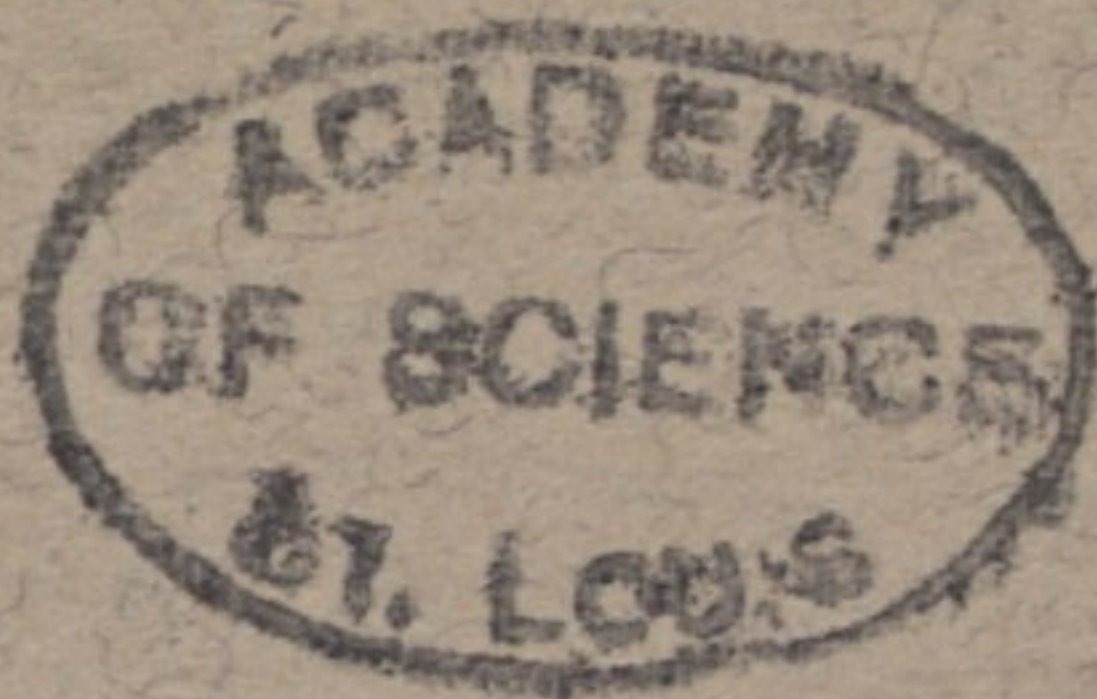


Number 3



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**UNITED STATES DEPARTMENT OF AGRICULTURE
BUREAU OF CHEMISTRY AND SOILS**

In cooperation with the North Carolina Department of Agriculture and
the Agricultural Experiment Station

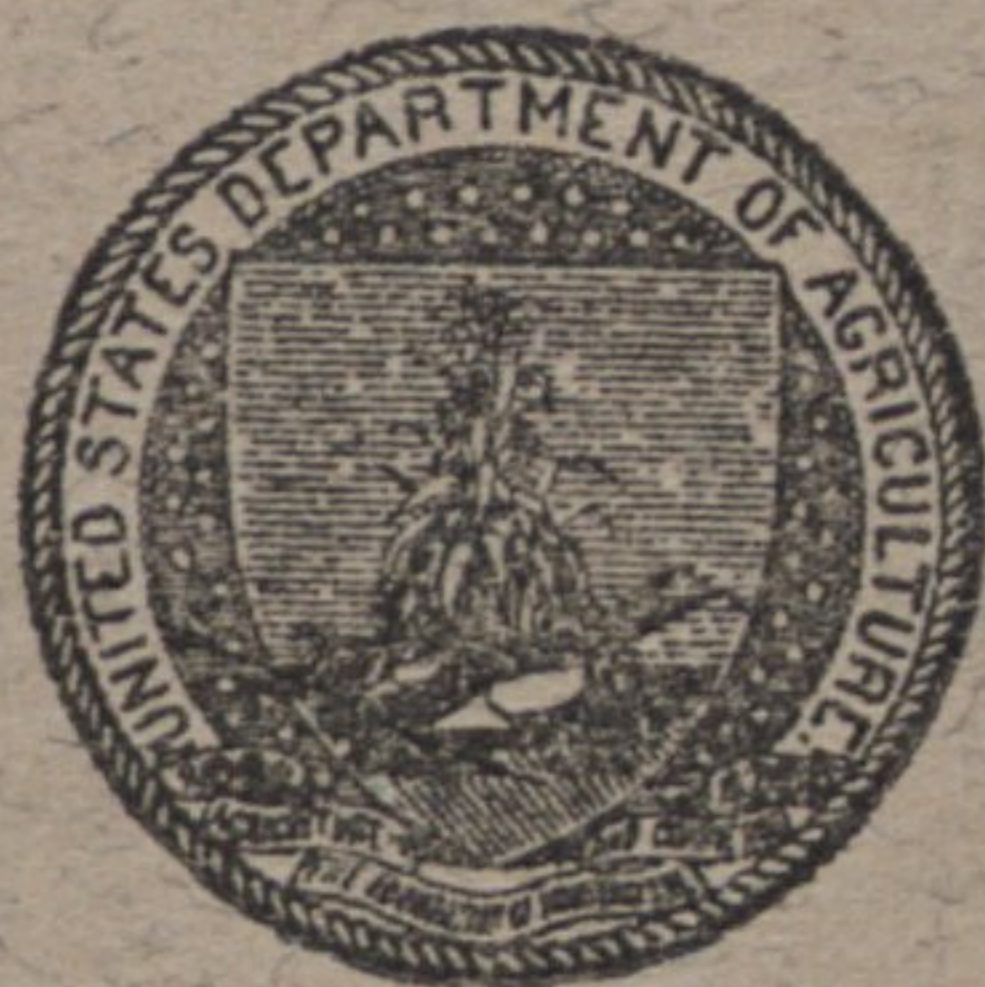
**SOIL SURVEY
SAMPSON COUNTY, NORTH CAROLINA**

BY

**R. C. JURNEY, U. S. Department of Agriculture, in Charge, and
W. A. DAVIS and W. D. LEE, North Carolina
Department of Agriculture**



Beginning with the 1923 Series, Soil Survey Reports will be issued separately. These reports of the individual areas will be sent to libraries as soon as they are available and should be filed, preserved, and ultimately bound to take the place of the bound volumes of the Field Operations which have previously been supplied by the department. The reports for each year will be consecutively numbered, the last report for a particular year bearing the conspicuous notice: "This number is the final and last Soil Survey Report for the Year 192-."



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SOIL SURVEY OF SAMPSON COUNTY, NORTH CAROLINA

By R. C. JURNEY, of the U. S. Department of Agriculture, in Charge, and W. A. DAVIS and W. D. LEE, of the North Carolina Department of Agriculture

DESCRIPTION OF THE AREA

Sampson County lies in the southeastern part of North Carolina, the western line being about 15 miles from Fayetteville, the northern part about 18 miles from Goldsboro, and the extreme southern end about 25 miles from Wilmington. The maximum length of the county from north to south is about 56 miles, and the greatest distance east and west is about 28 miles. The boundary line is composed of streams or broken lines which give the county an irregular shape. The total area is 950 square miles, or 608,000 acres.

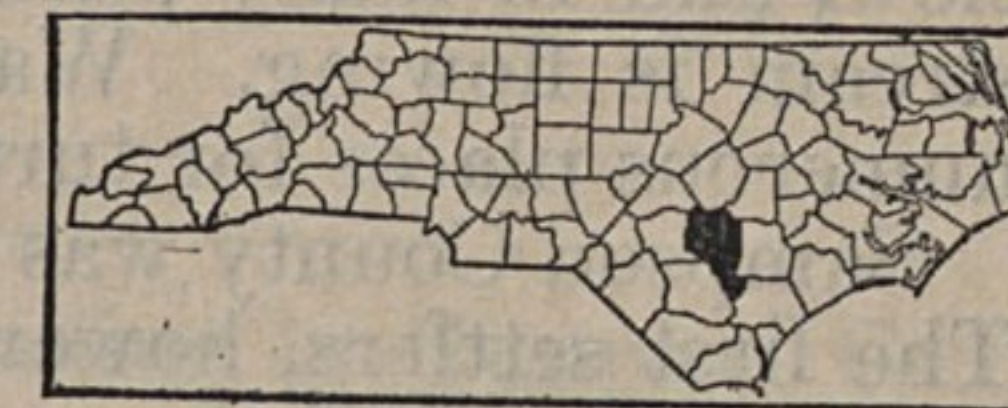


FIG. 3.—Sketch map showing location of the Sampson County area, North Carolina

The surface of Sampson County is a plain that has been dissected slightly by the shallow valleys of the numerous streams. The topography ranges from almost level to undulating and gently rolling, the prevailing surface being gently rolling. The nearly level topography is encountered in the pocosons, bays, depressions, and ponds, where natural drainage ways have not formed. The slopes leading to the drainage ways are mostly gradual, although in places along some of the larger streams there are a few steep or broken areas.

Along the larger streams in the southern half of the county there are well-defined terraces or second bottoms, ranging in width from a few feet to about 2 miles. The surface of these terraces is nearly level to gently undulating, with a slight incline toward the streams and in the direction of their flow. Adjacent to nearly all the streams are flat swamp areas which vary from a few rods to about one-half mile in width.

The county ranges in elevation above sea level from about 65 feet to 200 feet. The elevation at Atkinson, about 4 miles outside the county in Pender County, is 63 feet, whereas at McKoy, just across the line in Johnston County, it is 208 feet. Other elevation points are Clinton 150 feet, Beaman Crossroads 178 feet, Piney Green Church 188 feet, Rosin Hill 175 feet, and Newton Grove 185 feet. The general slope of the county is southward.

With the exception of the watershed of Goshen Swamp in the northeastern corner and a few minor streams along the northern and eastern boundary, most of the drainage water of the county eventually finds its outlet through Black River, a tributary of South River. The western part of the county is drained through South River and

its tributaries; the central part through Little Coharie and Great Coharie Creeks, and the eastern part through Six Runs Creek and its tributaries. Little Coharie and Great Coharie Creeks merge about 3 miles west of Ingold and form Black River. Branches of these larger drainage ways extend to nearly all the farms, but in most places ditches are necessary to assist the run-off.

There are many poorly drained areas which range in size from a few acres to about 5 square miles. They occupy positions near the sources of streams or in flats where drainage ways are not fully developed, and are found in practically all parts of the county. Some of the larger areas of insufficient drainage are Bull Pocason, Bear Pocason, Burnt Pocason, Beaverdam Dismal, and Big Dismal in the northern part, and Dismal Bay, Keiths Bay, Pigeon Flats Bay, Harvel Bay, and Prissy Bay in the southern part. Parts of the terrace lands lying adjacent to the uplands are partly saturated, owing to seepage. Practically all the swamps are water-logged during the winter and are subject to overflow during continued rains.

The stream valleys range in depth from a few feet to about 60 feet below the general upland surface. The stream currents are slow, and in many places it is difficult to determine which way the stream is flowing. Water power is developed in a small way at numerous places for turning grain mills.

Sampson County was formed in 1784 from part of Duplin County. The first settlers, however, arrived in 1745 and took up land in the southern part of the county near the large streams. The early settlers were Scotch and Irish. English settlers moved in later, and as time passed many came from the eastern counties and from adjoining counties. The present population consists of descendants of the pioneers and of those immigrants who came at later dates. The proportion of negroes is quite large. There is also a small colony of Croatan Indians along South River near Clement.

The county at present is fairly uniformly settled. The northern half is slightly more thickly peopled, whereas settlement in the lower southern and southwestern sections is more sparse.

According to the 1920 census the population of the county is 36,002, all which is classed as rural. The average density is 40.6 persons to the square mile.

Clinton, the county seat, has a population of 2,110. It is an important trading center and shipping point and has a fairly large lumber industry. Roseboro, in the western part of the county, is the next largest town and has a population of 749. Many smaller towns are distributed along the railroads and in the country districts and are locally important as shipping points or trading centers for agricultural sections.

Sampson County has adequate railroad facilities except in the northern parts. Two lines of the Atlantic Coast Line Railroad serve the county. One line traverses the extreme western part, and another runs eastward from Clinton and connects with the main line at Warsaw. The Atlantic Coast Line Railroad from Goldsboro to Wilmington passes within 1 to 8 miles of the eastern county line and provides shipping facilities for people residing in that section.

The county has a good system of public roads. The State Highway No. 60 crosses the county from northwest to southeast, entering at Elmon Bridge on Mingo Swamp, passing through Clinton, and

leaving the county southeast of Harrells Store. From Clinton to Elmon Bridge the road is graveled, and from Clinton southward it will be hard surfaced when the construction under way is completed. State Highway No. 24 enters the county at Autryville and passes eastward across the county through Clinton to Warsaw in Duplin County. The county has built several highways of the sand-clay type, and other projects are under way. In a few years all important sections of the county will be in easy reach of a good road.

Telephone service is available throughout most of the rural sections, and mail routes extend to all important localities. Well-kept and substantial church and school buildings are located at convenient points. Consolidated county schools are situated at Harrells Store, Ingold, Shady Grove School, Rosin Hill, and Newton Grove. The Farm Life School and the Pineland School for Girls are located at Salemburg.

The principal markets for the cotton grown in the county are Clinton, Roseboro, and Dunn (Harnett County). The tobacco is placed with the cooperative association at Clinton or sold on the open markets at Smithfield and Wilson. The berries and early vegetables are shipped to northern markets.

CLIMATE

There is no official Weather Bureau station in Sampson County, but the following data taken from the records of the Weather Bureau station located at Fayetteville, Cumberland County, 35 miles west of Clinton, will give a fairly good index to the weather conditions that prevail in the county.

According to these records the mean annual temperature is 61.5° F., the winter mean being 44° F. and the summer 77.8° F. The highest temperature on record is 103° F. in July, and the lowest is -5° F. in February, although December and January are normally the coldest months. The winters are sufficiently open and mild for outdoor work most of the time. The average yearly snowfall is 6 inches; the snows are light and remain on the ground for only a short time. The latest recorded killing frost in the spring occurred on April 26, and the earliest in the fall, on October 12. The average date of the last killing frost in the spring is March 31, and the average date of the first in the fall is November 5. This gives an average growing season of 219 days, which is ample for all crops commonly produced in the county.

The average yearly rainfall at Fayetteville is 51.43 inches. It is well distributed through the year. The average for the spring is 12.26 inches and for the summer 17.40 inches. The annual precipitation for the driest year was 34.52 inches and for the wettest year 58.28 inches.

The rainfall is adequate for all crop needs, and total crop failures are rare. The long growing season and abundant moisture are especially favorable for trucking, which is carried on extensively. The maximum rainfall occurs in July and August, which is typical of this section of the State. The lightest precipitation occurs in the fall, thus facilitating the harvesting of crops, especially cotton, which must be gathered clean to bring best prices.

The following table gives the essential details of the climate as shown by records of the Weather Bureau:

Normal monthly, seasonal, and annual temperature and precipitation at Fayetteville, Cumberland County

(Elevation, 170 feet)

Month	Temperature			Precipitation			
	Mean	Absolute maximum	Absolute minimum	Mean	Total amount for the driest year (1909)	Total amount for the wettest year (1920)	Snow, average depth
	° F.	° F.	° F.	Inches	Inches	Inches	Inches
December.....	43.8	80	2	3.87	1.38	5.56	0.9
January.....	43.8	81	4	3.87	.96	2.74	1.2
February.....	44.5	81	-5	4.12	3.61	3.86	3.8
Winter.....	44.0	81	-5	11.86	5.95	12.16	5.9
March.....	50.1	90	15	4.39	1.80	3.97	.1
April.....	60.9	94	28	3.53	1.80	6.59	T.
May.....	70.3	100	37	4.34	5.18	.84	.0
Spring.....	60.4	100	15	12.26	8.78	11.40	.1
June.....	76.2	102	49	4.78	5.31	6.79	.0
July.....	79.1	103	52	6.62	3.65	9.17	.0
August.....	78.0	102	51	6.00	6.86	7.67	.0
Summer.....	77.8	103	49	17.40	15.82	23.63	.0
September.....	72.3	100	39	4.20	2.91	4.09	.0
October.....	63.0	97	28	3.28	.85	.67	T.
November.....	52.0	86	16	2.43	.21	6.33	T.
Fall.....	62.4	100	16	9.91	3.97	11.09	T.
Year.....	61.5	103	-5	51.43	34.52	58.28	6.0

AGRICULTURE

Agriculture in the county dates from about 1745, when Scotch settlers from the vicinity of Wilmington began farming operations on the terraces along the large streams. These terrace soils were the principal farmed soils until a grant of 10,000 acres at "Sampson Hall," near Clinton, was settled by the Irish. Agriculture was largely confined to these two main divisions until after the Civil War. The remainder of the county was covered by pine forest.

The early farming was on the plantation system. Agriculture consisted in the production of corn, cotton, hogs, sheep, and cattle.

Just after the Civil War the tar and turpentine industry developed in the large upland pine forests in the southern, western, and northern sections. A large part of the population engaged in this industry until 1880, when the supply began to wane and many workers moved to Georgia to resume operations there. From 1880 to about 1900 lumbering flourished and had its decline. This industry is quite active to-day, but is not as important as formerly, as most of the original forest has been cut.

During the turpentine and lumbering periods agricultural development in the county was greatly retarded. The transition was completed about 1900, and since that year more time and energy have been devoted to agricultural pursuits.

From 1880 to 1910 corn, cotton, sweet potatoes, cowpeas, and tobacco were the important crops in respect to acreage, and oats, rye, and wheat were of secondary importance.

The following table, compiled from the census reports from 1880 to 1910, shows the acreage and yields of the leading crops:

Acreage and production of the leading crops in 1879, 1889, 1899, and 1909

Crop	1879		1889		1899		1909	
	Area	Production	Area	Production	Area	Production	Area	Production
Corn.....	Acres	Bushels	Acres	Bushels	Acres	Bushels	Acres	Bushels
Oats.....	53,951	486,768	61,294	492,629	64,902	605,060	62,085	777,340
Rye.....	654	6,297	796	8,112	329	3,590	606	10,413
Wheat.....	409	2,086	673	2,583	61	310	121	924
Cowpeas.....	1,249	7,970	679	5,086	1,448	12,060	164	1,722
Sweet potatoes.....	1,997	37,166	2,894	28,004	4,877	48,697	18,474	40,775
Cotton.....	15,346	214,596	19,118	224,291	2,745	248,026	3,091	328,272
Tobacco.....	28	Bales	19	Bales	20,054	Bales	28,758	Bales
		6,291		5,290		8,364		16,167
		Pounds		Pounds		Pounds		Pounds
		14,352		7,655		270,230		826,358

Agriculture in Sampson County at the present time consists in the production of both cash and subsistence crops.

Corn occupies the largest acreage. The 1920 census reports 53,483 acres in corn in 1919, which yielded 991,145 bushels, or an average of 18.5 bushels per acre. Corn is strictly a subsistence crop, as practically all of it is used on the farm as feed for stock and as meal in bread. Small quantities are sold at the local mills.

Cotton is the next important crop in point of acreage. In 1919 45,756 acres were devoted to this crop, with a yield of 35,326 bales, or an average of 0.78 bales per acre. Cotton is the main source of farm income, and the welfare of a great part of the county depends upon this important crop.

Tobacco is also an important cash crop, and its culture has greatly increased since 1910. According to the census there was 5,102 acres in tobacco in 1919, producing 3,191,249 pounds, or an average of 625 pounds per acre. Tobacco is produced mostly in the northern half of the county. It is of the bright-leaf variety and used in making smoking tobacco and cigarettes.

Hay and forage crops were grown on 24,928 acres in 1919, which yielded 17,838 tons of feed. All these crops were fed to work stock and cattle on the farms. The hay and forage crops include a small acreage of cultivated grasses, clover, and alfalfa, and a large acreage of oats, rye, velvet beans, soy beans, and coarse forage.

Sweet potatoes are grown on nearly every farm for home consumption. In 1919 there were 3,188 acres in this crop, which yielded 333,100 bushels. A few are sold locally, but none are shipped to outside markets. During the same year there were 1,437 acres in oats, yielding 29,131 bushels. Oats are fed to stock and a part saved for seed. There were 1,277 acres in cowpeas, producing 6,202 bushels. The cowpeas are used both as food and for seed. Wheat was grown on 1,136 acres and produced 10,761 bushels. Rye is grown for cover crops, spring pasturage, and seed. In 1919 only 59 acres were reported in rye, but the acreage has been greatly increased since then.

The important special crops of the county are strawberries, dewberries, and vegetables. These crops are grown principally east and northeast of Clinton and in the immediate vicinity of Clinton. Small quantities are produced in the vicinity of Roseboro and Harrells Store. The leading early vegetables are garden peas, potatoes, onions, snap beans, peppers, and sweet corn. Watermelons and cantaloupes are grown in a small way for shipment. The census reports the value of the vegetable crop in 1919 as \$1,100,212, but this probably includes sweet potatoes and also all garden vegetables consumed at home, as well as those shipped.

Large quantities of huckleberries (blueberries) are shipped each year. These berries grow wild in many of the bays and pocosons of the county. It is said that the value of this crop in a normal year is \$100,000.

Garden vegetables, potatoes, sorgo, apples, peaches, and grapes are produced on practically every farm for home consumption. Apple and peach trees produce well when given proper care. At present there is a noticeable number of young home orchards in the county.

The livestock industry has not been developed in the county. There are a few dairies which supply milk at Clinton. Each farm has from one to six milk cows which supply dairy products for home use and small quantities of butter for sale locally. The milk cows are mainly grade Jersey, but in some sections there are grade Guernsey and grade Holstein cattle. A few cattle are slaughtered for home supply and for sale at the local markets. Hogs are kept on practically every farm and are generally of improved kinds, such as Duroc-Jersey, Poland-China, or a cross between these two. There are also a few small flocks of sheep and goats. The census of 1920 does not report domestic animals sold or slaughtered, but the 1910 census reports in this category 3,688 cattle, 35,138 hogs, and 716 sheep and goats. The value of dairy products, exclusive of home use, in 1919, according to the census was \$123,713 and of poultry and eggs produced \$348,895.

The farmers of Sampson County generally recognize the adaptation of certain soils to particular crops. The Ruston and Marlboro types are highly prized as cotton soils. These types as well as the Norfolk soils are also recognized as excellent for corn, sweet potatoes, truck crops, and dewberries. The Norfolk sandy loam and deep phase of this type are considered especially good for the production of bright-leaf tobacco.

The Coxville, Dunbar, and heavy Portsmouth soils are well suited to strawberries. The Portsmouth and Coxville soils are also considered well suited to oats. The Plummer, Leon, and St. Johns soils are generally recognized as having a low value for agriculture and are better suited to forestry. The Kalmia, Okenee, and Leaf soils were formerly used for cotton and corn, but farming on the greater part of these ceased many years ago, and only broom-sedge fields and second-growth forests remain.

The equipment on the better farms consists of 2-horse breaking plows, disk and spiked-tooth harrows, riding cultivators, fertilizer distributors, manure spreaders, stalk cutters, cotton and corn planters, weeders, soy-bean harvesters, and, on a few, tractors. On the smaller farms the equipment is composed of dixieboy plows,

walking cultivators, spiked-tooth harrows, acme harrows, sweep plows, and hand hoes. The country homes range from small tenant houses to substantial modern buildings. In the southern part of the county many of the colonial houses remain. The barns on the better farms are amply large to store crops and shelter the work stock and machinery. On the tenant farms the barns are usually small and insufficient. The fences are of barbed or woven wire, although in some sections plank or rail fences are common. The work stock includes both mules and horses, but mules are more generally used.

Systematic rotation of crops is not practiced in the county. Cotton and corn are alternated on many farms. Rye is sown on many of the farms as a cover crop and for spring pasture. Cotton fields are sown to rye in the fall in some localities, but this is not a general practice. Soy beans or velvet beans are planted by many for soil improvement and for hay. In the vicinity of Clinton it is a common practice to plant potatoes or sweet corn between the cotton rows. Cowpeas, clover, and alfalfa are produced to a limited extent for hay and for the improvement of the soil.

Commercial or home-mixed fertilizers are used throughout the county. In 1919 there were 5,771 farms in the county, and 5,305 of these reported the use of fertilizers. The total amount expended was \$1,890,004, or an average of \$356.27 to the farm.

Corn is fertilized with 400 to 600 pounds per acre of 8-2-2 or 8-3-3 fertilizer¹ or 300 to 400 pounds per acre of a home mixture of acid phosphate and cottonseed meal. Nitrate of soda is applied to corn when the stalks are about waist high, the application varying from 75 to 100 pounds per acre. In some sections corn is fertilized only with stable manure and a side dressing of nitrate of soda. Cotton receives from 500 to 800 pounds per acre of 8-2-2 or 8-3-3 fertilizer, or the same quantity of acid phosphate and cottonseed meal mixed. In some localities it receives an addition of about 100 pounds per acre of nitrate of soda.

Tobacco land is fertilized with 800 to 1,000 pounds per acre of 8-3-3 or 9-3-3 grade. Oats are not generally fertilized, but some farmers apply 100 to 200 pounds of nitrate of soda to oats as a top dressing. Potatoes are given an acreage application of 1,000 to 2,000 pounds of 8-3-3 fertilizer or a similar quantity of acid phosphate, kainit, nitrate of soda, and cottonseed meal mixed. Truck crops and berries receive 800 to 1,000 pounds per acre of 8-3-3 fertilizer.

The 1920 census shows that 2,389 farms reported the use of hired labor, with an average expenditure of \$118.75 a farm. Both white and colored laborers are employed. The price paid by the day is \$1.50, which is about equal to the price paid by sawmills and public works in the county. The present price paid for picking cotton is \$1 per hundred pounds and for gathering berries 1½ to 2 cents a quart. Women and children are employed to some extent for picking cotton and berries.

According to the 1920 census there are 5,771 farms in the county, which represents 75.4 per cent of the total area. The average farm contains 74.1 acres.² The size of farms ranges from 10 to 200 acres.

¹ Percentages of phosphoric acid, nitrogen, and potash, respectively.

² The average size of farm here stated is influenced by the enumeration of each tenancy as a "farm."

The improved land is only 34.8 per cent of the total, or an average of 25.8 acres to the farm. In some sections of the county there are holdings of several thousand acres, but these represent forest or cut-over lands. The county as a whole may be classed as one of small farms.

Landowners operate 60.9 per cent of the farms, tenants 39 per cent, and managers 0.1 per cent. Tenancy increased from 31.2 per cent in 1880 to 39 per cent in 1920. According to the prevailing system of leasing farm lands, the landlord furnishes the land, fertilizer, and seed, and the crop is divided equally between him and the tenant. In the event the owner furnishes the work stock also, the tenant receives only one-third of the crop.

According to the 1920 census the average value of all farm property is \$5,499 per farm, of which 69.8 per cent is represented by land, 16.4 per cent by buildings, 4.5 per cent by implements, and 9.3 per cent by domestic animals. The average assessed land value is \$51.82 per acre.

Land ranges in value according to state of improvement, nearness to good roads and markets, or the character of the standing timber. The range in price of average farm land is from \$50 to \$75 an acre. Some land is held at \$100 to \$200 an acre. There is no present market for the cut-over land, or for the land embraced in the bays and pocosons.

SOILS

The soils of Sampson County vary in color from light gray and yellowish gray to dark gray and black. The well-drained and cultivated soils are light colored, whereas the poorly drained soils are dark, owing to the accumulation of rather large quantities of decayed organic matter. In the well-drained forested areas the first inch or two of the surface material is dark gray, showing that a small quantity of organic matter has been formed through the decay of leaves and other plant remains, but after such areas are cleared and placed in cultivation the organic constituents of the soil are soon lost.

The surface soil textures range from medium sand and sandy loam to fine sand and fine sandy loam. The distribution of these two textures is rather sharply defined. The fine-grained soils are found in the eastern half of the county. The boundary follows roughly the Great Coharie Creek to a point near Ingold, where it turns eastward to Delway and Harrells Store, and then southward to the Pender County line. Another belt of fine sand and fine sandy loam soils, about 3 miles wide, begins in the vicinity of Roseboro and runs northward to Beaverdam Swamp. With the exception of the first-bottom and second-bottom soils, the texture of the soils covering the rest of the county is medium sand or sandy loam. Generally the surface soil is loose and mellow. There are, however, several large areas in which the sandy surface layer is thin, the underlying heavier material appearing at less than 6 inches.

The subsoils range from loose, mellow sands to heavy, plastic, and almost impervious fine sandy clay and clay. The subsoil of most of the sandy loam soils is a friable crumbly sandy clay. The subsoils range in color from pale yellow to brownish red, mottled yellow and red, yellow and gray, or yellow, gray, and bright red. Most of the subsoils of well-drained soils are yellow, brownish red, or yellow

slightly mottled with red. In the southern part of the county there are quite extensive areas of soil with an impervious hardpan. This hardpan is composed of sand cemented together with organic matter and is encountered anywhere from 18 to 30 inches below the surface.

A 3-foot section of the soils of the county reveals from 2 to 4 distinct horizons or layers. The well-drained sands have 2 distinct layers, while most of the other soils have 3 or 4, which differ in color and structure.

The soils of Sampson County contain no carbonate of lime. In a few localities lime carbonate is found in the underlying material from which the soil has been derived but the soil derived from it has been leached of the carbonate to depths of several feet. One area in which the underlying material contains carbonate of lime lies in the vicinity of Harrells Store, and another, in which there are indications of its presence, is in the vicinity of Newton Grove.

Sampson County lies wholly within the Coastal Plain province, between the flatwoods belt on the south and the more rolling portion on the north. The soils of the county may be divided into two groups, old sedimentary and recent alluvial. The sedimentary soils are those which have been formed through the various processes of weathering from old sediments, thought by geologists to have been laid down in an ancient sea. The alluvial soils which have suffered little weathering, if any, consist of materials transported by the rivers and deposited along their courses. Most of the soils of the county belong in the sedimentary group. The materials giving these soils consist of beds of unconsolidated sand, sandy clay, and clay.

On the basis of differences in color, structure, topography, and drainage conditions, the soils of the county are grouped into several series. Each series includes a number of soil types differing from one another in the texture of the surface soil.

The types of the Norfolk series have light-gray to grayish-yellow surface soils and a yellow, friable sandy clay or sand subsoil. The types are well drained.

The types in the Ruston series are characterized by gray to grayish-brown surface soils and by a reddish-yellow, yellowish-red, or mottled red and yellow, moderately friable sandy clay subsoil. They are closely associated with the Norfolk soils. They have an undulating to rolling surface and are naturally well drained.

The types of the Marlboro series have brownish-gray, gray, light-brown or brownish-yellow surface soils, which generally rest on a yellow subsurface layer. The subsoil is a deep-yellow or brownish-yellow heavy sticky sandy clay, which usually becomes a mottled red and yellow, friable sandy clay at 28 to 32 inches in depth. The Marlboro soils differ from the Norfolk soils in being browner and somewhat more loamy in the surface soil and in having a heavier subsoil, lying nearer the surface and mottled with red in the lower part. The surface is level to gently rolling, and the natural drainage is good.

The Susquehanna series includes types with gray to brownish-gray surface soils underlain by a plastic, heavy subsoil mottled red, gray, and yellow. The surface varies from level to rolling and hilly. The types are often found on the lower slopes near streams. The surface

drainage is good, except on the level areas, but the impervious nature of the heavy clay subsoil retards underdrainage.

The types of the Dunbar series have gray surface soils. The upper subsoil is yellow, and in the heavier types it is tough and compact. The lower subsoil is a yellow, mottled with red and gray, tough and slightly plastic clay. The soils are developed in the flatwoods region and are intermediate between the Norfolk soils on the one hand and the Coxville on the other. The surface is prevailingly flat. The surface drainage is fairly good in places, but the internal drainage is poor because of the compact and tough structure of the subsoil.

The types of the Coxville series have 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 subsoil is moderately friable; the lower part is tough and in places rather plastic. The surface is flat to slightly undulating, and the natural surface drainage is poorly established.

The surface soils of the types of the Portsmouth series are dark gray to black, and the subsoil is a gray or mottled yellow and gray, friable sandy clay. The dark color of the surface soil is due to an accumulation of organic matter under swampy conditions. The soils occupy flat areas or slight depressions and are naturally poorly drained.

The types of the Plummer series have light-gray to ashy-gray surface soils. The subsoil is gray throughout the 3-foot section in the case of the sand types and is a mottled yellow and gray, friable sandy clay in case of the sandy loam types. Natural drainage is poor.

The surface soils of types in the Leon series are light gray to white. A rusty-brown hardpan stratum is usually encountered at 12 to 24 inches in depth. This is 8 to 10 inches thick and underlain by a white or light-brown sand. The Leon soils are closely associated with the St. Johns series.

The St. Johns series includes types with very dark gray to black surface soils and a light-gray to white sand subsoil. A rusty-brown to black hardpan stratum appears at depths of 16 to 24 inches. This is 3 to 10 inches thick and is composed of sand cemented with iron and organic matter. Below the hardpan the material is a light-gray or brown sand. The surface is flat and the soils are poorly drained.

The types of the Kalmia series are gray to yellowish gray in the surface, and the subsoil is composed of yellow friable sands and sandy clays. These soils are developed upon the second bottoms or terraces. The topography is flat to undulating and drainage is poor in the flatter areas. The Kalmia soils resemble those of the Norfolk series.

The types grouped in the Leaf series have light-gray to gray soils, a compact gray or gray and yellow clay upper subsoil, and a mottled red and gray or red and yellow, tough and somewhat plastic clay lower subsoil. These soils are developed on terraces and in part are fairly well drained.

In the Okenee series are grouped types characterized by dark-gray to black surface soils and a drab or mottled drab, gray, and yellow, tough, plastic subsoil. The surface is frequently quite

mucky, owing to a large accumulation of organic matter. These soils occur in flats and depressions on stream terraces, and the drainage is poor. The soils resemble the Portsmouth soils of the uplands.

The surface soils of the types in the Chastain series are gray to dark gray and the subsoil is a gray or mottled gray, red, and yellow, impervious, plastic clay. The types occupy first-bottom positions and are poorly drained.

The types of the Johnston series have black soils, high in organic matter. The subsoil is a gray or mottled yellow, gray and brown, friable sandy clay. The soils occur in the first bottoms, and the drainage is poorly established.

Besides Swamp, which is a miscellaneous type, there are mapped in Sampson County 27 distinct soil types and 5 phases. These have been grouped in 15 soil series. The table below gives the actual and relative extent of these several types. Their distribution is shown on the accompanying soil map.

Areas of different soils

Soil	Acres	Per cent	Soil	Acres	Per cent
Norfolk sand.....	123,264	20.3	Coxville fine sandy loam.....	12,672	2.1
Norfolk sandy loam.....	34,304	8.3	St. Johns sand.....	10,560	1.7
Deep phase.....	16,768		Leon sand.....	7,680	1.3
Norfolk fine sand.....	47,936	7.9	Leaf fine sandy loam.....	7,552	1.2
Norfolk fine sandy loam.....	44,928	7.9	Plummer fine sandy loam.....	7,232	1.2
Deep phase.....	2,752		Okenee sandy loam.....	5,248	.9
Swamp.....	44,736	7.4	Portsmouth sand.....	4,928	.8
Ruston fine sandy loam.....	6,976	5.7	Susquehanna fine sandy loam.....	4,864	.8
Deep phase.....	27,712		Portsmouth fine sand.....	4,352	.7
Marlboro fine sandy loam.....	34,368	5.7	Dunbar sandy loam.....	3,904	.6
Portsmouth fine sandy loam.....	30,528	5.0	Kalmia sand.....	3,328	.5
Ruston sandy loam.....	3,840	4.3	Johnston loam.....	3,264	.5
Deep phase.....	22,272		Kalmia fine sandy loam.....	2,304	.4
Portsmouth sandy loam.....	23,104	3.8	Chastain fine sandy loam.....	1,152	.2
Dunbar fine sandy loam.....	20,736	3.4			
Marlboro sandy loam.....	16,064	2.6			
Kalmia fine sand.....	15,552	2.6			
Okenee fine sandy loam.....	12,736	2.2			
Heavy-subsoil phase.....	384				
			Total.....	608,000	---

NORFOLK SAND

The surface layer of the Norfolk sand in the wooded and cut-over areas is a gray sand 1 to 2 inches deep. The subsoil is a pale-yellow to brownish-yellow loose medium sand 3 feet or more in depth. In plowed areas the surface soil is a light-gray, yellowish-gray, or almost white medium sand 5 or 6 inches deep. In a few places the surface soil is a dark-gray sand and the subsoil a pale-yellow to grayish-yellow sand. Where the sand has been beaten out and bleached, the surface has a whitish appearance. In some places gravel or coarse sand occurs in the surface soil, but these areas were too small to show separately on the map.

The Norfolk sand occurs in large and irregular areas in the western, central, and southern parts of the county. One rather wide belt begins in the northwestern part near Starling Bridge and extends southward along South River and near the Atlantic Coast Line Railroad for a distance of about 40 miles to the Pender County line. Another wider but shorter area begins just east of Salemburg and follows roughly the divide between Little Coharie and Great Coharie Creeks to a point near where these two streams unite.

Another large development of this soil is north and east of Clear Run. There are numerous small areas over a large part of the county.

The type occupies positions both on stream divides and on the slopes leading down to the streams. The topography varies from almost level to undulating and gently rolling. Owing to the porous nature of the soil, the drainage conditions are good and the land can be tilled immediately after rains.

The Norfolk sand covers a greater area than any other soil type in the county. It is, however, relatively unimportant agriculturally, because only about 10 per cent of it is used for farming. Large areas are in the condition of cut-over lands, and the present vegetation consists of a few scattering pine and a rather thick growth of forked-leaf scrub oak, with an undergrowth of wire grass over most of the areas. Some merchantable pine timber is still standing. Locally there are also a few red, white, and post oak trees.

Corn and cotton constitute the principal crops on the Norfolk sand. Sweet potatoes, garden vegetables, tree fruits, and grapes are produced for home needs. Tobacco is a minor crop. Cotton yields from one-fourth to three-fourths bale per acre, and corn from 15 to 30 bushels. Crops are given rather heavy applications of fertilizer. Cotton receives 500 to 800 pounds of an 8-2-2 or 8-3-3 mixture, and corn about 400 pounds of the same grades. An addition of 50 to 100 pounds per acre of nitrate of soda is usually applied. Stable manure is used on corn land in such quantities as are available. Sweet potatoes and vegetables yield well. Tobacco gives only fair yields.

Improved farm land of this type is held at about \$25 to \$50 an acre. A large proportion of the type is cut-over land for which there is no present market. Much of this land should be devoted to forestry.

The Norfolk sand would be greatly improved by turning under green-manuring crops or by adding large quantities of stable manure. Cover crops of rye or crimson clover may be grown and turned under before planting time in the spring. The North Carolina Department of Agriculture recommends complete fertilizers relatively high in potash for cotton and corn on this type. The Norfolk sand warms up early in the spring and is well suited to the production of truck crops, grapes, sweet potatoes, rye, watermelons, and vegetables. Staple crops require heavy fertilization. The soil holds moisture remarkably well during dry seasons.

NORFOLK FINE SAND

The surface layer of the Norfolk fine sand in the forested areas is a gray fine sand 1 to 3 inches deep. The subsoil is a pale-yellow friable fine sand to a depth of 3 feet or more. In plowed fields the surface soil is a light-gray to almost white fine sand, 5 to 7 inches deep.

The Norfolk fine sand is developed mainly east and southeast of Clinton to Harrells Store. Large areas occur in the vicinity of Beulah, Laurel Hill School, Chestnutts Mill, Mount Gilead Church, south of Elliott, near Stewart Creek School, and in the vicinity of

Waycross. It is found on the broad interstream areas and on the gradual slopes leading to drainage ways. The surface is smooth to gently rolling. The soil is open and porous and has good natural drainage.

The Norfolk fine sand is extensive, but owing to the relatively small acreage in cultivation it ranks low in agricultural importance. Only about 10 to 15 per cent of the type is used for farming. A large part is covered with shortleaf pine forest. On some areas where the original timber has been cut scrub oak trees predominate. In some sections there are a few trees of white and post oak, dogwood, hickory, and sweet gum. Cotton and corn are the principal crops. Oats, tobacco, rye, and soy beans are grown in a small way. Sweet potatoes, potatoes, garden vegetables, and fruits are grown for home supply.

In order to get fair yields on the soil, it is necessary to use rather heavy applications of fertilizer. Cotton yields one-third to three-fourths bale per acre when fertilized with 600 to 800 pounds of 8-2-2 or 8-3-3 fertilizer. Corn yields 15 to 25 bushels per acre and is usually given from 400 to 600 pounds of 8-2-2 fertilizer or 400 to 500 pounds per acre of a mixture of acid phosphate and cottonseed meal. Tobacco yields 600 to 800 pounds per acre and is fertilized with 800 to 1,000 pounds of 8-3-3 mixture. Nitrate of soda is usually applied as a side dressing to corn and cotton.

The selling price of the Norfolk fine sand depends in most areas upon the value of the standing timber. Farm land sells at \$20 to \$40 an acre, depending upon the state of improvement and the nearness to good roads and markets. The undeveloped areas sell at a much lower figure.

The suggestions for improving the Norfolk sand will also apply to the Norfolk fine sand. Most of this type is best suited to forestry.

NORFOLK SANDY LOAM

The surface soil of the Norfolk sandy loam is a light-gray loamy sand about 6 inches deep. This is underlain by a pale-yellow loamy sand or sandy loam which extends to depths of 15 to 18 inches. The lower subsoil is a yellow friable sandy clay to depths of 3 feet or more. In wooded areas the gray top layer is only 1 or 2 inches thick and the underlying material is pale yellow.

The Norfolk sandy loam is confined almost entirely to the northwest quarter of the county, where it occupies fairly large areas closely associated with the Marlboro sandy loam. Most of the Norfolk sandy loam occurs west of Great Coharie Creek and north of Salemburg. Some of the largest developments are in the vicinity of Owen Grove Church, Piney Green Church, Beaman Crossroads, north from Salemburg to Orange and then northwest to Spring Branch Church, north of Oakhurst School, and in the neighborhood of Beaverdam Church and Oakland School. In the southern part of the county it occurs around Ingold and 3 miles southwest of Ingold.

The type occupies positions on the interstream ridges and on the gentle slopes approaching streams. The surface is level, undulating, or gently rolling. The soil is sufficiently porous to insure good sur-

face and internal drainage. Except for some of the flat areas, ditches are not necessary.

The Norfolk sandy loam is one of the more important farming soils of the county. Approximately 75 per cent of it is cultivated. It was formerly covered with longleaf pine forests, but practically all the timber has been cut. There are, however, a few areas of original pine standing. The other forest growth is composed of second-growth pine, with a scattering of oak, hickory, dogwood, and sweet gum.

Cotton is the principal crop on this type of soil. Corn ranks next in importance. Tobacco of the bright-leaf variety occupies a rather large acreage. In addition to these main crops, sweet potatoes, oats, soy beans, velvet beans, rye, and cowpeas are produced in a small way. Garden vegetables, potatoes, grapes, and other fruits are grown on nearly every farm for home consumption. The Norfolk sandy loam is one of the best soils of the county. It produces much higher yields than the sand types. Cotton yields about 1 bale to the acre, corn 20 to 30 bushels, and tobacco 800 to 1,000 pounds. Other crops give excellent yields.

All of the staple crops are fertilized. Cotton receives 500 to 600 pounds per acre of 8-2-2 or 8-3-3 grades or a home mixture of about 600 pounds of acid phosphate and cottonseed meal. Corn is fertilized usually with 300 to 400 pounds per acre of similar fertilizers, although some farmers apply only stable manure and a side dressing of nitrate of soda. In addition to the complete fertilizers, nitrate of soda is applied to cotton and corn at the rate of 75 to 100 pounds per acre. Oats receive very little fertilization, although a few give a light top-dressing of nitrate of soda. Some farmers enrich their soil by growing leguminous crops, such as soy beans, velvet beans, or cowpeas. A few turn under cover crops of rye. Tobacco land is fertilized with 800 to 1,000 pounds per acre of 8-3-3 fertilizer.

The Norfolk sandy loam sells at \$50 to \$100 an acre, depending upon state of improvement or nearness to good roads and markets.

The Norfolk sandy loam is well suited to the production of cotton, bright tobacco, peanuts, crimson clover, corn, sweet potatoes, cowpeas, potatoes, watermelons, cantaloupes, grapes, rye, truck crops, and vegetables. It is unusually good cotton land. The soil is easily tilled and farming operations can be carried on soon after rains. Owing to its smooth surface, improved machinery can be used over all the type.

The Norfolk sandy loam is deficient in organic matter, and green-manuring crops, such as clover or rye, would prove beneficial.

This soil as well as all other farmed lands of the county, would be greatly benefited by systematic crop rotations. The following rotations are suggested by the North Carolina Department of Agriculture:

Three-year rotation. (1) Cotton, with crimson clover sown in cotton during the fall. (2) Crimson clover plowed under; corn, with cowpeas sown in the corn; oats and hairy vetch sown in the fall. (3) Oats and vetch cut for hay, followed by soy beans or cowpeas.

Four-year rotation. (1) Corn, with soy beans or cowpeas sown in the corn. (2) Cotton, with rye or crimson clover and rye sown on the land after the first picking. (3) Sweet potatoes, with oats and

vetch sown after the potatoes are dug. (4) Oats and vetch cut for hay, followed by soy beans or cowpeas; crimson clover sown in the fall, after soy beans or cowpeas.

Norfolk sandy loam, deep phase.—The surface soil of the Norfolk sandy loam, deep phase, is a light-gray medium sand about 6 inches deep. The upper subsoil is a pale-yellow loamy sand to sandy loam, which may extend to depths of 20 to 30 inches. The lower subsoil is a yellow friable sandy clay. This extends to depths of 3 feet or more. In wooded areas the surface layer is gray for 1 or 2 inches, and then the pale-yellow sand is encountered. The principal difference between the phase and the type is the depth to the sandy clay subsoil, which lies much deeper in the phase than in the type.

The Norfolk sandy loam, deep phase, is confined mainly to the same part of the county as the type, with which it is closely associated. The phase usually represents a gradation between the sandy loam and the sand types. The topography varies from almost level to gently rolling, and the soil is well drained.

The Norfolk sandy loam, deep phase, is important agriculturally, and about 60 per cent of it is cultivated. The forest growth consists mainly of shortleaf pine, with some dogwood, oak, and hickory. On parts of the soil broad and forked leafed oaks are common. The crops grown are similar to those on the sandy loam type. Cotton yields from one-half to 1 bale per acre, corn 15 to 20 bushels, and tobacco 600 to 1,000 pounds. The kinds of fertilizer used are similar to those for the sandy loam type, but the applications are slightly heavier. The selling price of this soil depends upon the value of the forest or upon the price of the surrounding soils.

The suggestions for the improvement of the Norfolk sandy loam will apply equally to the deep phase. The soil is especially well suited to the production of bright-leaf tobacco.

NORFOLK FINE SANDY LOAM

The surface soil of the Norfolk fine sandy loam is a gray loamy fine sand, 6 to 8 inches deep. This is underlain by a pale-yellow loamy fine sand or fine sandy loam extending to depths of 15 to 18 inches. The lower subsoil is a pale-yellow friable fine sandy clay to depths of 36 inches or more. In wooded areas the gray surface covering is usually only about 1 or 2 inches thick.

The Norfolk fine sandy loam is almost entirely confined to the eastern part of the county. Large areas are mapped in the vicinity of Newton Grove, Hobbs Crossroads, Keener, Huggins Store, Suttontown, Poplar Grove, north, east, and south of Clinton, near Turkey, north of New Hope Church, south of Mount Gilead Church, and in the neighborhood of Delway and Harrells Store.

The type occupies undulating to gently rolling interstream areas. A small part of it occurs on gentle slopes approaching streams. Some areas are practically level and require ditches to insure thorough drainage. Both surface drainage and underdrainage are good over most of the soil.

The Norfolk fine sandy loam is one of the important agricultural soils of the county. Approximately 60 per cent of it is cleared and under cultivation. The remainder is forested with shortleaf pine,

scrub oak, and sweet gum, together with a little dogwood, sourwood, white oak, post oak, and hickory.

Corn and cotton are the principal staple crops, and tobacco is produced on a small acreage. Oats, rye, wheat, soy beans, and velvet beans are crops of minor importance. Home supplies of vegetables, sweet potatoes, potatoes, and fruits are grown on practically all farms. In the eastern and northeastern sections of the county some truck crops are planted; these crops consist of potatoes, garden peas, onions, sweet corn, peppers, beans, dewberries, and cantaloupes.

Corn yields 20 to 30 bushels per acre. The crop is usually fertilized with 300 to 400 pounds per acre of 8-3-3 fertilizer or an equal quantity of acid phosphate and cottonseed meal mixed. Nitrate of soda is applied as a side dressing at the rate of 75 to 100 pounds per acre. Some farmers apply only stable manure to corn land before or at time of planting, but follow with a side dressing of nitrate of soda later in the season. Cotton yields one-half bale to 1½ bales per acre. Cotton land receives 600 to 800 pounds per acre of 8-3-3 fertilizer. Some of the farmers also give cotton a side dressing of sodium nitrate. Tobacco produces 800 to 1,000 pounds an acre, and usually receives about 1,000 pounds per acre of 8-3-3 fertilizer. Truck crops give good yields. Potatoes are given an acreage application of 1,500 to 2,000 pounds of 8-3-3 fertilizer or an equal quantity of a mixture of acid phosphate, kainit, cottonseed meal, and sodium nitrate. The other truck crops receive from 800 to 1,000 pounds per acre of an 8-3-3 mixture.

The Norfolk fine sandy loam sells at \$50 to \$100 an acre, depending upon the state of improvement and proximity to good roads and markets. The price of the forest areas depends largely upon the character of the growth.

This soil is mellow and friable, easily cultivated, and warms up quickly in the spring. It is especially adapted to the production of truck crops, such as beans, peas, potatoes, spinach, cabbage, lettuce, cucumbers, kale, and strawberries. It is also well suited for the growing of bright tobacco, peanuts, cotton, crimson clover, cowpeas, corn, grapes, sweet potatoes, cantaloupes, and watermelons. The growing of leguminous crops and systematic crop rotations, as suggested for the Norfolk sandy loam, will likewise improve this soil.

Norfolk fine sandy loam, deep phase.—The surface soil of the Norfolk fine sandy loam, deep phase, is a gray fine sand 1 to 3 inches deep, passing into a pale-yellow loamy fine sand or fine sandy loam, which extends to depths of 20 to 30 inches. Below this the subsoil is a yellow friable fine sandy clay to a depth of 3 feet or more. In plowed fields the gray surface material ranges in depth from 5 to 7 inches.

The Norfolk fine sandy loam, deep phase, has only a small development. The largest areas are south of Clinton, west of Beulah, and near Trinity Church. Smaller areas are situated elsewhere in the eastern part of the county. The surface is undulating to gently rolling and, owing to the porous soil and favorable topography, drainage is good.

The soil is agriculturally unimportant because of its relatively small extent. About 40 per cent of it is devoted to crops, mainly

corn and cotton. The uncultivated areas are in forest, mainly shortleaf pine and scrub oak, with a little dogwood, hickory, sourwood, and sweet gum. Cotton yields one-fourth to 1 bale per acre and corn 15 to 25 bushels. Crops are fertilized with similar kinds and about the same quantities of fertilizer as on the Norfolk fine sandy loam.

RUSTON SANDY LOAM

The surface soil of the Ruston sandy loam is a gray to brownish-gray loamy sand 5 to 7 inches deep. The subsurface layer is a dull-yellow or brownish-yellow loamy sand or sandy loam 12 to 18 inches deep. The subsoil is a yellowish-red to reddish-brown, moderately friable sandy clay which extends to a depth of 3 feet or more. In a few places the surface mantle has been eroded and the reddish-brown or yellowish-brown subsoil exposed, but such areas are small.

The Ruston sandy loam is developed in the northwestern section of the county in scattered and comparatively small areas. The more important developments are near Bellevoir School, Beaman Crossroads, south and north of Newman Millpond, near Blackmans Pond and Blackmans Mills, near Orange and Shady Mill, and south of Stony Run Church. The type is found on the slopes or on the higher parts of interstream ridges. The topography is undulating to gently rolling, and all of the soil is well drained.

This is an important farming type, notwithstanding its relatively small acreage. Fully 80 per cent of it is cultivated; the remainder supports a forest growth of pine, with a scattering of oak, dogwood, and hickory. The principal crops are cotton and corn. Oats, wheat, and soy beans are produced in a small way. The soil is exceptionally strong, and cotton yields two-thirds bale to 1½ bales per acre, and corn produces 20 to 30 bushels per acre. To get these yields, the crops are fertilized with similar quantities and kinds of fertilizer as applied on the Norfolk sandy loam. The suggestions for handling the Norfolk sandy loam will apply to this type of soil.

Ruston sandy loam, deep phase.—The Ruston sandy loam, deep phase, is a gray to brownish-gray sand, 2 to 6 inches deep, underlain by a dull-yellow or brownish-yellow loamy sand which extends to depths of 20 to 30 inches, where it passes into a yellowish-red or reddish-brown friable sandy clay. The phase differs from the Ruston sandy loam mainly in the depth of the sandy surface material. There is a little waterworn gravel over the surface in places, but these gravelly areas are too small to show on the soil map. In other places the surface mantle has been washed off and the red subsoil left exposed; such areas are only a few feet wide and small in number.

The phase is rather extensive, but is confined mainly to the northwestern and western parts of the county. It occurs almost exclusively on the breaks connecting the smoother uplands with the lowlands along the streams. It is found in narrow strips along Great Coharie and Little Coharie Creeks, and Bearskin and Big Swamps, and most of their tributaries. The soil, owing to its position, is well to excessively drained.

The deep phase of the Ruston sandy loam is unimportant as a farming soil in the county, and only patches of it are used for crops.

The smoother parts are farmed in connection with the adjoining soils. The crops are corn and cotton and the yields are about the same as on the Norfolk sand. The forest growth consists of shortleaf pine, in which appears a little dogwood, hickory, white oak, and post oak. Most of the phase is better suited to forestry, as it erodes easily when cleared.

RUSTON FINE SANDY LOAM

The surface soil of the Ruston fine sandy loam is a gray or yellowish-gray loamy fine sand, about 6 inches deep, grading into a brownish-yellow fine sandy loam which continues to depths of 12 to 18 inches. The subsoil is a yellowish-red to brownish-red, compact but friable, fine sandy clay to a depth of 3 feet or more. In some of the fields there are a few eroded spots where the yellowish-red subsoil is exposed, but these are too small to map.

The Ruston fine sandy loam is small in extent and is developed in scattered areas in the western and northeastern parts of the county. The largest bodies are found near Goshen and Youngs Swamps, in the northeastern part, north and south of Bethlehem Church and immediately south of Clinton. Smaller areas occur in the western part near Oakhurst School and north of Roseboro.

The type occupies positions on the high uplands near where streams have cut rather deep valleys. The surface is smooth to gently rolling. Surface drainage is well established, and the under-drainage is good.

The Ruston fine sandy loam is a strong farming soil, and most of it is cropped. About 20 per cent of it is in forest, the growth consisting mainly of shortleaf pine. The principal crops produced are corn and cotton. Oats, rye, wheat, soy beans, velvet beans, and cowpeas are grown to a small extent. There are also a few small fields of alfalfa and crimson clover. The soil is used quite extensively for the production of potatoes and other truck crops.

Corn yields 20 to 30 bushels per acre and cotton one-half to 1 bale. Oats, soy beans, clover, and alfalfa give excellent returns. The yields of truck crops are good. All the crops on this soil receive about the same fertilizer treatment as similar crops on the Norfolk fine sandy loam.

Land of the Ruston fine sandy loam sells at \$50 to \$150 an acre, depending upon the condition of improvements and the nearness to markets and good roads.

Ruston fine sandy loam, deep phase.—The surface soil of the Ruston fine sandy loam, deep phase, is a light-gray loamy fine sand 3 to 6 inches thick. This is underlain by a yellow or a brownish-yellow loamy fine sand to depths of 20 to 30 inches. The subsoil is a yellowish-red or brownish-red, friable, compact fine sandy clay, extending to depths of 3 feet or more. In places there are eroded spots too small to map separately.

The phase is confined largely to the eastern half of the county, and it is found on or near the breaks to practically all the stream bottoms. Owing to the prevailing sloping character of the surface and the porous sandy nature of the soil both surface and internal drainage are good to excessive. The steeper parts erode easily when cleared of forest growth.

The deep phase of the Ruston fine sandy loam is not considered a desirable farming soil, and less than 5 per cent of it is cultivated. The remainder is forested with shortleaf pine, with a scattering admixture of dogwood, hickory, oak, and sweet gum. Some of the smoother parts are used for crops, which consist mainly of cotton and corn. Sweet potatoes and rye are grown in a small way.

MARLBORO SANDY LOAM

The surface soil of the Marlboro sandy loam in forested areas is a gray to brown sandy loam 1 to 3 inches deep, underlain by a layer of brownish-yellow, heavy sandy loam 6 to 8 inches thick. The subsoil is a deep-yellow or greenish-yellow, friable, but slightly sticky sandy clay, which passes at depths of 28 to 30 inches into a deep-yellow mottled light-red, friable sandy clay. In cultivated areas the surface layer is a gray to grayish-brown loamy sand or light sandy loam about 6 inches deep. When wet the soil has a decidedly brownish cast. In the cultivated fields a few soft gravel or concretions are present on the surface.

The surface soil of the Marlboro sandy loam is not uniform in depth. This feature may be noted in freshly plowed fields, in which there are many small spots where the clay subsoil has been brought to the surface by the plow. The subsoil in places is a friable clay, rather compact and firm. It is heavier than the subsoil of the Norfolk sandy loam.

Included with this type are many small bodies of dark-colored soil belonging to the Portsmouth or Coxville series. Such areas are common in nearly every field, but they could not be indicated on the soil map because of their small extent.

The Marlboro sandy loam is developed mainly in the north-central and northwestern parts of the county. In the northwestern part it is mapped north of Spring Branch Church to Stony Run Church, in the vicinity of Popes Store, and south from Mingo School to Halls Store. In the north-central section it is mapped east of Salemburg and north from Beaman Crossroads to the Johnston County line. Smaller areas are situated elsewhere in these two parts of the county. The soil occupies for the most part interstream country, although some of it occurs on the gradual slopes to the streams. The topography is almost level to gently rolling, and in the flatter areas ditches are necessary. The surface and internal drainage, however, is good over most of the type.

The Marlboro sandy loam is one of the important agricultural soils in the county. It is easy to till, except where the surface soil is shallow. Approximately 80 per cent of it is under cultivation; the rest is in forest consisting of shortleaf pine and a few oaks, hickory, and dogwood.

This type is highly prized as a cotton soil, and a large acreage is devoted to this crop. Yields range from three-fourths bale to 1½ bales per acre. The crop is fertilized with 600 to 800 pounds of 8-3-3 fertilizer and a top-dressing of 75 to 100 pounds an acre of nitrate of soda. Corn is second in importance and is grown principally as a subsistence crop. It yields 20 to 35 bushels per acre. The crop is given an acreage application of 300 to 400 pounds of 8-2-2

or 8-3-3 fertilizer and a top-dressing of nitrate of soda. Some farmers use a home mixture of acid phosphate and cottonseed meal, applied at about the same rate as the complete fertilizer.

Tobacco, an important cash crop, is grown quite extensively on this soil. It yields from 800 to 1,000 pounds per acre. Tobacco land is fertilized with 800 to 1,000 pounds per acre of 8-3-3 fertilizer. Oats, rye, wheat, soy beans, and cowpeas are grown on relatively small acreages. Oats yield 20 to 40 bushels per acre, and wheat 10 to 20 bushels. Rye, soy beans, and cowpeas give excellent returns. Sweet potatoes, potatoes, garden vegetables, and fruits are produced for home needs on nearly every farm.

No systematic rotation of crops is followed, but cotton and corn are frequently alternated. Some of the farmers sow rye in the cotton fields in the fall for winter pasturage or for green manuring. A few farmers plant soy beans or cowpeas between corn rows. Stable manure is applied to the land in such quantities as are available.

Farm land of this type sells at \$50 to \$100 an acre, depending upon the state of improvement and the distance from good roads and markets.

The Marlboro sandy loam, like the Norfolk and the Ruston sandy loams, can be maintained in a high state of productiveness. The incorporation of organic matter by plowing under green-manuring crops would be beneficial to the soil. Systematic rotations of crops would also be good for the land. The suggestions for the improvement of the Norfolk sandy loam will apply also to the Marlboro sandy loam.

MARLBORO FINE SANDY LOAM

The surface layer of the Marlboro fine sandy loam in the wooded areas is a brown or grayish-brown fine sandy loam, 2 or 3 inches deep. The subsurface layer is a brownish-yellow heavy friable fine sandy loam to 6 or 8 inches. The subsoil is a deep-yellow friable clay to about 28 inches, where it passes into a deep-yellow, mottled light-red, friable fine sandy clay. In plowed fields the surface soil to a depth of about 6 inches is a light-gray to brownish-gray fine sandy loam.

The surface soil of this type is shallow in many places and the heavy subsoil is frequently plowed up. There are usually a few brown concretions over the surface, but these are not present in sufficiently large quantities to modify the texture. Included with this soil are small flats and depressions of Coxville and Dunbar soils which are too small to show on the map. In some places the soil is heavier and the texture approaches a very fine sandy loam.

The Marlboro fine sandy loam is confined mainly to the western, northeastern, and southeastern parts of the county. The largest developments begin in the vicinity of Roseboro and extend north to Beaverdam Swamp. Other extensive areas are found in the vicinity of Newton Grove and near Delway and Harrells Store.

The topography is almost level to gently rolling. The type occupies positions on the interstream divides and to a small extent on gradual slopes near streams. Except for some of the more level areas, both surface and internal drainage are well established.

The Marlboro fine sandy loam is an important agricultural soil in the county, and about 65 per cent of it is cultivated. The timber growth on the rest is composed mostly of shortleaf pine, with a few scrub broadleaf oak, dogwood, hickory, and sweet gum trees.

Cotton and corn are the principal crops. A small acreage is devoted to oats, rye, wheat, velvet beans, soy beans, and cowpeas. In the vicinity of Roseboro and in the northeastern part of the county a small part of the soil is used for truck crops and strawberries. Cotton yields 1 bale per acre and corn 20 to 30 bushels. These crops are fertilized with the same brands and in like applications as for similar crops on the Marlboro sandy loam. Oats, soy beans, rye, and cowpeas yield well. The selling price of this soil is about the same as for the sandy loam type.

The Marlboro fine sandy loam is a good farming type and can be kept in a high state of productiveness. The surface material is slightly heavier than that of the other farmed soils of the county and for this reason it is somewhat more difficult to cultivate. The suggestions for improving the Norfolk sandy loam apply also to this type.

The yield of oats on a 25-acre field this year (1923) indicates that oats could be profitably grown elsewhere on the type. The oats were sown on soy-bean land and given a top-dressing of 200 pounds per acre of nitrate of soda. The crop will yield 60 or more bushels of oats to the acre. This land, until reclaimed by growing soy beans on it, was considered to be "worn out."

SUSQUEHANNA FINE SANDY LOAM

In forested areas the surface soil of the Susquehanna fine sandy loam is a gray to grayish-brown fine sandy loam, 1 to 3 inches thick, underlain to depths of 8 to 10 inches by a yellow, heavy fine sandy loam. The subsoil is a brownish-yellow tough clay to about 18 inches in depth, where it passes into a mottled yellow, gray and red, heavy plastic clay, which extends to a depth of 36 inches or more. The surface mantle is somewhat variable in thickness, and in the deeper areas the texture is usually a loamy sand or contains some coarse sand and fine gravel. In other words, the surface soil varies greatly in depth and texture.

The Susquehanna fine sandy loam is found in comparatively narrow strips along the breaks of some of the larger swamps. It occurs in close association with the deep phase of the Ruston soils and occupies similar positions. The largest areas are located east and south of Newton Grove. The surface of most of the type is steep or sloping and the drainage is good to excessive.

This is an unimportant agricultural soil in the county, and only about 3 per cent of it is cultivated. The rest supports a forest growth of pine, with some dogwood, oak, and hickory. The soil erodes easily when cleared. Owing to the unfavorable topography, the soil is probably best suited to forestry.

DUNBAR SANDY LOAM

The surface soil of the Dunbar sandy loam is a gray loamy sand to sandy loam, 6 to 8 inches deep, which is underlain by a yellow or dull-yellow, heavy, friable sandy loam to 15 or 18 inches in depth.

The subsoil is a yellow, mottled gray, heavy and slightly plastic sandy clay becoming mottled with bright red at depths of 30 to 36 inches. In wooded areas the surface soil is usually dark gray to a depth of 1 or 2 inches.

The Dunbar sandy loam is an intermediate soil between the Norfolk or Marlboro sandy loam on the one hand and the Coxville sandy loam on the other, the upper part of the soil resembling very much the Norfolk soil and the lower part the Coxville type. In some areas the yellow subsurface layer is only 2 or 3 inches thick, and the subsoil is encountered at 12 to 15 inches.

The Dunbar sandy loam has a relatively small extent in the county. The largest developments are in the vicinity of Shady Grove School in the northern part and near Hayne in the western part. Smaller bodies are located elsewhere. The type has a nearly level topography and occupies positions bordering pocosons or bays. The surface soil is fairly well drained because of the porous texture, but the underdrainage is poor because of the compact and tough structure of the subsoil. Ditching is necessary to insure good yields of crops.

The type is unimportant agriculturally because of its small extent in the county. About 50 per cent of it is farmed, and the rest supports a growth of shortleaf pine, with some oaks, maple, and sweet gum. Gallberry bushes are a characteristic undergrowth.

Corn and cotton are the chief crops, corn yielding 15 to 30 bushels per acre and cotton one-half to one bale. These crops receive about the same fertilizer treatment as similar crops on the Norfolk sandy loam. Oats, cowpeas, and soy beans are produced in a small way, and the yields are good. The suggestions for the improvement of the Norfolk sandy loam will apply to this soil, after drainage has been improved.

DUNBAR FINE SANDY LOAM

The surface soil of the Dunbar fine sandy loam consists of a gray or light-gray loamy fine sand to fine sandy loam, 6 to 8 inches deep. This is underlain by a yellow, heavy, friable fine sandy loam, to a depth of 15 or 18 inches. The subsoil is a mottled yellow and gray, heavy, plastic, fine sandy clay, with a few splotches of bright red, to a depth of 3 feet or more. In the forested areas the gray surface covering is usually only 1 to 3 inches thick. Included with this soil are small areas of Norfolk, Marlboro, and Coxville fine sandy loams too small to show on the map.

The largest developments of the Dunbar fine sandy loam are in the western and northeastern parts of the county. Large areas lie northward from Roseboro to Clement, and to the east and south of Newton Grove. Other important areas lie in the vicinity of Hatcher and in the southern part near Harrells Store and Newtons Crossroads. Smaller bodies of this soil are encountered elsewhere in the county.

The Dunbar fine sandy loam has a nearly level surface. It occupies flat situations on the interstream divides and low positions on the margins of pocosons and bays. The surface drainage is usually good, but, on account of the rather heavy and impervious nature

of the subsoil, the internal drainage is poor. Ditches are necessary for the successful growing of crops.

Approximately 35 per cent of this soil is under cultivation. A large proportion of it lying northward from Roseboro has not been reclaimed for agriculture. The forest growth is composed largely of shortleaf pine, with an admixture of some sourwood and small sweet gum. Gallberry bushes flourish as an undergrowth. Small parts of the soil are used for pasturage.

Corn and cotton are the leading crops. Tobacco is produced in a small way. Sweet potatoes, garden vegetables, grapes, and fruits are grown mainly for home use. Oats, soy beans, velvet beans, and cowpeas are produced on many of the farms. In the northeastern section and in the vicinity of Harrells Store the soil is used in a small way for truck crops and strawberries. The truck crops consist of potatoes, garden peas, sweet corn, and onions. Cotton yields one-third to 1 bale per acre, and corn 15 to 30 bushels. All the other crops produced give good yields. The soil is well suited to oats, soy beans, and strawberries.

The selling price of this soil depends to a large extent upon the value of the standing timber. The price of the cleared areas ranges from \$30 to \$60 an acre depending upon the location and the improvements.

The Dunbar fine sandy loam in other parts of the State is considered a good farming soil. Its greatest need is thorough drainage and sufficient lime to correct the acidity. The soil, when properly reclaimed, is well suited to the production of cotton, corn, soy beans, oats, rye, clover, and peanuts. It is especially well suited to strawberries. The suggestions for the improvement of the Norfolk fine sandy loam will apply likewise to this soil.

COXVILLE FINE SANDY LOAM

The Coxville fine sandy loam to a depth of about 6 inches is a gray to dark-gray heavy fine sandy loam, which grades into a light-gray heavy fine sandy loam extending to 12 or 15 inches in depth. The subsoil is a mottled gray and yellow, heavy, plastic fine sandy clay to silty clay, which usually contains mottlings of bright red at depths between 30 and 36 inches. In some places the subsurface layer is a pale-yellow or yellow, mottled gray, heavy fine sandy loam. The surface soil in some areas approaches a very fine sandy loam in texture.

The type, as mapped, includes a few areas of Coxville sandy loam. The largest areas of this included soil are in the north-central part, 2 miles northwest of Shady Grove School, southwest of Beaverdam Church, and west of Bellevoir School.

The Coxville fine sandy loam has a comparatively small total area in the county. Fairly large areas occur in the western part south of Clement, in the northeastern section around Bull Pocoson, and in the southeastern part in the vicinity of Newtons Crossroads.

The type occupies flat interstream country in which natural drainage ways are few and imperfectly formed. Owing to the practically level surface and the impervious subsoil, the areas are insufficiently drained.

The Coxville fine sandy loam is unimportant agriculturally. Only a few small strips of better drained soil along the border are cultivated. The crops are corn, oats, and strawberries. Most of the type is used for forestry. The original timber has nearly all been sawed, but shortleaf pine grows rapidly and is cut when large enough. Most of the soil at present is forested with pine. There is some scrub oak and small sweet gum. The undergrowth is composed largely of gallberry, bay, and huckleberry (blueberry) bushes. The price of the land is based mainly upon the character of the forest growth.

In its present condition the type is best suited to forestry. In order to reclaim it for cultivation, thorough drainage and liming are necessary. For most of it large drainage areas would be required, as it is difficult to drain small or fractional parts. After the large canals are cut, numerous side ditches are necessary to insure good drainage, as the lateral movement of water in the soil is slow. When reclaimed this soil is well suited to the production of corn, cotton, oats, soy beans, and forage crops.

PORTSMOUTH SAND

The surface soil of Portsmouth sand to a depth of 10 or 15 inches is composed of a medium sand containing enough organic matter to give it a dark-gray to black color. The subsoil is a light-gray to almost white medium loose sand which continues to depths of 36 inches or more. In some places the subsoil may be a light-brown sand to a depth of 20 inches where it passes into a light-gray or white sand. The surface material, on account of the high content of organic matter, grades toward muck in some of the larger areas.

The Portsmouth sand is confined almost entirely to the southern part of the county, where it is closely associated with the Norfolk sand. The largest area lies west of Newtons Crossroads. The soil occurs principally in flats and depressions at the sources of small drainage ways. Both surface and internal drainage are inadequate, most of the soil being in a semiswampy condition part of the year.

The Portsmouth sand is not an agricultural soil in this county. Only a few small patches of it are farmed, and these only in connection with better drained soils. The native vegetation consists mainly of bay, gallberry, and huckleberry (blueberry) bushes, and briers, with a few scattering pine and sweet gum trees. The Portsmouth sand has a low potential agricultural value, and should be reserved for forestry.

PORTSMOUTH FINE SAND

The surface soil of the Portsmouth fine sand is a dark-gray to almost black loamy fine sand or sand which carries a high content of organic matter and extends to a depth of 8 or 10 inches. The subsoil is a light-gray to almost white loose fine sand to depths of 3 feet or more. It is loose and "creepy" and resembles quicksand. In places the subsoil is a light-brown fine sand to a depth of about 20 inches, where it passes into a gray fine sand. In some areas the surface is so rich in organic matter that it approaches muck in texture.

Most of the Portsmouth fine sand occurs in the southeastern section of the county in a few scattered and relatively small areas. The

largest of these is about 2 miles south of Clinton. The soil is closely associated with the Norfolk fine sand and occupies positions in flats and depressions near the heads of small streams.

The type is poorly drained and only a few small fields are cultivated. The crops are corn and oats, which give low yields. The soil supports a growth of bay bushes, gallberry bushes, and briers. There are some huckleberry (blueberry) bushes, from which the fruit is gathered and sold. A few pine trees are found on this soil.

The Portsmouth fine sand is considered one of the soils of the county which has a low agricultural value. It should remain in forest.

PORTSMOUTH SANDY LOAM

The surface soil of the Portsmouth sandy loam is a dark-gray to almost black, light sandy loam, 6 or 8 inches deep. The subsoil is a mottled yellow and gray friable sandy clay to a depth of 3 feet or more. In some places there is a light-gray friable sandy clay subsurface layer, which extends to a depth of 12 or 15 inches before it grades into the mottled yellow and gray subsoil.

The Portsmouth sandy loam is developed largely in the northwestern section of the county near the sources of Great Coharie and Little Coharie Creeks and Beaverdam Swamp. The largest areas lie west and north of Shady Grove School. Smaller tracts are located elsewhere in the northwestern quarter of the county.

The type occurs in pocosons, "ponds," and depressions and the topography is almost level. There are a few poorly defined drainage ways, but these are not sufficient to furnish drainage outlets. Water is only a few inches below the surface much of the year, and during the winter it stands on the surface in places.

Most of the type is in forest consisting of shortleaf pine. There is usually present an undergrowth of bay, gallberry, and other bushes. No large tracts of this soil are under cultivation at present. Oats, corn, and soy beans are produced on a few small areas. They yield well. When drained and limed this soil is well suited to the production of corn, oats, soy beans, forage crops, potatoes, and such truck crops as cabbage, kale, spinach, celery, onions, strawberries, and cucumbers.

PORTSMOUTH FINE SANDY LOAM

The surface soil of the Portsmouth fine sandy loam is a dark-gray to almost black fine sandy loam, 6 to 10 inches deep. The subsoil is a mottled gray and yellow, friable fine sandy clay to a depth of 3 feet or more. In some areas there is a subsurface stratum of light-gray fine sandy clay extending to a depth of 15 to 20 inches, and in a few places this continues to 3 feet or more.

The type is confined principally to the northeastern quarter of the county. It is extensively developed north of Clinton, in the vicinity of Palestine School, Plainview Church, and Huggins Store, southeast from Hobbs Crossroads, west and northeast of Newton Grove, in Bull Pocoson and Bear Pocoson, near Poplar Grove, and in the neighborhood of Bethlehem Church.

The Portsmouth fine sandy loam occupies prevailingly flat and level interstream areas and slight depressions. Natural drainage is

not developed, and the soil remains in a partially water-logged condition during much of the year. In order to grow crops successfully, ditches are necessary.

Approximately 1 per cent of this soil is cultivated. The fields are small. Corn, oats, and cotton are grown. The yields are only fair. Most of the type is left in forest, and lumber is the crop of greatest value. Temporary tram roads are built through the largest areas to haul out the logs. The timber is shortleaf pine, which grows rapidly, reaching a cutting stage in 20 to 30 years. The undergrowth usually consists of a few scrub oak and sweet gum trees, with gallberry, bay, and huckleberry (blueberry) bushes characteristic in the smaller growth. The selling price of this soil depends mainly upon the value of the forest.

The Portsmouth fine sandy loam, like the sandy loam type, when properly drained, limed, and fertilized, makes good farming land for corn, cotton, soy beans, cowpeas, rye, oats, forage crops, and truck crops.

PLUMMER FINE SANDY LOAM

In wooded areas the surface layer of the Plummer fine sandy loam is a dark-gray loamy fine sand, 1 to 3 inches thick. The subsurface material is a light-gray or ashy-gray fine sandy loam to a depth of about 15 inches, and is mottled in places with yellowish brown. The subsoil is a mottled light-gray and yellow, friable, loamy fine sand to fine sandy loam, which extends to 3 feet or more. Locally in the subsoil there are thin layers or pockets of light-gray fine sand. The subsoil is very friable, and when ditches are dug through it the walls quickly cave in. Included with this soil are many small areas of ashy-gray fine sand that were too small to indicate on the map. These areas usually are found in the marginal zone between the Norfolk and Portsmouth soils.

The Plummer fine sandy loam is developed almost exclusively in the northeastern and southeastern parts of the county, the largest tracts being situated east of Hobbs Crossroads, north of Piney Grove Church, east of Goshen Church, and northwest of Giddensville. One large area is in the southeastern part between Delway and Harrells Store.

This type, like the Portsmouth soils, occurs in flat interstream areas where the natural drainage ways are poorly defined. Some of it lies on broad, almost imperceptible slopes. Drainage is everywhere inadequate.

A part of the type is cut-over land, but most of it is in forest. The principal growth is shortleaf pine. There are a few scrub oak and sweet gum trees, and bay bushes. The undergrowth is composed mainly of gallberry bushes. A few small patches have been reclaimed and are used for farming, but the yields are very low.

The Plummer fine sandy loam is rather difficult to ditch on account of the friable subsoil which easily slides when exposed to the atmosphere. The soil is probably best suited to forestry.

LEON SAND

The surface soil of the Leon sand in forested areas is a gray medium sand, 1 to 3 inches deep, passing into a very light gray to almost

white medium sand, which generally extends to depths of 12 to 20 inches. Below this a dark-brown hardpan stratum is encountered. It is composed of sand cemented together with a small quantity of iron oxide and a large quantity of organic matter, and is 5 to 12 inches thick. Below the hardpan there appears a light-brown, light-gray, or almost white loose sand. In some places the depth to the hardpan may be 6 inches; in other places it is 24 or 30 inches.

The Leon sand is developed mainly in the southwestern part of the county. The more conspicuous areas are in the vicinity of Mints and Parkersburg and between Tomahawk and Kerr. Smaller areas are located elsewhere in that section. The type is confined almost entirely to interstream country, and is intermediate in elevation between the Norfolk sand on the one hand and the St. Johns sand on the other. The open porous surface material insures good top drainage, but the underlying hardpan retards the downward percolation of water.

This is an unimportant soil agriculturally, and most of it is cut-over land. The remaining timber is composed of shortleaf pine in various stages of growth and some scrub oak. There is an undergrowth of wire grass. A few small areas are planted to corn, oats, or garden vegetables. The yields of corn and oats are extremely low. The soil is probably better suited to forestry or pasturage than to farm crops.

ST. JOHNS SAND

The surface soil of the St. Johns sand, to a depth of 6 or 8 inches is a dark-gray to almost black sand, which carries a high percentage of organic matter composed of decayed leaves, twigs, and branches. The subsurface layer is a light-gray medium sand, with a thickness of 6 to 10 inches, where a dark-brown hardpan composed of sand held together with iron and organic matter is encountered. The hardpan ranges in thickness from 6 to 12 inches and is underlain by a gray or yellowish-brown incoherent sand. The depth to the hardpan, however, is variable, ranging from 6 to 24 inches.

The St. Johns sand occurs in the extreme southern part of the county. Extensive areas lie north and south of Tomahawk, southwest of Kerr, and northeast of Ivanhoe along the Pender County line. The type is developed in bays and depressions. The surface is flat. On account of its position and the impervious structure of the underlying hardpan, the soil is poorly drained and is in a semi-swampy condition much of the time.

This type of soil is not farmed. The vegetation is composed of a rather thick growth of bay and gallberry bushes, together with many briers. The decaying leaves and branches from these bushes constantly add organic matter to the soil. There are a few scattering pines, but most of these are crooked or stunted in growth. This soil is best suited to forestry or grazing.

KALMIA SAND

The surface soil of the Kalmia sand is a light-gray medium sand, 2 to 6 inches deep. The subsoil is a pale-yellow loose sand 3 feet or more in depth. The lower part of the subsoil becomes mottled light gray and yellow in some of the flat areas.

The Kalmia sand does not occupy a large area in this county. It is a terrace or second-bottom soil and is confined mainly to the southwestern part of the county, along South River, where it occurs in broken areas from near Brunson Bridge to Beattys Bridge. One of the largest areas lies just west of Ivanhoe. Smaller areas are mapped along Black River and Great Coharie Creek.

The surface of the Kalmia sand is undulating to gently rolling and hummocky. The soil, because of its porous nature, usually is well drained. Some of the flat parts require ditching.

The soil is relatively unimportant in the agriculture of the county, as only a few small fields are now farmed. Cotton, corn, and oats are the crops grown, with yields about equal to those on the Norfolk sand. Most of the soil was farmed many years ago. The present vegetation is second-growth pine and sweet gum, with an undergrowth of gallberry or broom sedge. The suggestions for the improvement of the Norfolk sand also apply to this soil.

KALMIA FINE SAND

The surface soil of the Kalmia fine sand is a mellow light-gray fine sand, about 6 inches deep. The subsoil is a pale-yellow incoherent fine sand to a depth of 3 feet or more. The lower subsoil is slightly loamy and becomes mottled with light gray in some of the flatter areas.

The Kalmia fine sand is one of the more extensive terrace soils in the county. It is situated along Six Runs Creek, Stewart Creek, and Black River, and some of the larger areas are over a mile wide. Smaller developments are mapped along Little and Great Coharie Creeks and other creeks of the county.

The type occurs on terraces that lie largely above overflow. The surface is gently undulating to gently rolling. In some places there are a few low knolls and slight ridges, probably formed by wind action. The soil is open and porous, insuring good drainage conditions. The flat situations usually need ditches to insure good internal drainage.

The Kalmia fine sand is not now an important farming soil in the county. Approximately 20 per cent of it is used for crops, which give relatively low yields. Corn produces 10 to 15 bushels per acre and cotton one-fourth to one-half bale. These crops are fertilized in about the same way as similar crops on the Norfolk sand. A few areas are in pasture. This type and the adjoining terrace soils were the first to be farmed and were the principal soils until after the Civil War, when the uplands were cleared for agriculture. At present most of the Kalmia fine sand is grown up with old-field pine and sweet gum, usually with an undergrowth of gallberry or broom sedge.

The soil is deficient in organic matter and relatively low as well in the three important plant-food elements. Good yields could be obtained by the incorporation of plenty of vegetable matter and by liberal applications of complete fertilizers. The suggestions for the improvement of the Norfolk sand apply with equal force to the Kalmia fine sand.

KALMIA FINE SANDY LOAM

The surface soil of the Kalmia fine sandy loam consists of 2 to 6 inches of light-gray loamy fine sand, which passes into a pale-yellow loamy fine sand or fine sandy loam, continuing to a depth of 15 to 20 inches. The subsoil is a yellow, friable, fine sandy clay to 3 feet or more below the surface. In places the subsoil is slightly heavy, and in others it becomes mottled with gray in the lower part.

The Kalmia fine sandy loam covers only a small total area in the county and occurs in relatively small bodies on the terraces of the larger streams. The surface is almost level to gently undulating. Both the surface and the internal drainage are well established for most of the type, although there are a few poorly drained places.

Most of the soil is farmed, but on account of its relatively small acreage it is unimportant agriculturally. A few areas are in pasture, and a small proportion is in old-field pine. The main crops are corn and cotton. Oats are produced in a small way. The yields and fertilizer treatment are about the same as for similar crops on the Norfolk fine sandy loam.

The soil has been farmed a long time, and much of it is more or less run down. The addition of plenty of organic matter would be beneficial. Complete fertilizers are also necessary to obtain the best crop yields.

LEAF FINE SANDY LOAM

The surface soil of the Leaf fine sandy loam is a light-gray to gray loamy fine sand 6 or 8 inches deep, underlain by a brownish-yellow or mottled gray and yellow compact fine sandy clay extending to depths of 15 to 24 inches. The subsoil is a mottled dull-red, yellow, and gray, or a red and yellow, heavy, tough, and somewhat plastic clay which extends to a depth of 3 feet or more. Included with this type are a few areas of Leaf sandy loam which are too small to indicate on the map.

The Leaf fine sandy loam is confined almost entirely to the southern half of the county. The largest developments are along Little Coharie and Great Coharie Creeks, near where these streams join, and along South River west of Tomahawk. Other important areas are found along these streams and also along Six Runs Creek and Black River.

The soil is developed on second bottoms and most of it is above overflow. The surface is nearly flat, although there are a few gently undulating areas. Owing to the prevailing level surface and the tough impervious structure of the subsoil, the type has poor drainage.

Approximately 5 per cent of the type is cultivated, the farms being located on the higher and better drained parts. The crops are corn and cotton, together with a small acreage of oats, soy beans, and cowpeas. The remainder is forested with shortleaf pine, with which is mixed scattering sweet gum and scrub oak. There is usually an undergrowth of gallberry, bay, and alder brush.

The Leaf fine sandy loam, if thoroughly drained and limed, would be suited to the production of cotton, corn, oats, soy beans, cowpeas, and forage crops. In its present state it is better suited to forestry.

OKENEE SANDY LOAM

The surface soil of the Okenee sandy loam is a dark-gray to almost black sandy loam, 15 to 20 inches deep, carrying a large quantity of organic matter. The subsoil is a dull-gray or brownish-gray, rather heavy, sticky, sandy clay to a depth of 3 feet or more. The soil resembles very much the Portsmouth soils of the uplands.

The Okenee sandy loam is developed mainly along South River between Brunson Bridge and Beattys Bridge. The areas range in width from a few yards to about one-half mile. The soil occurs on the terraces, and its position is usually next to the uplands or in slight depressions. Drainage is poor on most of the type.

The type is unimportant agriculturally. A few small tracts are cultivated to corn or oats. The remainder supports a forest growth of shortleaf pine and a few sweet gum and maple, with a dense undergrowth of bay, gallberry, and alder bushes and briers. When well drained and limed, this type is suited to corn, oats, grasses, and soy beans.

OKENEE FINE SANDY LOAM

The surface soil of the Okenee fine sandy loam consists of a dark-gray to nearly black fine sandy loam 15 to 20 inches deep. In most places it is well supplied with organic matter. The subsoil is a dull-gray or mottled gray and yellow, rather heavy, plastic fine sandy clay to 3 feet or more in depth. In some places the surface material approaches a loam in texture, while in other situations it grades toward a muck because of the high content of organic matter.

The soil is developed principally in the southern half of the county on the broad terraces along Little Coharie, Great Coharie, and Six Runs Creeks, and Black River. The areas range in width from a few yards to about 1 mile.

The type usually occupies positions adjoining the uplands on the one side and Kalmia fine sand on the other. The soil receives much seepage from the uplands and is generally poorly drained. A portion of it is ditched and reclaimed for agriculture.

The Okenee fine sandy loam, like the Kalmia fine sand, is one of the oldest farmed soils in the county. It was once practically all ditched and farmed, but the ditches are now mostly grown up with bushes or filled up by caving. Approximately 10 per cent of it is used for crops and a small part is in pasture. The remainder represents old fields grown up in broom sedge or water-loving grasses and shrubs. Some portions are covered with old-field pine and a few sweet gum. The crops produced are mainly corn, oats, and hay. Corn yields 15 to 35 bushels per acre. Oats and hay do well.

The Okenee fine sandy loam, when properly drained and limed, is well adapted to the production of corn, oats, soy beans, velvet beans, cowpeas, and hay crops.

Okenee fine sandy loam, heavy-subsoil phase.—The surface soil of the heavy-subsoil phase is a steel-gray to dark-gray heavy fine sandy loam 6 to 10 inches deep. The subsoil is a dull-gray, mottled with ochreous yellow, heavy, tough, plastic clay to a depth of 3 feet or more.

The phase occupies a few narrow areas on the terraces of Six Runs Creek west and south of Elliott. The topography is nearly flat to

gently undulating. Because of the heavy and almost impervious structure of the subsoil the drainage is poor.

Parts of this soil were once ditched and farmed, but most of it is now covered with vegetation consisting of shortleaf pine and a few oaks, poplar, maple, and sweet gum. There are a few bay bushes in places. A small part of the soil is used for pasture. When thoroughly drained and limed this land is suited to the same crops as the typical Okenee fine sandy loam. It is excellent for pasturage.

CHASTAIN FINE SANDY LOAM

The surface soil of the Chastain fine sandy loam is a dark-gray to almost black loam or fine sandy loam about 6 inches deep. The subsurface layer is a heavy, dull-yellow or brown fine sandy clay, which extends to depths of 10 or 15 inches. The subsoil begins as a heavy brown clay, but at about 24 inches it becomes a mottled gray, yellow, and red plastic clay, which continues to a depth of 3 feet or more.

The Chastain fine sandy loam is confined to the northwestern part of the county along the Harnett and Cumberland County lines. It occurs as a first-bottom soil in Mingo Swamp and is subject to overflow during protracted rainy seasons. The soil remains in a partially saturated condition during the winter.

This type is not farmed, but supports a forest growth of sweet gum, pine, ash, and cypress, with an undergrowth of water-loving shrubs. It should remain forested.

JOHNSTON LOAM

The surface soil of the Johnston loam is a dark-gray to black loam 12 to 20 inches deep. The subsoil is a dull-gray, brown, or mottled gray and yellow, rather heavy fine sandy clay to a depth of 3 feet or more. In some places white or brown sand is encountered at 30 to 36 inches below the surface. Near where the soil adjoins the uplands there is usually some medium or coarse sand washed on the surface. The soil as a whole has a high content of organic matter.

The Johnston loam occurs as a first-bottom soil in relatively small areas along many of the smaller streams of the county. The soil is alluvial in origin, having been formed by deposits of sand and clay along the streams. It occupies a low position and is subject to frequent overflows. Some of it is in a partly swampy condition much of the time.

Only a very small part of the soil is used for crops; the remainder represents old fields which support a growth of water-loving plants. There are a few old-field pines in places. A small part is in pasture. The crops produced are corn, oats, and hay. Corn yields 25 to 35 bushels per acre. The yields of oats and hay are good.

The Johnston loam, like the other poorly drained soils, requires thorough drainage and liming before crops can be grown successfully. Some areas of the soil will require diking to prevent overflowing of streams. When properly reclaimed the soil is well suited to corn, oats, soy beans, and grasses.

SWAMP

Swamp represents material that is variable in color, texture, and structure. The texture of the surface soil ranges from sand to loam and muck, and the color may be light gray, brown, or black. The subsoil is usually heavy and ranges in texture from sandy clay to silty clay and clay. The color may be dull gray, mottled yellow and gray, or brown. In some places the material is merely a black mucky loam 3 feet or more deep. Thin layers of sand commonly appear in the lower part of the 3-foot section. In many places sand bars mark the surface.

Swamp occurs as first bottoms along practically all the streams of the county. The areas range in width from a few yards to about one-half mile, the widest lying along Great Coharie and Six Runs Creeks. The areas are low and frequently covered by water. During the winter most of the soil is in a water-logged condition. The surface has an almost imperceptible slope in the direction of stream flow.

Swamp is nearly all covered with forest growth. A few areas are used for pasture. The timber of the larger areas is composed mainly of black gum and sweet gum, with some poplar, pine, cypress, and white oak. Lumbering is active in these areas. There is usually an undergrowth of various water-loving plants.

Reclamation of Swamp for agriculture involves the digging of canals and the building of dikes. Some of the soil when properly drained and limed would give good yields of corn, oats, and hay crops, but the expense of drainage would be heavy, and it is doubtful if reclamation is warranted under present economic conditions. With so much upland soil lying idle, Swamp should continue to be used as forest land.

SUMMARY

Sampson County lies in the southeastern part of North Carolina, the western boundary line being about 15 miles from Fayetteville. The county has an area of 950 square miles, or 608,000 acres.

The topography is prevailingly gently rolling, although many flat areas occur. The elevation above sea level ranges from about 65 feet to 200 feet. The drainage is complete over a large part of the county, but there are considerable swampy areas along the streams and other low-lying sections in which drainage is very poor.

The county is fairly uniformly settled, the southern part being more sparsely populated than the rest. The population was 36,002 in 1920, with an average density of 40.6 persons per square mile.

With the exception of the northern part, the county has good railroad facilities. Improved public roads lead to nearly all sections.

The mean annual temperature is 61.5° F., and the average growing season is 219 days. The average yearly rainfall is 51.43 inches.

Agriculture began in the county about 1745, and was confined mainly to the second-bottom soils in the southern part. The upland soils were farmed after the Civil War.

Agriculture at present consists in the production of corn and cotton as the leading crops. Tobacco is an important cash crop.

The crops of secondary importance are hay and forage, sweet potatoes, rye, oats, cowpeas, and wheat. Truck crops are grown to some extent and include garden peas, potatoes, onions, snap beans, bell peppers, and sweet corn. Some strawberries and dewberries are shipped.

The existence of an important industry in picking and marketing wild blueberries suggests the advisability of experiments looking toward the establishing of blueberry culture.

Systematic crop rotations are not practiced. Commercial or home-mixed fertilizers are in general use over the county. The farms average about 74 acres in size.³ Landowners operate 60.9 per cent of the farms, and tenants 39 per cent.

Most of the farmed soils are deficient in organic matter, and all the soils are more or less deficient in lime.

The county lies entirely in the Coastal Plain province and most of the soils have been formed directly from the underlying material. There are 27 distinct soil types and 5 soil phases mapped, in addition to Swamp.

The Norfolk sand and Norfolk fine sand are extensive, well-drained types, but they are used only to a small extent for agriculture. The main farmed types are the Norfolk sandy loam and its deep phase, Norfolk fine sandy loam, Ruston sandy loam, Ruston fine sandy loam, Marlboro sandy loam, Marlboro fine sandy loam, and Dunbar fine sandy loam. The Coxville fine sandy loam, Portsmouth sandy loam and fine sandy loam, Okenee fine sandy loam, and Leaf fine sandy loam are rather extensively developed and when properly reclaimed by draining and liming are well suited to the production of corn, oats, soy beans, and forage crops.

³ Each tenancy is considered a "farm" in this computation.

[PUBLIC RESOLUTION—No. 9]

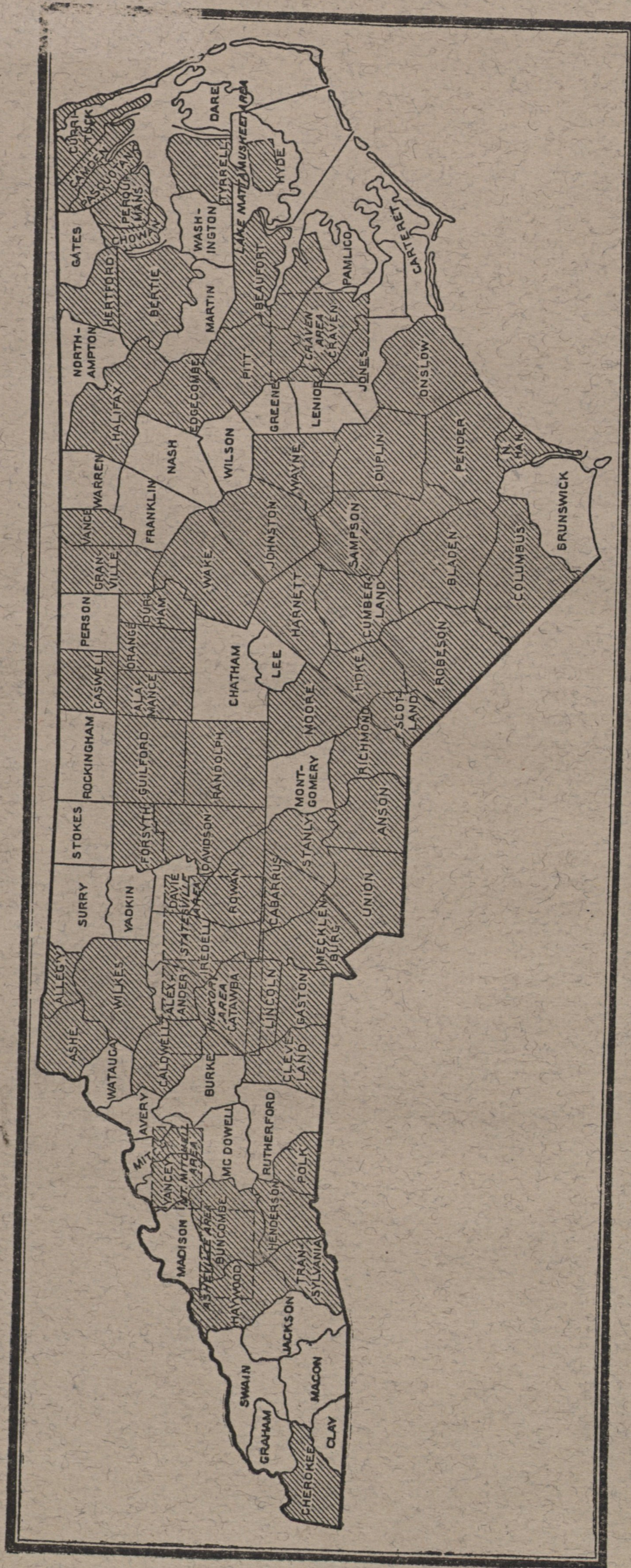
JOINT RESOLUTION Amending public resolution numbered eight, Fifty-sixth Congress, second session, approved February twenty-third, nineteen hundred and one, "providing for the printing annually of the report on field operations of the Division of Soils, Department of Agriculture."

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

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

Approved, March 14, 1904.

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



Areas surveyed in North Carolina, shown by shading