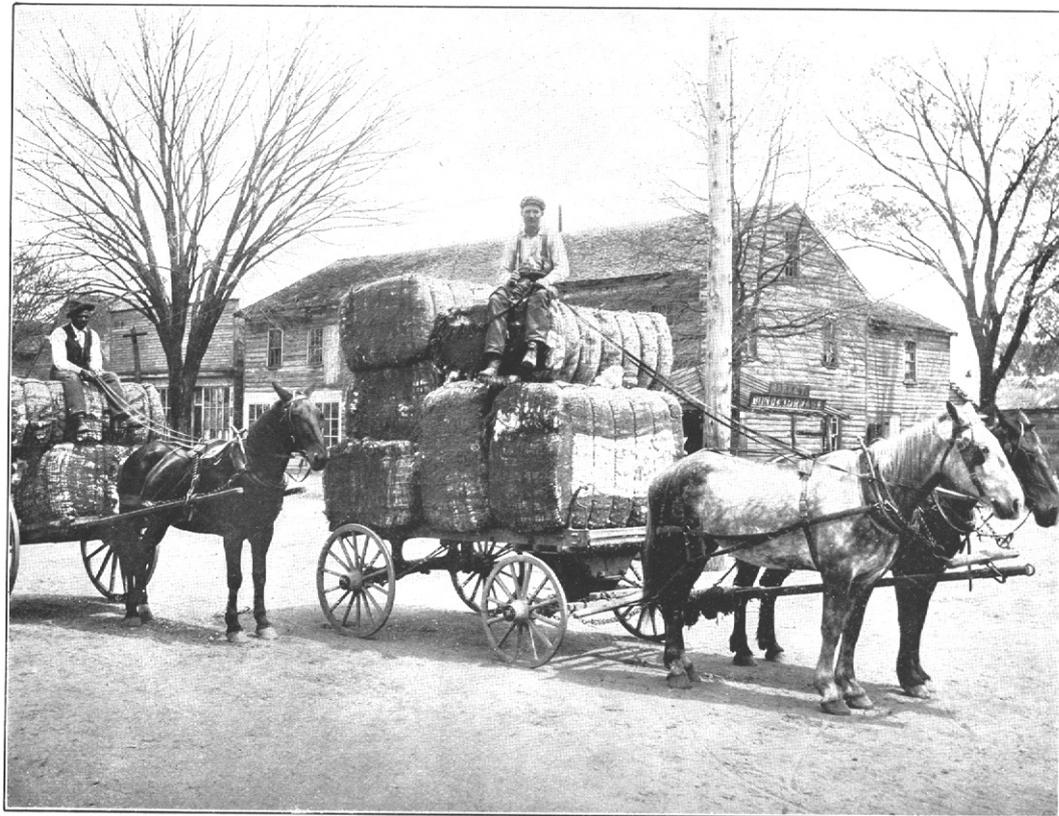
FIG. 19.—Typical negro cabin.

being made to manufacture the crop where it is grown, and in this way an important industry is being developed which has a far-reaching influence on the economic development of the State.

Since the introduction of bright tobacco in the eastern part of the State it has achieved remarkable success, and large districts of the area surveyed produce a fine type of lemon-yellow tobacco. In addition to the crops grown the development of the truck industry in the eastern portion of the area has made valuable large tracts of land which were formerly not desirable for agricultural purposes. Nearly all classes of early truck and early fruits are grown, and handsome profits are realized by successful farmers. The largest shipments of truck are from Goldsboro, Newbern, Kinston, and Lagrange.



COTTON FIELD.



HAULING COTTON TO MARKET.



COTTON PLATFORM AT KINSTON.

CECIL SANDY LOAM.

Cecil sandy loam is a brown sandy loam soil from 6 to 10 inches deep, containing from 10 to 30 per cent of quartz and rock fragments. It is underlaid by a red clay, containing quartz and rock fragments similar to the subsoil of the Cecil clay. It is locally known as "brown land."

Cecil sandy loam differs from Cecil clay in possessing a much larger percentage of sand in the soil. It is more friable than Cecil clay and more easily tilled, though the quartz and rock fragments have a wearing effect on plows and other soil implements.

This type of soil is found in large areas in the vicinity of Raleigh and in smaller areas at Clayton and Wilsons Mills. There are some large and gently rolling fields of this soil, but generally it is quite hilly.

Cotton, small grain, and corn do well on this soil, the cotton production averaging from one-half to three-fourths of a bale per acre where fertilizer is used. Bright tobacco is grown to some extent on this soil. Because of the moist, retentive character of the subsoil this type of soil withstands drought quite well. The forest growth is like that common to the plateau section, differing from the Coastal Plain forest growth in that it possesses a larger proportion of hardwood than pine.

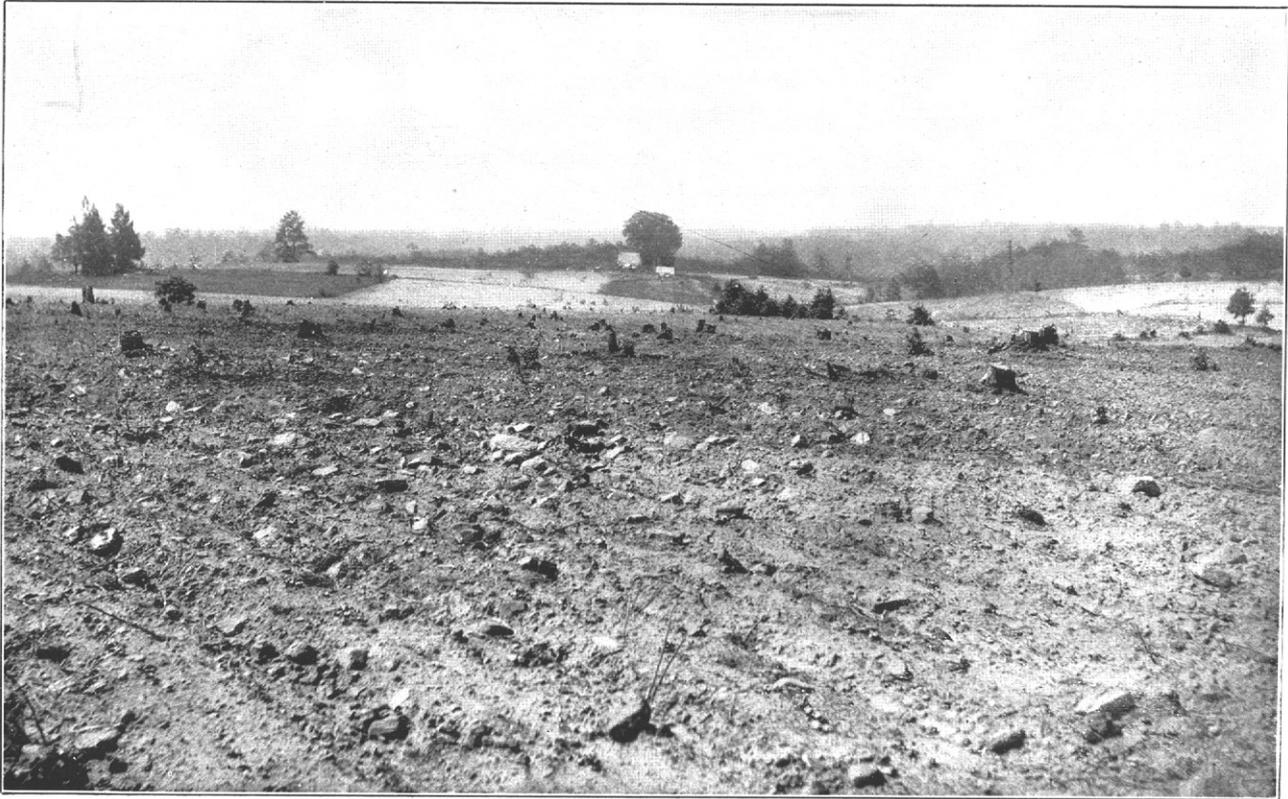
The following mechanical analyses of the soil and subsoil of the Cecil sandy loam show a large and uniformly proportioned infusion of sand in the soil, while the red clay subsoil analysis is almost identical with that of the Cecil clay subsoil:

Mechanical analyses of Cecil sandy loam.

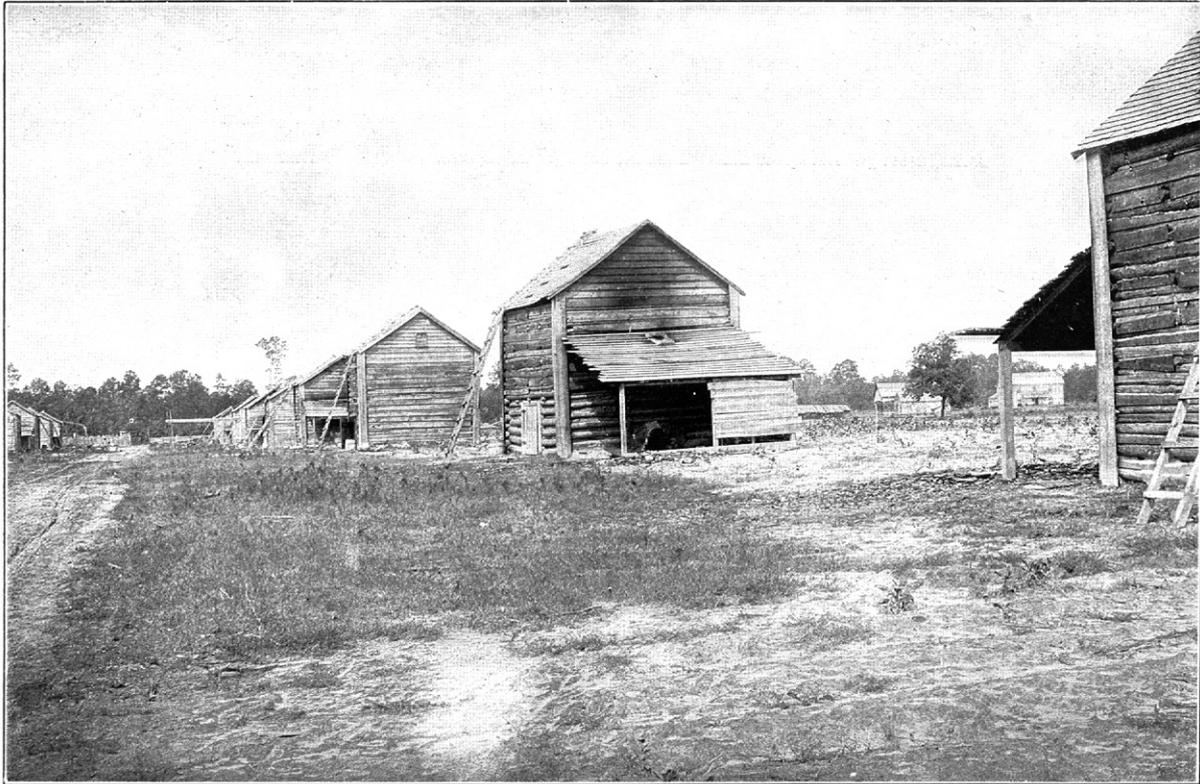
No.	Locality.	Description.	Organic matter, and loss.	Gravel, 2 to 1 mm.	Coarse sand, 1 to 0.5 mm.	Medium sand, 0.5 to 0.25 mm.	Fine sand, 0.25 to 0.1 mm.	Very fine sand, 0.1 to 0.05 mm.	Silt, 0.05 to 0.005 mm.	Clay, 0.005 to 0.0001 mm.
			<i>P. ct.</i>	<i>P. ct.</i>	<i>P. ct.</i>	<i>P. ct.</i>	<i>P. ct.</i>	<i>P. ct.</i>	<i>P. ct.</i>	<i>P. ct.</i>
5223	2½ miles S. of Raleigh.	Brown sandy loam, 6 to 10 inches.	3.58	6.03	18.14	12.76	26.73	10.49	12.30	9.35
5224	Subsoil of 5223	Stiff red clay, 16 to 30 inches.	7.63	4.94	8.40	5.77	11.36	3.94	19.37	37.92

DURHAM SANDY LOAM.

Durham sandy loam consists of a gray, rather coarse sandy soil from 12 to 15 inches deep, generally overlying a yellow clay subsoil. Like the two preceding types, quartz and rock fragments are found to the extent of from 10 to 30 per cent in both soil and subsoil. The



CECIL SANDY LOAM.



GROUP OF BRIGHT-TOBACCO BARNs WHERE TOBACCO IS CURED BY ARTIFICIAL HEAT.



BRIGHT TOBACCO BEING SOLD ON WAREHOUSE FLOOR AT GOLDSBORO.



CORN AND COWPEAS, SHOWING METHOD OF PULLING FODDER.



CHARACTERISTIC GROWTH ON POCOSON.

quartz and rock fragments seem to have been derived from the Piedmont formation, since the Durham sandy loam is always found in or close to the plateau area. The soil is easily tilled except for the presence of the fragments, which have the same wearing effect on soil implements noted in the two preceding types.

The origin of the subsoil is in part sedimentary, as is shown by the occasional presence of gravel and in part residual.

The largest development of Durham sandy loam is found south of Raleigh, and from here on to its eastern limit it occurs in small and irregular patches. Like the two preceding soils it ceases to appear beyond Wilsons Mills in the area surveyed. It also partakes of the hilly surface characteristic of the Piedmont Plateau.

The Durham sandy loam is better adapted to corn, bright tobacco, and truck than it is to cotton or small grain. However, with sufficient application of fertilizers, about one-half of a bale of cotton per acre may be grown. Because of its sandy character and low per cent of clay, this soil is more subject to leaching and drought than the preceding soils.

The following mechanical analyses show a larger proportion of sand and less of clay in both soil and subsoil than are found in the preceding types. It may be mentioned in passing that the analysis of the soil of the Durham sandy loam would not suggest the marked difference between it and the Cecil sandy loam that is evident in the field. The former is rather loose and leachy, while the latter is moist, retentive, and spongy, because of the slightly larger proportion of clay.

Mechanical analyses of Durham sandy loam.

No.	Locality.	Description.	Organic matter, and loss.	Gravel, 2 to 1 mm.	Coarse sand, 1 to 0.5 mm.	Medium sand, 0.5 to 0.25 mm.	Fine sand, 0.25 to 0.1 mm.	Very fine sand, 0.1 to 0.05 mm.	Silt, 0.05 to 0.005 mm.	Clay, 0.005 to 0.0001 mm.
			P. ct.	P. ct.	P. ct.	P. ct.	P. ct.	P. ct.	P. ct.	P. ct.
5225	3½ miles S. of Raleigh.	Gray stony sandy loam, 12 to 15 inches deep.	3.12	7.33	12.21	11.22	33.30	13.70	12.86	5.51
5226	Subsoil of 5225	Yellow or red clay, stony, 12 to 36 inches.	6.51	3.92	8.74	6.69	18.88	6.44	23.96	24.00

NORFOLK SANDY SOIL.

The Norfolk sandy loam varies from a coarse, sharp, gray, sandy soil to a gray, sandy loam, 10 to 20 inches deep, overlying a yellow clay. It is sedimentary in origin. No rock or quartz fragments are present in either the soil or subsoil, but occasionally gravel is found

in the subsoil. The soil is easily tilled, the natural drainage is good, and, because of the clay subsoil, it withstands drought fairly well. It is found to a large extent east and south of Raleigh, as well as in the vicinity of Clayton and Wilsons Mills and to the north of Princeton.

The surface of the Norfolk sandy soil is more level and the areas larger and more uniform than any of the preceding soils, yet when it occurs near streams it is hilly. About 5 miles north of Clayton, along the Neuse River, this soil occurs as a rather thin deposit (4 to 8 inches), which is eroded in places, exposing the yellow clay subsoil. In this locality when the plow strikes the subsoil, a soil of a somewhat heavier character is formed.

This soil is well suited to bright tobacco, corn, and truck, and to some extent to cotton.

The following analyses show some striking resemblances in the proportion of sand, silt, and clay to that of the Durham sandy loam, but since it contains no rock fragments or gravel it has a field characteristic quite different from any of the preceding soils. The lower percentage of organic matter (only 1 per cent, as against 3 per cent in the preceding soils) accounts for the gray, bleached appearance that marks this soil in the field as compared with the dull color of the other types.

Mechanical analyses of Norfolk sandy soil.

No.	Locality.	Description.	Organic matter, and loss.	Gravel, 2 to 1 mm.	Coarse sand, 1 to 0.5 mm.	Medium sand, 0.5 to 0.25 mm.	Fine sand, 0.25 to 0.1 mm.	Very fine sand, 0.1 to 0.05 mm.	Silt, 0.05 to 0.005 mm.	Clay, 0.005 to 0.0001 mm.
			<i>P. ct.</i>	<i>P. ct.</i>	<i>P. ct.</i>	<i>P. ct.</i>	<i>P. ct.</i>	<i>P. ct.</i>	<i>P. ct.</i>	<i>P. ct.</i>
5229	4 miles S. of Raleigh	Gray sandy loam, 0 to 15 inches.	0.76	8.56	22.23	12.13	33.73	10.88	9.98	3.30
5230	Subsoil of 5229.....	Stiff, yellow clay, 15 to 30 inches.	4.68	8.90	12.38	5.39	15.10	8.08	15.67	29.81
5231	4 miles N. of Princeton.	Gray sandy loam, 0 to 15 inches.	1.18	2.74	27.22	20.28	24.18	9.40	10.12	4.88

SUSQUEHANNA GRAVEL.

Susquehanna gravel is a deposit of gray sandy soil from 12 to 15 inches deep, overlying a yellow clay subsoil. From 10 to 25 per cent of gravel of a diameter of from one-fourth of an inch to 2 inches is found in the soil and often a like amount is also found in the subsoil. If the gravel were eliminated this soil type would be identical with the Norfolk sandy soil, which it resembles in possessing a sharp, bleached-looking sand as well as having a similar sedimentary origin. The gravel in some places obstructs tillage very much, and is quite wearing on soil implements.

The crops suited to this soil are the same as are adapted to the Norfolk sandy soil—bright tobacco, corn, and truck and cotton to some extent. This soil is slightly given to leaching, but because of the clay subsoil it holds fertilizers and withstands drought quite well. The distribution of this soil is limited to a few small areas in the vicinity of Clayton and Auburn, amounting to about 3 square miles.

The following analysis of the fine earth portion of the Susquehanna gravel shows it to be similar in texture to the Norfolk sandy soil, the principal difference as before noted being the gravel content of from 10 to 25 per cent. No analysis of the yellow clay subsoil was deemed necessary, as it is so similar to the Norfolk sandy soil.

Mechanical analysis of Susquehanna gravel.

[Fine earth.]

No.	Locality.	Description.	Organic matter, and loss.	Gravel, 2 to 1 mm.	Coarse sand, 1 to 0.5 mm.	Medium sand, 0.5 to 0.25 mm.	Fine sand, 0.25 to 0.1 mm.	Very fine sand, 0.1 to 0.05 mm.	Silt, 0.05 to 0.005 mm.	Clay, 0.005 to 0.0001 mm.
5233	10 miles S. of Raleigh.	Gray sandy soil, 0 to 15 inches.	<i>P. ct.</i> 1.57	<i>P. ct.</i> 12.70	<i>P. ct.</i> 17.76	<i>P. ct.</i> 12.62	<i>P. ct.</i> 26.17	<i>P. ct.</i> 15.22	<i>P. ct.</i> 9.64	<i>P. ct.</i> 4.73

GARNER STONY LOAM.

Garner stony loam is a sandy loam containing from 40 to 60 per cent of rock fragments and gravel. At a depth of from 6 to 15 inches it overlies a red tenaceous brick-clay subsoil, which often contains a trace of sand, rock fragments, and gravel. This type is found along streams and doubtless owes its origin to the extraction of clay and silt during a period of the rapid flow of the streams which it generally borders. It is found north of Clayton along the Neuse River and south along Crabtree Creek. This type packs firmly over the clay substratum, affording to all the roads that traverse it a firm roadbed almost equal to macadam.

Tillage is almost impossible, but in cases where cotton is once rooted good crops are secured because of the clay subsoil. These areas, however, are generally given to the growing of commercial pine and to cattle and hog pasture runs.

The following table shows the mechanical analyses of the soil and subsoil. The soil would be a good friable sandy loam were it not for the presence of the large amount of rock fragments and gravel that makes this soil almost useless for tillage purposes.

Mechanical analyses of Garner stony loam.

[Fine earth.]

No.	Locality.	Description.	Organic matter, and loss.	Gravel, 2 to 1 mm.	Coarse sand, 1 to 0.5 mm.	Medium sand, 0.5 to 0.25 mm.	Fine sand, 0.25 to 0.1 mm.	Very fine sand, 0.1 to 0.05 mm.	Silt, 0.05 to 0.005 mm.	Clay, 0.005 to 0.0001 mm.
5234	3 miles S. of Clayton.	Stony, gravelly soil, 0 to 15 inches.	<i>P. ct.</i> 4.03	<i>P. ct.</i> 17.04	<i>P. ct.</i> 13.72	<i>P. ct.</i> 7.86	<i>P. ct.</i> 17.86	<i>P. ct.</i> 17.80	<i>P. ct.</i> 14.07	<i>P. ct.</i> 7.39
5235	Subsoil of 5234.....	Stiff yellow and red clay, 15 to 40 inches.	6.62	3.65	4.30	2.35	5.77	8.76	22.37	45.91

SELMA SILT LOAM.

This is a gray silty loam mixed with fine sand 18 inches deep, overlying a mottled yellow clay subsoil, which sometimes contains fine sand and small gravel. It is a large and important area, found in its greatest extent in the vicinity of Selma and Princeton and to a lesser extent about Goldsboro. The surface is gently rolling, the natural drainage is good, only a small portion possessing rather poor natural drainage; artificial drainage is possible in nearly all such cases.

The Selma silt loam area is characterized by numerous fine sandy knolls and ridges from 2 to 6 feet high and from 5 to 40 acres each in extent. With their silty clay subsoils at a depth of 18 inches these ridges and knolls are especially suited to the growing of bright tobacco, corn, or truck, while the lower-lying more silty portion is well suited to cotton, which it yields at the rate of from three-fourths of a bale to one bale per acre. Both the sandy knolls and the lower-lying portions, however, admit of being used for cotton, corn, tobacco, or truck, and are so used. Both phases of this type are choice soils, easily tilled, and respond well to fertilizers.

The clay subsoil, while possessing some sand and occasionally gravel the size of beans, is sufficiently coherent to make the use of well curbing unnecessary. Wells from 20 to 40 feet deep are commonly found here, as in the other areas discussed. There is, however, a movement toward the use of drive pumps, which furnish water freer from contamination. In this area a water-bearing sandy stratum underlying the yellow silty clay is reached by drive pumps at a depth of from 30 to 60 feet.

The forest growth consists largely of pine, oak, and gum. Several small wild fruits are found; while of the domestic fruits the peach and cider apple are common. Many domestic varieties of grapes, such as the Delaware, Concord, and Scuppernon are grown.

The following table shows the analyses of the soil and subsoil of the Selma silt loam.

Mechanical analyses of Selma silt loam.

No.	Locality.	Description.	Organic matter, and loss.	Gravel, 2 to 1 mm.	Coarse sand, 1 to 0.5 mm.	Medium sand, 0.5 to 0.25 mm.	Fine sand, 0.25 to 0.1 mm.	Very fine sand, 0.1 to 0.05 mm.	Silt, 0.05 to 0.005 mm.	Clay, 0.005 to 0.0001 mm.
5237	1 mile W. of Princeton. Subsoil of 5237.	Gray silt loam, 0 to 18 inches.	<i>P. ct.</i> 1.52	<i>P. ct.</i> 8.72	<i>P. ct.</i> 23.92	<i>P. ct.</i> 12.82	<i>P. ct.</i> 26.62	<i>P. ct.</i> 11.90	<i>P. ct.</i> 13.25	<i>P. ct.</i> 3.72
5238		Mottled yellow clay with base of fine sand and gravel, 18 to 40 inches.	2.65	10.21	14.66	11.62	17.70	9.68	11.57	21.26

SELMA HEAVY SILT LOAM.

This is a rather heavy gray silty loam, from 10 to 20 inches deep, overlying a stiff mottled clay. It is often spoken of as "stiff land" or "clay land." Like the preceding soil, it is of sedimentary origin and represents a large and important area. It is found as large flat areas in the vicinity of Selma, Princeton, and to the north of Dover. There is no sharp line of demarcation between the soil and subsoil, one gradually merging into the other. The subsoil is, however, much stiffer than the soil.

The knolls and ridges spoken of in the preceding soil type very seldom occur in the Selma heavy silt loam. Natural drainage is poor; artificial drainage is possible and nearly always necessary to insure a good crop. Fertilizers are well retained. This soil is suited to cotton, which it yields at the rate of from three-fourths of a bale to little more than one bale per acre. Under good drainage conditions, however, corn, vegetables, and small fruits are successfully grown.

The following analyses of three soils and two subsoils show the heavier character of this soil as compared with the immediately preceding type. The marked difference between the soil and subsoil is in accord with the observations in the field. No. 5242, representing the heavier phase of this area, is locally known as "clay soil." Nos. 5240 and 5244 represent the area of largest extent.

Mechanical analyses of Selma heavy silt loam.

No.	Locality.	Description.	Organic matter, and	Gravel, 2 to 1 mm.	Coarse sand, 1 to 0.5 mm.	Medium sand, 0.5 to 0.25 mm.	Fine sand, 0.25 to 0.1 mm.	Very fine sand, 0.1 to 0.05 mm.	Silt, 0.05 to 0.005 mm.	Clay, 0.005 to 0.0001 mm.
			loss.							
5240	2 miles NE. of Kinston.	Heavy gray silt loam, 0 to 10 inches.	<i>P. ct.</i> 3.82	<i>P. ct.</i> 2.01	<i>P. ct.</i> 4.16	<i>P. ct.</i> 4.40	<i>P. ct.</i> 37.80	<i>P. ct.</i> 21.40	<i>P. ct.</i> 22.29	<i>P. ct.</i> 4.26
5241	Subsoil of 5240.....	Stiff gray-mottled clay, 10 to 36 inches.	2.33	1.22	3.38	3.92	29.97	21.38	21.56	15.94
5242	3 miles N. of Tuscarora, near Jasper post office.	Stiff mottled gray clay loam, 0 to 10 inches.	2.16	1.74	4.76	5.30	35.84	9.49	23.04	17.30
5243	Subsoil of 5242.....	Stiff gray-mottled clay, 10 to 36 inches.	3.17	1.88	4.17	3.92	23.24	6.38	19.90	37.31
5244	One-fourth mile SW. of Selma.	Heavy gray silt loam, 0 to 8 inches.	1.86	.52	1.56	1.79	13.34	34.96	37.44	7.96
5245	Subsoil of 5244.....	Yellow silty clay, 8 to 36 inches.	3.14	6.38	11.02	8.62	21.44	11.48	11.39	26.46

GOLDSBORO COMPACT SANDY LOAM.

This is a soil type which comprises several variations in texture, all consisting, however, of gray, ashy, sharp, generally compact sand. Usually it has no distinctive subsoil, though it often grades gradually into a sandy clay substratum. It is a sedimentary soil varying in color from a bleached gray to black, the color being due to organic stains. This type is generally found in lower lying flat areas along the Neuse River at Kinston and extending into and around the Dover Pocoson area. The lower lying portions, containing the black sandy features, were once subjected to swamp conditions. When these are drained and an application of lime used, good crops of cotton and corn are secured.

The gray or bleached phase lies somewhat higher, but it generally requires considerable artificial drainage. In the gray phase occur compact spots from 5 to 20 acres or more in extent, which, on account of their compactness, suggest the possible presence of some cementing material. These spots are undesirable and are locally known as "stiff gray land," which when partially dry can scarcely be plowed. Instances are noted where a good application of barnyard manure seems to have made these compact or seemingly cemented areas more friable.

Cotton and corn are generally grown with fair success on all the variations of this soil type where drainage is practiced and suitable cultural methods are employed.

The following table of analyses is given to show the peculiar sandy-

clay character of both soils and subsoil. No. 5250 represents the coarse phase, while the other three (soils) represent the finer phase.

Mechanical analyses of Goldsboro compact sandy loam.

No.	Locality.	Description.	Organic matter, and loss.	Gravel, 2 to 1 mm.	Coarse sand, 1 to 0.5 mm.	Medium sand, 0.5 to 0.25 mm.	Fine sand, 0.25 to 0.1 mm.	Very fine sand, 0.1 to 0.05 mm.	Silt, 0.05 to 0.005 mm.	Clay, 0.005 to 0.001 mm.
			<i>P. ct.</i>	<i>P. ct.</i>	<i>P. ct.</i>	<i>P. ct.</i>	<i>P. ct.</i>	<i>P. ct.</i>	<i>P. ct.</i>	<i>P. ct.</i>
5246	2½ miles E. of Cove post office.	Fine, gray, compact, sandy loam, 0 to 15 inches.	1.29	0.94	2.50	1.70	12.98	37.39	31.76	11.27
5247	Subsoil of 5246.....	Yellow-mottled clay with fine sand, 15 to 40 inches.	2.09	.68	1.74	1.18	9.92	26.35	31.57	26.20
5248	Three-fourths mile SW. of Kinston.	Fine, gray, compact, sandy loam, 0 to 20 inches.	3.76	11.22	17.18	15.30	18.94	5.90	10.19	16.80
5249	3 miles N. of Lagrange.	Gray, very compact loam, 0 to 16 inches.	1.38	7.26	14.46	11.14	20.56	14.22	19.25	10.77
5250	1 mile E. of Goldsboro.	Coarse, compact, sandy loam, 0 to 20 inches.	3.09	31.68	23.38	7.22	9.22	4.22	11.65	9.37

NORFOLK SAND.

The Norfolk sand is a deep sandy soil 3 to 6 feet or more in depth. Often the first 6 inches is gray or bleached in color, while the underlying portion is a brown or yellow sand of the same texture. In different localities it varies from a fine sandy soil to a coarse sandy soil, all the variations having, however, the same general character as regards the production of crops.

The Norfolk sand is an extensive and important type. It is a truck soil, suited to the early maturity of crops because of its warm, dry nature. It occurs to a large extent along the Neuse River at Lagrange, Kinston, and Newbern, and also in some places 2 or 3 miles from the river. Immediately south and southwest of Lagrange is found a large area of the coarse phase, at Newbern occurs the medium phase, and 3 miles south of Lagrange, bordering the Neuse River, is the fine sandy phase (soil 5251), on which cotton does well.

The surface of the Norfolk sand is generally flat or gently rolling, possessing good drainage. Occasionally spots are met which are often subject to drought because of the great depth to the water table.

The following table shows the mechanical analyses of two samples of the Norfolk sand:

Mechanical analyses of Norfolk sand.

No.	Locality.	Description.	Organic matter, and loss.	Gravel, 2 to 1 mm.	Coarse sand, 1 to 0.5 mm.	Medium sand, 0.5 to 0.25 mm.	Fine sand, 0.25 to 0.1 mm.	Very fine sand, 0.1 to 0.05 mm.	Silt, 0.05 to 0.005 mm.	Clay, 0.005 to 0.0001 mm.
5251	3 miles S. of La-grange.	Fine sandy soil, 0 to 20 inches.	<i>P. ct.</i> 1.75	<i>P. ct.</i> Tr.	<i>P. ct.</i> 1.84	<i>P. ct.</i> 8.90	<i>P. ct.</i> 72.86	<i>P. ct.</i> 8.95	<i>P. ct.</i> 2.43	<i>P. ct.</i> 2.52
5252	1½ miles W. of New-bern.	Brown sandy soil, 0 to 40 inches.	.76	0.60	3.80	8.22	68.62	12.84	2.74	2.30

SANDHILL.

The Sandhill soil is a gray, sharp, incoherent sand of considerable depth—from 10 to 50 feet or more—found usually in the form of high flat ridges or hills. The first 6 or 9 inches is generally bleached, while the underlying portion is of a brown or reddish color and of the same texture as the soil. Its origin appears to have been a sand bar deposited by coastal waters and modified by wind action.

In the area surveyed only a small margin of this extensive Sandhill soil of the Coastal Plain occurs about 2 miles south of Goldsboro. It was sufficient, however, to correlate it with the great sand ridge that extends from about this point southward through North and South Carolina, Georgia, Alabama, Mississippi, Louisiana, and terminating in Texas.

It is a dry, barren soil, as it lacks sufficient moisture for crops. In wet seasons or when irrigated, truck does well. The natural growth is pine and scrub oaks. Stone fruits and small fruits, such as peaches, apples, grapes, and the blackberry, which are able to extend their roots deep, do well if they get started and are well cared for.

From the foot of the Sandhill type, even during dry seasons, a constant flow of pure water generally comes. The roads, as a matter of course, that traverse this soil are very loose and sandy, except in wet weather, when they are more easily traveled.

The following table of analyses shows a similarity of this type to the soil of the Norfolk sand, which is in keeping with the field observation as to texture and origin. The low per cent of organic matter and small clay content tallies also with the loose, leachy character of this soil noted in the field.

Mechanical analyses of Sandhill.

No.	Locality.	Description.	Organic matter, and loss.	Gravel, 2 to 1 mm.	Coarse sand, 1 to 0.5 mm.	Medium sand, 0.5 to 0.25 mm.	Fine sand, 0.25 to 0.1 mm.	Very fine sand, 0.1 to 0.05 mm.	Silt, 0.05 to 0.005 mm.	Clay, 0.005 to 0.0001 mm.
			<i>P. ct.</i>	<i>P. ct.</i>	<i>P. ct.</i>	<i>P. ct.</i>	<i>P. ct.</i>	<i>P. ct.</i>	<i>P. ct.</i>	<i>P. ct.</i>
5255	2½ miles SW. of Goldsboro.	Gray, loose, incoherent, sandy soil, 0 to 40 inches.	1.47	3.86	9.62	18.96	40.74	15.78	5.02	4.12
5256	3 miles W. of Goldsboro.do.....	1.78	2.16	32.22	28.30	23.90	4.66	4.06	2.75

NORFOLK FINE SANDY LOAM.

This type consists of a mellow, fine, sandy loam from 10 to 15 inches deep, overlying a yellow, rather stiff clay subsoil. The soil and subsoil are of sedimentary origin. This type represents a large and important area in the eastern part of North Carolina. In the present survey it occurs to a large extent at Kinston and from thereon to Newbern.

This soil is peculiarly adapted to a wide range of crops, being well suited to the growing of cotton, corn, truck, and bright tobacco. Cotton yields from one-half to three-fourths of a bale per acre. Fertilizers are retained and drought is withstood quite well because of the clay subsoil. Open wells 20 and 30 feet deep are quite common in this area; a water-bearing stratum of sand is reached by drive pumps at a depth of from 60 to 80 feet. The test farm at Tarboro, Edgecombe County, is located on this important soil type.

The following table of analyses shows the distinctive character of the Norfolk sandy soil, namely, a fine, rather mellow sandy soil underlaid with a rather stiff yellow-clay subsoil containing a trace of fine sand. No. 5253 represents a variation of this type where it grades into the Norfolk sand near Newbern, and where it is used largely as a truck soil. No. 5259 represents the heavier phase of this type, and Nos. 5257 and 5261 represent the lighter phase as well as the largest area. The subsoils for all the variations are rather stiff, except No. 5254 of the truck soil, which is sometimes quite sandy and incoherent.

Mechanical analyses of Norfolk fine sandy loam.

No.	Locality.	Description.	Organic matter, and loss.	Gravel, 2 to 1 mm.	Coarse sand, 1 to 0.5 mm.	Medium sand, 0.5 to 0.25 mm.	Fine sand, 0.25 to 0.1 mm.	Very fine sand, 0.1 to 0.05 mm.	Silt, 0.05 to 0.005 mm.	Clay, 0.005 to 0.0001 mm.
			<i>P. ct.</i>	<i>P. ct.</i>	<i>P. ct.</i>	<i>P. ct.</i>	<i>P. ct.</i>	<i>P. ct.</i>	<i>P. ct.</i>	<i>P. ct.</i>
5253	2½ miles W. of Newbern.	Medium fine sandy loam, 0 to 15 inches.	1.55	Tr.	3.18	4.24	46.56	21.15	6.91	16.00
5254	Subsoil of 5253.....	Yellow sandy clay, 15 to 40 inches.	1.33	Tr.	2.70	5.38	54.86	17.16	4.81	13.13
5257	4 miles NE. of Kinston.	Fine sandy loam, lighter phase, 0 to 15 inches.	2.03	1.14	4.36	7.28	43.30	26.54	11.91	3.32
5258	Subsoil of 5257.....	Yellow sandy clay, 15 to 36 inches.	3.36	1.55	3.51	5.28	31.43	15.01	9.70	29.57
5259	2½ miles W. of Newbern.	Fine sandy loam, heavier phase, 0 to 10 inches.	2.40	.64	9.32	21.10	16.92	7.94	27.77	13.75
5260	Subsoil of 5259.....	Stiff mottled-gray clay, 10 to 40 inches.	3.57	Tr.	5.62	11.04	9.58	3.83	22.44	43.70
5261	3 miles W. of Tarboro (test farm).	Fine sandy loam, lighter phase, 0 to 18 inches.	.90	0.00	Tr.	1.26	54.10	26.15	12.49	4.79
5262	Subsoil of 5261.....	Stiff yellow clay with trace of sand, 18 to 40 inches.	2.81	Tr.	.64	.52	40.32	20.06	13.10	23.12

NEUSE CLAY.

The Neuse clay is a stiff silty or fine sandy loam, from 10 to 20 inches deep, gray in color, and underlaid to a great depth with a stiff, mottled-clay subsoil. In the present survey it occurs along the Neuse River near Kinston and in and around Tracy Swamp, about 2 miles north of Dover station. Along the Neuse River it is known locally as mud-bottom land, and is there subject to overflow; here it is generally left to a dense growth of cypress, gum, ash, alder, vines, and rank grass, and is used as a pasture run for hogs and cattle.

Tracy Swamp is subject to standing water to a depth of from 3 to 6 feet during periods of much rainfall. It is used in dry seasons as a pasture run. Attempts are being made to reclaim this area by ditching and draining it into the Neuse River, which, if successful, will open up some fine cotton land. The forest growth of cypress, gums, etc., is the same as that described for this type along the Neuse River.

To the north of Tracy Swamp, separated off on the map by a dotted line, lies a large area of Neuse clay elevated high enough not to be so much subject to standing water, making tillage to some extent possible. Here the area is quite flat, but drainage is possible by ditching. The forest growth is largely long-leaf pine. Cotton and corn do well when once rooted in this soil. On account of the soil becoming

so dry and hard during droughty seasons that the plow can scarcely turn it, or so sticky in wet seasons that implements can barely move through it, this soil is generally difficult to till and does not possess a very good reputation among the local farmers. When loosened and dried out this soil dusts about under the feet like flour. The addition of barnyard manure or green crops plowed under would tend to make the soil more friable and productive.

The following table shows the mechanical analyses of the samples as follows: No. 5265 represents the large area of stiff-clay phase north of Tracy Swamp, near Dover station; Nos. 5266 and 5267 represent the lighter and friable phase found in Tracy Swamp and along the Neuse River, which areas are not much tilled at present on account of the poor natural drainage and frequent overflow.

Mechanical analyses of Neuse clay.

No.	Locality.	Description.	Organic matter, and	Gravel, 2 to 1 mm.	Coarse sand, 1 to 0.5 mm.	Medium sand, 0.5 to 0.25 mm.	Fine sand, 0.25 to 0.1 mm.	Very fine sand, 0.1 to 0.05 mm.	Silt, 0.05 to 0.005 mm.	Clay 0.005 to 0.0001 mm.
			loss.							
			<i>P. ct.</i>	<i>P. ct.</i>	<i>P. ct.</i>	<i>P. ct.</i>	<i>P. ct.</i>	<i>P. ct.</i>	<i>P. ct.</i>	<i>P. ct.</i>
5265	5 miles N. of Dover.	Very stiff, gray, silty clay, 0 to 20 inches.	2.54	.32	2.46	2.26	12.68	10.60	41.46	26.12
5266	4½ miles W. of Kinston.	Stiff, mottled, silty clay, 0 to 20 inches.	9.51	.00	1.38	4.30	13.36	7.52	35.04	28.84
5267	2 miles W. of Dover.	Stiff, mottled-gray clay, 0 to 20 inches.	9.87	Tr.	2.72	3.35	20.16	14.64	37.80	10.80

SAVANNA.

The Savanna land is a type due to location instead of soil character. It is a flat area surrounding the Pocason land near Newbern, subject to from 6 to 20 inches of standing water during rainfall, but artificial drainage is possible over most of this area. The natural forest growth consists mainly of long-leaf pine, gum, and oak. In this area occur numerous depressions, from 3 to 8 feet deep and from 100 to 300 feet or more in diameter, which generally contain standing water and a dense growth of water cypress. The openings left by the removal of the lumber pine support a dense growth of rank grass and shrubbery, which seems to furnish good pasture nearly the entire year.

The soil is similar in texture to that of the Norfolk fine sandy soil at a depth of 8 or 12 inches, and is generally underlaid with a mottled, rather stiff yellow-clay subsoil. Where the Savanna land borders the truck soils, it possesses from 8 to 12 inches of rather loose, gray, sandy loam, which grades quickly into the stiff clay subsoil. Where the

Savanna land is well drained it is very productive for cotton, corn, and grass crops.

The following mechanical analyses of samples of soils and subsoils show the similarity in texture of this type to that of the Selma heavy silt loam (5268) and the Norfolk fine sandy soil (5270), both phases at a depth of from 8 or 12 inches, grading rapidly into a heavy clay subsoil:

Mechanical analyses of Savanna.

No.	Locality.	Description.	Organic matter, and	Gravel, 2 to 1 mm.	Coarse sand, 1 to 0.5 mm.	Medium sand, 0.5 to 0.25 mm.	Fine sand, 0.25 to 0.1 mm.	Very fine sand, 0.1 to 0.06 mm.	Silt, 0.5 to 0.005 mm.	Clay, 0.005 to 0.0001 mm.
			loss.							
5268	3 miles W. of Newbern.	Heavy gray silt loam, 0 to 8 inches.	P. ct. 2.76	P. ct. 1.30	P. ct. 1.48	P. ct. 2.18	P. ct. 32.54	P. ct. 20.38	P. ct. 27.42	P. ct. 11.53
5269	Subsoil of 5268.....	Stiff mottled gray clay, 8 to 36 inches.	4.31	Tr.	.72	.72	11.76	11.11	23.80	48.24
5270	4½ miles W. of Newbern.	Loose gray sandy loam, 0 to 8 inches.	4.24	.34	4.13	8.35	42.45	13.21	19.27	7.07
5271	Subsoil of 5270.....	Yellow mottled clay, 8 to 36 inches.	3.30	Tr.	1.71	5.95	28.68	8.91	16.50	34.25

POCOSON.

The Pocason area possesses a character distinctively incident to location. Generally speaking, it is a swampy area, depressed from 2 to 10 feet below the surface of the surrounding land. The typical Pocason consists of a black, spongy, mucky soil, supporting a scattering growth of scrub pine, a dense undergrowth of gallberry shrubs, wire grass, and broom sedge, and all woven together with brier vines. During moderately dry seasons this affords a pasture run for cattle and hogs—after they learn to get through the almost impassable matting. The scrub pines are 6 or 8 inches in diameter and from 20 to 30 feet high, and are useful for firewood, fence posts, and a poor grade of timber. During dry seasons these areas are sometimes subjected to fire, rendering them useless for a long time for cattle and hog runs because of the almost complete burning of the muck soil and the shrub and grass growth. Generally, however, these areas are subject to standing water, especially in the winter season.

Through these Pocason lands extend extensive ridges and knolls, from 3 to 6 feet higher than the mucky area just described. These generally possess a soil similar in texture to that of the Goldsboro compact sandy loam, supporting a strong growth of commercial long-leaf pine. On the margin of these ridges often occur small spots of gum and cypress swamps and irregular strips of canebrakes. At a

depth of from 10 to 15 inches the soil of these ridges generally grades into a sandy clay subsoil. When drained and tilled these ridges yield good crops of cotton, corn, and grass.

The Pocason land of the present survey consists of a large tract between Dover and Cove post offices, known as the Dover Pocason. There are also small areas of this land near Newbern, Goldsboro, Lagrange, and Kinston. About one-half of the Dover Pocason consists of the knolls and ridges of the gray sandy loam above mentioned. At Goldsboro, Lagrange, and Kinston these areas have also a soil similar to these ridges—a gray sandy loam which is capable of tillage when drained. Three miles south of Lagrange, in the Pocason area, there is about 2 square miles of the black spongy soil above mentioned, known locally as “buckleberry soil.” A portion of this soil is cultivated and yields well of corn, cotton, grass, and some vegetables when well ditched. All crops tend to a rank growth, because of the large amount of humus present in the soil.

MUCK.

The muck soil consists of varying amounts of vegetable mould, mixed with fine sand and clay, generally underlaid at a depth of from 2 to 6 feet, with a substratum similar in character to the adjacent land. In the present survey it occurs generally along the upper courses of small slow-moving streams, which are usually headed in large flat areas. Where drained, some of these soils yield large crops of hay, as well as corn and truck. The natural growth consists of cypress in the very wet swampy phases and alderbush, gum, willow, broom sedge, and rank grass on the more elevated and tillable phases.

MEADOW

This term, as used in the present survey, stands for a low-lying flat, usually poorly drained, land along the larger streams. It figures mostly as a narrow margin along the Neuse River and its larger branches from Raleigh to Goldsboro, where it ceases to appear any more, because of the soil admitting of being classified with other types having a more specific texture. The meadow soil is a river deposit 3 feet or more deep, varying from a clay to a sandy loam. As used here, however, it generally consists of a rather deep, fine sandy or silty loam. It is a fertile soil, easily tilled, and adapted to grass and pasturage and occasionally to general farming where drainage is possible. The forest growth consists largely of willow, alderbush, and gum.

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