U. S. DEPARTMENT OF AGRICULTURE,

BUREAU OF SOILS.

IN COOPERATION WITH THE NORTH CAROLINA DEPARTMENT OF AGRICULTURE AND THE STATE AGRICULTURAL EXPERIMENT STATION.

SOIL SURVEY OF ONSLOW COUNTY, NORTH CAROLINA.

BY

R. C. JURNEY, IN CHARGE, R. E. DEVEREUX, AND E. H. STEVENS, OF THE U. S. DEPARTMENT OF AGRICULTURE, AND S. F. DAVIDSON AND W. D. LEE, OF THE NORTH CAROLINA DEPARTMENT OF AGRICULTURE.

[Advance Sheets—Field Operations of the Bureau of Soils, 1921.]

WASHINGTON:
GOVERNMENT PRINTING OFFICE.
1923.

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[PUBLIC RESOLUTION—No. 9.]

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

Resolved by the Senate and House of Representatives of the United States of America in Congress assembled, That public resolution numbered eight, Fifty-sixth Congress, second session, approved February twenty-third, nineteen hundred and one, be amended by striking out all after the resolving clause and inserting in lieu thereof the following:

There shall be printed ten thousand five hundred copies of the report on field operations of the Division of Soils, Department of Agriculture, of which one thousand five hundred copies shall be for the use of the Senate, three thousand copies for the use of the House of Representatives, and six thousand copies for the use of the Department of Agriculture: *Provided*, That in addition to the number of copies above provided for there shall be printed, as soon as the manuscript can be prepared, with the necessary maps and illustrations to accompany it, a report on each area surveyed, in the form of advance sheets, bound in paper covers, of which five hundred copies shall be for the use of each Senator from the State, two thousand copies for the use of each Representative for the congressional district or districts in which the survey is made, and one thousand copies for the use of the Department of Agriculture.

Approved, March 14, 1904.

[On July 1, 1901, the Division of Soils was reorganized as the Bureau of Soils.]

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MAP.

Soil map, Onslow County sheet, North Carolina.

SOIL SURVEY OF ONSLOW COUNTY, NORTH CAROLINA.

By R. C. JURNEY, in Charge, R. E. DEVEREUX and E. H. STEVENS, of the U. S. Deparment of Agriculture, and S. F. DAVIDSON and W. D. LEE, of the North Carolina Department of Agriculture.

DESCRIPTION OF THE AREA.

Onslow County lies in the southeastern part of North Carolina, about 20 miles south of Newbern and 25 miles north of Wilmington. It is bounded on the north by Jones County, on the northeast by Jones and Carteret Counties, on the southeast and east by the Atlantic Ocean, and on the west and southwest by Pender and Duplin Counties. The county is irregular in shape and has an area of 750 square miles, or 480,000 acres.

The general surface of Onslow County varies from flat to gently rolling and rolling. The more conspicuous flat areas lie in the eastern, northern, and western sections of the county, and include Lloyds Meadows, Horse Swamp Pocoson, Whiteoak Pocoson, the pocoson north of Huffmantown and Jarmantown, and Great Sandy Run Pocoson. The areas mapped as Tidal marsh and the numerous swamps are also flat. Smaller flat areas occur throughout the county, particularly in bays, pocosons, and meadows near the sources of small streams. The regions of gently rolling to rolling topography lie adjacent to Whiteoak River, near New River and its several tributaries, and along the Stump Sound. Bluffs from 5 to 20 feet in height extend along New River from Jacksonville to the sound.

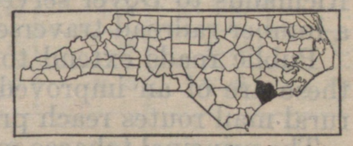

FIG. 6.—Sketch map showing location of the Onslow County area, North Carolina.

There are no established elevation points in the county. The elevation ranges from about sea level in the southern part to about 51 feet above in the northern part. Comfort, (Jones County) about 2 miles from the northern county line, is 51 feet above sea level. Tides rise on New River as far up as Jacksonville and on Whiteoak River as far as Stella Bridge. Whiteoak Pocoson and Great Sandy Run Pocoson are apparently the highest parts of the county. The prevailing slope of the country is southward.

Onslow County is drained largely by New River and its tributaries. This river rises in the extreme northwestern part and flows southward to the ocean. Whiteoak River and its tributaries drain the eastern part, and Black, Ninemile, Sandy Run, Shelter, and Juniper Swamps the western part. Small streams which empty directly into the sound carry the drainage in the extreme southern and southeastern portions of the county. Smaller branches of the main drainage ways extend throughout many parts of the county, but there are numerous large areas in which natural drainage has not been established. The

largest of these are Whiteoak Pocoson, Great Sandy Run Pocoson, Lloyds Meadows, and Horse Swamp Pocoson. Other poorly drained areas are the numerous smaller pocoson depressions and bays around the heads of small streams, the swamps adjacent to nearly all the streams, and the tidal marshes.

The streams of the county have reached base level, and their currents are consequently sluggish. Water power has been developed only in a few places, where it is used in operating gristmills.

Onslow County was formed in 1743 from the County of Bath. The early settlers were French Huguenots and Scotch-Irish from the Cape Fear country near Wilmington. The present population consists mainly of descendants of the early settlers and of persons who have moved in from adjoining counties. The population is unevenly distributed, the more thickly settled sections being in the northwestern part of the county and along New River, Whiteoak River, and Stump Sound. According to the 1920 census, the county has a population of 14,703, all of which is classed as rural. The density of population is 19.8 persons per square mile.

Jacksonville, with a population of 656, is the largest town and county seat. Richlands, in the northwestern part of the county, has a population of 548; and Swansboro, in the eastern part, a population of 420. These towns are local trading centers for important agricultural sections.

The county is well served with railroad facilities. The Atlantic Coast Line Railroad from Wilmington to Newbern crosses the central part of county. The Dover & South Bound Railroad from Richlands to Dover serves the northwestern part of the county, and a lumber railroad traverses the northern part.

Public roads extend to many sections of the county, but none of these are of an improved type. Telephones are in general use and rural mail routes reach practically all parts of the county.

The principal tobacco markets are Richlands, Jacksonville, Kinston, Newbern, and Warsaw. Cotton is sold at Wilmington and Newbern. Corn is disposed of at the local markets. Peanuts are shipped to Norfolk, and sweet potatoes to northern markets. Cured meat is marketed at Wilmington and Richmond, Va.

CLIMATE.

In the absence of a Weather Bureau station in the county, use will be made of the records kept at Sloan, Duplin County, which it is believed are fairly representative of conditions in Onslow County.

The average annual rainfall for the year, according to these records, is 52.63 inches. It is well distributed throughout the year. The average for the spring is 11.78 inches and for the summer 19.21 inches. The average snowfall for the year is 3.8 inches.

The mean annual temperature is 61.9° F. The average temperature for the summer is 77.5° F., and for the winter 45.5° F. The date of the latest killing frost in the spring is recorded as May 15, and that of the earliest in the fall as October 1. The average date of the last killing frost in the spring is April 17, and that of the first in the fall October 19. Accordingly the average length of the growing season is 185 days, which is sufficient for the maturing of the crops commonly grown in this section.

The following table gives the normal monthly, seasonal, and annual temperature and rainfall as recorded at Sloan, Duplin County:

Normal monthly, seasonal, and annual temperature and precipitation at Sloan, Duplin County.

[Elevation 50 feet.]

Month.	Temperature.			Precipitation.			
	Mean.	Absolute maximum.	Absolute minimum.	Mean.	Total amount for the driest year (1911).	Total amount for the wettest year (1901).	Snow average depth.
	°F.	°F.	°F.	Inches.	Inches.	Inches.	Inches.
December	45.6	79	4	3.56	2.30	5.09	0.1
January	46.0	81	1	3.48	3.09	3.09	.7
February	44.8	81	1	4.73	.52	4.39	3.0
Winter	45.5	81	1	11.77	5.91	12.57	3.8
March	54.7	94	14	4.17	3.96	5.29	T.
April	60.6	94	27	3.19	1.93	2.56	T.
May	69.4	99	37	4.42	.54	9.40	.0
Spring	61.6	99	14	11.78	6.43	17.25	T.
June	75.8	102	45	5.23	3.45	6.00	.0
July	78.7	100	49	7.00	4.95	12.82	.0
August	78.0	102	51	6.98	5.90	7.42	.0
Summer	77.5	102	45	19.21	14.30	26.24	.0
September	73.7	99	38	3.85	4.55	7.20	.0
October	62.8	92	26	3.40	4.85	1.57	.0
November	52.7	86	14	2.62	1.99	1.98	T.
Fall	63.1	99	14	9.87	11.39	10.75	T.
Year	61.9	102	1	52.63	38.03	66.81	3.8

AGRICULTURE.

The early agriculture of Onslow County, which began before 1734, consisted chiefly in growing corn and raising live stock. The first farms were located at the mouth of New River. As the population increased new lands were settled along the sound and along New River and Whiteoak River, the land farther from the rivers and sound being taken up last.

In the early days cattle were pastured during the summer on the natural meadows and wire-grass ridges of the uplands, and during the winter on the marsh grasses and sedges along the sound. This practice is followed by some even at the present time. The early settlers drove their cattle to Fayetteville for market.

Somewhat later cotton and peanuts were added to the list of commercial crops, but tobacco did not become an important cash crop until 1901.

In the first half of the nineteenth century the production of tar, pitch, and turpentine had become an important industry, Swansboro at that time being the largest market in the world for these products. From 1870 to 1890 lumbering superseded turpentining as the most important industry.

The chief crops in 1879, according to the census, were corn, cotton, and sweet potatoes; in 1889, corn, cotton, peanuts, sweet potatoes; and hay; in 1899, corn, cotton, peanuts, sweet potatoes, and tobacco, and in 1909, corn, peanuts, cotton, tobacco, sweet potatoes, dry peas, and hay and forage crops. During the period from 1879 to 1909, peaches, apples, grapes, and vegetables were produced on nearly all farms but mainly for home use.

The agriculture of Onslow County at the present time consists chiefly of the production of corn, tobacco, cotton, peanuts, sweet potatoes, and vegetables.

Corn is more generally grown than any other crop, although not enough is produced to meet the local demand. It is used for feeding the work stock and fattening hogs and also to some extent to supply bread.

Tobacco is an important crop and one of the principal cash crops of the county. This tobacco is a light-weight, bright-leaf type used in the manufacture of cigarettes and light smoking tobaccos. Cotton is also an important cash crop.

The following table gives the acreage and yield of the principal crops for the years 1879, 1889, 1899, 1909, and 1919, as reported by the Federal Census:

Acreage and production of principal crops of Onslow County, census years 1879 to 1919, inclusive.

Crop.	1879.		1889.		1899.		1909.		1919.	
	Acres.	*Bushels.*	*Acres.*	*Bushels.*	*Acres.*	*Bushels.*	*Acres.*	*Bushels.*	*Acres.*	*Bushels.*
Corn	23,259	105,019	23,793	189,689	23,574	213,090	20,790	221,809	19,196	277,210
Sweet potatoes	765	67,980	1,324	102,104	1,020	97,595	1,153	103,594	559	64,924
Peanuts	.....	.....	2,134	42,506	2,649	63,483	7,056	195,934	905	24,211
		Bales.		*Bales.*		*Bales.*		*Bales.*		*Bales.*
Cotton	6,660	2,841	6,127	1,720	4,937	2,295	6,043	3,288	9,448	5,775
				Tons.		*Tons.*		*Tons.*		*Tons.*
Hay and forage	.....	.....	692	692	524	421	2,861	1,459	5,299	1,910
								Bushels.		*Bushels.*
Dry peas	.....	.....	.....	.....	.....	.....	581	3,519	15	77
						Pounds.		*Pounds.*		*Pounds.*
Tobacco	.....	.....	.....	.....	570	508,500	1,229	1,053,769	3,164	2,323,701
							Trees.	*Bushels.*	*Trees.*	*Bushels.*
Apples	.....	.....	.....	.....	.....	.....	14,278	9,517	6,062	2,970
Peaches	.....	.....	.....	.....	.....	.....	73,364	9,482	4,868	1,393
							Vines.	*Pounds.*	*Vines.*	*Pounds.*
Grapes	.....	.....	.....	.....	.....	.....	1,258	341,410	2,832	332,506

Some recognition is given by the farmers of this county to the adaptation of crops to certain soils. The Dunbar fine sandy loam, Norfolk fine sandy loam, and Norfolk fine sand are considered good soils for cotton, corn, peanuts, sweet potatoes, and tobacco. The Coxville fine sandy loam, Portsmouth fine sandy loam and loam, and Bladen fine sandy loam, when properly drained, are known to be well suited to corn, soy beans, oats, vetch, grass, and forage crops. The Lakewood fine sand, St. Lucie fine sand, Leon fine sand, Portsmouth sand and fine sand, and Plummer fine sandy loam are held to have a much lower agricultural value, and are used mostly as a range for cattle and hogs. Muck, Swamp, Coastal beach, and Tidal marsh are soils which are generally recognized as having practically no agricultural value in their present condition.

Farm houses on the better farms are large and well constructed. Many of them have modern conveniences. The barns are large, and

there are numerous outbuildings for the storage of farm products and machinery. The tenant houses and barns are small. The machinery on the better farms consists of two-horse breaking plows, sulky plows, riding cultivators, spike-tooth and disk harrows, clod crushers, stalk cutters, and cotton and corn planters. A few tractors are in use. The small farms have one-horse cultivators and Dixie breaking plows, spike-tooth harrows, and cotton and corn planters. The cultivated fields are fenced with barbed or woven wire. Cattle and hogs have free range. Dipping vats have been located at several points in the county to rid the cattle of ticks.

The work stock consists largely of mules. The beef cattle are grade Aberdeen or Hereford crossed on the native scrub stock. The milk cows are of the Jersey or Holstein breeds. The hogs are grades, a mixture of Duroc-Jersey, Poland-China, Hampshire, or Berkshire with native stock.

Farm lands are generally broken in the spring. The plowing is usually shallow. Some of the farmers turn under winter cover crops of rye or oats, but this is not a general practice.

Crop rotation is practiced by some of the better farmers. The most common rotation is: First year, peanuts; second year, cotton; third year, soy beans; fourth year, corn. Many farmers plant rye or bur clover at the last cultivation of cotton. By many corn and cotton are grown in alternate years. Tobacco usually follows corn. Soy beans are sometimes planted with corn, each crop in its separate row. Winter cover crops of rye, bur clover, or oats, or oats, vetch, and clover mixed, are grown on many farms to supply grazing and forage and to maintain the supply of organic matter in the soils.

According to the 1920 census, 1,933 farms reported the use of commercial fertilizers, with an average outlay of $190.73 per farm, or a total expenditure of $368,697. The use of commercial fertilizer is general. The fertilizers most commonly used on cotton are 8–3–3 or 8–2–2 [1] grades, or a "home" mixture of acid phosphate, cottonseed meal, fish scrap, nitrate of soda, and kainit, in such proportions as to give the formula 8–2–2. From 500 to 800 pounds per acre are applied. A light side dressing of nitrate of soda also usually is given this crop. Corn is fertilized with 400 to 700 pounds per acre of mixtures analyzing 8–2–2, 8–3–3, 8–4–2, 8–4–0, or 6–4–0, or a home mixture of acid phosphate, cottonseed meal, and kainit, with the formula 8–3–3. Nitrate of soda is usually applied at the rate of 100 pounds per acre. Peanuts are given an acreage application of about 1 ton of lime, and in addition acid phosphate or commercial fertilizer of 10–0–2 grade applied at the rate of 300 pounds an acre. Land plaster is not used extensively in the county for peanuts. In growing tobacco, from 800 to 1,000 pounds per acre of mixtures analyzing 8–4–7, 8–4–4, or 8–3–3 are applied. Sweet potatoes and Irish potatoes are given 400 to 800 pounds per acre of 8–4–3 or 8–4–7 fertilizer.

Farm labor in Onslow County is scarce. Both white and colored laborers are employed. The prevailing wage of day laborers is $1 and of laborers hired by the month $20 with board. Cotton is picked largely by women and children, who receive from $1 to $2 per 100 pounds. Tobacco primers receive about double the wages of ordinary farm hands.

[1] Percentages of phosphoric acid, nitrogen, and potash.

According to the census, there were 2,179 farms in the county in 1919, their total area representing 40.6 per cent of the area of the county. Of the land in farms 28.1 per cent is improved. The farms range in size from 20 to 200 acres, averaging 88.7 acres per farm. Large tracts of forest and cut-over land are held by individuals or by land and lumber companies.

The 1920 census shows that 59.3 per cent of the farms are operated by the owners, and 40.6 per cent by tenants. Usually farms are rented on a share basis. When the landlord furnishes work stock, fertilizer, and seed, the tenant receives one-third the crop; when the tenant furnishes the work stock and half the fertilizer, he receives half the crop.

According to the 1920 census the value of all farm property is $7,193,877, of which 65.9 per cent represents the value of land, 17.9 per cent the value of buildings, 3.9 per cent machinery and implements, and 12.3 per cent live stock.

Land values range from $10 to $200 an acre. Improved farm land sells for $75 to $200 an acre, and cut-over or unimproved land brings $10 to $35 an acre.

SOILS.[2]

Onslow County lies entirely in the seaward belt of the Coastal Plain region of North Carolina. The elevation ranges from sea level to slightly above 50 feet and the natural surface drainage of practically the entire county is poor. Most of the surface comprises large flat to slightly undulating areas, and in many of these, particularly in the pocosons, natural drainage ways have not been established.

There is wide variation in the colors of the soils, which range from white, light gray, or dark gray to black in the surface portion. The light-colored soils include the Norfolk, St. Lucie, Lakewood, and Dunbar series; the dark-gray soils include the Coxville, Bladen, Portsmouth, and Plummer. The black soils comprise the Hyde and St. Johns series and Muck. The Hyde soils and Muck contain an extremely large proportion of organic matter to a depth of 3 feet or more. This is thoroughly incorporated with the mineral matter in the Hyde loam and there is no distinct line of demarcation between the soil and subsoil in many places. Muck is composed of about 80 per cent of fairly well decayed vegetable matter mixed with about 20 per cent of mineral matter.

With the exception of a few areas of marl, composed of small shells, which underlie a part of the county, there are no deposits of lime in the county. This marl is due to the deposition of shells and does not represent carbonate of lime dissolved from the upper part of the soil and redeposited as a layer in the soil or subsoil. This marl is important, and some of it has been mined and placed on the land with good results.

In Onslow County there are three general groups of soils which have distinct layers, or horizons, within the 3-foot section. The first group includes the Norfolk, St. Lucie, and Lakewood soils, which are composed of what appears to be the most thoroughly weathered or oxidized and best drained material in the county. In

[2] The soils of Onslow County do not join in every instance with those of Jones, Duplin, and Pender Counties because of the more fully worked-out classification in the more recent survey.

the St. Lucie there is no difference between the soil and subsoil, but in the Lakewood there are two distinct layers, the white surface soil and the orange-yellow subsoil. In the Norfolk there are three layers, the gray surface, the yellow subsurface, and the yellow sandy clay subsoil.

The second group embraces the Dunbar, Coxville, and Bladen soils, which have three distinct horizons in the 3-foot section, a gray to dark-gray surface layer, a light-gray or yellowish-gray subsurface, and a mottled and tough and sometimes plastic subsoil layer.

The third group comprises the St. Johns, Leon, and Onslow series. These soils are characterized by a distinct hardpan layer of brown to almost black sand cemented together with organic matter, and each contains three distinct soil sections or horizons: (1) The surface layer, which is usually a friable material; (2) the hardpan layer, which is usually from 3 to 8 inches in thickness; and (3) the lower subsoil, generally friable, except in the case of the Onslow, in which it is a stiff, rather heavy clay.

The soils of Onslow County owe their origin to the weathering of unconsolidated sands, sandy clays, and clays. These materials were brought down from the Piedmont and Appalachian regions and deposited on the ancient sea floor, later elevated above sea level. Through the processes of weathering, which have varied with differences in drainage, oxidation, and aeration, and through the modifying influences of plant and animal life, changes have taken place in these various materials, with a consequent formation of a large number of more or less distinct soil types. The accumulation of large amounts of organic matter in the soils in different sections of the county has been due to poor drainage and to the growth and decay for centuries of accumulations of vegetation. Throughout the county there is a noticeable uniformity in the texture of most of the soils, the surface material being prevailingly a fine sand or fine sandy loam and many of the subsoils loose incoherent fine sand, fine sandy clay, or heavy plastic clay.

Upon the basis of similarity in color, texture, structure, and drainage condition the soils of the county have been grouped into soil series, and these divided into soil types on the basis of differences in texture.

The types of the Norfolk series have gray to yellow surface soils and yellow friable sand or sandy clay subsoils. The topography of these soils is gently rolling to rolling, and the natural surface and internal drainage are good. The Norfolk fine sand with a shell phase and the fine sandy loam with a deep phase are mapped.

The surface soils of the Dunbar series are prevailingly gray. The upper subsoil is yellow and in the heavier types it has a tough, compact structure. The lower subsoil is a tough and slightly plastic clay of yellow color, mottled with bright red or red and gray. These soils are developed in the flatwoods region of the Coastal Plain and represent material intermediate in weathering between that of the Norfolk on the one hand and the Coxville on the other. One type, the Dunbar fine sandy loam, is mapped in the county.

The types included in the Onslow series are characterized by gray to grayish-brown surface soils 3 to 6 inches deep, a yellowish-brown to almost black hardpan layer, composed of fine sand cemented by organic matter and iron, with a thickness of about 4 to 8 inches, and below this a subsoil of yellow, heavy sandy clay, mottled with light

red and gray. This series closely resembles the Dunbar except for the hardpan layer. One type, the fine sandy loam, and a yellow-subsoil phase of this type, are mapped in the present survey.

The surface soils of the types included in the Lakewood series are white, and the subsoil is orange or golden yellow in color. The surface material resembles that of the Leon or St. Lucie soils and the subsoil that of the Sassafras series. The fine sand is the only type of the Lakewood series found in Onslow County.

The types in the St. Lucie series are characterized by the snow-white color, loose structure, and extremely droughty nature of both soil and subsoil. The soils consist of almost pure white quartz sand practically free of organic matter, silt, and clay. Only one type of this series, the fine sand, is mapped in the county.

The surface soils of the types included in the Leon series are light gray to white. A subsurface hardpan stratum is usually found at depths of 12 to 24 inches. The fine sand is the only type of the series mapped in the present survey.

The surface soils of the types in the St. Johns series are very dark gray to black and the subsoils light gray to white. A rusty-brown hardpan stratum is encountered at depths of 16 to 24 inches below the surface. This stratum is usually 3 to 10 inches thick and consists of a compact layer of fine sand or sand cemented with a small quantity of iron and a large amount of organic matter. Two types, the fine sand and fine sandy loam, are developed in Onslow County.

The surface soils of the types in the Portsmouth series are dark gray to black, and the subsoil is gray or mottled yellow, gray, or drab. The dark color of the surface soils is due to the admixture of much organic matter, accumulated under a swampy condition. The Portsmouth sand, fine sand, fine sandy loam, and loam types, and a prairie phase of the loam are mapped.

The types in the Coxville series are characterized by gray to dark gray surface soils and a mottled gray and yellow subsoil, which at about 18 to 30 inches is mottled with bright red. The upper part of the subsoil is moderately friable; the lower part is tough and in some places rather plastic. These soils are closely related to the Bladen soils on the one hand and to the Portsmouth soils on the other. The Coxville fine sandy loam is the only type of this series mapped in Onslow County.

The surface soils of the types classed in the Bladen series are gray, brown, or almost black, and the subsoil is a mottled gray or drab and brownish-yellow, or ocherous-yellow, tough plastic clay. The soils appear to be intermediate between the Coxville soils and Tidal marsh. They are closely associated with the Coxville series, but are not as well drained, and the subsoil does not possess the characteristic red mottlings of the Coxville soils. Only the Bladen fine sandy loam is developed in Onslow County.

The Susquehanna series comprises types with light-gray surface soils and a dull-yellow, tough silty clay subsoil, which becomes mottled with yellow and gray and in the lower part of the 3-foot section with red and drab. The Susquehanna clay loam is the only type of this series mapped.

The soils of the Plummer series are light gray to ashy gray and in many places faintly mottled with dingy brown. The subsoils are gray throughout the 3-foot section in the sand types and mottled

yellow and gray friable sandy clays in the sandy loam types. One type of the Plummer series, the fine sandy loam, is found in the county.

The Hyde series includes types with black surface soils and a black to steel-gray subsoil. Both soil and subsoil have a high content of organic matter. Only one type, the loam, occurs in this county.

In addition to the several soil series there are four miscellaneous soils in the county which can not be classed with any definite soil series. They are Muck, Swamp, Coastal beach, and Tidal marsh.

The following table shows the actual and relative extent of the several soil types mapped in Onslow County:

Areas of different soils.

Soil.	Acres.	Per cent.	Soil.	Acres.	Per cent.
Norfolk fine sand	71,296	15.0	Portsmouth sand	13,632	2.8
Shell phase	192		Coxville fine sandy loam	13,440	2.8
Muck	45,760	9.5	Tidal marsh	13,440	2.8
Dunbar fine sandy loam	44,608	9.3	Bladen fine sandy loam	9,408	2.0
Leon fine sand	38,976	8.1	Lakewood fine sand	9,088	1.9
Norfolk fine sandy loam	34,816	7.6	Susquehanna clay loam	8,704	1.8
Deep phase	1,280		St. Johns fine sandy loam	3,904	.8
Swamp	35,264	7.3	Coastal beach	3,520	.7
Onslow fine sandy loam	26,304	6.5	St. Johns fine sand	1,792	.4
Yellow-subsoil phase	4,608		St. Lucie fine sand	1,600	.3
Portsmouth fine sandy loam	30,784	6.4	Hyde loam	1,408	.3
Portsmouth fine sand	29,376	6.1			
Plummer fine sandy loam	15,360	4.0	Total	480,000	.....
Dark-colored phase	4,032				
Portsmouth loam	13,632	3.6			
Prairie phase	3,776				

NORFOLK FINE SAND.

The surface soil of the Norfolk fine sand is a light-gray to yellowish fine sand, 6 to 8 inches deep. The subsoil is a yellow or pale-yellow, loose, mellow fine sand to a depth of 36 inches or more. Along the sound the surface of this type is light gray to almost white and the subsoil is pale yellow. In wooded areas the surface soil to a depth of 1 or 2 inches is gray to dark gray. Along the sound and in some of the wooded areas a brown or ocherous-yellow discoloration from small sandstone concretions is frequently found in the subsoil. In the vicinities of Angola School and Ninemile School the subsoil is heavier than typical. The soil, however, is not heavy enough to be classed as a loamy fine sand. Some small areas of medium sand are included in this type.

The Norfolk fine sand is developed in practically all parts of the county. The largest areas occur north of Catharine Lake, in the vicinity of Meadow View School, south and west of Ninemile School, north and south of Angola, north and west of Cypress School, and along the sound and New River. Smaller bodies are developed elsewhere in the county.

The soil occurs on broad interstream divides and on slopes leading to drainage ways. The topography ranges from almost level to gently rolling and rolling. Owing to the open porous nature of the soil, the natural drainage is good.

The Norfolk fine sand is one of the important farming soils of the county. About 40 per cent of the type is under cultivation, and

the rest is forested with pine, scrub oak, some live oak, sweet gum, and dogwood. Wire-grass, which affords summer pasturage, constitutes the main undergrowth.

The chief crops are corn, cotton, peanuts, and tobacco. Corn is used mainly to feed the work stock and the farm animals. Cotton and tobacco are strictly cash crops. Peanuts are grown both as a cash crop and as forage for hogs. Sweet potatoes are grown mainly for home use, but some find their way to market. Irish potatoes, garden vegetables, and grapes and other fruits are grown for home consumption.

Corn yields 20 to 35 bushels per acre, cotton one-fourth to three-fourths bale, tobacco 600 to 800 pounds, and peanuts 30 to 40 bushels. Sweet potatoes produce 80 to 100 bushels, and garden vegetables give very satisfactory returns.

Corn is given an acreage application of 400 to 700 pounds of commercial fertilizer, or a home mixture of acid phosphate, cottonseed meal, fish scrap, and kainit. A side dressing of 50 to 100 pounds per acre of nitrate of soda is applied when the plants are about waist high. Cotton receives 500 to 800 pounds of commercial or home-mixed goods. An application of 50 to 100 pounds per acre of nitrate of soda is usually given also. Tobacco receives 800 to 1,200 pounds per acre of fertilizers relatively high in potash. Peanuts are fertilized with about 300 pounds of 10–0–2 fertilizer and 1 ton of lime per acre, and sweet potatoes receive about the same kinds and applications of fertilizer as tobacco. The formulas of the different grades used for the several crops are stated in the section on agriculture.

Cover crops of rye or oats are grown by some of the farmers and turned under in the spring as green manure. Some soy beans, cowpeas, and clover are grown, but these crops are not general on this type of soil. Stable manure is applied in such quantities as are available.

Land of this type sells for $50 to $100 an acre, depending upon the improvements and nearness to towns or markets. Cut-over land can be bought for $20 to $35 an acre.

For the improvement of the Norfolk fine sand in this part of the Coastal Plain, the following four-year and five-year rotations are recommended by the North Carolina Agricultural Experiment Station:

Four-year rotation.

Year.	Crop.	Fertilization.
First	Corn; soy beans; all roughage turned under.	100 to 125 pounds per acre acid phosphate plus stable manure, or 100 to 125 pounds per acre of cottonseed meal and 50 pounds per acre of kainit. Side dressing of 50 to 60 pounds per acre of nitrate of soda.
Second	Cotton; rye turned under.	At planting, 150 to 250 pounds per acre acid phosphate, 150 to 300 pounds cottonseed meal, 80 to 200 pounds kainit. In the summer, 75 to 160 pounds per acre of nitrate of soda.
Third	Peanuts; rye turned under.	None.
Fourth	Soy beans for hay or seed; crimson clover to be turned under.	From 200 to 300 pounds per acre acid phosphate and 50 pounds kainit.

Apply 1 to 2 tons ground limestone per acre every four years.

Five-year rotation.

Year.	Crop.	Fertilization.
First	Corn; soy beans; all roughage turned under.	From 100 to 125 pounds per acre acid phosphate plus stable manure, or 100 to 125 pounds per acre cottonseed meal and 50 pounds kainit. In summer, 50 to 60 pounds per acre nitrate of soda.
Second	Cotton; rye to be turned under; crimson clover.	At planting, 150 to 250 pounds per acre acid phosphate, 150 to 350 pounds cottonseed meal, 80 to 300 pounds kainit. In summer, 75 to 160 pounds per acre nitrate of soda.
Third	Soy beans for hay or seed.	From 200 to 300 pounds per acre acid phosphate and 50 pounds kainit.
Fourth	Oats and vetch for hay; soy beans turned under.	None.
Fifth	Cotton; crimson clover turned under.	At planting, 150 to 250 pounds per acre acid phosphate, 150 to 350 pounds cottonseed meal, 80 to 200 pounds kainit. In summer, 75 to 160 pounds per acre nitrate of soda.

From 1 to 2 tons per acre of ground limestone should be applied once in the rotation. Soy beans may be planted in alternate 3-foot rows with corn or may be broadcasted at the time the corn is laid by. Rye may be planted when cotton is laid by. Oats and vetch may be sown in the fall of the third year.

Norfolk fine sand, shell phase.—The surface soil of the Norfolk fine sand, shell phase, ranges in depth from 8 to 15 inches, and varies in color from gray to brown, being darker than the soil of the typical Norfolk fine sand. Scattered over the surface and embedded in the soil are large quantities of oyster, clam, conch, and other sea shells, which make the soil more porous and somewhat difficult to work. The subsoil is a pale-yellow loose fine sand to a depth of 3 feet or more.

There is only a small development of the shell phase in the county. The most important areas are located at Freemans Landing and at the mouth of Bear Creek in the southeastern part of the county. It is thought that Indians left the shells on the soil. The surface is gently rolling and the drainage is good. Most of the phase is farmed, and yields are slightly higher than on the typical Norfolk fine sand.

NORFOLK FINE SANDY LOAM.

The surface soil of the Norfolk fine sandy loam is a light-gray to yellowish loamy fine sand to fine sandy loam 6 to 8 inches deep, passing into a pale-yellow loamy fine sand, which extends to a depth of 12 to 15 inches. The subsoil is a yellow friable fine sandy clay to a depth of 36 inches or more. In wooded areas an upper layer of the soil, 1 or 2 inches thick, is gray to dark gray. In many of the areas that have been farmed a long time the surface is pale yellow to almost white. Included in the type are several small areas which have a reddish-yellow subsoil; these, if more extensive, would have been mapped as Ruston fine sandy loam. There are also included a few small areas of Norfolk very fine sandy loam.

The Norfolk fine sandy loam occurs mostly in the northwestern, western, and central parts of the county. Some small developments are located in the eastern part. The largest areas are west of Jarmantown, north and south of Mercers Store, west of Catharine Lake, north of Mortons Store, west of Cypress School, along New River

between Hadnot Point and Frenchs Creek, and in the eastern part of the county around and near Belgrade.

The soil occupies interstream ridges and the slopes approaching streams. The surface is nearly level to gently undulating and rolling. Natural surface and internal drainage for most of the soil is well established. Ditches are required in some of the flatter situations for successful farming.

The Norfolk fine sandy loam is an important agricultural soil in the county and about 50 per cent of it is cultivated. The remainder is forested with pine, together with some scrub oak, hickory, dogwood, sourwood, and holly. The undergrowth of gallberry bushes and wire grass is usually burned over in the spring and the fresh grass used for summer pasturage.

The chief crops on the Norfolk fine sandy loam are corn, cotton, tobacco, and peanuts. Some sweet potatoes, potatoes, garden vegetables, grapes, fruits, rye, oats, clover, and soy beans are also grown.

Corn yields 20 to 40 bushels per acre, cotton one-half to 1 bale, tobacco 600 to 1,000 pounds, peanuts 30 to 40 bushels, sweet potatoes 60 to 125 bushels, and soy beans 15 to 35 bushels of seed.

Fertilizers are generally used, the mixtures varying with the different crops, as noted in the section on agriculture. Somewhat lighter applications are used for corn than upon the Norfolk fine sand, but the other crops receive fully as large applications as on the lighter-textured type. Stable manure also is applied when available. Some of the farmers grow green-manuring crops, such as rye, oats, or clover.

Land of this type sells for $50 to $150 an acre, depending upon the improvements and nearness to markets. The selling price of the forested areas is governed largely by the value of the standing trees.

The Norfolk fine sandy loam is well adapted to the production of corn, cotton, sweet potatoes, bright tobacco, peanuts, cowpeas, vetch, crimson clover, oats, truck crops, potatoes, watermelons, muskmelons, grapes, peaches, and pecans. The soil is easily worked and can be maintained in a high state of productiveness. The addition of organic matter, proper fertilization, and a more systematic crop rotation are suggested for the improvement of this soil. The four-year and five-year crop rotations recommended for the Norfolk fine sand will apply equally well to the fine sandy loam type.

Norfolk fine sandy loam, deep phase.—The surface soil of the Norfolk fine sandy loam, deep phase, consists of a yellowish-gray to pale-yellow loamy fine sand which ranges in depth from 5 to 8 inches, where it passes into a pale-yellow loamy fine sand which extends to a depth of 24 to 30 inches. The subsoil below 24 to 30 inches is a yellow friable fine sandy clay. In wooded areas the immediate surface soil to a depth of 1 or 2 inches is light gray to gray.

This phase has only a small development in the county. It is found chiefly southeast of Camp Perry and north of Silverdale and Hubert, with smaller areas elsewhere. The soil occurs on interstream ridges and on slopes approaching streams. The topography is undulating to gently rolling, and the drainage conditions are good.

Owing to its small extent, this soil is unimportant. About 35 per cent of it is cultivated and the rest supports a growth of pine and scrub oak and a few hickory and dogwood trees.

The main crops are corn, cotton, and tobacco. Peanuts and sweet potatoes are crops of secondary importance. Corn yields 15 to 35 bushels per acre, cotton one-fourth to three-fourths bale, and tobacco 600 to 800 pounds. These crops receive about the same fertilizer treatments as similar crops on the Norfolk fine sand. Suggestions for the improvement of the Norfolk fine sand will apply equally to the Norfolk fine sandy loam, deep phase.

DUNBAR FINE SANDY LOAM.

The surface soil of the Dunbar fine sandy loam is a gray loamy fine sand or fine sandy loam 6 to 8 inches deep. The subsoil to depths of 20 or 24 inches is a yellow friable fine sandy clay; below this it is mottled yellow, gray, and sometimes bright red, tough, slightly plastic fine sandy clay or clay. The surface soil in wooded areas is usually dark gray to a depth of 1 or 2 inches. In the plowed areas, where some of the lower subsoil is mixed with surface material. the color is light gray or pale yellow.

The Dunbar fine sandy loam is developed in nearly all parts of the county. The largest areas lie near Jarman School, around Richlands, at Union Chapel, in the vicinity of Mortons Store, south of Jacksonville near Jarman Landing, on the west border of Stones Bay, south of Half Moon School, south of Kellum, east of Deppe, and north of Belgrade, in the vicinity of Loco School. Other smaller developments occur elsewhere in the county.

The Dunbar fine sandy loam occupies positions on the broad interstream areas and on slopes leading to drainage ways. The surface varies from flat to gently rolling and rolling. The surface drainage is fairly good for the more rolling areas, but the internal drainage is poor, owing to the compact structure of the lower subsoil. Ditches are required over most of the type to insure adequate drainage in planted fields.

The soil is an important agricultural type in the county. Approximately 40 per cent of it is under cultivation. The rest is forested with pine and some sweet gum, scrub oak, hickory, and dogwood. The undergrowth is composed of gallberry bushes and wire grass, the latter being of value for summer pasturage. Some of the land has been cut over, and only a scattering growth of pine is left.

The principal crops are corn, cotton, and tobacco. Peanuts are grown and are used largely for fattening hogs. Sweet potatoes are planted for home use and for sale. Crops mainly for home use are garden vegetables, potatoes, grapes, peaches, watermelons, and muskmelons. Rye and oats are grown mainly as winter cover crops, giving pasturage in early spring. Soy beans are grown for hay or seed.

Corn yields 25 to 40 bushels per acre, cotton one-half to 1 bale, and tobacco 800 to 1,000 pounds. Peanuts produce 30 to 40 bushels per acre, and sweet potatoes 80 to 125 bushels. Soy beans give excellent results.

Fertilizer practice in general is practically the same as on the Norfolk soils. Fields intended for peanuts are commonly limed at the rate of 1,000 pounds of burnt lime per acre. Fertilizers for the peanut crop do not contain nitrogen. Marl is applied to cotton and corn land by some of the farmers. Forest mold, ditch-bank earth, and stable manure mixed are spread over the land to increase the content of organic matter of the soil.

Land of this type is held at $50 to $200 an acre, depending upon the improvements and proximity to markets. The price of forested areas is governed largely by the value of the timber.

The Dunbar fine sandy loam is a good agricultural soil, and it can be built up and maintained in a high state of productiveness. The soil is deficient in organic matter, which can be supplied by turning under green-manure crops. Deeper plowing and systematic crop rotations would be beneficial. The crop rotation recommended for the Norfolk fine sand applies equally to this soil.

The table below gives the results of mechanical analyses of samples of the soil, subsurface, and subsoil of the Dunbar fine sandy loam:

Mechanical analyses of Dunbar 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.*	*Per cent.*
235708	Soil, 0 to 7 inches	0.0	1.4	1.7	60.8	10.0	19.2	6.9
235709	Subsurface, 7 to 18 inches	.0	.8	1.3	50.0	9.8	20.7	17.3
235710	Subsoil, 18 to 36 inches	.0	1.0	1.3	43.6	8.5	20.6	24.9

ONSLOW FINE SANDY LOAM.

The surface soil of the Onslow fine sandy loam is a gray fine sandy loam or loamy fine sand 5 to 7 inches deep. Underlying the surface soil is a rusty-brown or ocherous-yellow hardpan layer 6 to 8 inches thick. This is called locally "sand rock" and is composed of fine sand cemented with organic matter and iron. The subsoil is a mottled yellow and gray, sometimes bright red, tough, plastic fine sandy clan to clay, which extends to a depth of 36 inches or more.

A few brown sandstone concretions are scattered over the surface or embedded in the soil. In wooded areas the surface soil is slightly darker in color than in the open fields. The brown hardpan material is sometimes brought to the surface in plowing, where upon weathering it crumbles and gives a brownish tinge to the surface soil.

The Onslow fine sandy loam is developed in the east-central and southeastern parts of the county. The largest areas lie 2 miles east of Jacksonville, west of Grays Point, south of Kellum, north of Cedar Grove School, northeast of Littletons Store, and north of Swansboro. The soil occurs on interstream areas and on the slopes approaching streams.

The topography is almost level to gently rolling, and the lack of surface relief, with the impervious nature of the hardpan stratum, causes inadequate drainage. The hardpan does not allow water to percolate downward, and during seasons of heavy rainfall crops are sometimes drowned out.

The soil is nevertheless agriculturally important, about 35 per cent of its area being under cultivation. The forest growth is chiefly pine, with some sweet gum, dogwood, and scrub oak. The undergrowth consists of scattered bay bushes, gallberry bushes, and wire grass. Cattle graze on the wire grass during the summer.

Corn, cotton, and tobacco are the principal crops. Peanuts are grown to a small extent for feeding hogs. Sweet potatoes, potatoes, garden vegetables, grapes, and other fruits, are grown mainly for home use. Soy beans are planted for hay or seed by some farmers. Corn yields 15 to 35 bushels per acre, cotton one-half to three-fourths bale, and tobacco 600 to 800 pounds. Peanuts, sweet potatoes, and soy beans give fair yields. Crops on the Onslow fine sandy loam are given about the same fertilizer treatment as similar crops on the Norfolk fine sandy loam.

Land of this type sells for $35 to $75 an acre, depending upon the improvements, closeness to markets, and value of timber.

The greatest problem in producing crops on this soil is the breaking of the underlying hardpan, which in places is difficult to plow through. When the hardpan is once thoroughly broken up the soil should produce as well as the Dunbar fine sandy loam.

Onslow fine sandy loam, yellow-subsoil phase.—The surface soil of the Onslow fine sandy loam, yellow-subsoil phase, is a light-gray fine sandy loam or loamy fine sand from 5 to 7 inches deep. Underlying the surface mantle is a rusty-brown or ocherous-yellow hardpan stratum 6 to 8 inches thick, similar to that in the typical soil. The subsoil is a yellow friable fine sandy clay to 36 inches or more.

The yellow-subsoil phase is developed almost entirely in the eastern part of the county. The largest aeras lie south of Cedar Grove School, in the vicinity of Hubert, and near Great Neck Landing. The phase occurs mostly on slopes near drainage ways. The topography is gently rolling to rolling. Natural drainage is good, but internal drainage is retarded by the hardpan layer.

This soil, because of its comparatively small extent, is of little importance. About 35 per cent of it is cultivated, and the rest supports a forest growth of pine, scrub oak, and some dogwood. The undergrowth is mainly wire grass.

Corn, cotton, and garden vegetables are the principal crops. Corn yields 15 to 35 bushels per acre and cotton one-half to three-fourths bale. Garden vegetables do well. Crops are fertilized in the same way as those on the Norfolk fine sand.

Land of this phase sells for $35 to $75 an acre, depending upon the improvements and the value of the timber.

The soil is deficient in organic matter, but this can be supplied through the use of stable manure or green manures. Deeper plowing, to break the hardpan layer, would also prove beneficial.

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

Mechanical analyses of Onslow 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.*	*Per cent.*
235711	Soil, 0 to 7 inches	1.3	0.9	1.6	43.3	28.6	19.1	5.2
235713	Subsoil, 12 to 36 inches	.0	.4	1.1	31.7	22.1	15.5	29.4

LAKEWOOD FINE SAND.

The surface soil of the Lakewood fine sand is a white fine sand 8 to 10 inches deep. The subsoil is a yellow uniform fine sand to a depth of 36 inches or more. In places the subsoil contains brownish

or ocherous-yellow discolorations probably due to the disintegration of sandstone concretions.

The Lakewood fine sand is confined largely to the southeastern part of the county. It occupies gently rolling to rolling ridges or hillsides and hummocky areas. The largest areas occur on the east side of Farnell Bay near Duck Creek post office and Freemans Landing and south of West Bear Creek School. The surface and internal drainage are good to excessive, owing to the open nature of the soil and the prevailingly rolling topography.

The soil is used only to a small extent for farming. There are a few patches in corn or peanuts, the yields of which are low. The fertilizer treatment is about the same as for the Norfolk fine sand.

Most of the type is either in forest of pine and scrub oak or is cut-over land. In many places a young growth of longleaf pine appears. The undergrowth is mostly wire grass, which has some value as pasturage. The Lakewood fine sand is valued mainly for its forest.

The soil is greatly in need of organic matter, but even when this is supplied and heavy applications of stable manure and fertilizer are used only small yields of the ordinary crops are obtained.

ST. LUCIE FINE SAND.

The St. Lucie fine sand is a white, incoherent fine sand, 3 feet or more deep. The soil is almost entirely of quartz, practically without silt, clay, or organic matter. A hardpan stratum is encountered in places at a depth of 36 inches.

The type occurs in the southern and southeastern parts of the county. The largest area lies east of Folkstone. It occupies ridges and knolls in association with Lakewood and Leon soils. The surface is gently rolling to rolling and the drainage is good to excessive.

The St. Lucie fine sand has no present agricultural value, none of it being farmed. Most of it is cut-over land. The land remaining in forest supports a thin growth of pines and scrub oak, with an undergrowth of gallberry bushes and wire grass.

LEON FINE SAND.

The surface soil of the Leon fine sand is a light-gray to white fine sand, 12 to 24 inches deep. Below the surface soil there appears a rusty-brown, coffee-colored, or dark-brown to almost black hardpan varying in thickness from 6 to 10 inches. The cementing material in this hardpan is mostly of organic origin, but consists in part of iron compounds. The subsoil below the hardpan is a light-gray to white fine sand. In places the hardpan is near enough the surface to be reached with the plow.

The type occurs mainly in the southwestern, southern, and southeastern parts of the county. The largest developments are northeast of Bay Meeting House; in the vicinities of Dixon, Folkstone, and Hollyridge; and southeast of Eden Church. A large area lies southeast of Catharine Lake. Smaller bodies are encountered elsewhere in the county.

The Leon fine sand occurs on broad interstream divides and on gentle slopes approaching drainage ways. The topography ranges from level to gently rolling. The natural surface drainage is good, but the internal drainage is retarded by the hardpan layer.

The Leon fine sand is an extremely poor agricultural soil. Less than 2 per cent of the type is used for farming. Most of it is in the the condition of cut-over land, and is used extensively as a range for cattle and hogs. The forest growth on the areas that have not had the lumber removed consists of a scattered growth of pine, scrub oak, and sweet gum. The undergrowth is largely gallberry bushes and wire grass.

A few small tracts in the vicinity of logging camps and shipping points are used for growing corn, oats, and garden vegetables. Corn and oats give comparatively low yields, but garden vegetables do well. Fertilizer treatment is about the same as for the same crops on Norfolk fine sand.

The selling price of the Leon fine sand, which ranges from $10 to $35 an acre, is dependent largely on the character of the forest growth.

The agricultural value of the Leon fine sand is low. The application of large quantities of stable manure and the turning under of green-manure crops, such as cowpeas, vetch, or rye, would increase the organic content and the moisture-holding capacity of the soil so that fertilizers could be more profitably used. Only a very small percentage of this soil is farmed in any part of the South. Perhaps a few vegetables and truck crops could be produced commercially in favorably situated areas.

ST. JOHNS FINE SAND.

The surface soil of the St. Johns fine sand is a dark-gray to black fine sand 10 to 20 inches deep. Below this material appears a rusty-brown to black hardpan, from 3 to 10 inches thick, consisting of fine sand cemented together with organic matter and small quantities of iron compounds. The lower subsoil is a light-gray to white fine sand having the nature of quicksand.

The type is confined to the southeastern part of the county. The largest areas lie north of Traps Bay, east of Hazel Chapel, and in the southern part of Horse Swamp Pocoson. The soil occurs in flats and slight depressions and the surface is approximately level. Both surface and internal drainage are poor.

The St. Johns fine sand has no present agricultural value in Onslow County. The areas are forested with a scattering growth of pine and scrub oak. The undergrowth consists of gallberry bushes, briers, and wire grass. The land is used for grazing cattle and hogs. Land of this type may be brought for $10 to $35 an acre, the price depending mainly upon the value of the timber.

ST. JOHNS FINE SANDY LOAM.

The St. Johns fine sandy loam consists of a dark-gray to black fine sand or loamy fine sand, 6 to 10 inches deep, underlain by a brown to black hardpan, like that in the fine sand, and below this by a mottled gray and yellow friable fine sandy loam to fine sandy clay which extends to a depth of 3 feet or more.

The type is confined almost entirely to the central part of the county. The largest areas lie 2 miles east of Jacksonville, west of Piney Green, and 1 mile south of Gillette Landing. The soil occurs in flats and slight depressions, near the sources of small streams, and both surface and internal drainage are poor.

The St. Johns fine sandy loam is not cleared or used for farming. Most of it supports a forest of pine, scrub oak, and sweet gum. The undergrowth consists mainly of gallberry and myrtle. In places the soil has been cut over and only a few pine trees remain. The selling price of this land is about the same as for the fine sand, and, as in case of that soil, depends largely upon the value of the forest.

The suggestions for improving the Portsmouth fine sandy loam apply also to this soil. The soil, however, is probably better suited to forestry than to farming.

PORTSMOUTH SAND.

The surface soil of the Portsmouth sand is a dark-gray to black sand containing a large quantity of organic matter and ranging in depth from 8 to 18 inches. The subsoil is a light-gray to white medium sand to a depth of 36 inches or more. In places the surface soil has a brown coloration, probably due to the presence of small concretions.

The Portsmouth sand occurs mainly in the western and northwestern parts of the county. The largest areas lie east of Tar Landing, south of Springfield School, northeast of Mercers Store, between Gregory Crossroads and Catharine Lake, northeast of Huffmantown, and along the edge of the western part of Whiteoak Pocoson. The soil occupies positions around heads of small streams and also occurs in flats and slight depressions. The topography is almost level and the natural surface and internal drainage are poor, the soil being water-logged the greater part of the year.

Only a few small areas of the Portsmouth sand are farmed. These are used in the production of corn, cotton, and garden vegetables. The yields of corn and cotton are relatively low. Most of the soil supports a scattering growth of pine, with an undergrowth of bay, gallberry, and huckleberry bushes. The selling price of the land is dependent largely upon the value of the timber.

The Portsmouth sand, if thoroughly drained, properly limed, and given heavy applications of fertilizer high in phosphate and potash, would give fair yields of cotton, corn, oats, forage crops, and vegetables. The soil will require heavy fertilization to maintain its productivity.

Included with the Portsmouth sand are a few areas of Plummer sand, which were not mapped separately, owing to their small extent. The Plummer sand has a gray to light-gray surface soil and a light-gray sand subsoil, and has about the same agricultural value as the Portsmouth sand.

PORTSMOUTH FINE SAND.

The surface soil of the Portsmouth fine sand is a dark-gray to black fine sand or loamy fine sand ranging in depth from 8 to 20 inches. The surface soil carries a high content of decayed vegetable matter, and in some of the flatter areas the proportion is very nearly enough to give a true Muck. The subsoil is a light-gray to white fine sand, which extends to a depth of 36 inches or more. The surface material in places has a brownish color from small concretions and the subsoil in many areas has the nature of quicksand.

This type is developed largely in the western, southern, and southeastern parts of the county. The largest areas are found near Maplehurst School and Angola School, around the edges of Great Sandy Run Pocoson, and west of Dixon. Smaller developments occur elsewhere in the county. The soil occupies flats and slight depressions, commonly near the sources of streams. The topography is nearly level and drainage is poorly established.

The Portsmouth fine sand is not important agriculturally. Only a few small areas have been reclaimed for farming, and the rest supports a scattered growth of pine, with a dense undergrowth of bay bushes, huckleberry, gallberry, and briers. Wire grass grows on some of the higher land and furnishes pasturage for cattle during the summer.

The few small areas farmed are devoted to corn and garden vegetables. Corn yields from 10 to 20 bushels per acre. The suggestions for reclaiming the Portsmouth sand apply also to the Portsmouth fine sand.

The Portsmouth fine sand sells for $10 to $35 an acre, the price depending mainly upon the value of the timber.

PORTSMOUTH FINE SANDY LOAM.

The surface soil of the Portsmouth fine sandy loam is a dark-gray to black fine sandy loam, high in organic matter, and 8 to 15 inches deep. Typically the subsoil is a mottled yellow and gray friable fine sandy clay to a depth of 3 feet or more. In places, however, the upper part consists of a light-gray fine sandy clay, the mottled yellow and gray material appearing at 24 to 30 inches from the surface. The soil in some of the depressed areas approaches a loam in texture.

This type of soil is largely confined to the northwestern, western, and eastern parts of the county. The largest areas lie north and east of Huffmantown, north of Ninemile School, and north and south of Deppe. Smaller developments occur elsewhere in the county.

The Portsmouth fine sandy loam occupies flats and slight depressions in some of the small pocosons and in situations near the sources of streams. The topography is almost level to gently undulating. Drainage has not been fully established, and the soil is wet during the greater part of the year.

On account of the poor drainage conditions the Portsmouth fine sandy loam is not farmed. It originally supported a forest growth consisting largely of pine, with an undergrowth of bay, gallberry, and briers. Large areas of the type have been cut over and here only a few scattering pines remain. On some of the higher areas wire grass affords some grazing.

A few small tracts that have been cleared and ditched for farming grow corn, cotton, oats, and garden vegetables. Corn yields 15 to 30 bushels per acre and cotton about one-half bale. Crops receive about the same fertilizer treatment as on the Dunbar fine sandy loam.

The soil in its present state is not suitable for farming, and the price of the land is governed largely by the value of the forest growth, the cut-over areas having a very low value.

The Portsmouth fine sandy loam, if properly drained and limed, would give good yields of corn, forage crops, Irish potatoes, strawberries, and vegetables. Heavy fertilization would be necessary to produce the best results.

PORTSMOUTH LOAM.

The Portsmouth loam consists of a dark-gray to black mellow loam, 8 to 18 inches deep, underlain by a subsoil of light-gray or mottled yellow and gray friable fine sandy clay, which extends to a depth of 36 inches or more. Where areas adjoin the fine sandy loam of the series it is difficult to establish boundaries between the two types. The surface soil has a high content of organic matter from the accumulation of partly decayed vegetable matter, decay being arrested by the wet conditions under which the type has developed.

The Portsmouth loam is mapped in the northwestern and eastern parts of the county. Important areas occur north of Jarmantown, around the eastern border of Whiteoak Pocoson, in Lloyds Meadows and Horse Swamp Pocoson, and west of Silverdale. It typically occupies flats and slight depressions and has a level to gently undulating surface. This topography, coupled with the lack of natural drainage ways, produces poor drainage.

The greater part of the Portsmouth loam is at present in the condition of cut-over land, with a few scattering pines standing, or is forested with pine and an undergrowth of bay and gallberry bushes. Wire grass and broom sedge grow on some of the areas, giving them greater value as pasture for cattle. A very small percentage of the type is planted to corn, cotton, and garden vegetables, the yields being about equal to those on the fine sandy loam type.

The price of land on this type, as upon much of the poorly drained land in the county, depends mainly on the value of the timber growth.

The suggestions for the improvement of the Portsmouth fine sandy loam apply also to this type.

Portsmouth loam, prairie phase.—The surface soil of the Portsmouth loam, prairie phase, is a black loam 6 to 12 inches deep. The subsoil is a mottled yellow and gray friable sandy clay throughout the 3-foot profile.

The soil is confined to the eastern part of the county; the largest areas are situated 1 mile south of Deppe and in the northern part of Lloyds Meadows. The topography is practically level, but the surface is apparently slightly higher than the adjoining typical Portsmouth loam. The surface and internal drainage are nevertheless poorly established.

The Portsmouth loam, prairie phase, is used largely for grazing cattle during the summer. The phase, in contrast to the typical Portsmouth loam, is practically treeless, the growth consisting of only a few pine and sweet gum trees and an undergrowth of gallberry bushes scattered here and there. It represents prairie or treeless conditions.

The Portsmouth loam, prairie phase, if properly drained and limed, would be well suited to the production of corn, oats, soy beans, and forage crops. It can be brought under cultivation at small expense after it is drained.

COXVILLE FINE SANDY LOAM.

The surface soil of the Coxville fine sandy loam is a gray to dark-gray fine sandy loam 6 to 8 inches deep. The upper subsoil is a moderately friable yellow or mottled yellow and gray fine sandy clay, which extends to depths of 18 to 24 inches. The lower subsoil is a mottled yellow, gray, and bright-red, tough, plastic fine sandy clay to clay which extends to a depth of 36 inches or more.

The Coxville fine sandy loam occurs in nearly all parts of the county, but the largest development is in the eastern part, west, east, and southeast of Kellum and west of Belgrade. Smaller areas are situated northeast of Half Moon, west of Haws Run Church, and around Padgett. Included with this type are a few small areas of Coxville very fine sandy loam.

The topography of the Coxville fine sandy loam is flat to gently undulating. The soil occupies positions in flats and pocosons on interstream divides. Owing to the almost level topography and rather impervious subsoil, the surface and internal drainage are poor. Ditches are necessary for successful farming.

Probably not more than 5 per cent of the type is under cultivation. The rest supports a forest of pine, with some sweet gum, and an undergrowth of bay bushes, gallberry, briers, and some wire grass. This is usually burned over in the spring to improve the grazing.

A few areas of the soil have been ditched and reclaimed for farming. The chief crops are corn, cotton, sweet potatoes, oats, and vegetables. Corn yields 20 to 35 bushels per acre, cotton one-third to three-fourths bale, and sweet potatoes 60 to 80 bushels. The crops are given about the same fertilization as on the Dunbar fine sandy loam.

The Coxville fine sandy loam, when properly drained, is adapted to cotton, corn, oats, soy beans, cowpeas, strawberries, and forage crops. Its value in its present undrained condition is based on the character of the forest. For the improvement of the soil thorough drainage is necessary, and heavy applications of lime are needed to correct acidity. The type will respond to deep plowing and the growing and turning under of leguminous crops. The Coxville fine sandy loam is inherently a good agricultural soil and more of it could be used profitably for farming.

BLADEN FINE SANDY LOAM.

The Bladen fine sandy loam consists of a gray to dark-gray, locally mottled with brown, loam to fine sandy loam, 6 to 10 inches deep underlain by a mottled gray and yellow or drab and ocherous-yellow, tough, plastic, silty clay to clay.

This type is confined largely to the north-central part of the county. Large areas are situated northwest of Tar Landing, northeast of Half Moon, north and east of Kellum, and in the southern part of the county east of Turkey Creek School. Smaller developments occur elsewhere.

The soil occupies flat areas or slight depressions in the pocosons and the surface is almost level. Both the surface and internal drainage are poor.

Only about 4 or 5 per cent of the Bladen fine sandy loam is farmed. Most of the areas are cut-over land, with an undergrowth of broom sedge and wire grass affording summer pasturage.

At present only one farm of importance is situated on this type of soil. The land was cleared and drained about five years ago, and an acreage application of 2 to 4 tons of ground limestone given.

Corn yields average 50 bushels per acre, soy beans 35 bushels, oats 35 bushels, cotton 1 to 1½ bales, sweet potatoes 100 to 150 bushels. Oats, vetch, and clover mixed give excellent yields of hay. Corn and cotton receive an acreage application of 400 to 600 pounds of 8–2–2 fertilizer.

Soils of the Bladen series are used extensively in North Carolina and Florida for the production of truck crops, such as Irish potatoes, cabbage, and tomatoes. The soils are also well adapted, when properly drained, as the yields on the farm mentioned show, to corn, cotton, oats, soy beans, cowpeas, and forage crops. Suggestions for the improvement of the Coxville fine sandy loam apply to the Bladen fine sandy loam.

SUSQUEHANNA CLAY LOAM.

The surface soil of the Susequehanna clay loam is a light-gray heavy very fine sandy loam to silt loam 4 to 8 inches deep. The subsoil, which begins as a dull-yellow tough silty clay, becomes a mottled yellow and gray, heavy, though plastic clay, marked in the lower part of the 3-foot section with mottlings of red and drab. The surface soil on many of the slopes has been eroded away and the dull-yellow heavy clay exposed.

The type is mapped in small areas in the northwestern and eastern parts of the county. The largest bodies occur along the upper courses of New River, Mill Swamp, Jenkins Swamp, Cowhorn Swamp, and in the eastern part of the county along Queens Creek near Hubert. The soil is confined largely to the slopes near streams. The topography is gently rolling to rolling, and the natural surface drainage good.

This is a relatively important farming type in the county, and approximately 40 per cent of it is under cultivation. The rest is forested with pine, scrub oak, some white oak, sweet gum, dogwood, and hickory.

Corn, cotton, tobacco, peanuts, sweet potatoes, and garden vegetables are grown, the last two crops mainly for home use. Cotton yields one-half to 1 bale per acre, corn 25 to 40 bushels, tobacco 800 to 1,000 pounds, peanuts 30 to 35 bushels, and sweet potatoes 60 to 80 bushels. Corn receives 500 to 600 pounds per acre of 8–2–2, 9–2–2, or 9–3–3 fertilizer and a side dressing of nitrate of soda at the rate of 50 to 75 pounds per acre; cotton receives 500 to 800 pounds per acre of 8–2–2 or 9–2–2 fertilizer; and tobacco 800 to 1,000 pounds of 8–2–3, 8–3–3, or 9–2–3 fertilizer. Peanuts are treated with about 1 ton of lime and 300 pounds of 10–0–2 fertilizer per acre. The crops on this type are used mainly for fattening hogs, but some are sold. Corn is consumed largely on the farm as feed for stock. Cotton, tobacco, and to some extent sweet potatoes are cash crops.

Land of this type is held at $30 to $75 an acre, the price depending upon the location with respect to towns and upon the character of the improvements.

The Susquehanna clay loam is a good strong soil and one capable of being built up and maintained in a high state of cultivation under proper management. Deep plowing, proper preparation of the seed bed, and the incorporation of organic matter by turning under such crops as cowpeas, oats, or rye are steps recommended. The growing of winter cover crops also is essential, as the soil erodes easily if left unprotected during the winter.

PLUMMER FINE SANDY LOAM.

The surface soil of the Plummer fine sandy loam is a light-gray to ashy-gray fine sandy loam or loamy fine sand 6 to 10 inches deep. The subsoil is a mottled light-gray and yellow, friable or crumbly fine sandy clay or loamy fine sand to a depth of 3 feet or more. In some places the subsoil is a light-gray friable fine sandy clay or loamy fine sand, without mottling. Layers or pockets of gray fine sand are encountered in the subsoil in many places.

The Plummer fine sandy loam is confined mainly to the southwestern part of the county. It is developed along the Pender County line, west of Cypress School, and between Shelter Swamp and Juniper Swamp. The soil occurs on interstream flats and on gentle slopes near swamps. The surface is nearly flat to gently undulating and the drainage is poor. Some of the areas on the slopes remain in a partly water-logged condition throughout the year.

The Plummer fine sandy loam is a soil of low agricultural value. Only a few small tracts are farmed. On these corn and garden vegetables are the chief crops. The type supports a scattering growth of pine, some sweet gum, scrub oak, baybushes, and a little cypress. The undergrowth is composed mainly of gallberry bushes. On some of the higher positions wire grass and other coarse grasses appear. These supply some grazing.

The Plummer fine sandy loam, even if drained and limed, would give only low yields of corn, oats, and forage crops. The suggestions for the improvement of the Portsmouth fine sandy loam apply also to this soil.

Plummer fine sandy loam, dark-colored phase.—The surface soil of the Plummer fine sandy loam, dark-colored phase, is a dark-gray to almost black fine sandy loam, 6 to 10 inches deep. The subsoil is a mottled yellow and gray friable fine sandy clay or loamy fine sand, becoming mottled with bright red in the lower part of the 3-foot section. Pockets or strata of fine sand are frequently encountered in the subsoil.

This phase has only a small development in the county; it is found mainly in the extreme northwestern part, about 2 miles northwest of Jarmantown, and one-half mile west of Haw Branch. The topography is almost level to gently undulating, and the drainage is poor.

Only a few small areas of the phase are cultivated. Corn and cotton are grown, but the yields are low. A large part of the phase is cut-over land, and the rest is forested, mainly with pine, in which appears a little scrub oak and sweet gum. The undergrowth is composed of gallberry bushes or wire grass and broom sedge. This type is best suited to use as forest or pasture land.

HYDE LOAM.

The Hyde loam consists of a dark-gray to black loam, 8 to 10 inches deep, resting upon a subsoil of dark-brown to bluish-black loam or fine sandy loam, which extends to a depth of 3 feet or more. In areas that have been cultivated a long time the surface material is

lighter in color and apparently contains a higher percentage of fine sand.

The Hyde loam has only a small development in the county; the most important areas lie just east of Francktown near the border of Whiteoak Pocoson. The surface is almost level and the natural drainage is poorly established. Drainage canals are necessary to reclaim the lands for agriculture.

Approximately one-third of the area of this type is under cultivation; the rest supports a growth of pine and sweet gum and a dense undergrowth of bushes and briers.

A large tract of the Hyde loam was drained and reclaimed for farming a few years prior to the Civil War, and the soil has been used continuously for crops to the present time. Corn yields 25 to 30 bushels, and cotton one-half to three-fourths bale per acre. Corn receives about 400 pounds per acre of acid phosphate and cottonseed meal mixed, or the same quantity of an 8–2–2 fertilizer. In addition about 50 pounds per acre of nitrate of soda is applied when the corn begins to tassel. Cotton land is given an acreage application of 500 pounds of 8–2–2 fertilizer. Considerable marl is applied to both corn and cotton land. This is one of the best corn soils in the county.

Suggestions for the improvement of the Portsmouth loam will also apply to the Hyde loam.

MUCK.

The surface of Muck is a black material composed largely of decayed organic matter and showing little change to a depth of 24 to 36 inches. The subsoil, which occurs at a depth of 24 to 36 inches, is composed of a gray to brown compact fine sand which in places is sticky; and at depths of 40 to 48 inches the material is a brown, gray, or mottled brown and gray, loamy, sticky fine sand. The texture increases in heaviness with depth, being at 60 to 72 inches a gray, bluish, or mottled brown and gray, sticky fine sandy clay or clay. Near the boundary of the fine sandy soil types that surround the Muck areas there is a perceptible increase in the mineral constituents.

The surface material in many places contains some coarse vegetable matter, such as roots, fibers, twigs, and leaves. When this Muck is burned the loss on ignition is around 80 per cent. This would place it in the class of Peaty Muck.

Muck is developed in the northern, western, and southeastern parts of the county. The largest continuous areas are situated in the inner areas of Whiteoak Pocoson and Great Sandy Run Pocoson. Smaller developments occur in some of the small bays and pocosons in the southeastern part of the county.

The surface of the soil is nearly level. Abandoned drainage ditches along the Old State Road and the lumber railroad in Whiteoak Pocoson indicate that the surface is slightly higher near the middle of the pocoson. Numerous streams head near the outer border of the pocoson. Whiteoak River heads at a bridge on the Old State Road and flows eastward. Water stands on the surface or near the surface during the winter months and is only a few feet below the surface during the summer. When dry the material composing Muck will burn. It also is easliy drifted when in this condi-

tion. When wet it is spongy. Fires have burnt numerous holes over the surface in Whiteoak Pocoson.

Muck is not an agricultural soil in Onslow County. The timber consists of a scant growth of scrub pine, with an undergrowth of baybushes, briers, and ferns. Reeds grow in places near the margin of the areas. Here the pines are larger and the undergrowth is denser. The soil is usually burned over in the early spring, and the reeds and fresh undergrowth furnish summer pasturage.

There has been no recent sale of any of the areas of Muck, and its selling value could not be ascertained. A large part of it is said to belong to the State of North Carolina. In other places in the State where material of this kind has been cleared and farmed, low yields have been obtained, especially after the first year or two. It is considered to have a very low value for the production of general farm crops and has not been tested for special crops.

SWAMP.

The material mapped as Swamp is variable in color, texture, and structure. The surface soil is a dark-gray, drab, or black loam to fine sandy loam, and the subsoil is a gray, bluish, or black silty loam, fine sandy clay, or clay. In places the material is a black loam throughout the 3-foot section, while in a few areas there is a surface layer of black loam and below this a layer of brown silty loam to silty clay loam. Along some of the larger streams in places bars of white to yellow sand have been deposited by flood waters. The material of Swamp as a whole is so variable and complex that it can not be separated into distinct soil types.

Swamp occurs as first bottoms along many of the streams of the county. The widest areas are along Whiteoak River, New River, and Sandy Run, Shelter and Juniper Swamps. Very little Swamp, however, occurs along New River below Jacksonville. Narrow strips of Swamp occur along many of the other streams of the county.

The surface is nearly flat, but has a gradual slope in the direction of the streams. The material is only slightly elevated above the water level of the streams and remains in a saturated condition during the summer months, and during winter it is subject to frequent overflows.

The Swamp material is alluvial in origin, having been brought down from the adjoining slopes and deposited by the streams. The soil material is being constantly changed by new deposits and by the accumulation of vegetable matter from decayed leaves and branches of trees and other plant remains.

Swamp has no present agricultural use. Only a few small areas have been reclaimed and are used for corn and grass. On these areas corn yields 20 to 30 bushels per acre. Most of the Swamp is heavily forested with black and sweet gum, poplar, and some white oak, ash, hickory, and pine.

Swamp is commonly sold in connection with adjoining uplands, and the price depends mainly upon the value of the timber.

COASTAL BEACH.

Coastal beach is composed of white, light-gray, or light-brown, fine or medium to coarse sand, the prevailing texture being fine sand.

The material has a depth of several feet. Some sea shells are scattered through the sand.

Coastal beach occurs in the southeastern part of the county between the sound and the ocean. It varies in width from a few feet to nearly one-half mile and ranges in elevation from a few feet to 25 feet or more above sea level. The surface features are irregular, comprising ridges, knolls, dunes, and depressions, and are constantly being changed by the action of tides and winds.

Coastal beach has no present agricultural value. A few water oaks constitute the only growth, and these appear only in spots.

TIDAL MARSH.

The surface soil of Tidal marsh varies from dark-gray to bluish-drab or black loam, clay, silt loam, or heavy sandy loam, 6 to 8 inches deep. The subsoil is a black, bluish, or steel-colored clay to clay loam, extending to depths of 3 feet or more. In some places gray sand is found at a depth of about 18 inches.

Tidal marsh is confined to the southeastern part of the county, between the mainland and the Coastal beach. Smaller areas occur along Whiteoak River, Queens Creek, Bear Creek, and smaller streams near the sound. The surface is level, and most of the soil is submerged during tides. Owing to this condition and also to the excess of salt, none of the type is used for farming. The soil supports a luxuriant growth of marsh grasses which afford a little pasturage for cattle and ponies.

Tidal marsh, if reclaimed by dikes and by the removal of the excess of salt, would be well suited to the production of rice, corn, and hay.

SUMMARY.

Onslow County is situated in the southeastern part of North Carolina. The topography varies from flat to gently rolling and rolling. The general slope of the county is southward. The drainage is effected mainly through New River and its tributaries. Natural drainage has not been established over a large part of the county.

The population is unevenly distributed, with an average density of 19.8 persons to the square mile. Railroad facilities are good, and public roads lead to nearly all parts of the county. Important markets outside the county are New Bern, Wilmington, Kinston, Norfolk, and Richmond.

The average annual rainfall is 52.63 inches, and the mean annual temperature is 61.9° F. The rainfall is well distributed.

The county was settled prior to 1734, and the early agriculture consisted in growing corn and raising livestock. The first soils farmed were near the mouth of New River. The important farm crops at present are corn, cotton, peanuts, tobacco, and sweet potatoes.

Crop rotation is practiced by some of the farmers. The use of commercial or home-mixed fertilizer is general. Land values range from $10 to $200 an acre.

Onslow County lies entirely in the Coastal Plain province of North Carolina. The soils are derived from unconsolidated sands, sandy clay, and clays. Eighteen types and 5 phases representing 13 soil series, and in addition Muck, Swamp, Coastal beach, and Tidal marsh,

are mapped. The Norfolk fine sand, Norfolk fine sandy loam, Dunbar fine sandy loam, Onslow fine sandy loam, and Susquehanna clay loam are the important agricultural soils. The Portsmouth fine sandy loam, Portsmouth loam, Coxville fine sandy loam, Bladen fine sandy loam, and Hyde loam are good soil types, but are not farmed on account of poor drainage conditions. The Lakewood fine sand, St. Lucie fine sand, Leon fine sand, St. Johns fine sand and fine sandy loam, Portsmouth sand and fine sand, Plummer fine sandy loam, Muck, Swamp, Coastal beach, and Tidal marsh are considered poor agricultural soils.

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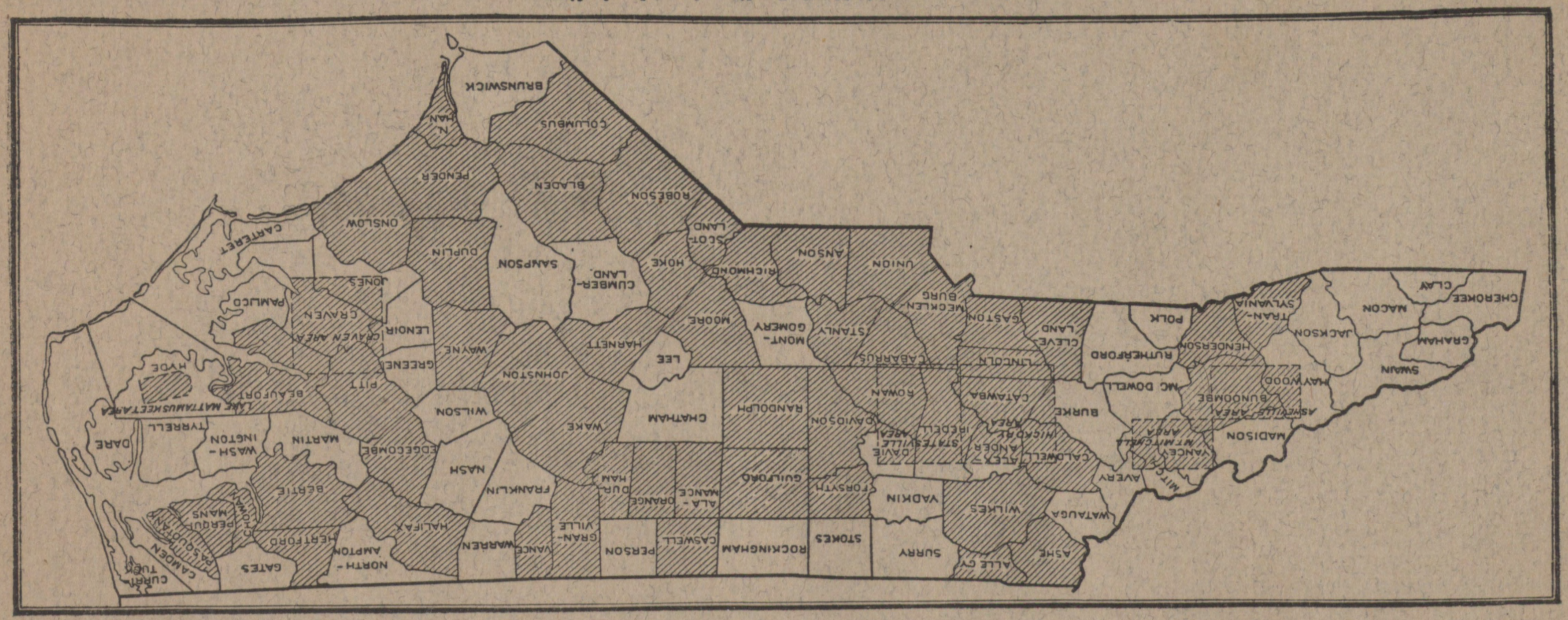

Areas surveyed in North Carolina, shown by shading.