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 HARNETT COUNTY, NORTH CAROLINA.

BY

ROBERT 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, 1916.]

WASHINGTON:
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SOIL SURVEY OF HARNETT COUNTY, NORTH CAROLINA.

By ROBERT 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.

Harnett County lies in the east-central part of North Carolina, about 18 miles south of Raleigh and 15 miles north of Fayetteville. It is bounded on the north by Wake County, on the northeast by Johnston County, on the southeast by Sampson County, on the south by Cumberland County, on the southwest by Hoke County, and on the west by Moore, Lee, and Chatham Counties. The county is irregular in outline, having either roads or streams as boundary lines on the east, south, and southwest. It embraces an area of 595 square miles, or 380,800 acres.

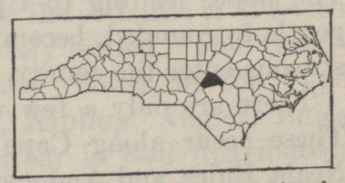


FIG. 1.—Sketch map showing location of the Harnett County area, North Carolina.

Harnett County lies mainly in the Coastal Plain province, but part of the northwestern section is within the Piedmont. The county as a whole consists of generally level to rolling uplands, dissected by the valleys of the Cape Fear, Upper and Lower Little, and Black Rivers. The topography, however, varies widely in different parts of the county, and the extreme range is from flat and gently undulating to rolling, hilly, and broken. West of Hector and Fish Creeks and extending to the Lee and Chatham County lines lies a rolling to hilly area. This becomes rough and broken as the streams are approached, but it includes some smooth interstream areas. It constitutes the Piedmont section of the county.

The area inclosed by a line extending southward from a point 1 mile south of Lillington almost to Linden Bridge, thence northeast to Freewill Church, and thence to the County Home is practically flat and is locally known as the "flatwoods." An area extending from Duke south to the Cumberland County line and thence northeast to Hodges Chapel has level to gently undulating surface features. A line extending from Duke northeast to Hodges Chapel, thence following the Johnston and Wake County lines to Hector Creek, thence reaching south to the Cape Fear River and continuing

to Duke incloses a level to rolling interstream area, which becomes somewhat broken near the streams, especially around their heads.

The section extending west from Lillington to the Lee County line, thence south to Barbecue Church, and thence southeast to Bunnlevel has a generally rolling surface, with some level areas. The southwestern part of the county, reaching from Barbecue Church west to the Lee County line, southeast to the Cumberland County line, and thence tapering to a point 1 mile west of Bunnlevel, is a rolling to hilly section, characterized by several high ridges. It is referred to as the "sand hills."

The slopes leading to the drainage ways are as a rule gradual, becoming steep or rounded near the streams. The slopes along Cape Fear River from Lillington to the Chatham County line range from steep to abrupt, while those from Lillington to the Cumberland County line are rounded. Along the creeks north and northeast of the Cape Fear River the slopes range from gentle to abrupt, the more abrupt ones occurring in the Piedmont section of the county. The slopes leading to Upper and Lower Little Rivers range from gentle to rounded, becoming more abrupt near the points where the streams enter the county.

There are only a few well-developed first bottoms in the county. These occur along Cape Fear and Black Rivers, Mingo Swamp, Neals, Buies, and Anderson Creeks, and a few minor streams. Well-developed second bottoms, or terraces, occur along the Cape Fear River below Lillington and along Upper and Lower Little Rivers and a few of the creeks. These terrace lands range in width from one-fourth mile to 3 miles. They are widest at the points where the Cape Fear and Upper and Lower Little Rivers unite.

Lillington, situated in the east-central part of the county, is 635 feet above sea level, while Dunn, in the southeastern corner, is only 214 feet above sea level. These are the only points in the county for which records of elevation are available. From general observation, Cameron Hill School, in the western part of the county, seems to be situated at the highest elevation.

The county has a general slope toward the southeast, and is drained through the Cape Fear River and its tributaries, Upper and Lower Little and Black Rivers. Branches of these four rivers reach into all parts of the county, and every farm is connected with one or more of these drainage outlets. With the exception of the "flatwoods" section south of Lillington, the uplands have good surface drainage. Practically all the first bottoms are poorly drained, the exceptions being some of the higher lying areas along the Cape Fear River and a few of the creeks. With the exception of a few swampy areas, all the second bottoms are fairly well drained.

Practically all the streams are swift flowing and are actively deepening their channels. Water power can be developed along the rivers and larger creeks, and there are several gristmills in operation.

Harnett County was formed in 1855 from a part of Cumberland County. The original settlers were Scotch and Welsh, the former coming directly from Scotland. They first located on the second-bottom lands along the Cape Fear and Upper and Lower Little Rivers. Later, when it was discovered that the "piny-woods lands," or uplands, were productive, settlement extended to these sections. The population of the county in 1910 was 22,174, all of which was classed as rural, giving a density of 37.3 persons to the square mile. The present population consists of the descendants of the early settlers and later immigrants, mainly from near-by counties. There are no foreigners, but a considerable number of negroes. The distribution of the population is unequal, varying to a large extent with the character of the soils. The country west of a line extending south from Lillington to Byrd Pond and south of the Atlantic & Western Railroad west from Lillington is very sparsely settled. The "sandhill" section is even more thinly populated. North of the Cape Fear River, in the vicinity of Cokesbury, Kipling, Angier, Buies Creek Post Office, and Coats, the population is well distributed. The section around Duke and Dunn is the most thickly settled part of the county.

The two largest towns in the county are Dunn and Duke, with populations in 1910 of 1,823 and 500, respectively. Lillington, the county seat, has a population of 380. The next towns in point of size are Buies Creek, with a population of 249; Angier, with 221; Coats, 169; Kipling, 150; and Chalybeate, 115. There are a number of other villages located along the railroad lines.

The county has excellent transportation facilities. Lines of the Atlantic Coast Line Railroad, the Norfolk Southern Railroad, the Durham & Southern Railroad, and the Atlantic & Western Railroad operate in the county.

Public roads, many of them well improved, extend to nearly all parts of the county, and others are under construction. An abundance of road-building material, such as gravel, sand, and clay, is available. The towns and the more thickly settled rural sections have telephone service, and there are rural mail-delivery routes in practically all sections. Well-kept churches and schoolhouses are distributed throughout the county.

Most of the cotton grown in the county is sold at Wilmington. Part of the crop is disposed of at Duke, where it is manufactured into cotton goods. A large quantity of cotton seed is manufactured

into oil and meal at Lillington. Most of the tobacco is sold at Fuquay Springs, N. C., but some is shipped to Durham. The peaches, dewberries, and early vegetables produced are sold chiefly at Greensboro. A small quantity of the other products of the county is disposed of at the local markets of Lillington, Duke, and Dunn.

CLIMATE

According to the records of the nearest available Weather Bureau station, at Fayetteville, Harnett County has a mean annual temperature of 61° F. The winter mean is 43.4° and the summer mean 77.7°. The highest recorded temperature is 108°, in July, and the lowest —5°, in February. The date of the latest recorded killing frost in the spring is April 21, and that of the earliest in the fall, October 19. The average dates of the last killing frost in the spring and the first in the fall are April 4 and November 7, respectively. This gives a growing season of 217 days.

The average annual rainfall amounts to 54.91 inches, which 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 of 18.21 inches, and lightest in the fall with an average of 10.60 inches. The total rainfall for the driest year on record was 37.38 inches, and for the wettest year, 102.16 inches.

The following data, compiled from the records of the Weather Bureau station, at Fayetteville, which is about 14 miles south of Harnett County, represent approximately the conditions in the latter:

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

Month.	Temperature.			Precipitation.		
	Mean.	Absolute maximum.	Absolute minimum.	Mean.	Total amount for the driest year.	Total amount for the wettest year.
	° F.	° F.	° F.	Inches.	Inches.	Inches.
December	43.7	78	9	4.38	3.78	8.25
January	43.1	78	9	4.18	2.20	10.25
February	43.4	79	— 5	4.63	6.18	10.80
Winter	43.4	79	— 5	13.19	12.16	29.30
March	54.4	89	15	5.00	2.44	8.75
April	60.3	91	28	3.62	2.75	12.70
May	70.1	98	37	4.29	1.84	4.13
Spring	61.6	98	15	12.91	7.03	25.58

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

Month.	Temperature.			Precipitation.		
	Mean.	Absolute maximum.	Absolute minimum.	Mean.	Total amount for the driest year.	Total amount for the wettest year.
	° F.	° F.	° F.	Inches.	Inches.	Inches.
June	76.2	101	50	4.26	2.37	2.50
July	79.1	108	54	7.18	2.50	17.20
August	77.7	102	51	6.77	2.80	13.25
Summer	77.7	108	50	18.21	7.67	32.95
September	72.0	99	39	4.30	5.24	7.70
October	62.0	90	28	3.49	2.00	3.50
November	51.8	85	16	2.81	3.28	3.13
Fall	61.9	99	16	10.60	10.52	14.33
Year	61.2	108	— 5	54.91	37.38	102.16

AGRICULTURE.

Agriculture in Harnett County began in colonial times. At first it was confined chiefly to land in the second bottoms of streams in the southern part of the county. The early crops consisted of corn, wheat, peas, potatoes, apples, and grapes grown for home consumption. Cotton also was cultivated to a small extent for home use, and in the early days cattle formed the chief source of revenue. Very few sheep were raised. Immediately after the Civil War the uplands were first cleared and tilled, and at about the same time the cultivation of cotton was begun upon a commercial scale and soon became the most important agricultural product.

Turpentining began prior to the Civil War and continued until a few years ago. Lumbering also flourished. The exploitation of the forest resources of the county for a while retarded agricultural development.

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

Acreage and production of principal crops, census years 1880 to 1910, inclusive.

Crop.	1910		1900		1890		1880	
	Acres.	Bushels.	Acres.	Bushels.	Acres.	Bushels.	Acres.	Bushels.
Corn	31,125	403,418	32,367	290,770	26,842	191,880	21,244	180,458
Cotton	20,094	[1] 11,821	15,266	[1] 5,864	15,191	[1] 4,326	9,281	[1] 3,627
Wheat	504	3,231	3,026	14,090	2,164	10,792	2,393	10,957
Oats	895	12,027	555	4,600	1,783	10,208	1,202	7,640
Cowpeas	11,566	22,073	3,512	28,161	.....	10,449	.....	13,196
Sweet potatoes	1,959	188,342	1,381	134,860	1,300	96,757	962	96,118
Tobacco	219	[2] 146,150	353	[2] 175,510	6	[2] 2,339	32	[2] 9,510

[1] Bales. [2] Pounds.

Cotton and corn are still the most extensively grown crops in the county, cotton being the most important cash crop. Tobacco is also a cash crop, but it is of little importance on account of the small acreage. Most of the corn is fed to work stock. Cowpeas are grown as a green manure and for the hay and seed. Oats are used chiefly for forage, while rye is grown as a cover crop. Wheat and sweet potatoes are produced mainly for home consumption.

Stock raising is of little commercial importance. Practically every farmer keeps one or more milch cows and enough hogs for home consumption, and some keep a few sheep. A small number of hogs and cattle are slaughtered or sold at the local markets each year. The milch cows are usually of Jersey, Holstein, or mixed breeds, and practically all the hogs are of improved breeds. The value of dairy products in 1909, excluding those used at home, amounted to $41,833.

The leading special crops of the county are peaches and dewberries. Some nursery stock also is produced. These special crops are grown in the sand-hill section of the county, in the vicinity of Spout Springs and Olivia. Irish potatoes, garden vegetables, collards, melons, peaches, and apples are grown on practically every farm, mainly for home use. Small quantities are sold at local markets. Patches of sorghum are grown on some farms. The cane is made into sirup for home use and for sale in the local markets. Grapes are grown to a small extent for home use. In 1910 there were 23,354 apple trees, 19,542 peach trees, 2,934 grapevines, and 17 acres of blackberries and dewberries in the county. The total value of the fruits and nuts produced in 1909 was $40,208.

Some of the farmers of Harnett County recognize the special adaptation of certain soils to particular crops. The Wickham fine sandy loam, Ruston gravelly sandy loam, Ruston sandy loam, and Norfolk sandy loam are known to be the better cotton soils. The Ruston fine sandy loam and sandy loam and the Norfolk sandy loam are used extensively for corn and wheat. Cowpeas and sweet potatoes are considered to give the best results on the more sandy soils, such as the Norfolk sand. The Norfolk sandy loam, deep phase, is the preferred soil for tobacco, and the Hoffman sandy loam and Norfolk sand, sandhill phase, are recognized as being best suited to the production of peaches and dewberries. The "cold lands," such as the Coxville silt loam and sandy loam; the Portsmouth loam, known as "pipe-clay land"; and the "sand," or Norfolk sand, sandhill phase, as well as some areas of the typical Norfolk sand, are generally recognized as the less productive soils of the county.

The farm equipment, as a rule, consists mainly of 1-horse implements, including turning plows, cultivators, spike-tooth harrows, cotton and corn planters, fertilizer distributors, and stalk cutters. Some of the better farms have improved labor-saving machinery, such as disk plows, disk harrows, weeders, manure spreaders, reapers, riding cultivators, and land rollers. Both horses and mules are used for work stock, mules predominating. The farm buildings are for the most part small, but some of the better improved farms have large, well-equipped barns.

A majority of the farmers plow to a shallow depth in the spring, but in the better agricultural sections deeper breaking is practiced. Corn is generally planted in furrows and cultivated with double-share plows or multi-toothed cultivators. Cotton is usually planted on the ridges, the rows being spaced 3 feet apart. The crop is generally cultivated with sweep plows.

Crop rotation is practiced by a few of the more successful farmers. The rotation in most general use consists of corn, with cowpeas sown between the rows at the last cultivation, followed the next year by cotton. In some of the better farming sections corn, crimson clover, and cotton are rotated.

The use of commercial fertilizer is general throughout the county. In 1909 86.5 per cent of all the farms used commercial fertilizer, with an expenditure of $76.51 each. For cotton 300 to 400 pounds per acre of a complete fertilizer analyzing 8–2–2, 8–3–3, or 9–2–2 is used,[1] while for corn an acreage application of 200 to 300 pounds of an 8–2–2 or 8–3–3 mixture is made at the time of planting, with an additional application of 75 to 100 pounds per acre of sodium nitrate at the last cultivation. Tobacco land receives an acreage application of 600 to 1,000 pounds of an 8–3–5 or 8–4–5 mixture. Some of the farmers use home mixtures of 16 per cent acid phosphate, cottonseed meal, and kainit. These mixtures would analyze approximately 8–2–2 or 8–3–3. Cowpeas and other leguminous crops are grown to a small extent as soil improvers, and stable manure is applied quite liberally in some sections of the county to increase the organic-matter content of the soils. Lime is used to some extent as a soil improver.

Farm help is somewhat scarce. Both white and negro laborers are employed. Monthly wages range from $15 to $20, and in a few instances to as much as $30, without board, and from $10 to $15 a month where board is furnished. Cotton pickers receive 50 to 75 cents per hundred pounds.

Farms range in size from about 20 acres to 900 acres, the average size in 1910 being 90.8 acres.[2] In the sand-hill section of the county there are some individual holdings ranging from 6,000 to 54,000

[1] Fertilizer constituents are given in this order: Phosphoric acid, nitrogen, and potash.
[2] The census tabulates each tenancy as a "farm."

acres. In 1910 there were 2,710 farms in the county, 65 per cent of which were operated by the owners, 34.8 per cent by tenants, and 0.2 per cent by managers. Farms are rented both for cash and on shares. If the owner furnishes the land, buildings, and fertilizer he receives one-half the crops, but if the tenant furnishes the fertilizer the owner receives only one-third of the crops.

The selling price of land ranges from $10 to $200 an acre, the average being about $40 an acre. Land in the sand-hill section is held for $10 to $25 an acre. In the vicinity of Duke and Dunn values range from $75 to $200 an acre.

SOILS.

Harnett County lies within both the Coastal Plain and Piedmont Plateau provinces. The Piedmont Plateau province occupies an area of about 50 square miles, mostly in the northwestern part of the county along the slopes leading to the Cape Fear River, with strips one-fourth mile to 1½ miles wide on the slopes and breaks of Upper Little River, Hector and Neals Creeks, and the smaller streams in the western and northern parts of the county.

The soils of the Coastal Plain part of the county have been derived from unconsolidated deposits of sand, sandy clay, and heavy clay. The materials forming these deposits were brought down from the Piedmont Plateau and Appalachian Mountain regions and laid down in an ancient sea. The soils derived from them differ materially in color, structure, drainage, topography, and crop adaptation. The soils of this derivation are grouped in five series—the Norfolk, Ruston, Hoffman, Coxville, and Portsmouth.

The soils of the Piedmont Plateau section of the county are residual in origin, having been derived from the underlying rocks through the processes of weathering. These rocks are fine grained, consisting chiefly of mica schist, gneiss, and granite, with some slate, and have given rise to types with prevailing fine sandy surface soils. The underlying rocks carry more or less iron, and the thorough oxidation of the iron compounds has imparted a red color to the soils. Numerous quartz veins cutting the parent rocks have been broken down and the fragments scattered conspicuously over the surface or mingled with the soil mass. The Piedmont soils are grouped in the Cecil and Appling series.

The second-bottom alluvial soils along the Cape Fear and Upper and Lower Little Rivers have been formed mainly from reworked material brought down from the Piedmont Plateau section of the State by these streams. In places along the Upper and Lower Little Rivers and some of the larger creeks, however, the second-bottom soils have been derived from reworked Coastal Plain sediments.

The soils of the first bottoms along the Cape Fear River and the upper part of Upper Little River have been formed from material conveyed from the Piedmont Plateau uplands by these streams, while the soils of the first bottoms along the other streams of the county have been derived from Coastal Plain material washed from the adjoining slopes.

The soils of the second bottoms are included in the Wickham and Kalmia series and those of the first bottoms in the Ochlockonee, Johnston, Chastain, and Congaree series, and Swamp.

In all, 24 soil types, in addition to Swamp, Gravel hills, and Rock outcrop, are mapped in Harnett County.

The surface soils of the types included in the Norfolk series are predominantly gray, but range from light gray to grayish yellow. The subsoils consist of yellow, friable sandy clay or sand. These soils occupy nearly level to rolling uplands throughout the Coastal Plain section of the county. Four types are mapped, the coarse sand, sand, sandy loam, and silt loam, together with a sandhill phase of the sand and a deep phase of the sandy loam.

The surface soils of the types of the Hoffman series are light gray to yellowish gray. The subsoils consist of pink, or mottled pink, gray, and reddish, hard, compact sandy clay. The subsoils contain material resembling decomposed arkose sandstone or feldspar. Fragments of ferruginous sandstone are conspicuous over the surface in places. The topography ranges from sloping to rolling and hilly. This series is represented in the county by one type—the sandy loam.

The types included in the Ruston series have gray to grayish-brown soils and a reddish-yellow to yellowish-red, dull-red or yellowish-brown, moderately friable sandy clay subsoil, occasionally mottled with gray and shades of yellow in the lower part. The topography ranges from gently undulating to rolling. In this series three types are mapped, the gravelly sandy loam, sandy loam, and fine sandy loam.

The surface soils of the Coxville series are light gray to dark gray. The subsoils consist of yellowish, moderately friable clay, which abruptly passes into yellowish, rather plastic, compact clay, mottled in the lower part with shades of gray and bright red. The topography is prevailingly flat and the soils are poorly drained. Two members of this series are mapped, the sandy loam and silt loam.

The Portsmouth series includes types with dark-gray to black soils, having a high content of organic matter, and a subsoil of light-gray to mottled gray and yellow color. The heavier members are always plastic, though usually carrying a noticeable proportion of

sand. These soils are developed in flat to slightly depressed, poorly drained situations. Only one type of this series, the loam, is mapped in Harnett County.

The surface soils of the types grouped in the Cecil series are gray to red, the sandy members prevailingly having the lighter color. The subsoils consist of heavy red clay. Numerous veins of quartz and a content of sharp quartz sand are characteristic of the subsoil. Mica flakes also are usually present. Areas of the heavier types of this series are called locally "red clay land." The soils are derived chiefly from granite and gneiss, weathered to great depths, and rock outcrops are rare. The topography is rolling to hilly, with level to undulating interstream areas. The soils of this series are the most important and widely distributed of the Piedmont Plateau. Five types are mapped in Harnett County, the stony fine sandy loam, stony clay loam, gravelly sandy loam, fine sandy loam, and clay loam.

The types belonging in the Appling series have grayish to pale-yellow soils and mottled or streaked red and yellow or yellowish-red subsoils. Grayish or drab colors also occur occasionally in the subsoil. These soils are derived chiefly from schist and gneiss. The topography is about the same as that of the Cecil series. Only two members of the Appling series are mapped in the present survey, the gravelly fine sandy loam and fine sandy loam.

The surface soils of the types classed in the Wickham series are reddish to reddish brown and contain a higher percentage of organic matter than the Norfolk soils. The subsoil usually consists of reddish, micaceous, heavy sandy loam or loam, becoming coarser, looser, and more incoherent 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. The topography is level to gently undulating, and drainage is fairly well established. This series is represented in Harnett County by only one type, the fine sandy loam.

The Kalmia series includes types having gray to grayish-yellow surface soils and yellow or mottled yellow and gray subsoils. In the better drained situations the subsoil is yellow, resembling that of the corresponding members of the Norfolk series. The Kalmia soils are derived chiefly from reworked Coastal Plain material, although along the larger streams issuing from the Piedmont Plateau and Appalachian Mountain regions more or less material has been transported from these regions. The surface usually is flat and the drainage inadequate. Only one member of this series, the Kalmia fine sandy loam, is mapped in Harnett County.

The types of the Ochlockonee series have dark-gray to brownish soils and mottled brownish, yellowish, and gray subsoils. This series includes the dark-colored first-bottom soils along the streams of the Coastal Plain. The soils are composed mainly of Coastal Plain wash. They are, as a rule, poorly drained. One type is mapped in the county, the Ochlockonee silt loam.

The surface soils of the types grouped in the Johnston series are black and have a high content of organic matter. The subsoils are gray or mottled gray, yellow, and brown. These soils occur in the first bottoms along Coastal Plain streams and are subject to overflow. They are derived from Coastal Plain material, with a varying admixture of Piedmont and Appalachian material. The loam is the only type of this series mapped in Harnett County.

In the Chastain series have been grouped the alluvial soils with grayish to dark-gray soils, resting on gray to mottled gray and yellow subsoils. There is usually in soils of this series a substratum of mottled red and gray, impervious, plastic clay, which hinders drainage. These soils occupy first bottoms along the streams of the Coastal Plain, and the material consists of sediments derived from Coastal Plain soils. One type of the Chastain series, the loam, is mapped in the present survey.

The surface soils and subsoils 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 yellowish mottlings are encountered in the subsoil of the poorly drained areas. These 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 streams in the Coastal Plain a slight commingling of Coastal Plain material. The soils are usually poorly drained, and crops are sometimes damaged by overflows. Only one member of the Congaree series is mapped in this county, the silt loam.

Swamp consists of undifferentiated soils occupying areas permanently wet or covered with water, occurring in the first bottoms along some of the smaller streams.

The Gravel hills include areas consisting largely of waterworn gravel, with interstitial material consisting of reddish-yellow loamy sand, sandy loam, or sandy clay. This material occurs on hills and ridges along the western margin of the Cape Fear River bottoms, and has been formed, it is believed, through the agency of moving water along ancient shore lines.

The following table gives the actual and relative extent of the various soil types mapped in Harnett County:

Area of different soils.

Soil.	Acres.	Per cent.	Soil.	Acres.	Per cent.
Norfolk sand	46,208	26.2	Chastain loam	4,416	1.2
Sandhill phase	53,504		Congaree silt loam	3,776	1.0
Norfolk sandy loam	52,096	19.4	Kalmia fine sandy loam	3,648	1.0
Deep phase	21,696		Cecil stony fine sandy loam	3,456	.9
Ruston sandy loam	36,160	9.5	Norfolk coarse sand	3,264	.8
Hoffman sandy loam	30,848	8.1	Gravel hills	3,264	.8
Cecil fine sandy loam	15,232	4.0	Cecil stony clay loam	3,200	.8
Ruston gravelly sandy loam	15,168	4.0	Portsmouth loam	2,944	.8
Cecil gravelly sandy loam	11,776	3.1	Appling fine sandy loam	2,752	.7
Ruston fine sandy loam	11,712	3.1	Coxville sandy loam	1,536	.4
Wickham fine sandy loam	11,712	3.1	Johnston loam	1,472	.4
Swamp	10,048	2.6	Appling gravelly fine sandy loam	960	.3
Norfolk silt loam	9,344	2.4	Rock outcrop	128	.1
Cecil clay loam	8,960	2.3			
Coxville silt loam	6,528	1.7			
Ochlockonee silt loam	4,992	1.3	Total	380,800	.....

NORFOLK COARSE SAND.

The Norfolk coarse sand consists of a gray to yellowish-gray, loose, coarse sand, 6 to 8 inches deep, underlain by a yellow to pale-yellow, incoherent, coarse sand, which extends to a depth of 3 feet or more. In cultivated fields, where the soil has been depleted of organic matter, the surface soil has a whitish appearance. Along ridges and near the streams, coarse rounded gravel frequently occurs on the surface, and occasionally a layer of this gravel is encountered about 20 inches below the surface. In some places the subsoil is loamy at a depth of 30 inches.

The Norfolk coarse sand is confined chiefly to the eastern part of the county along the Johnston County line and to the section north of Coats along the Durham & Southern Railroad to Barclaysville. There is also a small area in the northwestern part of the county along the Wake County line.

This type occurs along ridges and on slopes near stream courses. The topography is undulating to gently rolling or rolling. Both surface drainage and underdrainage are good. The soil dries easily and can be tilled immediately after rains.

The Norfolk coarse sand is not important agriculturally. About one-half the type is under cultivation, the remainder being forested with scrub oak and scattered longleaf and old-field pine. Cotton is the most important and corn the next most important crop. Tobacco is grown to a small extent. Sweet potatoes and garden vegetables are produced for home use and oats for forage. Some cowpeas and rye are grown.

Cotton yields ordinarily one-fourth to one-half bale per acre. Corn generally yields 8 to 10 bushels per acre, and with applications of stable manure and fertilizer as much as 25 bushels. Sweet potatoes yield 200 to 300 bushels per acre.

Land of this type sells for $10 to $25 an acre, depending upon the improvements and location with respect to towns and transportation lines.

The Norfolk coarse sand is decidedly deficient in organic matter. This can be supplied by the liberal use of stable manure or by turning under crops of cowpeas, rye, or vetch.

NORFOLK SAND.

The Norfolk sand consists of a gray to yellowish-gray, medium sand, 5 to 8 inches deep, underlain by a yellow, incoherent sand which extends to a depth of 3 feet or more. Over forested areas the surface material to a depth of 1 or 2 inches is, as a rule, somewhat darker than usual, owing to the accumulation of organic matter. In some of the cleared areas and cultivated fields the surface material is white.

In places the lower subsoil consists of reddish-yellow loamy sand. A few areas of fine sand and reddish-yellow sand, too small to show on the map, are included with this type. On the ridges and near the streams small quantities of rounded gravel occasionally are encountered.

This type is fairly well distributed over the county, but is most extensive in the northern, northeastern, and western parts. The largest areas occur in the vicinity of Hockaday School, Neals Creek Church, Chalybeate, and Duncan, in the northern part of the county, and around Summerville Church, Arlington, and Big Branch School, in the western part. The type occupies the low ridges and level areas of the uplands and the slopes near streams. The topography is level to undulating or rolling, being more rolling near the streams than elsewhere. Both the surface drainage and the underdrainage are good.

The Norfolk sand is an important type agriculturally. Probably two-thirds of it is under cultivation, the remainder consisting of cutover land with a growth of scrub oak, scattered pine, and wire grass, and of forested areas occupied mainly by longleaf pine, with some dogwood. Cotton and corn are the chief crops. Oats, cowpeas, rye, and sweet potatoes are grown to some extent. Tobacco is relatively important. Garden vegetables are grown in small patches for home use.

Cotton yields ordinarily one-third to one-half bale and corn 10 to 25 bushels per acre. Under favorable conditions, and with proper

methods of cultivation and fertilization, as much as 35 bushels of corn has been obtained. With large applications of fertilizer tobacco does well. Sweet potatoes yield 200 to 300 bushels per acre. Grapes, melons, and vegetables do well.

Terracing generally is practiced on this type to prevent washing of the surface material. Rye is grown by some farmers both as a cover crop and a green manure. Cowpeas are grown to some extent as a green manure. Stable manure is used by many farmers. Cotton land is generally given an acreage application of 600 pounds or more of an 8–2–2, 8–3–3, or 9–2–2 fertilizer mixture. For corn a mixture of 16 per cent acid phosphate and cottonseed meal is commonly used, though in many cases a complete fertilizer is applied. A top-dressing of sodium nitrate may be given when the tassel begins to "shoot." A home mixture of 200 pounds acid phosphate, 200 pounds cottonseed meal, and 100 pounds of kainit, with an additional application of 50 pounds of sodium nitrate as a top-dressing, has been used on corn land with good results.

Land of the Norfolk sand is valued at $10 to $40 an acre, depending on the improvements and location.

With the incorporation of large quantities of organic matter and liberal applications of fertilizer the ordinary yields of corn, cotton, and other crops on this type can be greatly increased.

Norfolk sand, sandhill phase.—The Norfolk sand, sandhill phase, consists of a gray to yellowish-gray, loose, medium sand, 5 to 8 inches deep, underlain by a pale-yellow, incoherent sand which extends to a depth of 3 feet or more. In places, especially on the slopes, the surface soil is reddish-yellow and has a loamy texture. Here and there rounded gravel is conspicuous on the surface. A few spots of coarse sand, as well as some areas of reddish-yellow sand resembling the Ruston sand, too small in extent to separate on the map, are included with this phase.

This phase is confined to the section locally referred to as the "sand hills," in the western and southwestern parts of the county. It occurs in an almost unbroken area beginning at a point 1 mile west of Bunnlevel and extending westward to the Hoke County line, south of Upper Little River. It is most extensive in the vicinity of Overhills, Spout Springs, and Pineview.

The phase occupies winding ridges, rounded hills, and slopes. The topography varies from almost level to undulating, rolling, and even hilly. There are also gentle slopes leading to some of the drainage ways. The surface drainage and underdrainage are good. Some of the steeper slopes are excessively drained.

The Norfolk sand, sandhill phase, is of little importance agriculturally. Probably not over 2 per cent of it is under cultivation, the remainder consisting of cut-over lands with a second growth of

blackjack oak and scattered longleaf pine. The surface is covered with wire grass. Small patches of cotton and corn are grown. Sweet potatoes, sorghum, oats, and garden vegetables are produced to some extent. Peaches and dewberries are grown in a small way at Spout Springs. The fruit is of excellent quality.

Crop yields are relatively low. Corn yields 8 to 12 bushels and cotton one-fourth to one-half bale to the acre. Sorghum and sweet potatoes do fairly well. Peach trees require careful pruning and spraying. One or two pounds of an 8–3–3 or 8–4–4 fertilizer mixture is applied around each tree.

Land of this phase sells for $10 to $25 an acre, depending largely upon nearness to the railroads and character of improvements.

The Norfolk sand, sandhill phase, has been built up into a fairly productive soil in other "sand-hill" sections of the State. It is low in organic matter, which can be supplied by the addition of stable manure where available, or by the turning under of green-manure crops, such as cowpeas and rye. Rye is also an effective winter cover crop, where it is necessary to prevent erosion. Fertilizer must be used to obtain good yields. The successful production of cotton, corn, peaches, dewberries, and grapes around Hoffman and Pinehurst and in other places in the sand-hill belt indicates that their culture could be profitably extended in Harnett County.

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 loamy sand or sandy loam that extends to a depth of 15 to 18 inches. The subsoil is a yellow, friable sandy clay to a depth of 3 feet or more.

Over some of the forested areas the surface soil is dark gray, and the subsoil in some of the flat areas shows slight mottlings of gray. Occasionally the subsoil of the better drained areas is reddish yellow or has red spots in the lower depths. Areas of Norfolk coarse sandy loam and fine sandy loam too small to map are included with this type.

The Norfolk sandy loam is fairly well distributed over the county, except in the southwestern part. The largest areas lie in the vicinity of Dunn, Buies Creek, Cape Fear School, Christian Light Church, Ephesus Church, Murchison School, Leaflet Church, and Byrd Pond. The type usually occupies smooth interstream areas or gentle slopes near streams. The topography is level or gently undulating to gently rolling, the more rolling areas usually lying near the streams. Surface drainage and underdrainage are generally adequate, although a few of the flatter areas need ditching.

The Norfolk sandy loam is one of the more important soils of the county. More than three-fourths of the type is under cultivation, the remainder being forested with longleaf and old-field pine and dogwood, with some oak, hickory, and persimmon. Cotton, corn, and cowpeas are the principal crops, with wheat, oats, rye, and tobacco next in importance. Sweet potatoes, Irish potatoes, melons, and garden vegetables are grown to a small extent.

Crop yields are much higher than on the sand types of the Norfolk series. Cotton yields from one-half to 1½ bales per acre, with an average yield of about 1 bale. Corn yields 15 to 50 bushels to the acre, with an average of about 20 bushels. Tobacco yields 500 to 700 pounds, and wheat 10 to 15 bushels per acre. Cowpeas, oats, sweet potatoes, Irish potatoes, vegetables, and melons do well.

As in the sand types, terracing is generally practiced on the slopes to prevent washing. In some sections rye is grown as a cover and green-manure crop. Cowpeas and crimson clover are also grown to some extent as green manures. Some farmers alternate corn and cotton, cowpeas being sometimes seeded in the corn at the last cultivation.

Cotton land usually receives an acreage application of 300 to 600 pounds of an 8–2–2, 8–3–3, or 9–2–2 fertilizer, while corn receives 200 to 500 pounds of an 8–2–2 or 8–3–3 mixture, or of a home-mixed acid phosphate, cottonseed meal, and kainit. Nitrate of soda is applied as a top-dressing about the time the corn begins to tassel. Stable manure is used by some farmers to increase the organic-matter content of the soil. Tobacco land is given an application of 500 to 1,000 pounds per acre of an 8–3–3 or 8–3–4 mixture.

Land of the Norfolk sandy loam sells for $30 to $100 an acre, the price depending upon the improvements and location.

The Norfolk sandy loam, like its associated types, is deficient in organic matter. This can be supplied as suggested for the other soils of the series. A good system of crop rotation would be beneficial, and deeper plowing of the shallower areas would improve the soil. This type is well adapted to the production of bright tobacco and is used in other sections of the State for that purpose. It is also well suited to the production of Irish potatoes, sweet potatoes, and certain fruits, including grapes. Vegetables, peanuts, and chufas do well.

Norfolk sandy loam, deep phase.—The surface soil of the Norfolk sandy loam, deep phase, is similar to that of the typical Norfolk sandy loam, except in depth. It is usually about 20 inches deep, but may extend to a depth of 30 inches or more. The subsoil generally is a yellow, friable sandy clay, but in a few places it is a sandy loam and in others a heavy loamy sand. Occasionally gravel is encountered on the surface.

The Norfolk sandy loam, deep phase, is confined chiefly to the western and northern parts of the county, being developed in rather large areas near Morris Chapel, Spring Hill Church, and Cambro Mill in the western part and in the vicinity of Duncan, Kipling, Neals Creek Church, and Angier in the northern part. It occupies situations similar to those of the Norfolk sandy loam and has a similar topography, except that it is more rolling in places. Both the surface drainage and underdrainage are good.

This phase is important agriculturally. The soil is farmed in conjunction with the typical Norfolk sandy loam. About two-thirds of the phase is under cultivation, a part of the other third being forested with pine, dogwood, and persimmon, and the remainder being in cut-over land, with a second growth of broad and forked leaf blackjack oak. In the forested area there is usually an undergrowth of wire grass. The crops produced on the phase are similar to those on the typical soil. Tobacco, however, is grown to a greater extent than on any other soil in the county. Yields are slightly smaller than on the typical Norfolk sandy loam, but larger than on the Norfolk sand. Cotton yields one-half to 1 bale and corn 15 to 40 bushels per acre, according to the quantity of fertilizer and manure used. The methods used in cultivating and fertilizing this soil are similar to those followed on the typical Norfolk sandy loam.

Land of the Norfolk sandy loam, deep phase, ranges in price from $15 to $60 an acre, depending upon the improvements and the location with respect to towns and transportation facilities.

The suggestions made for the improvement of the typical Norfolk sandy loam apply equally well to its deep phase. The phase is especially well suited to the production of peanuts and bright tobacco.

NORFOLK SILT LOAM.

The surface soil of the Norfolk silt loam consists of a light-gray to yellowish-gray, mellow silt loam, carrying a high percentage of very fine sand, and grading at a depth of 4 to 6 inches into a pale-yellow silty loam or silt loam. The subsoil, which is encountered at a depth of 8 to 12 inches, is a yellow, friable clay containing a considerable quantity of silt. It is firmer and more compact than the subsoils of the other Norfolk types and does not dry out so readily. In the wooded and flat areas the surface soil is dark gray, and in the more rolling areas it contains a somewhat greater proportion of very fine sand. The subsoil of poorly drained areas is faintly mottled with red and gray in the lower part.

This type is confined almost wholly to the flatwoods section south of Lillington and east of Bunnlevel, extending to the Cape Fear River terraces. It occupies the higher and better drained parts of

the flatwoods. The topography is flat to gently undulating and slightly rolling. Neither surface drainage nor subdrainage is well established, and ditching is necessary before farming can be carried on.

The Norfolk silt loam is one of the less extensive soil types of the county. About one-third of its area is under cultivation, the remainder being forested with pine, sweet gum, and scrub oak. Cotton and corn are the main crops, with oats, wheat, and rye next in importance. Sweet potatoes and garden vegetables are grown for home use. Cotton yields ordinarily from one-half to 1 bale per acre, and occasionally as much as 2 bales. Corn yields 15 to 30 bushels per acre. Oats and wheat ordinarily give moderate yields.

On some farms this soil has been fairly well drained and aerated by deep ditches leading to the slopes along the Cape Fear River. Liming to improve the physical structure of the subsoil has given fairly good results. Cotton land is fertilized with 400 to 600 pounds per acre of an 8–3–3 mixture. Corn also receives liberal applications of fertilizer and, in some instances, of stable manure.

Land of the Norfolk silt loam sells for $15 to $40 an acre, the price depending upon the improvements and the location with respect to towns and railroads.

For the improvement of this soil thorough drainage of the entire flatwoods section is necessary. This probably could be effected through Upper and Lower Little Rivers. After drainage has been established, lime will be required to improve the physical structure of the subsoil as well as to correct acidity. The incorporation of organic matter through green-manure crops, such as cowpeas, clover, or rye, or by the application of stable manure, would be beneficial. Deeper plowing and thorough pulverization of the soil before planting are advisable.

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

Mechanical analyses of Norfolk silt loam.

Number.	Description.	Fine gravel.	Coarse sand.	Medium sand.	Fine sand.	Very fine sand.	Silt.	Clay.
		Per cent.	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*
234311	Soil	0.2	1.0	0.8	4.0	14.0	68.4	11.4
234312	Subsoil	.0	.6	.4	2.5	10.6	60.2	25.6

HOFFMAN SANDY LOAM.

The surface soil of the Hoffman sandy loam is a light-gray to brown, medium loamy sand, changing usually to pale yellow below 1 to 6 inches. The subsoil, which lies from 6 to 20 inches below the

surface, ranges in color from pink, reddish yellow, mottled red and yellow or yellow to light red, and consists of a rather heavy, indurated sandy clay extending to a depth of 36 inches or more. In wooded areas and depressions the surface soil usually is dark gray. Occasionally it contains some coarse sand or fine gravel. Fragments of ferruginous sandstone are conspicuous over the surface in many places. The subsoil is in places composed of material which resembles fragments of decomposed feldspar.

The Hoffman sandy loam is confined entirely to the sand-hill section in the southwestern and western parts of the county. The largest areas are situated in the vicinity of Cambro Mill, Valley Mount School, Overhills, Spout Springs, Pineview, and Olivia, and along the slopes of McLeod, Buffalo, and Cypress Creeks. The topography ranges from nearly level in interstream areas to rolling and even hilly around the upper reaches of the streams. Both surface drainage and underdrainage are good.

Like the associated Norfolk sand, sandhill phase, the Hoffman sandy loam, though comparatively extensive, is of relatively little agricultural importance. Not over 5 per cent of it is under cultivation, the remainder consisting of cut-over lands grown up in blackjack oak and scattered longleaf pine, with an undergrowth of wire grass. Along the streams considerable valuable timber remains.

Corn and cotton are the principal crops, but are grown only in small fields. Wheat and oats are grown in scattered patches. Sweet potatoes, sorghum, and vegetables are produced for home use, and some peaches and dewberries for market.

Cotton yields ordinarily one-fourth to one-half bale per acre, larger yields being obtained with heavy applications of fertilizers and stable manure. Corn yields 10 to 20 bushels per acre when manure is added and as much as 40 bushels when both fertilizer and stable manure are applied. Tobacco yields 600 pounds per acre when fertilized with about 500 pounds of an 8–3–4 or 8–3–5 mixture. Irish potatoes, sweet potatoes, strawberries, peaches, and dewberries do well.

Land of the Hoffman sandy loam has about the same selling value as the Norfolk sand, sandhill phase.

The suggestions given for the improvement of the Norfolk sand, sandhill phase, are also applicable to this type.

RUSTON GRAVELLY SANDY LOAM.

The surface soil of the Ruston gravelly sandy loam, to a depth of 15 to 20 inches, consists of a gray to yellowish-gray medium to coarse loamy sand or light sandy loam, carrying 15 to 50 per cent of rounded quartz and quartzite gravel. The subsoil is a yellowish-

red to reddish-yellow sandy clay, carrying some gravel, and extending to a depth of 3 feet or more. A few areas of gravelly sand have been included in this type, as they are too small to show on a map of the scale used in the survey.

The Ruston gravelly sandy loam is inextensively developed in the central, west-central, and eastern parts of the county. The largest areas occur in the vicinity of Coats, Olive Branch School, along Fish and Camels Creeks, and near Holly Springs and Spring Hill Churches. Smaller areas lie along the streams in other sections of the county. The type occupies ridges and the slopes along drainage ways. The topography is level to undulating and rolling and both surface drainage and underdrainage are good.

Less than half of this type is under cultivation, the remainder supporting a forest growth consisting mainly of longleaf pine, with some oak, hickory, and dogwood. The type is used for general farming, cotton and corn being the main crops. Oats, cowpeas, rye, wheat, sweet potatoes, vegetables, and grapes are also grown. Cotton yields one-half to 1 bale and corn 20 to 30 bushels per acre. About the same kinds and quantities of fertilizer are used as on the Norfolk sandy loam.

The price of land of this type ranges from $25 to $40 an acre, depending upon the improvements and location.

RUSTON SANDY LOAM.

The surface soil of the Ruston sandy loam consists of a gray to brown sandy loam or loamy sand, passing at 4 to 6 inches into a yellow or slightly reddish yellow loamy sand or light sandy loam with a depth of 12 to 18 inches. The subsoil is a yellowish-red to reddish-yellow sandy clay extending to a depth of 3 feet or more. Near Coats and in the vicinity of Dunn some gravel occurs on the surface, and in places in the vicinity of Angier fragments of ferruginous sandstone are conspicuous.

Included in this type are some areas of Orangeburg sandy loam too small to separate on the map. These consist of a brownish-gray, light sandy loam 8 to 10 inches deep, underlain by a bright-red, friable but sticky sandy clay which extends to a depth of 3 feet or more.

This type is of comparatively small extent. Some of the largest and most typical areas are in the vicinity of Dunn, Duke, Coats, Barclaysville, Mamers, and Ephesus Church. Small bodies are situated in the northern, eastern, and west-central parts of the county, especially along the stream courses. In the section near Dunn the type occupies level to undulating interstream areas, while in other sections it occurs in level or gently rolling to rolling interstream situations. Both surface drainage and underdrainage are good.

The Ruston sandy loam is one of the important soils of the county, and most of it is under cultivation. A few areas are forested, mainly with longleaf pine, with some oak, hickory, and dogwood.

The main crops are cotton and corn. Near Dunn the type is used quite extensively for the production of wheat and oats. Rye, cowpeas, vetch, and alfalfa are grown to some extent. Soy beans do well, but are grown by only a few farmers. Crimson clover, which was only recently introduced on this soil, gives fair results. Sweet potatoes, Irish potatoes, and other vegetables thrive.

Crop yields are higher on this type than on the Norfolk sandy loam. Cotton yields three-fourths to 2 bales per acre, the average yield being about 1 bale. Corn yields 20 to 50 bushels per acre, averaging about 35 bushels. Wheat yields 12 to 15 bushels per acre. These crops are fertilized and in many cases given large applications of stable manure.

The price of land of the Ruston sandy loam ranges from $40 to $200 an acre, depending upon the improvements and location.

This type is deficient in organic matter, which can be supplied by means of green-manure crops. Crimson clover, vetch, and cowpeas do well, and their incorporation as green manures aids materially in improving the soil. A more general use of crop rotations would be beneficial.

RUSTON FINE SANDY LOAM.

The surface soil of the Ruston fine sandy loam consists of a gray to yellowish-gray, light loamy fine sand, grading at about 6 inches into a pale-yellow, light fine sandy loam. This is underlain at a depth of 10 to 15 inches by a reddish-yellow or yellowish fine sandy clay. Small areas in the vicinity of Duke containing a bright-red subsoil are included with this type, as they are too small to separate on the map.

The Ruston fine sandy loam is inextensive, and occurs mostly in the southeastern part of the county. The largest bodies lie south of Buies Creek, extending down the eastern side of the Cape Fear River to the Cumberland County line. Other areas occur near Dunn and in the vicinity of the County Home.

This type occupies high interstream areas. The topography is level to gently undulating and rolling. Surface drainage is well established and underdrainage is good. The type is important, and nearly all of it is under cultivation. There are a few scattered areas of woodland, on which the growth consists chiefly of pine.

Cotton and corn are the main crops, and wheat, oats, rye, and cowpeas secondary crops. Crimson clover, alfalfa, and vetch are

grown to a small extent. Cotton yields three-fourths bale to 1½ bales to the acre, averaging about 1 bale. Corn yields from 20 to 65 bushels to the acre, averaging about 35 bushels. Wheat and oats do well, the former yielding 15 to 20 bushels per acre. Fertilizer is used in about the same proportions as upon the Norfolk sandy loam. Some of the more progressive farmers grow crimson clover, cowpeas, and rye as green-manure crops. Considerable quantities of stable manure are applied.

The range in price of land of the Ruston fine sandy loam is about the same as that of the Ruston sandy loam. The suggestions for improvement given for the latter type are also applicable to the fine sandy loam.

COXVILLE SANDY LOAM.

The surface soil of the Coxville sandy loam consists of a light-gray or gray to black, rather heavy sandy loam, 8 to 12 inches deep. The subsoil is a mottled yellow and gray, heavy, tough, plastic clay or sandy clay, with bright-red mottlings in the lower part of the 3-foot section.

This type is of very small extent. More important areas lie 2 miles southeast of Spring Hill Church and near Cambro Mill. Smaller areas occur in other parts of the county. The type occupies low, flat situations and depressions. Its drainage is poor.

None of this type is cultivated. It supports a forest growth consisting mainly of pine with a few oak and sweet-gum trees. With proper drainage it is adapted to the production of corn, cotton, oats, and cowpeas.

The results of the mechanical analyses of samples of the soil and subsoil of the Coxville sandy loam are shown in the following table:

Mechanical analyses of Coxville sandy loam.

Number.	Description.	Fine gravel.	Coarse sand.	Medium sand.	Fine sand.	Very fine sand.	Silt.	Clay.
		Per cent.	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*
234321	Soil	0.8	13.4	12.6	29.6	11.8	20.9	11.1
234322	Subsoil	1.0	10.8	10.2	24.9	9.3	22.8	21.2

COXVILLE SILT LOAM.

The surface soil of the Coxville silt loam consists of a light-gray to dark-gray silty loam or silt loam, 6 to 8 inches deep. The subsoil usually begins as a mottled yellow and gray, compact silty clay loam or very fine sandy clay, which becomes heavier in texture and tougher with depth and shows mottlings of bright red at a depth of 15 to 30 inches. In places the surface 2 to 3 inches is almost black, while in other places the subsoil is a light-gray or

bluish-gray, heavy, tough clay, with some mottlings of red and yellow.

In the more rolling situations near Cape Fear and Lower Little Rivers the surface soil is light gray to a depth of about 6 inches, where it is underlain by a yellow, tough clay that passes at 12 to 15 inches into a yellow, yellow and red, or yellow, gray, and red, tough, heavy, impervious clay. This better drained and more rolling soil resembles in some respects the Susquehanna silt loam.

The Coxville silt loam is confined almost entirely to the flatwoods section south of Lillington and east of Harnett, Bunnlevel, and Fonville. Small patches occur in the southeastern part of the county. The topography is prevailingly flat, although some of the areas near the Cape Fear and Upper Little Rivers are undulating to gently rolling. The type is poorly drained and most of it is forested with pine, scrub oak, and sweet gum. A few patches are cleared and cultivated and give fair yields of cotton, corn, and oats.

Land of this type sells for $10 to $25 an acre, depending upon location with respect to towns and railroads.

The Coxville silt loam can be improved by draining and the application of lime and stable or green manure. In its natural state the soil bakes, and the addition of organic matter would improve its physical condition.

PORTSMOUTH LOAM.

The surface soil of the Portsmouth loam consists of a black loam, 8 to 10 inches deep, which becomes dark gray upon drying. The subsoil is a drab, plastic silty clay loam, with brown and yellow mottlings, and extends to a depth of 3 feet or more. Along the line of contact with other types the subsoil is a drab sand or sandy clay, with some mottlings of yellow in the lower part.

This type is of small extent, and occurs chiefly in the southeastern part of the county in the vicinity of Duke and Dunn. It occupies depressions and situations around the heads of streams. The topography is flat and the drainage poor.

Most of this type supports a forest of pine and sweet gum, with some bay bushes. A few of the depressions have been cleared and ditched and are cultivated. Fair yields of corn, oats, and vegetables are obtained.

CECIL STONY FINE SANDY LOAM.

Areas shown on the soil map in Cecil fine sandy loam color and marked with stone symbols represent the Cecil stony fine sandy loam. The surface soil of this type is a light-gray to light-brown fine sandy loam, 6 to 12 inches deep, carrying from 20 to 50 per cent of rounded and angular quartz fragments, ranging in diameter from 2 to 8 inches. The subsoil is a bright-red, heavy clay extending to a depth

of 3 feet or more. It contains some mica flakes, and frequently passes into the decomposed bedrock at 30 to 36 inches.

This type occurs in comparatively small bodies or narrow strips in the northwestern part of the county, along the headwaters of Avents Creek and the western slopes to the Cape Fear River northwest of Camels Creek. The topography is rolling to hilly and broken and the surface drainage is good.

The Cecil stony fine sandy loam is an unimportant type agriculturally. The greater part of it is forested, mainly with oak, in which occur some pine, hickory, dogwood, and persimmon. Cotton, corn, cowpeas, and oats are grown to a small extent and give fair yields. Land of this type brings about the same price as the Cecil stony clay loam.

CECIL STONY CLAY LOAM.

Areas mapped in Cecil clay loam color and indicated by stone symbols represent the Cecil stony clay loam. The surface soil of this type is a red to reddish-brown loam or clay loam, 5 to 6 inches deep, carrying 30 to 60 per cent of rounded and angular fragments of quartz ranging in diameter from 2 to 8 inches. The subsoil is a stiff red clay extending to a depth of 3 feet or more and containing a considerable quantity of fine mica flakes. In many places the surface soil consists of a light-gray fine sand, 2 or 3 inches in depth, but the extent of such areas was not sufficient to warrant separate mapping.

The Cecil stony clay loam is confined mainly to the northwestern part of the county, along Camels and Cedar Creeks and the Lee County line. Small spots occur east of the Cape Fear River and bordering the Wake County line.

The type is developed upon ridges and near streams, and the topography is rolling to hilly and broken. Drainage is well established, being excessive on the steeper slopes.

Only a small percentage of this soil is farmed, the remainder being forested with oak, pine, hickory, and dogwood. Some of the wooded area is used as pasture land. The stones interfere seriously with tillage, and farming is more difficult and expensive than on the clay loam. Fair yields of cotton, corn, and oats are obtained.

Land of this type sells for $10 to $30 an acre, depending upon the improvements and the distance from markets and transportation lines.

CECIL GRAVELLY SANDY LOAM.

The surface soil of the Cecil gravelly sandy loam consists of a light-gray to reddish-brown, medium loamy sand to light sandy loam, 6 to 10 inches deep, containing 25 to 50 per cent of rounded and angular quartz gravel and a few rounded stones. The subsoil is a

bright-red, stiff clay, 3 feet or more in depth. Mica flakes are usually present in the subsoil.

The Cecil gravelly sandy loam is confined to the northwestern part of the county. The largest bodies lie along Parkers Creek and the Cape Fear River. Smaller areas occur along Camels, Fish, and Neals Creeks and in the vicinity of Christian Light Church. A few small areas are also encountered along the slopes of Upper Little River.

This type occupies ridges and the slopes bordering streams, and has a gently rolling to rolling and broken surface. The broken areas occur near the Cape Fear River and the smaller streams. Drainage is good, the surface drainage being excessive in the more rolling areas.

A very small proportion of this type is under cultivation, most of it being forested with oak, pine, hickory, dogwood, and persimmon. Fair yields of cotton and corn are obtained upon those areas having the more favorable surface features.

This land is usually sold in conjunction with other types and brings from $15 to $40 an acre, the price depending upon the topography, the improvements, and the distance from towns and shipping points.

CECIL FINE SANDY LOAM.

The surface soil of the Cecil fine sandy loam consists of a light-gray fine sandy loam 3 or 4 inches deep, underlain by yellowish-gray, more compact material of the same texture as the surface layer, and 6 or 7 inches thick. The subsoil is a stiff, friable, red clay which extends in most places to a depth of 3 feet or more. In many places there is a stratum of reddish-yellow clay between the surface soil and the red subsoil. There are occasionally a few angular quartz gravel particles and stones scattered over the surface. Some finely divided mica flakes are usually present in the soil and subsoil, and frequently the decomposed parent rock is encountered at a depth of 30 to 36 inches.

The Cecil fine sandy loam is developed mainly in the northwestern part of the county and to some extent in the western part. It occurs in fairly large areas west of Pine Dale School and along the slopes leading to Neals, Hector, Avents, Cedar, and Camels Creeks. It is also encountered on the slopes approaching Upper Little River, in the western part of the county. The topography is gently rolling to rolling and hilly, becoming somewhat broken near the streams. Both surface drainage and internal drainage are good. Terraces are sometimes necessary to prevent erosion.

This is not a very important type agriculturally, and only about one-third of it, comprising the more level areas, is at present under cultivation. The remainder is forested with oak, hickory, pine, and

dogwood. Cotton and corn are the principal crops. Wheat, oats, and rye are also grown.

Cotton yields one-half to 1 bale per acre with an acreage application of 400 pounds of fertilizer. Corn yields 15 to 40 bushels per acre, averaging about 20 bushels with applications of 300 pounds per acre of complete fertilizer. Wheat yields 10 to 20 bushels per acre, averaging about 15 bushels. Some farmers use a top-dressing of sodium nitrate for corn when it begins to tassel. Others apply stable manure. Crimson clover and rye are grown by some farmers as green manures.

Land of the Cecil fine sandy loam sells for $15 to $35 an acre, depending upon the improvements and location.

This type can be improved by plowing a little deeper each year and thoroughly pulverizing the soil, by turning under leguminous crops such as cowpeas and clover, and by applying stable manure. Winter cover crops should be grown to prevent the washing that takes place in bare fields on the slopes. More systematic rotation of crops would be beneficial.

CECIL CLAY LOAM.

The Cecil clay loam consists of a red to reddish-brown loam or clay loam, 5 or 6 inches deep, underlain by a red, stiff friable clay, which extends to a depth of 36 inches or more. Some of the more level areas have spots of gray fine sandy material, 3 or 4 inches in depth. The subsoil usually contains some mica flakes and frequently grades into the decomposed parent rock at a depth of 30 to 36 inches.

This type is well developed in the northwestern part of the county. The largest body occurs along the slopes of Daniels Creek. Smaller areas are encountered along Parkers Creek and between Avents Mill and Midway School. Another small area lies along Upper Little River near Harrington Bridge.

The type occurs on ridges, slopes, and breaks near streams. Its topography is rolling to hilly and broken. Drainage is good to excessive.

About one-third of this type is cultivated, and it is one of the most important soils in the northwestern section of the county. The uncultivated land is forested with oak, pine, hickory, and dogwood. Some of the wooded areas are used for pasture land. The crops grown on this soil and the yields obtained are similar to those on the Cecil fine sandy loam type. The clay loam is fertilized in practically the same way. It requires stronger teams and heavier implements for efficient plowing and cultivation.

Land of the Cecil clay loam sells at $20 to $50 an acre, depending upon the improvements and location.

Like the Cecil fine sandy loam, this type is deficient in organic matter. It responds to the same methods of improvement, and can be easily built up and maintained in a high state of productiveness. The soil is best suited to grains, grasses, and clovers.

APPLING GRAVELLY FINE SANDY LOAM.

Areas mapped in Appling fine sandy loam color and indicated by gravel symbols represent the Appling gravelly fine sandy loam. The surface soil of this type is a gray to yellowish-gray fine sandy loam, 6 to 15 inches deep, containing 15 to 40 per cent of rounded and angular quartz gravel. The subsoil is a yellowish-red or streaked yellow and red, rather heavy, stiff clay, extending to a depth of 3 feet or more.

This type occurs in small bodies along Hector and Fish Creeks, along the Lee and Chatham County lines, and west of Cumberland Union Church. The topography is rolling to broken, and the drainage is good.

Very little of this type is under cultivation, most of it being forested with pine and oak. If cleared its best use would be for pasture.

APPLING FINE SANDY LOAM.

The surface soil of the Appling fine sandy loam consists of a light-gray to yellowish-gray fine sandy loam, 8 to 15 inches deep. The subsoil is a yellowish-red, rather heavy clay, mottled or streaked with yellow and red in the lower part of the 3-foot section. The decomposed bedrock is frequently encountered at a depth of 30 to 36 inches.

This type is of small extent. The largest bodies lie along Neals, Hector, Avents, and Camels Creeks. Other areas occur along some of the small streams in the western and northwestern parts of the county. The topography is rolling to broken, and the drainage is good.

Practically all of this type is forested, the principal trees being oak and pine. The rougher areas should remain in forest, or, if cleared, sown to grass and used for pasture. In the following table are shown the results of the mechanical analyses of samples of the soil and subsoil of the Appling fine sandy loam:

Mechanical analyses of Appling fine sandy loam.

Number.	Description.	Fine gravel.	Coarse sand.	Medium sand.	Fine sand.	Very fine sand.	Silt.	Clay.
		Per cent.	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*
234329	Soil	1.2	2.4	1.9	29.6	40.9	16.2	8.3
234330	Subsoil	.2	.6	.6	18.6	17.2	17.4	45.7

WICKHAM FINE SANDY LOAM.

The surface soil of the Wickham fine sandy loam is prevailingly a light-brown fine sandy loam or loamy fine sand, 6 to 15 inches deep. The subsoil consists of a reddish-yellow, heavy fine sandy loam, abruptly passing into a yellowish-red, rather stiff, friable clay. In places the surface soil is a yellowish-gray fine sandy loam. Mica flakes frequently occur in both surface soil and subsoil. A few spots of Wickham clay loam too small to separate on the map are included.

Associated with this type in the poorly drained situations are small areas having a gray fine sandy loam surface soil, 6 to 15 inches deep, and a yellow, compact, rather heavy fine sandy clay subsoil, extending to a depth of 3 feet or more and mottled yellow and gray in the lower part. These areas would be mapped as the Alta Vista fine sandy loam if of sufficient extent.

The Wickham fine sandy loam occupies terraces along the rivers and some of the larger creeks. In places on lower terraces it is subject to occasional overflows. The largest and best developed areas are in the southern part of the county, where the Cape Fear and the Upper and Lower Little Rivers unite. The topography ranges from almost level to gently undulating. The type is well drained, except in occasional depressions and a few swampy areas near the streams.

This is an important soil, and over three-fourths of its area is under cultivation. The remainder is forested with pine, sweet gum, and cedar. A small proportion of the type is used for pasture. Cotton and corn are the main crops. Wheat, oats, and rye are also grown. Cotton yields three-fourths to 1½ bales per acre, averaging about 1 bale. Corn yields 15 to 50 bushels per acre, with an average of about 25 bushels. Wheat and oats do well. For cotton an acreage application of 300 to 400 pounds of an 8–3–3 fertilizer is generally made. A home preparation of 16 per cent acid phosphate and cottonseed meal is used by some farmers. Corn usually receives an application of 200 to 300 pounds per acre of complete fertilizer of the ordinary grades.

The price of land of the Wickham fine sandy loam ranges from $30 to $100 an acre, depending upon the improvements and the location.

The Wickham fine sandy loam has probably been under cultivation longer than any other type in the county. It has largely been used for cotton, and as a result of clean cultivation is deficient in organic matter. It can be improved by the addition of stable or green manures and by systematic crop rotations, including some of the legumes.

KALMIA FINE SANDY LOAM.

The surface soil of the Kalmia fine sandy loam consists of a gray to brownish-gray fine sandy loam or loamy fine sand, about 6 inches deep, grading into a yellow loamy fine sand which extends to a depth of 12 to 15 inches. The subsoil is a yellow, friable sandy clay, becoming reddish yellow in the lower part of the 3-foot section. In poorly drained situations the surface soil is dark gray and the subsoil usually is mottled yellow and gray.

The Kalmia fine sandy loam is inextensive. It occurs on terraces along Upper and Lower Little Rivers and a few of the larger creeks. Relatively large areas lie near Rich Mill and Clarke and McDougald Bridges on Upper Little River, and smaller areas along Anderson and Buffalo Creeks.

The topography is almost level to gently undulating. Drainage is good, except in a few depressions and low situations near the streams. In places on low-lying terraces the type is subject to occasional overflows.

This is an unimportant type agriculturally. Only about one-fourth of it is under cultivation, the remainder being forested with old-field and longleaf pine, sweet gum, and ash. Cotton and corn are the main crops, and oats and cowpeas are grown to a small extent. Cotton yields one-half to 1 bale and corn 15 to 25 bushels per acre.

OCHLOCKONEE SILT LOAM.

The surface soil of the Ochlockonee silt loam is a dark-gray to brown silt loam, 6 to 10 inches deep. The subsoil is a gray, or mottled gray and yellow, or brown, rather heavy clay or fine sandy clay. It extends to a depth of 3 feet or more.

Some areas of Thompson silt loam too small to indicate on a map of the scale used are included with this type. These areas have a gray to grayish-brown silt loam surface soil, 6 to 10 inches deep, and a yellow or mottled yellow and gray subsoil of silty clay to fine sandy clay, extending to a depth of 3 feet or more.

The Ochlockonee silt loam is of small extent. It occurs in the first bottoms along Upper Little River, Neals, and Buies Creeks, and a few of the smaller streams. The topography is flat. The type is subject to frequent overflows, and the greater part of it is covered with water for long periods, especially in the winter.

At present the Ochlockonee silt loam supports a forest growth consisting of sweet gum, cypress, pine, and ash, with an undergrowth of water-loving plants. Like the other first-bottom types, it is usually sold in conjunction with the adjoining terrace or upland

soils. If properly drained it would be well suited to the production of corn and other crops.

JOHNSTON LOAM.

The surface soil of the Johnston loam is a black loam from 10 to 18 inches deep, containing sufficient organic matter to have a mucky feel. The subsoil is a drab, heavy, plastic sandy clay, extending to a depth of 3 feet or more and mottled with red in the lower part. In poorly drained areas the surface soil is more mucky than usual, and bordering the uplands it is more sandy.

This is a first-bottom soil, occurring chiefly along McLeod Creek and a few of the smaller streams in the sand-hill section. The topography is prevailingly level, though in places hummocky. The land is subject to overflows and the natural drainage is poor.

The Johnston loam is of small extent, and the greater part of it is forested. An area of about 300 acres in the sand-hill region has been cleared and drained, and is utilized for the production of nursery stock, chiefly fruit trees. With proper drainage the type should produce large yields of corn.

CHASTAIN LOAM.

The surface soil of the Chastain loam consists of a dark-gray to black loam, 4 to 6 inches deep, passing into a rather heavy, brown sandy clay, which extends to a depth of 10 to 15 inches. The upper subsoil is a brown clay. Below, it becomes a mottled gray, yellow, and red, plastic clay, which extends to a depth of 3 feet or more.

This type is confined to the first bottoms of Mingo Swamp and Black River, in the eastern and southeastern parts of the county. It is subject to frequent overflows and remains in a saturated condition during the winter. All of it supports a forest growth of sweet gum, pine, ash, and cypress, with an undergrowth of water-loving shrubs. If properly drained and limed, this soil would produce fair yields of corn and oats.

Land of this type is usually sold in connection with the adjacent upland soils.

In the following table are shown the results of mechanical analyses of samples of the soil and subsoil of the Chastain loam:

Mechanical analyses of Chastain loam.

Number.	Description.	Fine gravel.	Coarse sand.	Medium sand.	Fine sand.	Very fine sand.	Silt.	Clay.
		Per cent.	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*
234339	Soil	0.5	6.0	5.1	27.5	17.0	25.1	18.9
234340	Subsoil	.6	3.5	3.0	16.9	15.3	26.1	34.8

CONGAREE SILT LOAM.

The surface soil of the Congaree silt loam is a yellowish-brown to chocolate-brown silt loam, 6 to 15 inches deep. The subsoil is a dark chocolate brown to reddish-brown, compact, friable, silty clay loam. Narrow strips of Congaree fine sand and fine sandy loam too small to indicate on the map are included with this type.

In some of the poorly drained areas the surface soil consists of a dark-gray or dull grayish brown silt loam, 8 to 10 inches deep, underlain by a dark-gray to drab, compact silty clay subsoil, mottled with brown and yellow. These areas would be mapped Wehadkee silt loam if of sufficient extent.

The Congaree silt loam occurs mainly in the first bottoms of the Cape Fear River, and to a small extent along Upper Little River between Harrington Bridge and the Lee County line. The areas of fine sand occur as sand bars near the streams. The topography is prevailingly flat, with a gradual slope toward the streams and in the direction of their flow. The type is subject to occasional overflow. Drainage is fair, except in low depressions near the uplands.

This is one of the inextensive soil types of the county. About one-half of it is under cultivation, the remainder being either in pasture or in forest, consisting largely of old-field pine and sweet gum, and some cypress.

Corn and hay are the principal crops. Cotton, wheat, and oats are of secondary importance. Corn yields 30 to 50 bushels per acre, averaging about 35 bushels, without the use of fertilizer. Wheat and oats do well.

SWAMP.

Swamp represents stream-bottom areas in which the soil material varies considerably in texture, color, and structure. The surface soil ranges in texture from coarse sand to silt loam, and in color from light gray to brown or black. The subsoil is usually heavier than the surface soil and may be sandy clay, silty clay, or clay. In color it may be drab, mottled yellow and gray or brown. In places there are no color or structural differences between the surface soil and subsoil, the material being a black, mucky loam about 3 feet in depth.

Swamp occurs in narrow strips along many of the streams of the county. Its largest development is along Barbecue Swamp, Anderson Creek, and the headwaters of Buies Creek and Black River. The land is saturated or covered with water most of the time.

None of this type is under cultivation. It supports a forest growth consisting mainly of gum and ash, with a few pine and hickory trees, and an undergrowth of bay bushes and other water-loving shrubs.

GRAVEL HILLS.

Gravel hills includes hilly areas in which 50 to 80 per cent of the material, to a depth of 4 to 10 feet, consists of rounded waterworn gravel ranging in diameter from one-fourth inch to 2 inches, with interstitial material consisting of reddish-yellow loamy sand, sandy loam, or sandy clay. Such areas are uncolored in the map, being indicated by the name "Gravel Hills" printed across them.

This type occupies hills and ridges on the western boundary of the Cape Fear River bottoms, lying only a short distance to the northwest of Lillington. Most of it is covered with forest, the growth consisting of pine, oak, and dogwood. The material is mined to some extent for road metal and railroad ballast.

ROCK OUTCROP.

A few small areas, too rough and rocky for cultivation, are shown on the map by means of the rock-outcrop symbol.

SUMMARY.

Harnett County—area 595 square miles, or 380,800 acres—lies in the east-central part of North Carolina, midway between Fayetteville and Raleigh.

The topography ranges from flat and gently undulating to rolling, hilly, and broken.

Drainage is effected through the Cape Fear River and its tributaries. With the exception of the flatwoods section and some of the first-bottom lands, the county is well drained.

The population of Harnett County in 1910 was 22,174, or an average of 37.3 persons to the square mile. The entire population is classed as rural. Dunn and Duke are the two largest towns, with populations in 1910 of 1,823 and 500, respectively. Lillington, the county seat, has a population of 380.

The county has good transportation facilities. Public roads, many of them well improved, extend to nearly all sections, and others are being constructed.

Harnett County has a mean annual temperature of 61° F., the winter mean being 43.4° and the summer mean 77.7°. The average annual rainfall amounts to 54.91 inches. There is an average growing season of 217 days.

Agriculture began in Harnett County prior to the Revolutionary War. At present corn and cotton are the main crops. Cotton is the principal cash crop. Cowpeas, sweet potatoes, oats, wheat, and tobacco, named in the order of acreage, are of secondary importance.

Rotation of crops is practiced to a small extent. The use of com-

mercial and home-mixed fertilizers is general. Farm labor is comparatively scarce.

Farms range in size from 20 to 900 acres, averaging 90.8 acres in 1910. Sixty-five per cent of the farms are operated by owners and 34.8 per cent by tenants. The selling price of land ranges from $10 to $200 an acre.

Harnett County is situated in the Coastal Plain and Piedmont Plateau provinces. The soils of the Coastal Plain section are derived from unconsolidated sands and clays of sedimentary origin. Those of the Piedmont Plateau are derived from igneous and metamorphic rocks, chiefly mica schist, gneiss, granite, and slate. The first and second bottom soils consist of alluvium, derived from both provinces.

In all, 13 soil series, embracing 24 types, in addition to Swamp, Gravel hills, and Rock outcrop, are mapped. Of these the Norfolk sand, sandhill phase, is the most extensive.

Of the upland types the Norfolk sand, Norfolk sandy loam, Norfolk sandy loam, deep phase, Ruston sandy loam, Ruston fine sandy loam, Cecil fine sandy loam, and Cecil clay loam are the more important agriculturally. The Wickham fine sandy loam is the most important second-bottom type.

The Norfolk silt loam, Coxville silt loam, Coxville sandy loam, Portsmouth loam, Ochlockonee silt loam, Johnston loam, Chastain loam, and Swamp are poorly drained types.

The Cecil gravelly sandy loam, stony clay loam, and stony fine sandy loam, and the Appling fine sandy loam and gravelly fine sandy loam are of rather small extent. These types have a rolling to broken topography and are for the most part forested.

The Norfolk sand, sandhill phase, and the Hoffman sandy loam are confined to the sand-hill section of the county. A very small portion of these types is farmed. They are better adapted to the production of peaches, grapes, and dewberries than of the general farm crops.

[PUBLIC RESOLUTION—No. 9.]

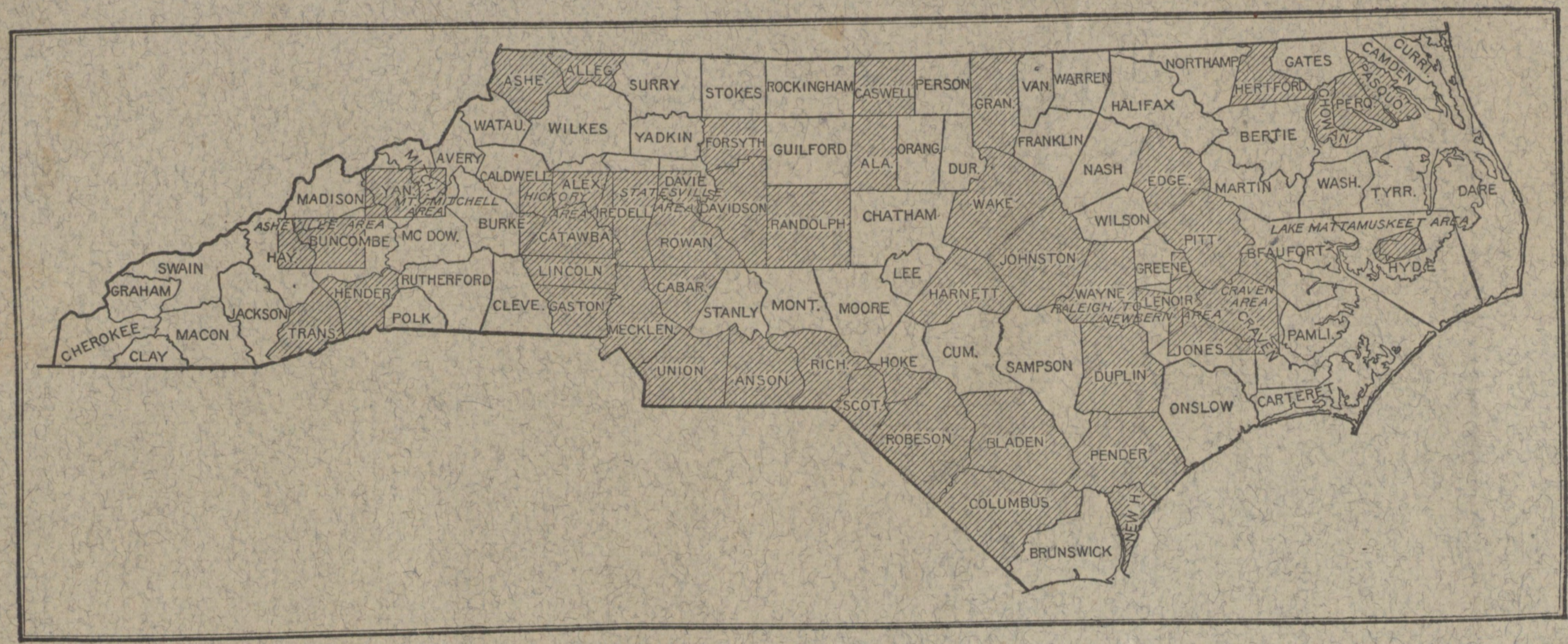
JOINT RESOLUTION Amending public resolution numbered eight, Fifty-sixth Congress, second session, approved February twenty-third, nineteen hundred and one, "providing for the printing annually of the report on field operations of the Division of Soils, Department of Agriculture."

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.