

U. S. DEPARTMENT OF AGRICULTURE,

BUREAU OF SOILS—MILTON WHITNEY, Chief.

IN COOPERATION WITH THE NORTH CAROLINA DEPARTMENT OF AGRICULTURE,
W. A. GRAHAM, COMMISSIONER; B. W. KILGORE, STATE CHEMIST, AND
DIRECTOR OF AGRICULTURAL EXPERIMENT STATION;
C. B. WILLIAMS, AGRONOMIST.

SOIL SURVEY OF BERTIE COUNTY,
NORTH CAROLINA.

BY

R. C. JURNEY, OF THE U. S. DEPARTMENT OF AGRICULTURE,
IN CHARGE, AND S. O. PERKINS, OF THE NORTH
CAROLINA DEPARTMENT OF AGRICULTURE.

W. EDWARD HEARN, INSPECTOR, SOUTHERN DIVISION.

[Advance Sheets—Field Operations of the Bureau of Soils, 1918.]



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LETTER OF TRANSMITTAL.

U. S. DEPARTMENT OF AGRICULTURE,

BUREAU OF SOILS,

Washington, D. C., January 6, 1920.

SIR: In the extension of the soil survey in the State of North Carolina during the field season of 1918 a survey was undertaken in Bertie County. This work was done in cooperation with the North Carolina Department of Agriculture.

I have the honor to transmit herewith the manuscript report and map covering this work and to request their publication as advance sheets of Field Operations of the Bureau of Soils for 1918, as authorized by law.

Respectfully,

MILTON WHITNEY,
Chief of Bureau.

Hon. D. F. HOUSTON,
Secretary of Agriculture.

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SOIL SURVEY OF BERTIE COUNTY, NORTH CAROLINA.

By R. C. JURNEY, of the U. S. Department of Agriculture, In Charge, and S. O. PERKINS, of the North Carolina Department of Agriculture.—Area Inspected by W. EDWARD HEARN.

DESCRIPTION OF THE AREA.

Bertie County lies in the northeastern part of North Carolina. The northern boundary line is about $21\frac{1}{2}$ miles south of the Virginia State line and about 70 miles south of Norfolk, Va. The boundary lines on the east, south, and west are formed by streams. The county has a total area of 682 square miles or 436,480 acres.

Bertie County lies almost entirely in the flatwoods section of the Coastal Plain, and the general surface is that of a low, flat plain varied with slight ridges and shallow stream valleys. Within this flatwoods plain the surface features vary in different sections of the county. In the eastern part, along the Chowan River from Salmon Creek to Colerain and then westward to Powellsville, the topography is gently rolling to rolling. In the western part of the county, from Roxobel southward through Lewiston to Quitsna, the surface is also gently rolling to rolling. Throughout the central part of the county, from the northern to the southern boundary, the topography is gently rolling, undulating, or flat. The flat areas are locally called "pocosons." The larger of these pocosons are Roquist, Buckleberry, and Pell Mell.



FIG. 1.—Sketch map showing location of the Bertie County area, North Carolina.

Along the Roanoke and Cashie Rivers there occur broken areas of terrace land. These terraces lie 10 to 20 feet below the uplands and have a gently rolling or undulating surface. Adjacent to the Roanoke River there is one large area of first bottom, varying in width from one-fourth mile to 6 miles. This area is almost level, with a gentle slope toward the stream and in the direction of its flow.

With the exception of those along the Chowan River, the slopes to practically all the streams are gradual or well rounded. Along the Chowan River there is an almost continuous, abrupt bluff, 20 to 40 feet in height.

There is little difference in elevation in different parts of the county. The highest reported elevation, that at Roxobel, is only 97 feet above sea level. At Kelford, also in the northern part, it is 93

feet, and at Aulander 69 feet. At Quitsna, which is situated in the upland only a mile from the Roanoke River lowlands, it is 53 feet. The slope of about four-fifths of the county is southeastward, and that of the remainder is northward. The main drainage divide runs westward from Perrytown to Roxobel.

The central part of the county is drained through Cashie River, Roquist Creek, Hoggard Mill Creek, White Oak Swamp, and Connaritsa Swamp. The northern part is drained by Loosing, Quiocconson, Barbecue, Cypress, and Chinkapin Swamps. The eastern and southeastern parts are drained by Salmon Creek. The Roanoke and Chowan Rivers receive directly only a small portion of the drainage waters of the county. Tributaries of the main drainage ways extend to nearly all sections, but the county nevertheless is inadequately drained. On account of the incompleteness of dissection considerable areas have poor surface drainage. Considerable areas still retain their constructional flatness, and in areas to which dissection has extended the channels of the smaller drainage ways are very shallow and often not well defined, so that the water movement is slow. The larger streams have cut their channels practically to base level and their flow is consequently sluggish. A few gristmills are operated along some of the creeks. The Cashie River is at "wind" tide level at Windsor. The more poorly drained areas of the county are included in Roquist, Buckleberry, and Pell Mell Pocosons and in smaller pocosons, in the first bottoms along the Roanoke River, and in the swamps along the Roanoke and Cashie Rivers. The better drained areas occur along the Chowan River and the Hertford County line, and in the vicinity of Roxobel, Lewiston, Quitsna, Windsor, and Woodard.

Bertie County was formed in 1738, and Hertford County was formed from part of its area in 1779. The county line has been changed only slightly since that date. The first recorded settlement was made at Colerain, about 1720. The early settlers were Scotch and Scotch-Irish, from Europe. English settlers came in later from Virginia. The population of the county has steadily increased, amounting in 1910 to 23,039. It is all classed as rural, and averages 32.8 persons to the square mile. The present population consists of the descendants of the early settlers, immigrants from near-by counties, and a large number of negroes. There is no foreign population. The population is unequally distributed over the county, the density varying, to a large extent, with the character of the soil. The poorly drained portions are the most sparsely settled. The more thickly settled parts of the county are in the vicinity of Colerain, Trap, Roxobel, Lewiston, Windsor, Woodard, and Merry Hill. The inhabitants in the region adjacent to the Roanoke River are principally negroes,

Windsor, the county seat, is the largest town, with a population in 1910 of 684. Other towns are Aulander, with a population of 543; Roxobel, with 491; Kelford, with 316; Colerain, with 189; Merry Hill, with 140; and Powellsville, with 75. These towns are important as local trading centers or lumbering points.

The railroad facilities of the county are inadequate. The Atlantic Coast Line Railroad from Norfolk to Rocky Mount crosses the northwestern corner of the county. A branch of the Seaboard Air Line extends into the northwestern part as far as Lewiston. The Wellington & Powellsville Railroad (narrow gauge) runs through the central part of the county from Ahoskie, Hertford County, to Windsor. The eastern and southern parts of the county do not have railroad facilities.

Steamboat lines, however, serve numerous landings and wharves on the Chowan and Roanoke Rivers, and on Cashie River as far as Windsor. Smaller boats ply up Salmon Creek as far as Mill Landing and up Cashote Creek to Cashote Landing. All these lines operate from Plymouth or Edenton.

Public roads reach into nearly all sections of the county. The highways are kept in good repair during the summer and fall months, but during the winter they are, in places, almost impassable. No improved roads have thus far been constructed.

Telephone lines and rural-delivery mail routes serve practically all the farms. Good churches and schools are located at convenient places throughout the county.

Practically all the cotton grown in the county is marketed at Norfolk, Va. The peanut crop is sold at Suffolk, Va., and the tobacco crop at Rocky Mount, N. C.

CLIMATE.

According to the records of the nearest available Weather Bureau station, at Edenton, in Chowan County, the mean annual temperature of this immediate region is 60.3° F. The winter mean is 42.5°, and the summer mean 77.5°. The highest recorded temperature is 100° F., reached in July, and the lowest is zero, reached in February. The date of the latest recorded killing frost in the spring is April 26, and that of the earliest in the fall, October 12. The average date of the last killing frost in the spring is April 1, and that of the first in the fall, November 1. This gives an average growing season of 214 days, which is sufficient for the maturing of all the farm crops usually grown.

The average annual rainfall is 50.93 inches. This is ample for the production of all the common crops. The precipitation is well distributed throughout the year, being heaviest in the summer, with an average total of 16.94 inches and lightest in the fall, with an average

of 10 inches. The rainfall in the driest year on record (1915) amounted to 35.53 inches, and in the wettest year on record (1906) to 69.34 inches.

The following table, compiled from the records of the Weather Bureau station at Edenton, represents approximately the weather conditions in Bertie County, as Edenton is only about 5 miles from the eastern boundary line of Bertie County.

Normal monthly, seasonal, and annual temperature and precipitation at Edenton, Chowan County.

Month.	Temperature.			Precipitation.		
	Mean.	Absolute maximum.	Absolute minimum.	Mean.	Total amount for the driest year (1915).	Total amount for the wettest year (1906).
	°F.	°F.	°F.	Inches.	Inches.	Inches.
December.....	43.1	75	12	3.47	2.90	3.80
January.....	42.6	78	12	3.55	3.60	4.30
February.....	41.7	79	0	4.49	1.55	5.80
Winter.....	42.5	79	0	11.51	8.05	13.90
March.....	51.6	90	17	4.21	2.20	5.50
April.....	58.3	93	28	3.36	2.50	1.10
May.....	68.3	95	35	4.91	3.00	3.25
Spring.....	59.4	95	17	12.48	7.70	9.85
June.....	74.8	99	46	4.91	6.00	9.27
July.....	79.5	100	52	6.52	4.45	16.18
August.....	78.3	99	50	5.51	1.90	10.38
Summer.....	77.5	100	46	16.94	12.35	35.83
September.....	72.3	98	40	3.31	2.60	2.46
October.....	61.2	88	28	3.98	3.53	6.40
November.....	51.2	84	20	2.71	1.30	.90
Fall.....	61.6	98	20	10.00	7.43	9.76
Year.....	60.3	100	0	50.93	35.53	69.34

AGRICULTURE.

Agriculture in Bertie County began about 1622, the year of the first land grant. At this period, however, there were only a few settlers in this region. About 1720 settlements were made along the Chowan River and later in the vicinity of Windsor and along the Roanoke River. The agriculture at first consisted in the production of wheat and corn and the raising of stock. The manufacture of tar,

pitch, turpentine, and staves, as well as lumbering and fishing, was an important source of income to the early farmers. The raising of cattle, hogs, and sheep for market was continued until a few years after the Civil War.

Before commercial fertilizer was introduced farmers used the fields until the soil was "worn out," when a new field was put in cultivation. The soil cultivated in this way was to a large extent the so-called "black land" of the county. The old fields now support a growth of pine which is large enough to be of commercial value.

The cultivation of cotton upon a commercial scale was begun immediately after the Civil War. Peanuts as a cash crop were introduced about 1879, and tobacco about 1898. From 1879 to 1889 corn was the most extensively grown crop, followed by cotton. The acreage devoted to peanuts increased rapidly, and by 1899 was slightly larger than that planted to cotton. Oats and wheat have gradually decreased in acreage since 1889.

The following table gives the acreage and production of the principal crops for the census years 1880, 1890, 1900, and 1910:

Acreage and production of principal crops, 1880 to 1910.

Crop.	1880		1890		1900		1910	
	<i>Acres.</i>	<i>Bushels.</i>	<i>Acres.</i>	<i>Bushels.</i>	<i>Acres.</i>	<i>Bushels.</i>	<i>Acres.</i>	<i>Bushels.</i>
Corn.....	37,735	345,091	35,868	270,233	40,312	481,080	31,818	288,370
Cotton.....	19,455	17,230	21,593	15,534	14,411	17,406	14,177	16,351
Peanuts.....			528	20,922	14,499	608,220	26,456	974,327
Oats.....	2,403	20,517	2,862	24,986	423	4,510	235	3,525
Wheat.....	309	2,189	100	1,141	64	570	15	154
Sweet potatoes.....	890	94,473	1,481	124,315	1,167	113,584	1,081	100,849
Tobacco.....	2	254			552	2379,780	877	2570,356
Cowpeas.....		27,402		3,635	844	11,098	467	4,970

¹ Bales.

² Pounds.

Agriculture in Bertie County at present consists in the production of both cash crops and subsistence crops. The leading money crops are peanuts, cotton, and tobacco, and the chief subsistence crops are corn and sweet potatoes.

There were 26,456 acres planted to peanuts in 1909, and the production amounted to 974,327 bushels, or an average of 37.2 bushels per acre. This yield is higher than the average for the peanut-growing section of the South. The Jumbo is the most common variety of peanut grown.

In 1909 cotton was planted to 14,177 acres and produced 6,351 bales, or an average of a little less than half a bale per acre. This is slightly more than the average for the Cotton Belt.

The area devoted to tobacco in 1909 was 877 acres and the production 570,356 pounds, or an average of 650 pounds per acre. The

tobacco grown consists of bright-leaf varieties used chiefly for the manufacture of cigarettes. The acreage in tobacco this year (1918) will be considerably increased, on account of the unusually high price.

The principal subsistence crop is corn. In 1909 there were 31,818 acres in corn, producing 288,370 bushels or an average of 9 bushels per acre. The bulk of the corn crop is fed to work stock on the farms. A small part is ground into meal for home use. Not enough corn is produced in the county for feeding purposes, and large quantities are imported annually.

Sweet potatoes were planted on 1,081 acres in 1909, and produced 100,849 bushels. The crop is used mainly at home, but a large quantity is sold on the local markets.

Oats occupied a total of 235 acres in 1909, and produced 3,525 bushels. The crop is fed to work stock, chiefly in the sheaf. There were only 15 acres in wheat in 1909, and the average yield was only 10 bushels per acre.

In 1909 there were 87 acres sown to tame or cultivated grasses, with a production of 179 tons. Peanut vines are used by many of the farmers for hay, and corn tops and fodder are stored for roughage. The county is not self-sustaining in hay and forage production. The census shows that 1,028 farms spent a total of \$38,357 for feed in 1909, or an average of \$37.31 per farm.

Crops of minor importance grown on nearly every farm for home use are Irish potatoes, sorghum, strawberries, garden vegetables, rye, cowpeas, and soy beans. Crimson clover and vetch are grown on a few farms. Practically every farm has a few fruit trees and grapevines. In 1910 there were 16,893 apple trees, 10,883 peach trees, and 1,151 grapevines in the county. There were also a few walnut and pecan trees.

Bertie County has no stock law, and the cattle are allowed free range. Stock raising is of little commercial importance. The census of 1910 reports a total of 2,810 dairy cows on farms. The better type of cattle are of Jersey breeding. Each farm has three or more hogs, the total number reported for the county in 1910 being 13,716. The pork produced is consumed chiefly at home. The hogs of recognized breeds are mainly Duroc-Jersey or Berkshire. There were 280 sheep and goats in the county in 1910. The wool is shipped to mills in the western part of the State and exchanged for blankets or cloth. Every farmer keeps a number of chickens, ducks, and geese.

The value of all animals sold or slaughtered in 1909 was \$151,256. Dairy products in that year were valued at \$6,342, and poultry and eggs at \$65,537. The total value of all crops in 1909 amounted to \$1,853,438.

Agriculture is confined almost entirely to the more rolling areas, where the run-off and internal drainage of the soils are naturally fair or good. There are large areas of land in the county which could be used for farming when reclaimed by drainage, but the problem is one calling for cooperative or State undertakings.

The adaptation of the different soils to certain crops is generally recognized. The Ruston fine sandy loam is generally considered the best cotton and peanut soil in the county. The Wickham fine sandy loam, Norfolk fine sandy loam, Dunbar fine sandy loam, and Dunbar very fine sandy loam are all considered good cotton, corn, and peanut soils. Tobacco does best on the Norfolk fine sandy loam and the more rolling areas of the Dunbar fine sandy loam. The Coxville, Portsmouth, and Bladen soils are not well developed agriculturally, on account of their inadequate drainage. These soils are called "po-coson lands." The Lufkin silt loam is known to have a less desirable structure than the soils of the Norfolk and Ruston series.

Land is usually broken in the early spring to a depth of 4 to 8 inches. A one-horse plow is generally used, but the better farmers use two-horse plows and break the land deeper. Peanuts as a rule are planted on a level seed bed, while corn and cotton are planted on low ridges. The rows in the case of peanuts and cotton are spaced about 3 feet apart, while the corn rows are spaced about 4 feet apart. Cotton is planted with a drill, and the stand is later thinned out with hoes. These crops are cultivated with sweeps, shovel plows, or walking cultivators.

Fields planted to peanuts are limed in the early spring, before the ground is broken, and "land plaster" is applied when the vines are in bloom. The nuts are generally harvested by cutting the tap roots with one-horse plows, the vines, with the peanuts attached, being lifted from the loose soil and allowed to wilt. Later the vines are stacked around poles in the field. The peanuts are picked by machinery, the harvest taking place during the fall months. The nuts are packed in 4-bushel bags, and nine-tenths of the crop is sold as soon as harvested. The vines are either used for hay or are returned to the soil as manure. Hogs are fattened on the peanuts inadvertently left in the fields.

In harvesting corn the leaves are stripped from the stalk about the time they begin to turn brown, tied in bundles, and hung on the stalk to dry. Later they are stored in the barn to be used as fodder for the work stock. In the fall the ears are pulled from the stalk, husked, and stored in cribs. The shucks are used as roughage for cattle.

Systematic crop rotations are seldom practiced in this county. A few of the better farmers follow a rotation which consists of

tobacco, crimson clover, whose stubble, after the cutting of hay, is turned under, and corn or cotton. A few farmers plant clover between the rows of cotton or corn, to be turned under the following spring. Cotton and peanuts, corn and peanuts, or tobacco and peanuts are alternated by most of the farmers, and the same crop is rarely planted in the same field for two successive years. Rye is grown to some extent as a cover crop, to be turned under during the spring for the purpose of enriching cotton or corn land.

Commercial and home-mixed fertilizers are used generally throughout the county. The census shows that 70.5 per cent of the farms used fertilizers in 1909, at a total outlay of \$157,807, or an average of \$62.33 per farm. Tobacco probably receives the heaviest fertilization. It is usually given 800 to 1,200 pounds of an 8-4-4, 9-3-3, 9-4-4, or 8-3-3 fertilizer.¹ Cotton land is treated with 400 to 1,000 pounds per acre of an 8-2-2, 8-3-1, 8-3-3, or 9-2-2 fertilizer, and corn land with 400 to 800 pounds of an 8-2-2, 8-3-1, or 9-2-2 fertilizer. From 100 to 200 pounds of sodium nitrate per acre is also given corn about tasseling time. Peanuts receive no commercial fertilizer, but lime is applied to the land before planting, at the rate of 500 to 1,000 pounds per acre, and the crop is also given an acreage application of 200 to 400 pounds of land plaster at blossoming time. The land plaster is used on the peanuts to make the pods fill out. Peanuts usually follow a fertilized crop.

Most of the fertilizers used are ready mixed, but many of the farmers use home mixtures, the necessary ingredients being supplied by suitable combinations of some of the following carriers: Acid phosphate, kainit, bone meal, tankage, nitrate of soda, and cottonseed meal. A popular mixture consists of acid phosphate and cottonseed meal. Barnyard manure is composted and applied to the land. Soy beans, clover, rye, and cowpeas are grown to a small extent for soil improvement. The most common method of obtaining organic matter for the soil is composting, along the fences in the field, a mixture of ditch-bank earth, pine straw, forest earth, stable manure, and peanut tops. This composting is done during the winter months, and the mixture is nearly all applied in the drill at or just before planting. This material not only adds organic matter and mineral plant food but also improves the working qualities of the soil.

Most of the farm laborers are negroes. The monthly wage ranges from \$30 to \$37.50, without board, and from \$15 to \$20 with board. Cotton pickers receive 75 cents to \$1.25 per hundred pounds of seed cotton. The cotton is picked chiefly by women and children. The 1910 census reports the use of hired labor by 49.5 per cent of the farms of the county, at a total expenditure of \$147,200, or \$93.50 each.

¹ Containing 8 per cent available phosphoric acid, 3 per cent nitrogen, and 3 per cent potash.

In 1910 the average size of the farms in Bertie County was 88.7 acres.¹ There are, however, many farms between 100 and 300 acres in extent, and a few holdings comprise 1,000 acres or more. There were 3,183 farms in the county in 1910, 53.8 per cent of which were operated by the owners, 45.9 per cent by tenants, and 03 per cent by managers. There has been a steady increase in the percentage of farms operated by tenants.

Farms are rented mainly on a share basis. When the landlord furnishes the work stock and fertilizer, the tenant receives one-third of the crop. When the tenant furnishes the work stock and half the fertilizer he receives one-half the crop. Cash rent ranges from \$3 to \$10 an acre, with no additional charge for improvements.

The average assessed value of farm land in this county in 1910 was \$12.36 an acre. Land values vary from place to place, depending on the improvements and the character of the soil, the acreage cleared, and the location with respect to markets, highways and railroads. Land values range from \$20 to \$100 an acre. The value of the wooded land depends upon the quantity and quality of the forest growth.

SOILS.

Bertie County lies wholly within the Coastal Plain province of North Carolina, and within that part of the Coastal Plain designated as the Flatwoods. The upland soils have been formed, through weathering processes, from unconsolidated deposits of fine sandy clay, silty clay, and clay deposited on an ancient sea floor, and subsequently elevated above water. The soils thus formed are grouped into series on the basis of differences in character of the soil material, color, structure, drainage, topography, and crop adaptation.

There are two distinct underlying clay formations, which differ in age. The older begins just south of Lewiston and extends in a southeasterly direction across the southern part of the county. It also occurs in narrow strips along stream breaks in the northern part. It consists of yellow, brown, and gray, heavy, tough, stratified, fine sandy clay or clay, streaked with red. It is locally called "white-oak clay." The soils of the Lufkin and Bladen series are derived from this formation.

In the northern and western parts of the county the underlying formation is composed of mottled yellow, gray, brown, and red fine sandy clay and silty clay. This clay material is not so tough or heavy as that in the southern part of the county. It gives rise to the Norfolk, Ruston, Dunbar, Coxville, and Portsmouth soils.

The textures of all these soils are prevailingly fine, and, with the exception of the Norfolk and Ruston series, the subsoils are heavy and mottled in color.

¹ Each tenancy is tabulated as a "farm."

The second-bottom alluvial soils along the Cashie River and the smaller streams of the county are composed of reworked Coastal Plain sediments. The second and first bottom soils adjacent to the Roanoke River represent reworked material transported from the uplands of the Piedmont Plateau and Appalachian Mountain provinces. The soils of the second bottoms are included in the Cahaba, Kalmia, and Wickham series, and those of the first bottoms in the Congaree series.

The surface soils of the types in the Norfolk series are light gray to grayish yellow, and the subsoils are yellow and friable. Three types, the fine sand, sandy loam, and fine sandy loam, are mapped in Bertie County.

The Ruston series includes types with gray to brownish surface soils and reddish-yellow to yellowish-red, dull-red, or yellowish-brown, moderately friable sandy clay subsoils. Two types, the fine sandy loam and very fine sandy loam, are mapped.

The members of the Dunbar series have prevailingly gray surface soils. The upper subsoils are yellow and, in the case of the heavier types, tough and compact. The lower subsoils are tough and slightly plastic clays of yellow color, mottled with bright red, or red and gray. The Dunbar soils represent a gradation between the Norfolk on the one side and the Coxville on the other. Two types are found in this county, the fine sandy loam and very fine sandy loam.

The types belonging to the Lufkin series have light-gray surface soils, underlain by impervious, tough clay, mottled yellow and gray. The subsoil is spotted with red in places. The difference in texture between surface soil and subsoil in the case of the sandy members is very marked. Two types are mapped in Bertie County, the fine sandy loam and silt loam.

The surface soils of the types classed in the Coxville series are light gray to dark gray. The subsoil is a mottled gray and yellow plastic clay, containing splotches of bright red. Two types, the fine sandy loam and silt loam, are mapped in this survey.

The surface soils of the members of the Bladen series are steel gray, or gray mottled slightly with brown. They are underlain by steel-gray, plastic clay subsoil, mottled with rusty brown or ochereous yellow. This series is represented in this county by two types, the fine sandy loam and silty clay loam.

The Portsmouth series includes types with dark-gray to black surface soils, high in organic matter, and light-gray to mottled gray and yellow subsoils. The heavier members are always plastic, though usually carrying a noticeable amount of sand. Two types, the fine sandy loam and loam, are mapped in this county.

The surface soils of the members of the Cahaba series are brown to reddish brown, or gray, and the subsoils are yellowish red to red-

dish brown. The members of this series occupy old stream terraces, lying largely above overflow, and represent the best-drained land of such terraces. Only one type, the fine sandy loam, is mapped in this county.

The surface soils of the types grouped in the Kalmia series are gray to grayish yellow and the subsoils are yellow or mottled gray and yellow. In the better drained situations the subsoil is yellow, resembling that of the corresponding member of the Norfolk series. The Kalmia series is developed along streams of the Coastal Plain region on terraces lying largely above overflow. It is represented in Bertie County by two types, the fine sand and the fine sandy loam.

The Wickham series is composed of types having reddish or reddish-brown surface soils, which contain a higher percentage of organic matter than the surface soils of the Norfolk types. The subsoil usually consists of reddish, micaceous, heavy sandy loam or loam, becoming coarser and looser at a depth of about 30 inches. The soils of this series occupy river terraces in the higher part of the Coastal Plain, near the Piedmont Plateau boundary. Two members are mapped in this survey, the fine sandy loam and silt loam.

Both surface soil and subsoil of the types grouped in the Congaree series are brown to reddish brown, there being comparatively little change in texture, structure, or color from the surface downward. Occasionally grayish and yellow mottlings are encountered in the subsoil of the poorly drained areas. The Congaree soils are developed in the overflowed first bottoms of Piedmont streams and in similar positions in the Coastal Plain region along streams issuing from the Piedmont. The material is derived from the soils of the Piedmont region with some admixture of Appalachian material and, along the courses of the streams in the Coastal Plain, a slight commingling of Coastal Plain material. Only one member of the Congaree series is mapped in this county, the silty clay loam.

Swamp represents material variable in texture and structure, permanently wet or covered with water, and occurring in the first bottoms of streams. New material is constantly being added to the Swamp areas.

In all, twenty-one soil types, in addition to Swamp, are mapped. The following table shows the actual and relative extent of the various types:

Areas of different soils.

Soil.	Acres.	Per cent.	Soil.	Acres.	Per cent.
Swamp.....	67,904	15.5	Dunbar fine sandy loam.....	28,736	6.6
Coxville silt loam.....	66,432	15.2	Ruston fine sandy loam.....	27,776	6.4
Dunbar very fine sandy loam	65,280	14.9	Norfolk fine sandy loam.....	27,712	6.3
Lufkin silt loam.....	40,832	9.3	Congaree silty clay loam.....	20,416	4.7
Bladen silty clay loam.....	36,096	8.3	Lufkin fine sandy loam.....	19,520	4.5

Areas of different soils—Continued.

Soil.	Acres.	Per cent.	Soil.	Acres.	Per cent.
Portsmouth loam.....	6,912	1.6	Coxville fine sandy loam.....	1,920	.4
Wickham silt loam	3,968	.9	Kalmia fine sand	1,728	.4
Ruston very fine sandy loam.	3,904	.9	Kalmia fine sandy loam.....	1,600	.4
Wickham fine sandy loam....	3,776	.9	Bladen fine sandy loam.....	1,600	.4
Portsmouth fine sandy loam..	3,520	.8	Cahaba fine sandy loam.....	1,344	.3
Norfolk fine sand.....	3,392	.8			
Norfolk sandy loam.....	2,112	.5	Total.....	436,480

NORFOLK FINE SAND.

The surface soil of the Norfolk fine sand is a light-gray to yellowish-gray fine sand, 6 to 10 inches deep. It is underlain by a pale-yellow, loose, incoherent fine sand extending to a depth of 3 feet or more. Occasionally a loamy fine sand or friable fine sandy clay is encountered at 30 or 32 inches below the surface.

Near Quitsna and Jordans Landing the surface soil is a light-brown or yellowish-brown, slightly loamy fine sand, and the subsoil is a yellowish-red to reddish-brown fine sand. Had this soil occurred in sufficiently large areas it would have been mapped as Ruston fine sand.

The Norfolk fine sand occurs in comparatively small bodies, usually in close association with the Norfolk fine sandy loam. The largest areas are mapped northwest of Windsor and southeast of Spellers Ferry Landing. Small bodies are distributed through the northwestern, northeastern, and southern parts of the county. The type is slightly higher in elevation than the surrounding soils. Its surface is gently rolling to hummocky, with here and there a few ridges and knolls. Both the soil and subsoil are open and porous and permit free passage of water, and the type has excellent surface and internal drainage.

The Norfolk fine sand is unimportant agriculturally, owing to its small extent. Most of it is farmed, the remainder being forested, chiefly with pine. The principal crops grown are peanuts, cotton, and corn. Sweet potatoes and other vegetables are produced for home consumption. Yields on this type are lower than on the Norfolk fine sandy loam. Peanuts have been found one of the best crops, yielding 35 to 60 bushels per acre. Cotton yields from one-fourth to three-fourths bale, and corn from 10 to 25 bushels per acre. A small total acreage is devoted to the production of bright tobacco. All the crops are fertilized to a greater or less extent, and the better yields mentioned are obtained with the aid of heavy fertilization.

This type can be greatly improved by the addition of organic matter in the form of stable manure or green-manuring crops, such as cowpeas, vetch, soy beans, or rye. The soil is well suited to the production of truck crops, Irish potatoes, sweet potatoes, Muscadine grapes, and early vegetables.

NORFOLK SANDY LOAM.

The surface soil of the Norfolk sandy loam consists of a gray to light-gray, medium loamy sand or light sandy loam, 5 or 6 inches deep, passing into a pale-yellow sandy loam, which extends to a depth of 10 to 16 inches. The subsoil is a yellow, friable sandy clay continuing to a depth of 3 feet or more.

Included with this type are some small areas having a coarser texture and a slightly deeper surface soil. In some places also the lower subsoil becomes reddish or mottled with red.

Areas of Norfolk sandy loam are found at Lewiston and 2 miles north of Grabtown. It occurs in relatively high interstream areas, whose topography is level to gently rolling. Owing to the porous nature of the surface soil and the friable subsoil, the surface and internal drainage is good.

This is an important type agriculturally, although it has only a small extent. Practically the entire type is under cultivation except for a few small areas of pine forest.

The type is used mainly for the production of peanuts, cotton, and corn. Tobacco is grown to a small extent, and garden vegetables and melons are produced for home use. Peanuts yield 60 to 80 bushels per acre, cotton one-half to 1 bale, corn 20 to 35 bushels, and tobacco 600 to 1,000 pounds. The type is fertilized with about the same amounts and kinds of fertilizer as are used on the Norfolk fine sandy loam. This type of soil ranges in selling price from \$40 to \$150 an acre.

The Norfolk sandy loam is deficient in organic matter. This can be supplied by the turning under of clover, vetch, or cowpeas. A good system of crop rotation would prove beneficial. The type is well adapted to the production of bright-leaf tobacco, and it is used in other counties for that purpose. It is also well suited to truck crops.

NORFOLK FINE SANDY LOAM.

The surface soil of the Norfolk fine sandy loam is a light-gray or yellowish-gray, mellow loamy sand, passing at 4 to 6 inches into a pale-yellow fine sandy loam or loamy sand which extends to 10 to 18 inches in depth. The subsoil is a bright-yellow, friable fine sandy clay, continuing to 3 feet or more in depth.

The surface soil in the wooded areas is usually gray or dark gray. The lower subsoil in the flatter areas and in those adjoining the

Dunbar soils is slightly heavier than typical and mottled with gray or red and gray. Included in the type are some bodies of fine sand too small to show on the map.

The Norfolk fine sandy loam occurs in the northeastern part of the county in the vicinity of Colerain and north of Trap. It is very extensive in the northwestern part around Roxobel and Kelford and north of Lewiston. Rather large areas are situated in the southern part south of Woodard and in the vicinity of Drew and Parker School. The type occurs in the higher and better drained parts of the county. It has an undulating to gently rolling surface, and the surface and internal drainage is good, although some of the flatter areas require ditching. This is an important type agriculturally. About 60 per cent of it is cleared and cultivated, the remainder being forested with pine, dogwood, oak, and hickory. A large proportion of the wooded area was formerly in cultivated fields.

This type is used for the production of cash crops, consisting of peanuts, cotton, and tobacco, and for the growing of corn for feeding work stock and for the making of meal for home use. Minor crops grown for home use are sweet potatoes, Irish potatoes, garden vegetables, and melons. Rye, soy beans, clover, and cowpeas are grown for feed and as soil-improving crops to a limited extent. Peanuts yield 50 to 75 bushels per acre, cotton one-half to 1 bale, corn 20 to 40 bushels, and tobacco 800 to 1,000 pounds.

All crops are fertilized except possibly peanuts, which are, however, alternated with a fertilized crop. Lime, at the rate of 500 to 1,000 pounds per acre, is applied to peanut land in the spring before breaking, and at the time the vines blossom from 200 to 400 pounds per acre of land plaster is used. Cotton usually is fertilized with 500 to 600 pounds per acre of an 8-2-2 or 9-2-2 fertilizer. Corn receives 400 to 500 pounds, in addition to a side application of 100 to 150 pounds per acre of sodium nitrate, applied at tasseling time. Tobacco is given an acreage application of 800 to 1,000 pounds of an 8-3-3, 8-4-4, or 9-4-4 fertilizer. Many farmers use a home mixture of acid phosphate and cottonseed meal for cotton and corn, applying this at the rate of 600 to 800 pounds per acre.

This type of soil sells at \$30 to \$100 an acre, depending upon the improvements, the nearness to towns and railroads, and the value of the timber growth.

The Norfolk fine sandy loam is mellow and easily tilled. It is decidedly deficient in organic matter, and this should be supplied by the growing and turning under of legumes, such as clover, cowpeas, vetch, or soy beans. Clover could be planted between the rows of clean-cultivated crops and turned under the following spring. The type is well suited to the production of bright-leaf tobacco. It is also a good soil for Irish potatoes, melons, and truck crops.

RUSTON FINE SANDY LOAM.

The surface soil of the Ruston fine sandy loam is a gray to brown, light loamy fine sand, passing at about 6 inches into a yellow to reddish-yellow or reddish-brown fine sandy loam which extends to a depth of 10 to 15 inches. The subsoil is a yellowish-red or reddish-brown, friable fine sandy clay, having a depth of 3 feet or more.

Included with this type are a few small areas which have a brown, fine sandy loam surface soil and a brick-red, friable sandy clay subsoil. The largest of these areas is situated about 2 miles south of Mount Olive Church. They represent the Orangeburg fine sandy loam, but owing to the small extent of that soil are mapped with the Ruston.

To the south of Sans Souci and about 4 miles southwest of Powellsville the surface soil is a gray or brown loamy sand with a sandy clay subsoil. This soil contains a larger percentage of coarse sand than the typical Ruston fine sandy loam, but does not differ in topography, crop yields, or cultural methods.

Included with the typical Ruston fine sandy loam are some patches of loamy sand and fine sand which occupy knolls and hillocks. The soil here has evidently been modified by wind action.

The Ruston fine sandy loam is most extensive in the western and southern parts of the county. Its largest development occurs west of Roxobel and Kelford, northeast of Lewiston, near Quitsna, Grabtown, Millers Store, and Woodard, and along the slopes to the Cashie River. The type occupies relatively high interstream areas and slopes leading to streams. The surface is gently undulating to rolling. The areas in the southern part of the county are hummocky in places, as a result of wind action. The drainage of the type is well established.

This is an important agricultural soil. About 80 per cent of it is under cultivation, the remainder being forested, principally with pine. Peanuts and cotton are the principal cash crops, usually grown in rotation. Corn is grown as a subsistence crop for feeding work stock. The greater part of the type is farmed by tenants.

Peanuts on this soil yield 50 to 80 bushels per acre, cotton three-fourths bale to $1\frac{1}{2}$ bales, and corn 25 to 50 bushels. The fields devoted to peanuts are limed and treated with land plaster as on the other soils of the county. Cotton and corn receive 400 to 800 pounds per acre of an 8-3-2 or 8-2-2 fertilizer, and corn in addition is given an acreage application of 100 to 150 pounds of sodium nitrate when the ears first appear. Crops on this type are usually cultivated level.

Land values on the Ruston fine sandy loam range from \$40 to \$100 an acre, depending upon the state of improvement and the nearness to markets.

The Ruston fine sandy loam is easily tilled and is probably the most productive soil in the county. The growing of winter cover crops, such as rye or clover, would be beneficial.

RUSTON VERY FINE SANDY LOAM.

The surface soil of the Ruston very fine sandy loam is a gray to light-brown or reddish-brown, mellow very fine sandy loam, 6 to 10 inches in depth. It is underlain to a depth of 36 inches by a subsoil of yellowish-red to reddish-yellow, compact, rather tough very fine sandy clay. In places the subsoil becomes lighter in color and heavier in structure in the lower portion of the 3-foot section.

The largest areas of Ruston very fine sandy loam are encountered along Indian Creek and on the slopes adjoining Connaritsa Swamp. The surface is undulating to rolling, and drainage is adequate except in some of the more nearly level areas, where ditching is necessary.

The Ruston very fine sandy loam is of relatively small extent, and it is unimportant agriculturally. About 40 per cent of it is under cultivation. The remainder is forested chiefly with pine, together with some oak, hickory, and dogwood.

Peanuts, cotton, and corn are the principal crops grown. Sweet potatoes, Irish potatoes, and vegetables are produced in small quantities for home use. Peanuts yield 50 to 60 bushels per acre, cotton, one-half to three-fourths bale, and corn, 15 to 25 bushels. Crops are fertilized in a similar way to those on the Ruston fine sandy loam.

Land values range from \$25 to \$60 an acre, depending upon the state of improvement and the value of the timber growth.

DUNBAR FINE SANDY LOAM.

The surface soil of the Dunbar fine sandy loam is a light-gray to brownish-gray fine sandy loam, 8 to 10 inches deep. It is underlain by a yellow, tough, compact fine sandy clay to clay substratum which extends to an average depth of 20 inches. Below this depth the subsoil is a mottled yellow, gray, and red, tough, slightly plastic clay, continuing to 3 feet or more in depth. The surface soil is slightly darker than typical in wooded areas, and in some places it is yellowish brown as a result of the accumulation of iron concretions. In many of the fields the soil when wet has a brown color, and there are occasional yellowish, partially eroded spots, on knolls and slopes. In some areas, pockets or thin layers of light-gray fine sand are encountered in the lower subsoil. The red mottlings are absent in the subsoil in some areas.

The Dunbar fine sandy loam is confined principally to the northeastern part of the county, in the vicinity of Mount Gould, Colerain,

Wakelon, Rosemead, and Trap. Smaller areas are found at Hexlena, Willifords School, and Aulander, and also near Mount Olive Church, Parker School, Drew, and Ross Church. The type is encountered on interstream divides and to a lesser extent on slopes leading to drainage ways.

The surface ranges from nearly level to rolling or even strongly rolling. The strongly rolling areas occur along draws and on breaks adjacent to the Chowan River. The surface drainage of the type is good, but the internal drainage is inadequate on account of the impervious nature of the subsoil, and ditching is necessary in many of the cultivated fields.

The Dunbar fine sandy loam is an important type agriculturally, since about 80 per cent of it is under cultivation. The remainder supports a growth of timber, chiefly pine, together with some dogwood, oak, and hickory. The principal cash crops are peanuts, cotton, and tobacco. Corn is grown as feed for work stock, and sweet potatoes, Irish potatoes, and vegetables for home use.

Peanuts yield 50 to 85 bushels per acre, cotton one-half to 1 bale, corn 20 to 40 bushels, and tobacco 800 to 1,200 pounds. Peanut land is given an acreage application of 800 to 1,000 pounds of lime before breaking, and land plaster is applied later at the rate of 200 to 400 pounds per acre. For cotton an acreage application of 500 to 1,000 pounds of an 8-2-2, 9-2-2, or 8-3-3 fertilizer is made. Corn is given 500 to 650 pounds per acre of an 8-2-2 or 9-2-2 fertilizer, which is supplemented at tasseling time with a side dressing of sodium nitrate, applied at the rate of 100 to 200 pounds per acre. Tobacco receives 800 to 1,200 pounds per acre of an 8-2-2, 8-4-4, or 9-3-3 fertilizer. For corn and cotton many farmers use a home-mixed fertilizer consisting mainly of acid phosphate and cottonseed meal, this being applied at the rate of 600 to 800 pounds per acre.

A few of the best farmers increase yields by sowing the fields to crimson clover. Cotton on clover sod yields an average of about 1½ bales per acre, and corn an average of 60 bushels. A few farmers also grow clover, cowpeas, or soy beans as soil improvers. All these crops do well.

This land sells for \$50 to \$100 an acre, depending on the improvements, the nearness to market, and the value of the timber growth.

The Dunbar fine sandy loam is in need of more organic matter, which can be supplied by growing and turning under crimson clover, vetch, rye, cowpeas, or cowpea vines. The soil is well adapted to crimson clover. Deeper plowing would be beneficial, and the soil should be stirred a little deeper each year. Deeper ditching and liming would benefit the flatter areas. This soil is well suited to growing Irish potatoes, sweet potatoes, and truck crops.

DUNBAR VERY FINE SANDY LOAM.

The surface soil of the Dunbar very fine sandy loam is a gray very fine sandy loam, underlain at 6 to 8 inches by a yellow, tough, compact very fine sandy clay or silty clay which extends to an average depth of 20 inches. The lower subsoil, which begins at this point, consists of a mottled yellow, gray, and red, tough and slightly plastic clay which extends to 3 feet or more in depth. In plowed fields the surface soil when wet has a brownish cast, and it is sometimes brown in wooded areas, owing to the oxidation of iron concretions. South of Rices School the surface soil is black, owing to a large accumulation of organic matter. In some of the more rolling areas the mottled subsoil is not reached above a depth of 24 to 28 inches.

The Dunbar very fine sandy loam is developed mainly in the northern and central parts of the county. The largest areas occur near Aulander, Hexlena, Center Grove Church, Powellsville, Burdens School, Ebenezer Church, Rices School, Peele School, and Pritchards School, and in the eastern part of the county near Riverside School and Ashley Church. The type occurs in close association with the Coxville silt loam, and occupies relatively low inter-stream areas and gentle slopes leading to the streams. It is slightly higher in elevation than the Coxville silt loam, and slightly lower than the Dunbar and Norfolk fine sandy loams. The topography is level or only gently undulating, and run-off and internal drainage are not well established. Ditching is necessary before the type can be successfully cultivated.

The Dunbar very fine sandy loam is an important agricultural soil. About 40 per cent of it is under cultivation, the remainder supporting a growth of pine which is cut for lumber. The most important crops grown are peanuts, cotton, corn, and tobacco. Sweet potatoes, Irish potatoes, and other vegetables are produced for home consumption. Soy beans, clover, vetch, oats, and cowpeas are grown to a small extent.

Peanuts yield 40 to 60 bushels per acre, cotton one-half to three-fourths bale, corn 15 to 25 bushels, and tobacco 800 to 1,000 pounds. Soy beans, cowpeas, clover and oats do well.

Peanut land is given about the same fertilizer treatment as on the Dunbar fine sandy loam. Cotton receives an acreage application of about 500 to 600 pounds of an 8-2-2 or 8-3-3 fertilizer. Corn is given 400 to 500 pounds per acre of an 8-2-2 or 9-2-2 fertilizer, supplemented by a side application of 100 to 200 pounds of nitrate of soda. Tobacco land is treated with 800 to 1,000 pounds per acre of an 8-3-3 or 8-4-4 fertilizer.

Land of this type sells for \$30 to \$75 an acre, depending upon the improvements, the nearness to railroads, and the quality and quantity of the timber growth.

The suggestions made for the improvement of the Dunbar fine sandy loam apply equally well to this type.

LUFKIN FINE SANDY LOAM.

The surface soil of the Lufkin fine sandy loam is a gray to light-gray loamy fine sand to light fine sandy loam, passing at 5 to 6 inches into a yellow fine sandy loam which extends to 10 or 12 inches. The subsoil begins as a dull-yellow or light-brown, tough clay, and passes immediately into a mottled yellow and gray, heavy, tough clay which frequently shows mottlings of red at a depth of 24 to 30 inches. At 30 inches the subsoil is usually a bluish-gray, heavy clay, only slightly mottled with yellow or red.

The Lufkin fine sandy loam is developed chiefly in the southern and southeastern parts of the county, near Cooper School, St. Lukes Church, Cashote Landing, Avoca, Black Rock, Edenhouse, and Ashley Church. Smaller areas are found near Mount Olive Church and 2 miles south of Powellsville. The type occupies interstream areas and slopes adjoining streams, and the surface is level or gently rolling. The run-off is good, but the internal drainage is inadequate in places on account of the impervious nature of the subsoil, and ditching is necessary for the flatter areas.

This is an important soil agriculturally, although it is of small extent. About 70 per cent of it is farmed. The remainder is forested, principally with pine, supplemented by dogwood, hickory, and white oak. The principal crops grown are peanuts, cotton, and corn. Tobacco is produced to a small extent. Sweet potatoes, Irish potatoes, and garden vegetables are grown for home use. Oats, rye, cowpeas, and soy beans are grown by a few farmers.

Peanuts yield 50 to 80 bushels per acre, cotton one-half bale to 1½ bales, corn 25 to 40 bushels, and tobacco 600 to 1,000 pounds. Oats, soy beans, and cowpeas do well.

From 400 to 800 pounds per acre of an 8-2-2, 8-3-1, or 8-3-3 fertilizer is applied to cotton fields. Corn receives similar fertilization with the addition of 50 to 150 pounds of sodium nitrate per acre. Tobacco ground is treated with 800 to 1,000 pounds per acre of an 8-3-2 or 8-3-3 fertilizer. In growing peanuts the soil is limed and later treated with land plaster.

This type of land is valued at \$50 to \$75 an acre, depending upon the state of improvement.

The Lufkin fine sandy loam is deficient in organic matter. This can be supplied by growing and turning under clover, vetch, cowpeas, or rye. Deeper plowing each year would also prove beneficial.

LUFKIN SILT LOAM.

The surface soil of the Lufkin silt loam, which is locally called "white-oak land," is a light-gray to gray, rather heavy silt loam, 5

to 8 inches deep, underlain by a dingy-yellow substratum of heavy silty clay or clay which extends to a depth of 12 to 16 inches. The subsoil, which extends to a depth of 36 inches or more, is a heavy, tough silty clay or clay, mottled yellow and gray with specks of red. The gray color becomes more pronounced in the lower portion of the 3-foot section.

In the more rolling areas and on slopes near streams the dull-yellow substratum is absent, and the mottled yellow and gray subsoil is encountered immediately below the surface soil. In the vicinity of Merry Hill the surface soil contains an appreciable proportion of very fine sand.

The Lufkin silt loam is developed mainly in the western, southern, and southeastern parts of the county. The largest areas are found west and south of Woodville, south and east of Windsor, near Fulcher School, at Cooper School, and around and south of Merry Hill. Small areas are encountered near the streams in the northern part of the county. The type occupies interstream positions and slopes approaching streams. The surface is level to gently rolling, becoming more rolling near the streams. The surface drainage is adequate, but the internal drainage is poor on account of the impervious subsoil.

This is an unimportant type agriculturally. About 25 per cent of it is under cultivation, the remainder being forested with pine, white oak, and some dogwood and hickory. White oak is a characteristic tree on this soil, but it is unsuitable for lumber. Pine trees make a rapid growth on this type, and much of it is used for the production of pine timber.

The principal crops grown are peanuts, cotton, and corn. A few small patches of wheat are sown. Sweet potatoes, Irish potatoes, and vegetables are grown for home use. Oats, rye, cowpeas, and soy beans are produced to a small extent.

Peanuts yield 30 to 70 bushels per acre, cotton one-fourth to one-half bale, corn 15 to 30 bushels, and wheat 10 to 15 bushels. Clover, oats, grasses, soy beans, and cowpeas give good returns. Peanuts are given practically the same application of lime and land plaster as on the Lufkin fine sandy loam. Corn and cotton receive 400 to 800 pounds per acre of an 8-2-2 or 8-3-1 fertilizer. Corn in addition is given a side application of sodium nitrate, amounting to 50 to 150 pounds per acre.

Owing to its plasticity, public roads over areas of the Lufkin silt loam are difficult to travel during the winter, on account of their miry condition. The soil "runs together" when wet, and bakes and clods upon drying, making cultivation difficult.

This land is valued at \$25 to \$50 an acre, depending upon the improvements or the value of the timber growth.

The Lufkin silt loam appears to be well adapted to wheat and grasses, and these crops could be grown more extensively. To improve the intractable structure of the soil, green-manuring crops such as rye, clover, cowpeas, or soy beans should be grown and plowed under. Plowing deeper each year and giving heavier applications of lime would also be beneficial.

COXVILLE FINE SANDY LOAM.

The surface soil of the Coxville fine sandy loam consists of a gray to dark-gray fine sandy loam, 7 to 10 inches deep. The subsoil is a mottled yellow and gray, stiff, rather plastic clay or fine sandy clay, grading at 18 to 20 inches into a heavy, plastic silty clay mottled with yellow, gray, and splotches of bright red. This material continues to a depth of 3 feet or more.

This type is of very small extent. The largest areas occur near Lewiston, along the Hertford County line, northwest of Drew, and at Peterson in the southeastern part of the county. Smaller areas are found in other parts. The type occupies low, flat situations, and the run-off and internal drainage are poor.

Only a small part of this type is cultivated, the remainder being forested with pine and a few sweet-gum trees. Corn and cotton are grown to a small extent. Corn yields 10 to 15 bushels per acre, and cotton one-fourth to one-half bale. Oats are grown in a few places and give good yields.

This type can be made more productive by deeper ditching and by liming. It is apparently well suited to corn, oats, soy beans, and strawberries.

COXVILLE SILT LOAM.

The surface soil of the Coxville silt loam consists of a gray to dark-gray or brownish-gray, rather compact silt loam, 6 to 10 inches deep. It is underlain to an average depth of 20 inches by a yellow, compact silty clay loam mottled with gray. At about 20 inches the subsoil begins as a mottled yellow, gray, and bright-red, heavy, plastic silty clay or silty clay loam, extending to 3 feet or more.

The surface 1 or 2 inches in the flatter areas is frequently black. Occasionally the upper subsoil is pale yellow, instead of mottled yellow and gray. The red mottlings of the lower subsoil are often absent, and in other places not encountered above depths of 30 to 36 inches.

The Coxville silt loam, which is locally referred to as "pocoson land," is mapped in practically all sections of the county, but is most extensive in the northern and central parts. The largest areas are found in Wahtom, Beaverdam, Hearts Delight, Haw, and Pell Mell Pocosons. Smaller areas are situated at Myers School, Piney Grove

Chapel, Piney Grove School, Rays School, Rocky Branch School, Parker School, Drew, Greens Cross Church, and 1 mile south of Wakelon. The type occupies broad, flat interstream positions, slightly lower than the associated Dunbar very fine sandy loam.

The surface is flat or only gently undulating, and drainage has not been fully developed. The streams are shallow and sluggish, and the type is water-logged and miry during much of the year, especially during the winter.

This is one of the most extensive types in the county, but less than 5 per cent of it is under cultivation. The remainder is forested, mainly with pine. There is a scattered growth of small oak and sweet gum, with an undergrowth of gallberry bushes. The wooded areas are used to some extent as range for cattle and hogs, and the pine growth is cut for timber at frequent intervals.

The small part of the type farmed is used mainly for the production of corn and cotton. A small acreage is devoted to the growing of oats, soy beans, and garden vegetables. On account of the poor drainage the yields are low. Corn yields 10 to 15 bushels per acre, and cotton one-fourth to one-half bale. Oats, soy beans, and garden vegetables give good results.

The selling value of this land depends largely upon the quantity and quality of the timber growth.

In order to reclaim the greater part of this type, drainage by organized districts will be necessary. When the land is thoroughly drained, heavy applications of lime, coarse stable manure, and green manures will be necessary to improve its structure and texture. The type if reclaimed would be well suited to the production of corn, cotton, grass, and forage crops. At present, however, it is probably best suited for the production of pine timber.

BLADEN FINE SANDY LOAM.

The surface soil of the Bladen fine sandy loam consists of 8 to 12 inches of gray to brownish-gray loamy fine sand to light fine sandy loam, slightly mottled with brown. The subsoil, which extends to a depth of 3 feet or more, is a steel-gray, heavy, plastic, sticky fine sandy clay or clay, mottled with brown or yellow. Occasionally these mottlings occur only at depths of 24 to 30 inches.

The Bladen fine sandy loam is of small extent. The largest areas occur at the head of Chinkapin Swamp southwest of Colerain, near Grabtown, and in the Connaritsa Pocoson. The type occupies low, flat situations, and the drainage is poorly established.

On account of its small extent, this is an unimportant agricultural soil. Only a few small areas are cultivated, the remainder being wooded with oak, gum, maple, beech, elm, and pine. Corn and oats

are the chief crops. Some hay is produced. Corn yields 25 to 45 bushels per acre, and oats give good yields. The soil if properly drained would be well suited to corn, oats, hay crops, and Irish potatoes.

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

Mechanical analyses of Bladen fine sandy loam.

Number.	Description.	Fine gravel.	Coarse sand.	Medium sand.	Fine sand.	Very fine sand.	Silt.	Clay.
		<i>Per cent.</i>						
234831.....	Soil.....	0.5	1.9	2.2	52.4	13.8	22.3	6.9
234832.....	Subsoil.....	.1	1.4	1.8	42.1	12.0	21.0	20.0

BLADEN SILTY CLAY LOAM.

The surface soil of the Bladen silty clay loam is a steel-gray or brownish-gray, heavy silt loam to heavy silty clay loam, mottled slightly with brown. This is underlain at a depth of 5 to 10 inches by heavy, plastic silty clay or clay which becomes tougher and heavier in the lower portion of the 3-foot section. The material is dull steel gray in color, mottled with rusty brown or ochereous yellow. This soil is locally called "pocoson land."

The Bladen silty clay loam is confined mainly to the southern part of the county, and is most extensive in Roquist and Buckleberry Pocosons. Smaller areas are situated in Beaverdam, Connaritsa, and Haw Pocosons, south of Center Grove Church, near Ross Church, south of Millers Store, and near Cedar Landing Church and Woodard. The type generally occupies the lowest elevations in the pocosons, and its surface is flat to slightly undulating. It is in a semiswampy, poorly drained condition.

This is one of the most extensive types of the county, but not over 1 per cent of it is cultivated. The remainder supports a forest growth consisting of large beech, maple, oak, elm, and a few pine trees, with an undergrowth of reeds and other water-loving plants. The type is used mainly as range for cattle and as hunting preserves. A few small areas are devoted to the production of corn, oats, and hay.

The Bladen silty clay loam in Buckleberry Pocoson was drained and farmed prior to the Civil War, and high yields of cotton and corn are said to have been obtained. In recent years parts of the type in Roquist and Connaritsa Pocosons were ditched and planted to corn, which yielded 40 or 50 bushels per acre. The land was limed, but no commercial fertilizer was used. These farmed areas were later flooded, and their cultivation has been abandoned.

By the establishment of large drainage districts the greater part of this type could be reclaimed. When thoroughly drained the liberal use of lime will be necessary to produce the best results. Corn, oats, and hay crops would yield well.

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

Mechanical analyses of Bladen silty clay loam.

Number.	Description.	Fine gravel.	Coarse sand.	Medium sand.	Fine sand.	Very fine sand.	Silt.	Clay.
		<i>Per cent.</i>						
234833.....	Soil.....	0.1	0.6	0.4	1.2	4.0	38.0	55.8
234834.....	Subsoil.....	.0	.4	.4	.4	2.4	20.9	75.8

PORTSMOUTH FINE SANDY LOAM.

The Portsmouth fine sandy loam, to a depth of 8 to 12 inches, consists of a dark-gray to black, loamy fine sand to fine sandy loam, high in organic matter.

The subsoil begins as a light-gray, friable fine sandy clay and at 18 or 20 inches becomes a mottled gray and yellow, rather heavy, sticky fine sandy clay or clay, extending to a depth of 36 inches or more. In cultivated areas the surface soil is lighter in color than typical. Occasionally the subsoil is a steel-gray fine sandy clay or loamy fine sand to a depth of 3 feet.

The Portsmouth fine sandy loam is not an extensive soil. Small areas are situated in the northern part of the county along the Hertford County line, near Lewiston, at Whites Crossroads, in the vicinity of Wakelon and Perrytown, near Goose Pond, and north of Colerain. The type occurs in low, flat, poorly drained situations near the heads of small streams, and is water-logged during part of the year.

Only a few small areas are farmed. The remainder of the type is forested with pine, with an undergrowth of scattered bay bushes and huckleberry and gallberry bushes. Corn and cotton are the principal crops grown. Corn yields 10 to 25 bushels per acre, and cotton one-fourth to one-half bale. Oats and soy beans do well.

The selling price of this land depends largely upon the value of the pine timber.

If properly drained and limed the type would give good yields of corn, cotton, Irish potatoes, soy beans, vegetables, hay, and forage crops.

PORTSMOUTH LOAM.

To a depth of 8 to 12 inches the Portsmouth loam is a dark-gray to black loam, containing considerable organic matter. It is under-

lain by a gray fine sandy clay subsoil which becomes mottled with yellow at 16 to 20 inches, and extends to a depth of 36 inches or more. The subsoil at 24 to 30 inches is frequently a heavy, plastic silty clay, mottled yellow and gray.

The Portsmouth loam is of small extent. The largest areas are found in Powells Pocoson west of Aulander and near Buzzards and Whites Crossroads. Smaller areas are mapped near Wakelon, Rosemead, and Perrytown. The type occupies flat, poorly drained situations at the heads of streams, and is partly water-logged. Only a few small areas are under cultivation. The type was formerly farmed to some extent, but the drainage ditches are now filled up. Most of the type supports a growth of pine forest, with an undergrowth of huckleberry and gallberry. Corn, cotton, and oats are grown to a small extent, and give comparatively low yields.

The selling price if this land depends largely upon the quality and density of the timber growth.

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

CAHABA FINE SANDY LOAM.

The surface soil of the Cahaba fine sandy loam is a gray or grayish-brown to reddish-brown, mellow fine sandy loam, 8 to 15 inches in depth. The subsoil is a yellowish-red or brownish-red, friable fine sandy clay, extending to a depth of 3 feet or more.

The Cahaba fine sandy loam occurs in the second bottoms along the Cashie and Roanoke Rivers. The largest areas are situated 2 miles south of Windsor at the County Home, and near Mooring Landing and Harrells Quarter along the Roanoke River. The surface is level to gently rolling, and the drainage is good.

Owing to its small extent the type is not important agriculturally, although it is practically all under cultivation. The principal crops grown are peanuts, cotton, and corn. Wheat and oats are produced in a small way. The yields and the fertilizer treatment are similar to those in the case of the Ruston fine sandy loam. The addition of organic matter by the growing and turning under of clover, rye, or vetch would be beneficial to this soil.

KALMIA FINE SAND.

The surface soil of the Kalmia fine sand is a light-gray or grayish-yellow to brownish-gray fine sand, 8 to 10 inches deep. The subsoil is a pale-yellow or yellow, loose, incoherent fine sand extending to 36 inches or more. In the lower subsoil a yellow loamy sand or friable fine sandy clay is sometimes encountered. The areas mapped at Cooper Landing and JACOBS Landing are really a sand in texture.

The Kalmia fine sand occurs as a second-bottom soil along the Cashie River and a few of the creeks. Its surface is level to gently rolling, and the drainage is good. The type is of small extent, the largest areas being those mapped to the north of Windsor.

Most of its area is farmed, but part is still forested with pine, dogwood, gum, and oak. The principal crops grown are peanuts, cotton, and corn. Yields are relatively low. Peanuts yield 30 to 40 bushels per acre, cotton one-fourth to one-half bale, and corn 15 to 20 bushels.

KALMIA FINE SANDY LOAM.

The surface soil of the Kalmia fine sandy loam is a light-gray to brownish-gray, loamy fine sand to fine sandy loam, 4 to 6 inches deep. It is underlain to a depth of 12 or 15 inches by a yellow, light fine sandy loam, which passes into a yellow, friable fine sandy clay subsoil extending to 3 feet or more in depth. The subsoil is frequently mottled with red or gray at a depth of 30 inches. Included in the type are small areas of fine sand which could not be indicated on the map.

The Kalmia fine sandy loam is confined to small developments along the Cashie River and a few of the larger creeks. The principal areas occur near Windsor, south of Ross Church, and northwest of Britton Grove School. The type occurs on level to gently rolling second bottoms, and is well drained.

Probably 75 per cent of this type is cultivated. The remainder supports a growth of pine, sweet gum, oak, and hickory. It is used for the production of peanuts, cotton, and corn. Oats, sweet potatoes, and garden vegetables are grown to a small extent.

The crop yields and fertilizer treatment are about the same as in the case of the Norfolk fine sandy loam. The type is deficient in vegetable matter, and green-manure crops such as clover, vetch, or rye should be plowed under. The type is well suited to growing melons and other truck crops.

WICKHAM FINE SANDY LOAM.

The surface soil of the Wickham fine sandy loam consists of a light-brown to reddish-brown loamy fine sand or fine sandy loam, 6 to 15 inches deep. The subsoil is a reddish-yellow or brownish-red, heavy, compact fine sandy clay, passing into a yellowish-red, stiff, friable clay. In a few places the type includes patches of reddish clay loam, too small to show on the map. These gall spots have apparently been caused by the action of strong winds. Finely divided mica flakes frequently occur in both soil and subsoil.

The Wickham fine sandy loam is confined to the second bottoms along the Roanoke River, in the western part of the county. The

largest areas occur near Devereaux and Spring Gut Landings, in Big Field Farm, and 2 miles west of Kelford. The type has a level to gently rolling surface, and is well drained, but it is subject to occasional overflows.

Practically all of the Wickham fine sandy loam is cultivated. Peanuts, cotton, and corn are the chief crops grown. Peanuts ordinarily yield 60 to 80 bushels per acre, cotton about 1 bale, and corn 25 to 50 bushels. Crops are given about the same fertilizer treatment as on the Ruston fine sandy loam. The type is farmed almost entirely by colored tenants.

This land is valued at \$75 to \$100 an acre, depending upon the state of improvement.

The Wickham fine sandy loam can be improved by the use of stable or green manures, and by crop rotations including clover, vetch, and cowpeas.

WICKHAM SILT LOAM.

The surface soil of the Wickham silt loam is a light-brown to reddish-brown silt loam, 6 to 10 inches in depth, underlain by a reddish-yellow or yellowish-red, compact, brittle silty clay loam or clay which becomes lighter in color at 24 to 36 inches. In the flatter and poorly drained areas the surface soil is brown or chocolate brown, and the subsoil is slightly reddish yellow or yellow.

The Wickham silt loam is developed in the second bottoms along the Roanoke River in the western part of the county. The largest areas are mapped near Clarks School and $2\frac{1}{2}$ miles west of Spring Hill Church. The type is slightly lower in elevation than the associated Wickham fine sandy loam, and the surface is level or only slightly rolling, but the drainage is good except in the flatter areas. The type is subject to occasional overflow, and earth embankments have been constructed in places to protect the farmed areas from inundation at stages of high water.

This is an unimportant soil agriculturally, on account of its small extent. The better drained areas are farmed, and parts of the flatter areas are in pasture. The tree growth in the wooded areas consists of pine, sweet gum, sycamore, and water oak. The principal crops grown on this soil are peanuts, cotton, and corn. Yields are about the same as on the Wickham fine sandy loam.

The better-drained areas of the Wickham silt loam sell for \$75 to \$100 an acre, depending upon the state of improvement. The type is farmed chiefly by colored tenants.

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

Mechanical analyses of Wickham silt loam.

Number.	Description.	Fine gravel.	Coarse sand.	Medium sand.	Fine sand.	Very fine sand.	Silt.	Clay.
		<i>Per cent.</i>						
234847.....	Soil.....	0.6	2.4	1.8	14.2	14.0	49.2	18.0
234848.....	Subsoil.....	.1	.4	.4	5.4	9.6	39.3	44.7

CONGAREE SILTY CLAY LOAM.

The surface soil of the Congaree silty clay loam is a brown to reddish-brown, heavy silt loam to silty clay loam, 8 to 10 inches deep. The subsoil is a brown to yellowish-brown silty clay or silty clay loam, extending to a depth of 3 feet or more. On a few slight ridges and knolls, too small to show on the map, the surface soil is a silt loam or fine sandy loam. Near the adjoining second-bottom soils the subsoil is frequently mottled with gray or yellow at a depth of 24 to 36 inches.

The Congaree silty clay loam is confined almost entirely to the northwestern part of the county, where it occurs in the first bottoms along the Roanoke River. The largest areas are encountered between Hills Ferry and Apple Tree Landing. The surface is almost level, with a gradual slope toward the river and in the direction of its flow, and relieved slightly by the courses of a few small drainage ways. The type lies only 3 to 12 feet above the normal level of the Roanoke River, and is subject to frequent overflows. Owing to its low position and prevailing level surface it is poorly drained.

The Congaree silty clay loam is not important agriculturally. Practically the entire type is forested with water oak, birch, sycamore, and a few elm trees. There is an undergrowth of wild grasses which afford excellent summer pasturage for cattle. Attempts were formerly made to reclaim the soil by the construction of levees along the river, but these embankments have been partially destroyed by high water. The Congaree silty clay loam if properly drained and protected from floods would give excellent yields of corn, grass, oats, and forage crops.

SWAMP.

Swamp represents stream-bottom areas in which the soil material varies considerably in texture, color, and structure. The surface material ranges in texture from fine sand or fine sandy loam to silt loam, loam, or silty clay loam, and in color from light gray to dark gray, brown, or black. The subsoil may be fine sand, fine sandy clay, silty clay, or clay, and it ranges in color from steel gray through mottled gray and yellow to mottled gray and brown. Frequently the soil is a

black mucky loam, 3 feet or more in depth. On the outer edge of the smaller swamps the soil is usually a yellowish or grayish fine sand to a depth of 3 feet. Along the Roanoke River in the southern part of the county the type is composed partly of a brown or reddish-brown silty soil (Congaree) with varied admixtures of differently textured sand and black vegetable matter.

Swamp occurs in the first bottoms along practically all the streams of the county. New material is constantly being added to the type by the washing in of soil material from the adjoining slopes and by the decaying of vegetable matter. The soil is poorly drained and remains saturated or partly covered with water the greater part of the year.

The Swamp areas vary in width from a few feet to 3 miles. The largest are situated in the bends of the Roanoke River in the southern part of the county and along the Cashie River.

This soil is not cultivated. It supports a thick growth of swamp timber, consisting of cypress and tupelo, with some water oak and holly on the outer edges. A few years ago unsuccessful attempts were made to grow rice in the swampy areas near the mouths of the Cashie and Roanoke Rivers. In some of the better drained areas cattle are grazed at present during the summer months. In the higher parts of the county some of the Swamp areas could be reclaimed by drainage, and if properly limed they would give good yields of corn, oats, hay, and forage crops. The selling price of this land depends largely upon the timber growth.

SUMMARY.

Bertie County lies in the northeastern part of North Carolina, mainly in the flatwoods section of the Coastal Plain. The topography ranges from flat to gently rolling or rolling. The county is inadequately drained. It includes a number of poorly drained areas, the largest of which are Roquist, Buckleberry, and Pell Mell Pocosons, in addition to the naturally poorly drained first bottoms along the Roanoke River and the swamps along the Cashie and Roanoke Rivers.

Bertie County was formed in 1783. The population of the county in 1910 was 23,039, all of which was classed as rural. The average density of population is 32.8 persons to the square mile. Windsor is the county seat and largest town.

The railroad facilities of the county are inadequate. The rivers of the county are navigable and are followed by steamboat lines. Public roads reach into nearly all sections of the county. The principal markets for agricultural products are Norfolk and Suffolk, Va., and Rocky Mount, N. C.

The mean annual temperature of the county is 60.3°, and the average growing season is 214 days in length. The mean annual rainfall is 50.93 inches. The precipitation is well distributed and is sufficient for all the crops commonly grown.

The agriculture of the county consists principally in the production of the cash crops of peanuts, cotton, and tobacco, supplemented by the production of corn, sweet potatoes, and garden vegetables for home use. Considerable quantities of feed are imported into the county annually, although stock raising is of little commercial importance. At present agriculture is confined mainly to the more rolling and better drained parts of the county.

Crop rotation is seldom practiced in this county. Commercial fertilizers are in general use, and crops are fertilized rather heavily. Farm laborers are scarce and consist mainly of Negroes. The average size of the farms according to the 1910 census is 88.7 acres. There are a total of 3,183 farms, 53.8 per cent of which are operated by owners and 45.9 per cent by tenants. Farms are rented mainly on a share basis. Land values range from \$20 to \$100 an acre.

Bertie County lies in the Coastal Plain region of North Carolina. The upland soils have been formed through weathering processes from the underlying deposits of unconsolidated sands and clays. The texture of the soils is prevailingly fine. The second and first bottom, alluvial soils, along the streams, have been formed from sediments washed from the uplands and deposited along the channels at times of overflow. There are mapped in the county a total of 21 soil types, in addition to Swamp.

The most important agricultural types are the Norfolk sandy loam and fine sandy loam, Ruston fine sandy loam, Dunbar fine sandy loam and very fine sandy loam, Lufkin fine sandy loam, and Wickham fine sandy loam.

There are some extensive soil types that are not farmed, mainly on account of poor drainage. These are the Coxville silt loam, Bladen silty clay loam, Congaree silty clay loam, and Portsmouth fine sandy loam and loam. They could be reclaimed by the establishment of drainage districts.

The Lufkin silt loam is an extensive soil farmed only to a small extent, chiefly because of the intractable structure of the subsoil.

Soils of minor agricultural importance, because of their small extent, are the Norfolk fine sand, Ruston very fine sandy loam, Coxville fine sandy loam, Cahaba fine sandy loam, Kalmia fine sandy loam and fine sand, and Wickham silt loam.

The areas mapped as Swamp have no agricultural value at present but some of the higher lying areas could be reclaimed by drainage.

[PUBLIC RESOLUTION—No. 9.]

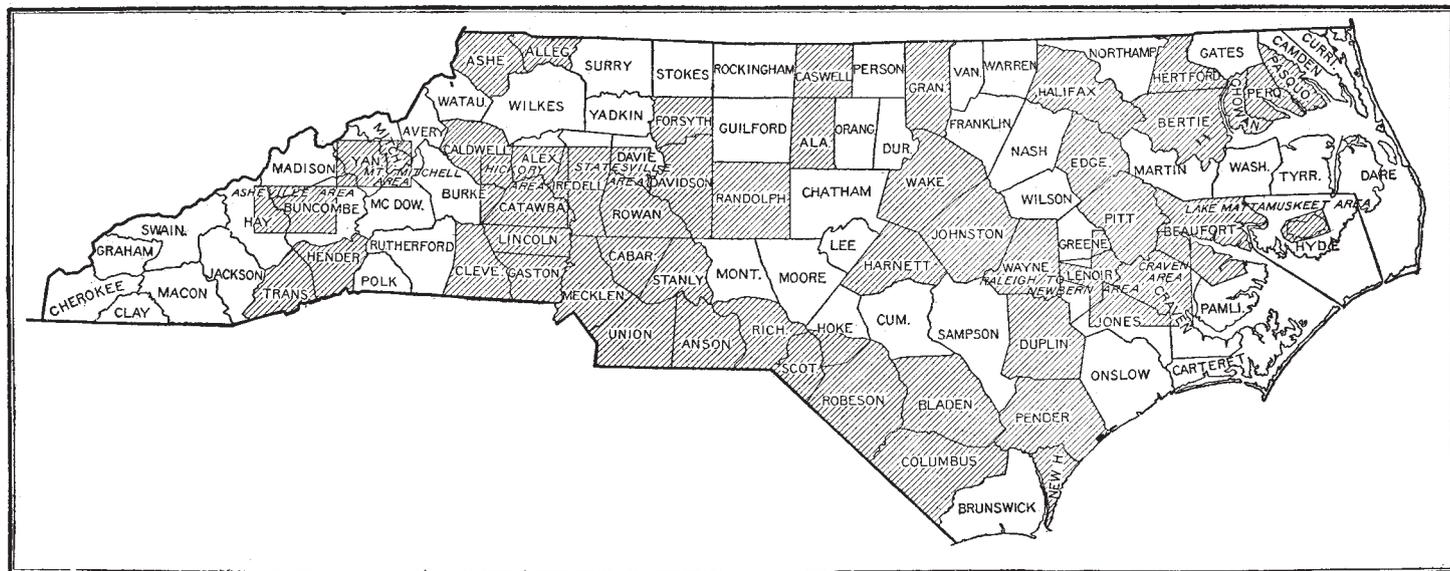
JOINT RESOLUTION Amending public resolution numbered eight, Fifty-sixth Congress, second session, approved February twenty-third, nineteen hundred and one, "providing for the printing annually of the report on field operations of the Division of Soils, Department of Agriculture."

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.

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