SOIL SURVEY OF SCOTLAND COUNTY, NORTH CAROLINA.

By R. B. HARDISON, J. W. NELSON, and DAVID D. LONG.

DESCRIPTION OF THE AREA.

Scotland County is situated in the southern part of North Carolina. It is bounded on the north by Richmond and Cumberland counties, on the east by Cumberland and Robeson counties, on the south by Marlboro County, South Carolina, and on the west by Richmond County. Scotland, with an area of 205,440 acres or 321 square miles, is one of the smallest counties in the State. It has a very irregular outline—the western, northwestern, northern, and northeastern

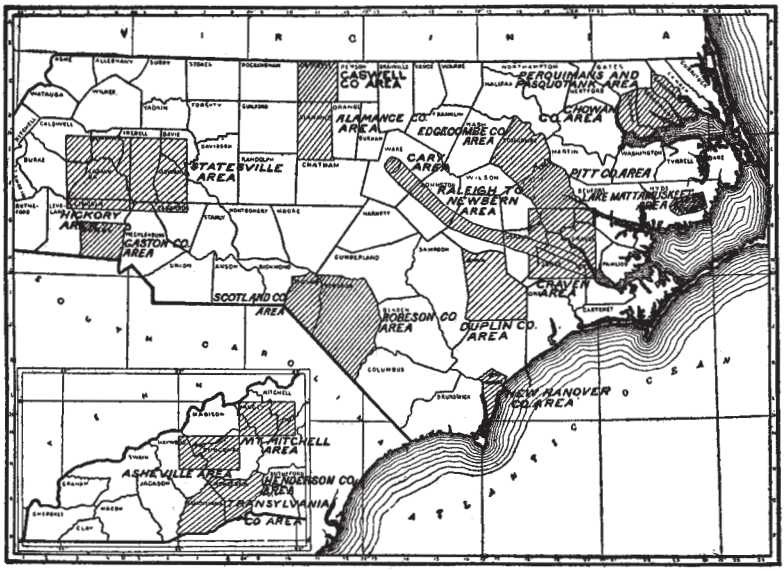

FIG. 14.—Sketch map showing location of the Scotland County area, North Carolina.

boundaries following the courses of streams or roads. The maximum length of the county is about 28 miles; its width varies from 13 to 21 miles.

An irregular line, drawn from a point on the county line 2 miles northwest of Gibson and extending in a general northeast direction across the county to a point 2 miles north of Wagram, divides the county into two distinct physiographic divisions. The country to the north of this line, about one-third the total area of the county, is

locally known as the "Sandhill" region, and the country south of this line as the "Flatwoods."

As a whole the topography of the latter section is level to gently undulating. There are many areas of considerable extent where the surface is flat. In other instances there are found sand knolls or ridges, whose elevation is slightly greater than that of the surrounding country. Basinlike depressions representing old lake beds occur frequently, but they are inextensive. This feature is especially noticeable in the section near Gibson.

The topographic features of the Sandhill and Flatwoods sections bear a striking contrast to each other, and the line of separation between them is very distinct. In passing from the latter to the former there is an abrupt rise in elevation of 6 to 8 feet, and the surface becomes rolling to hilly, the unevenness being the result of the erosive action of streams. From any elevation commanding a considerable view of the surrounding country there may be seen a great network of sand-hill branches, flowing in various directions through comparatively deep valleys. Interstream areas of the Sandhill region resemble elevated table-lands, and it is on these that the best roads of the northern part of the county are located.

With the exception of Lumber River, Joes Creek, and Bridge Creek, the regional drainage of Scotland County is accomplished by streams having their sources in the Sandhill section. Notable among these streams are Gum Swamp, Juniper, Jordans, Big Shoe Heel, and Little Shoe Heel creeks, all of which flow south and finally reach either Lumber River or Little Pee Dee River. Muddy Creek rises in the northwestern part of the county and flows east into Lumber River. Joes Creek, which drains the western part of the area, enters the county at the intersection of the county boundary and the main line of the Seaboard Air Line Railway, and flows southeast into Gum Swamp Creek. Along the various streams there are many dirt dams, which form ponds, whose water power is used for running mills of different kinds. On Joes Creek, near Gibson, there is under process of construction a hydro-electric plant.

From the direction of the drainage it is evident that the slope of Scotland County is toward the south. Elevations along railroads point also to a decrease in altitude in going from west to east. At Hasty, on the Atlantic Coast Line Railroad, the elevation is 197 feet, while at John Station, a point 2¼ miles farther east, the altitude is only 179 feet. Along the Seaboard Air Line Railway, between Laurel Hill and Laurinburg, a distance of only 5 miles, the elevation drops 32 feet, the former place being 250 feet above sea level and the latter 218.

Scotland County was formed in 1899 from parts of Richmond and Robeson counties. It was named Scotland in honor of the

mother country, whence came the majority of the early settlers. These Scotchmen, whose chief occupation was herding cattle, settled at first in the vicinity of Wilmington, and then in search of new grazing lands passed up the Cape Fear River valley to Fayetteville, and over into what is now Scotland County.

Since Scotland, as an organized county, is only in its infancy, it is impossible to secure definite figures to show its early growth. The 1900 census gives the population as 12,553. The population is at present about equally white and negro. A few Croatan families live in the southern end of the county.

Laurinburg, the chief town and county seat, with a population of 2,500, is located a little southeast of the central part of the county. Three cotton mills, one cotton-seed oil mill, and a window and door screen factory are located here. Gibson, the town of next importance, is situated in the southwestern part of the county. Wagram, John Station, Hasty, Laurel Hill, and Old Hundred are thriving towns of less importance. Numerous sidings for shipping watermelons and cantaloupes are conveniently located along the different railroad lines.

The railroad facilities of Scotland County are comparatively good. The Seaboard Air Line crosses the county from Hamlet to Wilmington by way of Laurinburg in practically a straight line. Both Hamlet and Wilmington are excellent railroad centers, and Scotland County melon growers find ready connection by way of either of these points for northern markets. The extreme southern end of the county finds an outlet for its produce over a branch line of the Atlantic Coast Line Railroad. Gibson is afforded transportation over the branch lines of the Seaboard Air Line and the Atlantic Coast Line. The Laurinburg and Southern, which is now under construction, will ultimately connect John Station, Laurinburg, and Wagram.

The dirt roads of Scotland County are in excellent condition and are steadily being improved. Stewartsville Township is at present expending $50,000 on sand-clay roads. As yet no macadam roads have been built and probably will not be, since sand-clay is much cheaper and is fairly satisfactory as regards lasting qualities.

CLIMATE.

The climate of Scotland County is that of the warm temperate zone. The winters are short and comparatively mild, and the summers are long and hot. Snows are of frequent occurrence during the winter months, but the fall is usually very light and remains on the ground for only a few days.

The prevailing wind in summer is from the south and southwest. The rainfall is quite evenly distributed throughout the year, and crops seldom suffer severely on account of droughts.

The following table, compiled from the records of the Weather Bureau station at Lumberton, in the county adjoining Scotland, gives the normal and absolute maximum and minimum monthly and annual temperatures and mean monthly and annual precipitation, together with the amount for the driest and wettest years, and the average depth of snow:

Normal monthly, seasonal, and annual temperature and precipitation at Lumberton, Robeson County, North Carolina.

Month.	Temperature.			Precipitation.			
	Mean.	Absolute maximum.	Absolute minimum.	Mean.	Total amount for the driest year.	Total amount for the wettest year.	Snow, average depth.
	°F.	°F.	°F.	Inches.	Inches.	Inches.	Inches.
December	44	74	13	3.1	3.3	5.6	0.5
January	43	76	8	4.0	2.2	4.0	1.9
February	41	74	1	49	5.9	2.2	2.9
Winter	43			12.0	11.4	11.8	5.3
March	53	85	18	3.7	2.5	3.6	T.
April	61	92	32	4.1	3.0	4.2	T.
May	71	98	39	4.3	3.4	12.5	.0
Spring	62			12.1	8.9	20.3	T.
June	77	101	50	5.3	2.3	5.5	.0
July	80	102	55	5.8	2.6	6.5	.0
August	79	101	53	6.0	4.5	7.0	.0
Summer	79			17.1	9.4	19.0	.0
September	72	97	35	3.9	3.3	9.4	.0
October	62	92	29	3.5	4.4	1.2	.0
November	52	82	15	2.4	4.3	1.0	.0
Fall	62			9.8	12.0	11.6	.0
Year	61	102	1	51.0	41.7	62.7	5.3

AGRICULTURE.

The grazing of cattle and sheep comprised the earliest agricultural pursuits of that territory now included in Scotland County. For this purpose the grass of the forests in the Flatwoods section of the county afforded ample pasturage. In this stage of agricultural development the settlers moved from one place to another, seeking new feeding grounds, and in doing so cleared small tracts of land in each place, on which they produced small quantities of corn and wheat for home use.

The cattle when ready for market were driven either to Fayetteville or to Wilmington, where they were sold. Usually two trips a year were made to these markets.

Early in the nineteenth century the turpentine industry began to replace grazing as the chief industry of the region. During this stage of development agricultural pursuits were carried on to a limited extent only, there being raised only enough corn, oats, and wheat, besides pork and beef, to supply home demands.

The trees in certain portions of the forests, after their supply of turpentine was exhausted, were cut for timber. A large quantity of lumber was sawed for shipping in addition to that used at home. The tracts of land thus cleared were used for agricultural purposes. When the land decreased in productiveness it was said to be "worn out," and new areas were taken into cultivation. The bottom land along stream courses was planted in oats and a little rice, while corn was planted on higher lying land. The preparation of the seed bed consisted of merely scratching the surface of the ground with a homemade plow and then harrowing with a brush harrow. Grain harvesting was done with a sickle, while thrashing and grinding were done either by hand or by crude homemade mills. Indigo was grown to a small extent and served as a money crop.

The present system of agriculture began to materialize after the reconstruction period. The demand for a ready-money crop brought about an increased production of cotton, while cattle raising and the growing of wheat and oats decreased proportionately. The production of cotton increased constantly and to-day it is the most important crop of the county. In 1908, 25,995 bales were produced. According to the census of 1900, there were 25,780 acres of land in cotton, but since that time the acreage has increased considerably. The production of corn is next to cotton in importance, there being 18,255 acres devoted to this crop in 1899. Since 1902 the growing of cantaloupes and watermelons has become an important industry. Only a small acreage is devoted to wheat, oats, rye, and grass, as the conditions are more favorable to the production of cotton, corn, and truck crops. Sorghum is grown for home use on small patches of land near the houses. Irish potatoes, sweet potatoes, peanuts, and asparagus are destined to play an important part in the future agriculture of the county. The rotation of crops had not been practiced to any extent up to 1902 or 1903. Until that time the prevailing system of agriculture was to plant cotton after cotton on the best lands and to produce corn continuously on the bottom lands or sandy lands too light in texture for profitable cotton growing. Many of the best farmers are now beginning to realize the value of rotation, and these alternate cotton with corn or small grain, followed by cowpeas. The growing of cantaloupes and watermelons has neces-

sitated a more systematic rotation of crops, for neither of these can be grown on the same soil more than once in three to seven years. In general, too few crops are grown on the average farm for a successful rotation.

Very few large two-horse plows are used for breaking land, but the general practice is to turn the soil only to a depth of 3 to 5 inches with a small turning plow, locally called a "dixie" plow. The farmers have tried large plows during the last few years and have secured results that will eventually cause the abandonment of the "dixie" for land breaking. The use of other types of improved farm machinery is not general. This is due to the fact that 65.9 per cent of the farms are operated by tenants who do not realize the value of labor-saving implements.

Stock feeding and dairying are not practiced in this county. One milch cow, which supplies milk and butter for home use, is usually found on each farm. Only a few pastures are maintained and these consist of fenced woodland. Hogs are allowed to run in such pastures during the summer months. During the fall months they are placed in pens and fattened on corn or ground feed. The number of hogs raised does not exceed the home needs for pork, lard, and kindred products.

The orchards of the county do not supply enough fruit to meet local demands, and apples, peaches, and other fruits are shipped into the county and bring high prices. Only a few peach or apple trees are found on the farms and these are given no care whatever. The value of all orchard products in 1899 was $1,183, or $1.10 per farm. The apples produced in the county are of summer varieties. Winter varieties of good keeping qualities can not be grown successfully. Peaches in the Flatwoods section of the county suffer from brown rot. Pears are affected by blight, and as a result few trees are found. In the Sandhill section the peach and pear trees planted about the houses give abundant yields of fruit of good quality. The trees are strikingly free from diseases and insect enemies, and the general conditions indicate that fruit growing on a commercial scale could be carried on successfully in this part of the county. The Scuppernong grape is grown throughout the entire county for home use.

As cotton is the most important crop of this area it is given the preference in regard to soils, fertilization, and cultivation. Various systems of fertilization are in practice. Among them may be mentioned the following: Eight hundred pounds per acre of a mixture containing 300 pounds of cotton-seed meal, 300 pounds of 14 per cent phosphoric acid, 200 pounds of 12 per cent kainit; 800 pounds per acre of a mixture containing 400 pounds cotton-seed meal, 200 pounds acid phosphate, and 200 pounds kainit; or an acreage application of 600 pounds composed of 300 pounds cotton-seed meal, 200 pounds

acid phosphate, and 200 pounds of kainit. Many of the cotton growers apply all the fertilizer at planting time, while others put in one-half at planting time and the other half about June 1. Nitrate of soda is generally applied about June 15 at the rate of 75 to 100 pounds to the acre. It should never be applied when there is not a good moisture supply in the soil. The varieties of cotton which are most popular are the Toole, Bates, King's Improved, and Johnson.

The Williamson method, or a modification of this method,[a] is gradually supplanting the old method of growing corn, and the yield, formerly ranging from 10 to 15 bushels per acre, has been increased 50 to 250 per cent. The aim of this method is to utilize fertilizer and soil moisture in the production of grain rather than stalk.

Fertilizers are used generally in two applications, and in addition top dressings of nitrate of soda and cowpeas are usually sown broadcast in the corn at the last plowing. The Williamson method is practiced on Portsmouth soils only when artificial drainage has

[a] The Williamson plan of corn culture (see Farmers' Bulletin No. 281, pp. 13–16), as well as the more common radical modification of this method, is especially adapted to the well-drained sandy loam soils of this region. Probably the most effective method for the region is essentially as follows: The soil should be fall or winter broken to a depth of something like 6 or 8 inches and harrowed. In the spring high ridges should be thrown up about 5 feet apart, leaving the raw lower soil or subsoil exposed in the deep water furrows between. Another deep furrow should then be run in the bottom of this water furrow and the corn planted in this. It is not a bad plan to mix in with the exposed lower soil or subsoil some of the surface soil. According to the Williamson method the corn is allowed to stand without cultivation or fertilization for two or three weeks, then cultivation is begun and later followed by side applications of fertilizer. Throughout much of the Coastal Plain region of the South a successful and common practice is to apply part of the fertilizer at the time of planting and to begin cultivation soon after the corn has made a good start, applying the remainder of the fertilizer and the usual amount of sodium nitrate as side applications some time in June. This method appears to give best average results, and it is believed that it would prove very profitable in Scotland County. One advantage in planting corn in deep trenchlike furrows lies in the favorable moisture conditions secured to the plant roots by the deep setting and the mulching or blanketing in of moisture by the soil thrown around the stalks by each successive cultivation, the ground being left practically level by the time the original high ridge is worked down, making a deep and thoroughly prepared root zone.

This method of planting corn on the freshly exposed subsoil or lower soil could hardly be expected to give good results on heavy clay land or land having a clay subsoil near the surface, like the predominating types of the Piedmont region, for the reason that freshly exposed clay in this section is not a fit abode for plants, and on the further account of the susceptibility of such clayey soil to bake, especially when not cultivated frequently, and to assume an unfavorable structural condition that could scarcely be corrected during the growth of a single crop.

been thoroughly established and the surplus organic matter has been greatly reduced by many consecutive years of cultivation.

Corn fertilization does not receive the careful attention that is given cotton. As a rule, much less fertilizer is applied to this crop than is given cotton. In quite a number of instances, however, equal amounts of the same mixture are applied to both crops. One of the most successful mixtures tried is as follows: Three hundred pounds cotton-seed meal, 150 pounds kainit, and 150 pounds acid phosphate. The mixture is applied at the rate of 600 pounds per acre. In a few instances excellent results have followed the use of 500 pounds per acre of cotton-seed meal.

The asparagus industry was started in Scotland County by the planting of 6 acres in 1903 and 9 acres in 1905. These 15 acres yielded in 1909 an average of 22 crates per day during the cutting season from April 1 to June 1. Clean culture is practiced. An acreage application of 1,000 pounds of kainit and 1,000 pounds of a 5–7–7 fertilizer is given in the early spring, followed by 1,000 pounds per acre of a 3–10–10 fertilizer when the crop is "laid by." The asparagus is packed into crates containing 24 bunches and shipped by express to northern markets.

Negro labor is plentiful in Scotland County. Negro women receive 50 cents a day for hoeing cotton, gathering cantaloupes, and other such labor. Negro men receive 60 to 75 cents a day, depending on the work done. Cotton is picked at the rate of 50 cents per 100 pounds of seed cotton. Skilled labor for picking and packing cantaloupes is scarce. A few of the most up-to-date cantaloupe growers employ skilled pickers from Georgia and Florida and pay them $2.50 a day. Plowmen receive $15 to $20 a month. According to the census of 1900, the expenditure for labor in the county was $72,270.

The farms vary in size from 25 acres to 2,000 acres. There are several men in the county who own from 13,000 to 15,000 acres each, but these holdings are unimproved land rather than farms. According to the 1900 census, the average size of farms was 118 acres, but this figure conveys a wrong impression, as the census counted each tenancy a farm.

Only 34.1 per cent of the farms are operated by the owners, the remainder being rented or worked under different share systems. When the tenant furnishes the stock and implements and the landowner all the fertilizer, each takes one-half the crop. In many instances the tenant receives one-third of the crop, with the exception of the cotton seed. Cantaloupe lands rent for $10 to $15 an acre.

Agricultural land has advanced in price from 50 to 300 per cent within the past decade. Present values range from $2.50 in the Sandhill region to $300 an acre near Laurinburg. The average price for cotton land in the Flatwoods section is $60 an acre.

In spite of the fact that Scotland County has made a wonderful advancement along agricultural lines, there is yet much room for improvement. More stable manure is needed, and an effort should be made to produce this by raising and feeding more live stock. This industry would also promote the practice of crop rotations, as a number of products would need to be introduced to provide forage. A greater variety of leguminous crops should be grown in this connection. If cotton growing is the chief aim of the farmers, they can do nothing better than precede the cotton by cowpeas, crimson clover, or velvet beans.

Deeper and more thorough plowing, using two-horse plows, should be more general and all improved farm machinery should be more extensively employed. In the cultivation of crops the consideration of soil moisture should be kept in view as well as the destruction of grasses and weeds. As a rule the organic-matter content of the soils should be increased by growing a greater diversity of crops and returning to the fields as much of the growth as practicable. That in itself will greatly improve moisture conditions. More attention may well be given to the selection of seed, especially in the case of cotton and corn.

Special Industries.

CANTALOUPES.

The cantaloupe industry was introduced into Scotland County in 1902. About that time a fruit brokerage company of New York City began operating a series of cantaloupe farms in different situations along the Atlantic coast from southern Florida to New Jersey. These farms were so situated with reference to climate that each in succession had its product on the market as the season advanced from south to north, the season opening April 15 with the farm in Florida and closing September 1 with the New Jersey farm. In this way the company kept its cantaloupes on the market throughout the season. An area of several hundred acres in Scotland County was selected as a location for one of the farms in this series, and experienced fruit growers from Florida and South Carolina were induced to operate it. By the year 1904 the product of this farm, on account of its superior flavor and excellent shipping qualities, commanded such fancy prices in northern markets that the company deemed it advisable to operate the industry on a larger scale. Consequently the New York truckers took into copartnership several Scotland County farmers and in this way permanently established the cantaloupe industry in this county. Since its introduction in 1902 the industry has made such rapid progress that Scotland is now one of the foremost of cantaloupe-producing counties in the United States,

the output reaching a total of 1,000 carloads during the season of 1908.

The Eden Gem variety is grown exclusively in this section. Experience has shown that home-grown seed does not reproduce a fruit of as fine quality as seed from more remote localities. The seed used is obtained from Rocky Ford, Colo.

Cantaloupes do not thrive on the Portsmouth and Coxville soils, but are grown more or less on all the types of the Norfolk series. The best results are obtained, however, on the best phase of the Norfolk sandy loam. The Norfolk coarse sand is also well suited to this crop.

The quantity and composition of fertilizers used vary with different planters. A thousand pounds per acre of a 10–3–10 (10 per cent phosphoric acid, 3 per cent nitrogen, and 10 per cent potash) grade is used by many of the most successful growers. In addition to this, 75 to 100 pounds per acre of nitrate of soda is used as a top dressing. The soil type on which the melons are planted seems not to be taken into consideration when the farmer selects his fertilizer, for in nearly every instance the same quantity and composition is used by the same planter on each soil. The relation of fertilizer to soil should receive more attention.[a] The gathering of cantaloupes begins about July 10 and continues three to four weeks, but invariably the greater part of the crop moves within a period of ten days. In packing, extreme care must be taken to see that no melons of inferior grade go into the crates, as these depreciate the value of the whole carload. The yields range from 100 to 350 crates per acre, the average being about 200 crates.

The greatest uncertainty in cantaloupe growing is the price that will be received for the crop. It not infrequently happens that the growers lose the whole expense of producing the crop, and occa-

[a] A very successful method of cultivating cantaloupes in this section is as follows: The soil is broken in fall or early spring as deep as possible with a two-horse plow and a subsoiler run behind this deep enough to make a well-prepared seed bed 10 to 14 inches deep. The land is then harrowed thoroughly and allowed to stand until two or three weeks before planting time, when the rows are laid off about 6 feet apart. Into the laying-off furrow one-third the fertilizer is distributed and mixed thoroughly with the soil by a small plow. A bed is now ridged up over the fertilizer and a second application of fertilizer is made on both sides of this ridge and covered by additional furrows, completing the bed. During the latter part of April the bed is leveled off with a board and the seed planted shallow with a seed drill. When the plants are well up shallow furrows are run on both sides with a small sweep and the plants thinned out to hills of one to two plants each, 12 to 18 inches apart in the row. Subsequent cultivation consists of frequent shallow plow cultivation between the rows until the vines become too long to admit of safe plowing. Cowpeas can be planted advantageously between the rows at the last cultivation.

sionally shipments are made which do not sell for enough to pay freight charges. At the beginning of the season melons of good quality often sell for $2.50 to $3 a crate. As the season progresses the price usually decreases. The average price throughout the entire season can be safely estimated at not less than $1 per crate. It is claimed by the best growers that cantaloupes at 40 to 60 cents a crate give better net profits than cotton at 10 to 12 cents a pound. The growers expect to make the pea-vine hay offset the expense of the crop until the gathering season. Then the cost of fertilizer, crates, gathering, packing, and shipping must be deducted from the proceeds of the cantaloupes.

In the past the method of marketing cantaloupes has been to ship them in refrigerator cars to northern commission houses and await such returns as the houses might make. This method has become very unpopular, however, and at present the melons are sold, when possible, to the local representatives of the commission houses. This method is not altogether satisfactory to the commission houses, because the market may be "flooded" when the cantaloupes arrive.

There is room for improvement along the line of preparation of the cantaloupes for market. Many growers do not exclude closely enough the melons of inferior grade. Then, too, they should be more neatly packed in the crates. Wrapping each melon in tissue paper would not only improve the appearance but would also prevent the spread of diseases such as "ripe rot" in a crate. The melons should be shipped in a better grade of crate. The crates used at present are not strong enough, and many of them break before reaching their destination.

WATERMELONS.

Like cantaloupes, watermelons grow with varying degrees of success on all the soil types of the Norfolk series. The most highly prized soils for this crop are the medium and deep phases of the Norfolk sandy loam. The Norfolk coarse sand is also considered fair, but its porous nature causes it to be droughty, and during dry seasons the crop is apt to suffer from lack of moisture. Generally speaking, this type is planted to watermelons only in order to rotate the land or to have the Norfolk sandy loam for cotton and corn.

The standard shipping varieties of watermelons are the Kolb Gem, the Eden Gem, and the Blue Gem. These are thick-rind varieties and stand shipment well. The seed is mostly of home selection, although some is obtained from Rocky Ford, Colo.

The most effective fertilizer is mixed at home. The proportions are 250 pounds 14 per cent phosphoric acid, 200 pounds cotton-seed meal, and 50 pounds potash. This mixture is applied at an acreage rate of 600 pounds.

Watermelon shipping begins about July 22. They are packed in bulk, four deep, in box cars, with only a bedding of straw or sawdust on the car floor. The average yield is about one-half carload per acre, 1,000 30-pound melons being considered a standard car. The size of shipping melons varies from 20 to 40 pounds.

Some growers sell for cash direct to the local representatives of commission houses, but this is not popular with the purchasers, because there is too much danger that the shipment will either spoil en route to its northern destination or meet a glutted market on its arrival. For these reasons most growers are forced to consign their product, through local representatives, to commission houses and await returns. The average price obtained is $50 to $100 a carload. Extra early melons of desirable size bring in some instances $200 a car.

SOILS.

Scotland County lies on the extreme western edge of the Atlantic Coastal Plain province. The geological formation which covers the area is the Columbia of Pleistocene age, and it is to the weathering of the sands and clays of this formation that the soils owe their origin. These materials may be traced to the Piedmont Plateau, having been brought down by streams and deposited in the ocean while the region was submerged in the sea. Though of the same geological origin, the wide differences existing between the soils of the Flatwoods section and the soils of the Sandhill section have given rise to entirely different agricultural conditions, and for this reason it is deemed advisable to discuss the soils of the two sections separately.

The Sandhill represents a part of an ancient shore line, or belt of sand hills, which extends along the Atlantic coast, at a distance of about 100 miles inland, across the State into South Carolina. It is a part of a major beach line which was dry land, while the Flatwoods area was still covered with water. The soils of the Sandhill section consist chiefly of medium to coarse sands, that have been more or less modified by weathering, drainage, erosion, and other soil-forming agencies. The relatively small proportion of fine-textured mineral particles which were originally present in the old beach-line sands have been carried away in the drainage waters and deposited at lower elevations. The original character of the surface material is believed to have been more nearly that of the present subsoil, which is a coarse, sandy clay. In the more rolling areas the depth of the sandy mantle has been lessened by surface and stream erosion, and in such places the coarse, sandy clay is found either on or near the surface, where, owing to atmospheric agencies, it has been more completely oxidized, as shown by its reddish-brown or mottled red color.

With the exception of small Portsmouth areas, the soils of the Sandhill are thoroughly drained. The principal types found in this

region are Norfolk coarse sand (Sandhill phase) and Hoffman sandy loam.

As already stated the materials from which the soils of the Flatwoods are derived belong to the same geological formation as those producing the Sandhill types, but they have been exposed to the various soil-forming agencies for a shorter time. The Flatwoods was probably a shallow sound or an arm of the sea whose waves washed up the materials to form the present Sandhill.

The action of streams and surface erosion has played only a minor rôle in the formation of the soils of the Flatwoods. Many of the sand knolls and ridges found in this part of the county were evidently thrown up by the waves about the time the region was emerging, but the areas of such soil are relatively small. The soils of the Flatwoods section were classified into six distinct types, viz, Norfolk sandy loam, Norfolk coarse sand, Portsmouth sandy loam, Portsmouth coarse sandy loam, Portsmouth clay loam, and Coxville clay loam.

The types of the Norfolk series occupy elevated and well-drained areas, while the Portsmouth and Coxville types are found in low-lying positions, in some instances old lake beds, and are poorly drained.

The following table gives the actual and relative extent of the several types:

Areas of different soils.

Soil.	Acres.	Per cent.	Soil.	Acres.	Per cent.
Norfolk sandy loam	79,040	38.5	Portsmouth clay loam	1,472	0.7
Norfolk coarse sand	23,104	38.2	Portsmouth sandy loam	1,152	.6
Sandhill phase	55,360		Coxville clay loam	256	.1
Swamp	28,480	13.9			
Hoffman sandy loam	8,576	4.1	Total	205,440	
Portsmouth coarse sandy loam	8,000	3.9			

NORFOLK SANDY LOAM.

The soil of the Norfolk sandy loam consists of 6 to 14 inches—in most cases the depth lies between 8 and 14 inches—of dull-gray, dark-gray, or brownish-gray loamy sand or loose light sandy loam. The subsoil, which is a pale yellow to bright yellow sandy clay, may be encountered at any depth between 6 inches and 30 inches, although the areas where the latter extreme is found are comparatively few. Between this soil and subsoil, where it is found at depths greater than 14 inches, there occurs a stratum of material of the same texture as the surface soil, but owing to low organic matter content usually of a yellow or pale yellow color. The variations in color of the surface soil are also due mainly to differences in the quantity of organic

matter which it carries. In the vicinity of Laurinburg, Gibson, and John Station the surface soil is uniformly darker than in the country to the north of Laurinburg near the margin of the Sandhill section. Small areas occupying slightly elevated knolls and ridges, and having exceptionally good drainage, are underlain by a red friable sandy clay. These occur frequently throughout the Flatwoods region, but are rather too small to show on the map. These areas are somewhat more productive than the Norfolk sandy loam, and of course would be mapped as another type if of sufficient extent. One of the largest is found 1½ miles east of Laurinburg on the Maxton road. Another area of considerable size occurs near Laurel Hill Church, and a small body was mapped a little to the west of the Springfield cotton mill.

The Norfolk sandy loam is the predominating soil of the Flatwoods section. The continuity of the areas in the southern two-thirds of the county is broken only by comparatively small areas of other soils. Several small areas of the type were mapped in the Sandhill section.

The surface features of the type as a whole are those of a level, gently undulating to gently rolling region. Interstream areas have the appearance of broad and gently sloping plateaus, with a surface not rolling enough to induce erosion, yet sufficiently undulating to insure excellent drainage. Rolling areas are very limited in extent and occur only near streams. Artificial drainage has been necessary only in a few instances.

The Norfolk sandy loam owes its origin to the weathering of the sands and clays of the Columbia formation. Originally these materials came from the Piedmont Plateau, having been brought down by streams as the weathered products of granites, gneiss, and other crystalline rocks and deposited in the sea while this part of North Carolina was still submerged. The soil of this type is a sandy loam of marked uniformity, and this fact, together with its even topography, would seem to indicate that its formation has been a process of weathering rather than a process of elimination and assorting by the action of waves, streams, or surface erosion. Chemical changes, especially oxidation, have been active weathering agencies and have resulted in many color differences. The latter are more pronounced in the subsoil of slightly elevated areas, where aeration and drainage have been most thorough.

In character of vegetation this soil is quite varied. Longleaf pine, hickory, white oak, red oak, dogwood, and an occasional holly constitute the chief timber growth. Originally the type was heavily forested to longleaf pine, with a considerable number of hardwood species, but the greater part of the merchantable timber has been cut. In slightly depressed areas there is a dense undergrowth of various shrubs.

The Norfolk sandy loam is adapted to a wide range of crops, many of which are either not grown at present or only to a slight extent. It is held in very high esteem as a cotton, corn, cantaloupe, and watermelon soil. The yields of the several crops depend largely upon the methods of cultivation employed and the quantity and composition of fertilizers applied. Deep fall plowing, followed by shallow crop cultivation, is becoming more generally practiced. The cotton yields range from one-half to 2¼ bales per acre, with an average of about 1 bale per acre. Under best methods, including a modification of the Williamson plan of cultivation, corn yields range from 30 to 60 bushels per acre, averaging probably 40 bushels. The cantaloupe yield varies from 150 to 300 crates per acre, averaging about 200 crates. Cowpeas are invariably sown in the corn, cantaloupes, and watermelons at the last cultivation. The peavine hay yield averages about 1 ton per acre. Sweet potatoes produce well on this type, but are only grown for home use.

This soil is admirably adapted to the production of vegetables, especially beans, English peas, early corn, asparagus, cabbage, and onions. Crimson clover can be grown successfully. This soil is well suited to the production of a bright yellow tobacco. It will also produce peanuts, velvet beans, and sorghum.

The Norfolk sandy loam is nearly all under cultivation and is for the most part in a high state of productiveness. It is valued highly and not much of it is for sale. Probably none of it could be bought for less than $60 an acre, while around Laurinburg and Gibson it is held at prices ranging from $200 to $300 an acre.

There is a deep phase of the Norfolk sandy loam which represents a gradation between the typical Norfolk sandy loam and the Norfolk coarse sand. The soil consists of 8 to 10 inches of light-gray, medium to coarse sand of porous structure resting on a compact gray, pale-yellow, or yellow sand. At a depth of 26 to 30 inches the sandy subsoil grades into a friable sandy clay, usually distinctly yellow in color.

One of the largest areas of this phase occurs as a narrow strip paralleling Jordans Creek on the west side for a distance of about 3 miles. A smaller area of similar outline occurs just south of the first-mentioned body along the west side of the same stream. The smaller areas are found east of Big Shoe Heel Creek and about 5 miles south of Wagram. Another area occurs in the southwestern part of the county on the west side of Gum Swamp Creek. These areas usually have a gentle and uniform slope toward the streams along which they occur. The surface of those areas near Wagram is more nearly level.

The formation of this deep phase of the type is due in part at least to wave action and took place while the Flatwoods section of the

area was a shallow sound or about the time this region was emerging from the water. Since the area has become dry land, the depth of the sandy mantle has probably been increased a little through surface washing. Originally it supported a valuable growth of longleaf pine, together with various hardwoods. In some places where the soil borders the swamp areas along streams there is found a rather thick growth of black gum, sweet gum, white oak, and post oak, beneath which there occurs shrubs of various kinds.

This would prove an excellent soil for asparagus, beans, English peas, cucumbers, strawberries, and other vegetables. The principal crops grown are cotton, corn, cantaloupes, and watermelons, but crop yields, especially of cotton and corn, are not as large as on the typical Norfolk sandy loam. Cotton rarely ever exceeds 1 bale per acre and its average yield is not more than two-thirds of a bale. Corn produces 15 to 40 bushels per acre, with an average of 25 bushels. Turning under cowpeas would improve the physical condition of this soil and would also increase the nitrogen content.

Where cotton is to be planted on this phase it should be preceded by a crop of cantaloupes or watermelons in which cowpeas are sown. While almost all of this soil is under cultivation, it is not in as high state of cultivation as the typical areas of the Norfolk sandy loam. However, on account of the great demand for farming lands in the southern part of the county this deep phase is highly valued, and it can not be bought for less than the other parts of the type.

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

Mechanical analyses of Norfolk 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.*
21767	Soil	5.1	22.9	13.4	16.8	6.9	21.4	13.3
21768	Subsoil	2.9	12.8	8.5	12.5	6.6	16.5	40.2

NORFOLK COARSE SAND.

The surface soil of the Norfolk coarse sand is a light-gray, yellowish-gray, or gray medium to coarse sand, having an average depth of 4 to 6 inches. In some of the very small areas, which occupy lower positions than the average, the surface soil is rather dark and somewhat compact, owing to the greater content of vegetable matter. As a rule the soil is loose and porous and is easily cultivated.

The subsoil consists of a pale-yellow or straw-colored medium to coarse sand of more compact structure than the soil. In many instances, especially near Laurinburg and John Station, this com-

pact sandy subsoil grades into a reddish loamy fine sand. Such areas, however, do not accord with the characteristics of the type and would have been mapped separately had they occurred in bodies of sufficient size.

There is a relatively high content of interstitial fine grains which make this soil more retentive of moisture and therefore more productive than some coarser phases of the type as mapped in other areas.

The largest area of Norfolk coarse sand occurs in the southern part of the county along Gum Swamp Creek. It extends as an unbroken body along both sides of the creek from Lytchs mill to the county boundary. An area of considerable size is found in the eastern part of the county near Lees mill. Smaller areas are of frequent occurrence throughout the Flatwoods section.

The Norfolk coarse sand occupies the knolls, ridges, and higher elevations of the southern two-thirds of the county, and is well drained. Its surface is for the most part gently rolling. The most rolling area is found along Gum Swamp Creek. In nearly every instance a small body of Norfolk coarse sand borders the basins which are occupied by the Portsmouth soils. These areas are droughty and usually unproductive.

In formation the Norfolk coarse sand is the result of the action of waves, streams, and surface erosion on the Columbia sands and clays. Many of the ridges of Norfolk coarse sand are unquestionably minor beach lines formed by the waves as the water receded. Since its emergence all the type has been more or less modified by stream and surface erosion.

Most of the Norfolk coarse sand is under cultivation. On the forested areas the growth consists of longleaf pine, white oak, red oak, hickory, and dogwood. The longleaf pine, which originally covered all areas of this soil, was very valuable as a source of turpentine products. With the decline of the turpentine industry most of the merchantable pine was removed.

The Norfolk coarse sand would prove an excellent soil for asparagus and many early vegetables, including cucumbers, beans, English peas, and sweet corn. It is also admirably adapted to the production of grapes, peaches, dewberries, and raspberries. Peanuts would be a profitable crop on this type if a liberal application of lime were used.

Cotton yields from one-third to 1 bale per acre. This crop should always follow cowpeas. Cantaloupes and watermelons do well. The average yield of corn is 10 to 25 bushels per acre. The soil is deficient in humus and could be improved by turning under cowpeas or velvet beans. These crops would also increase the nitrogen content. The subsoil of the Norfolk coarse sand is porous enough to permit a free downward passage of water, and sufficiently open and loose for an

easy penetration of the roots of plants. For these reasons it is not necessary to break the soil to depths greater than 6 or 8 inches.

The value of the Norfolk coarse sand depends mainly upon its location. The smaller bodies near Laurinburg, Gibson, and John Station are held at prices as high as those asked for either phase of the Norfolk sandy loam. The larger areas sell for $25 to $40 an acre.

Sandhill phase.—The soil mapped as Norfolk coarse sand (sandhill phase) consists of a subangular, medium to coarse incoherent sand, varying in depth from 4 to 6 inches. The surface 2 or 3 inches usually contains enough organic matter to give it a light-gray or gray color. In several instances, however, organic matter is so markedly absent that the surface has the appearance of snow banks. Occasionally a small level area is encountered in which the soil consists of rather dark grayish sand, slightly more compact in structure than the average of the type.

Below 6 inches and down to a depth of 20 to 26 inches the subsoil is a pale-yellow or yellow sand, of the same texture and structure as the soil, where it passes gradually into a reddish-yellow sand, finer textured and more loamy in its nature. Only in rare instances does the subsoil to a depth of 36 inches continue an incoherent, medium to coarse pale-yellow sand.

The Norfolk coarse sand (sandhill phase) occupies about 80 per cent of the Sandhill section, to which it is confined. The surface of the type, as a whole, is rolling to hilly. Interstream areas are often quite extensive, and as a rule are more gently rolling than the other portions of the type. The most rolling areas are found in the western part of the county, near Ghio, and northward from Ghio along the western boundary of the county. Many rolling areas are found also in the extreme northern part of the county, near Blues Bridge. The largest of the undulating areas occurs as interstream country, extending entirely across the county, from the extreme northwestern corner down to the intersection of the Rockingham and Turnpike roads. The topographic position of the soil, together with its porous structure, has resulted in such thorough drainage that the type is droughty.

The Norfolk coarse sand (sandhill phase) owes its origin to the unconsolidated sands of an old shore line, known as the "Belt of Sand Hills." Like the other soil materials of the area these sands belong to the Columbia formation, but unlike the mineral materials of the Flatwoods they were thrown up by the waves to form the old beach line many years before the southern two-thirds of the county emerged from the water. Since the elevation of this region above the level of the ocean the materials of the type have undergone considerable reworking by streams. Surface erosion has lessened the depth of the sand in many places and increased it in others. On many of the knolls suffering most from surface washing there is

found a considerable quantity of iron concretions, together with many fragments of ferruginous sandstone.

Only a small percentage of the type is cleared. The native vegetation consists of scattering longleaf pine, a scrubby growth of "round leaf" and "forked leaf" black-jack oak, together with some post oak and white oak. The undergrowth consists of wire grass and broom sedge.

None of the Norfolk coarse sand (sandhill phase) is heavily fertilized. The type is too light for the general farm crops. With an acreage application of 200 to 400 pounds of a low-grade fertilizer cotton yields one-fourth to one-half bale per acre and corn from 5 to 15 bushels per acre. Cowpeas do fairly well when a light application of phosphoric acid and potash is added. This soil is well suited to sweet potatoes, yields of 250 bushels per acre having been obtained in several instances. Spanish peanuts and artichokes can be grown. Only a small acreage of cantaloupes and watermelons is planted, the yields of both being light. The soil is too porous and light for asparagus. It will be found that the greatest value of this soil lies in its adaptation to the production of fruits, such as peaches, grapes, dewberries, and raspberries.

Humus is almost entirely wanting in this soil, a condition which should be remedied by turning under cowpeas, velvet beans, vetch, or some other leguminous crop, though clover can not be recommended. Watermelons and cantaloupes would give better yields under proper methods of cultivation and fertilization. If it is the intention of the farmers to grow cotton it should be done in a three-year system of rotation. Fall rye, followed by cowpeas in June, with either cantaloupes or watermelons the second year, should leave the soil in good condition for cotton the third year.

The value of the Norfolk coarse sand (sandhill phase) is increasing. Twenty years ago untimbered land of this type could be bought for 50 cents to $1 an acre. As late as ten years ago it rarely sold for more than $2.50 an acre. At present it is worth $2.50 to $15 an acre.

The following table gives the results of mechanical analyses of samples of both phases of the Norfolk coarse sand:

Mechanical analyses of Norfolk coarse sand.

Number.	Description.	Fine gravel, 2 to 1 mm.	Coarse sand, 1 to 0.5 mm.	Medium sand, 0.5 to 0.25 mm.	Fine sand, 0.25 to 0.1 mm.	Very fine sand, 0.1 to 0.05 mm.	Silt, 0.05 to 0.005 mm.	Clay, 0.005 to 0 mm.
Typical:		*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*
21759	Soil	1.3	28.9	28.3	27.8	3.3	4.9	5.3
21760	Subsoil	1.2	28.4	26.7	31.5	3.1	3.4	5.5
Sandhill phase:								
21763, 21765	Soil	2.1	32.9	20.1	30.2	6.8	5.2	2.4
21764, 21766	Subsoil	1.8	26.1	22.1	33.9	8.2	4.5	2.7

PORTSMOUTH COARSE SANDY LOAM.

The Portsmouth coarse sandy loam consists of 8 to 20 inches of black sandy loam to coarse sandy loam containing a high percentage of organic matter, underlain by a tenacious drab-colored clay, also containing considerable coarse sand. The subsoil is frequently mottled reddish, drab, and yellow in its lower depths by iron oxide. The type averages a fairly coarse sandy loam. The soil is variable, however, the loamy structure of the surface soil being replaced by a black medium sand to coarse sand as the Sandhill section of the county is approached. In other areas the dark-colored surface soil may extend to a depth of 6 inches only, where a bluish gray sandy clay is reached, the latter becoming mottled with reddish, drab, and yellowish at 24 to 30 inches. The sticky nature of the type when wet renders it less easily cultivated than the surrounding Norfolk soil.

Of the Portsmouth soils in the county, the coarse sandy loam type is the largest in area and the most important agriculturally. It is found in small bodies scattered throughout the county, the largest occurring in the southern and central parts. In that section of the county locally known as the Flatwoods the type occurs mostly as flat and poorly drained depressions or basins varying in size from a fraction of an acre to 600 or 800 acres. The areas of most agricultural importance are usually found either as narrow strips paralleling streams or as low-lying areas near the source of streams. Very little of the type is encountered in the northern or Sandhill section of the county. The few areas mapped in this section occur along stream courses. The Portsmouth coarse sandy loam, like other types of the area, owes its origin to marine sedimentation, the materials having been derived through surface washing and stream erosion from the Piedmont Plateau.

The native vegetation is varied. In some of the larger areas in the southern part of the county the timber growth is shortleaf pine exclusively, with an undergrowth of broom sedge. In early spring and summer this affords excellent grazing, provided the basins are not filled with water. In better drained areas the timber growth consists of longleaf pine, black gum, sweet gum, post oak, and white oak. A few small areas were encountered in which the native growth is exclusively cypress.

There is no apparent reason why strawberries, especially the late varieties, can not be successfully grown on this type. It is also well suited to truck crops, such as cabbage, lettuce, onions, beets, and celery. At present it is used chiefly for corn and oats, and when drained it produces good yields of both. It is usually not planted to cotton unless it occurs as a small area within a type of the Norfolk series. On account of its topography the soil is of a cold, wet nature,

and does not warm up early in spring; hence cotton, if planted early, comes up and dies; if planted late, the large organic matter content produces a luxurious weed with little or no fruit. When the organic matter content has been reduced by several consecutive years of cultivation to corn and oats, this soil can be made to produce a bale of cotton per acre. Under proper methods of cultivation and with favorable seasons corn will produce 40 to 60 bushels per acre, 45 bushels being about the average. A yield of 20 to 40 bushels of oats per acre is considered satisfactory.

Organic acids from decaying vegetation make the Portsmouth soils extremely sour, a property which should be corrected by the use of lime. In addition to correcting acidity, lime would also improve the structure of the heavier phases of this and the other types of the Portsmouth series by causing flocculation of the clay particles. This would also effect a more thorough downward passage of water, an additional advantage in the cultivation of the land.

The following table gives the results of mechanical analyses of the soil and subsoil of the Portsmouth coarse sandy loam:

Mechanical analyses of Portsmouth coarse 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.*
21775	Soil	7.4	26.2	16.7	21.0	10.8	4.5	13.7
21776	Subsoil	6.2	22.3	13.6	19.8	11.9	5.3	20.7

PORTSMOUTH SANDY LOAM.

The soil of the Portsmouth sandy loam, to a depth of 8 to 14 inches, consists of a black to gray sandy loam of high organic matter content. The subsoil is a steel-gray clay that frequently shows iron stains. As a rule the soil is not composed of a uniformly fine sand, but contains a small percentage of coarse sand. In a few instances, however, there is a marked absence of prominent sand grains, in which case the soil closely resembles a loam. The color of the surface soil varies with the amount of vegetable matter contained and the stage of decomposition through which this is passing. In many of the forested areas that are fairly well drained the top soil has a brownish appearance, owing to the fact that the organic matter is in an early stage of decomposition.

Areas of the Portsmouth sandy loam are confined chiefly to the extreme southern and southeastern parts of the county and as found here are relatively inextensive. The largest area is found just east of Johns Mill. Another important body occurs in the extreme southern corner of the county and a body of less extent was mapped 2 miles

west of Laurinburg. Several small bodies occur in the Sandhill section along Lumber River. The type occupies flat, low-lying, poorly drained areas. In the Flatwoods section the type occurs either as small basinlike areas or as irregular-shaped bodies within the more elevated Norfolk soils. In the Sandhill section it occupies the flood plains of Lumber River and is in a semiswampy condition. These areas in the Sandhill section are of no agricultural importance, except for summer pastures.

The Portsmouth sandy loam owes its origin to the finer materials of the Columbia formation. The type owes the characteristics distinguishing it from the Norfolk soils to long-continued subjection to semiswampy conditions.

Areas of the Portsmouth sandy loam support a native vegetation of gums, longleaf pine, and shortleaf pine, with a dense undergrowth of reeds and briers. Only a small proportion of the soil is under cultivation. Areas which have been drained produce excellent yields of corn and oats. The type is never planted to cotton, unless it occurs as a small body within the Norfolk soils.

As an individual type it is not highly valued for agricultural purposes. The smaller areas, which are surrounded by the Norfolk soils, sell at the same rate as the latter. A farm situated on the Portsmouth entirely would be valued from $15 to $25 an acre. As a rule the soil is acid and liming would be very beneficial.

The following table gives the results of mechanical analyses of the soil and subsoil of this type:

Mechanical analyses of Portsmouth 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.*
21777	Soil	6.3	21.1	12.7	20.1	11.2	9.8	19.0
21778	Subsoil	5.9	20.0	12.9	19.9	13.1	6.4	21.8

PORTSMOUTH CLAY LOAM.

The soil of the Portsmouth clay loam consists of 4 to 6 inches of very dark gray to bluish-gray heavy sand loam to clay loam. It contains a relatively large percentage of organic matter and except during long rainy seasons is a mellow, easily tilled soil. The subsoil is a heavy silt loam, clay loam, or very fine sandy loam, in color steel-gray mottled with yellow by iron salts. In places the loamy covering is so shallow that the soil represents true clay.

The largest area of the typical soil is found just south of Laurinburg, where it occurs as a slightly depressed body within the Norfolk sandy loam. The greater part of this body has been drained by means of open ditches and is under cultivation. It is held in high

esteem as a corn and oat soil. Little attempt is made to grow cotton on it, except near the margins, where it borders the Norfolk sandy loam. With favorable seasons and under proper methods of cultivation it can be made to produce 60 bushels of corn per acre, and with the exception of depressed areas it is valued as highly as the surrounding Norfolk soils.

There are several local variations of the Portsmouth clay loam, one of which is represented by an oval-shaped body of 600 acres, situated 4 miles east of Laurinburg, on the Maxton road. On account of the topographic position of this body, accumulation and decomposition of vegetable matter has progressed to such an extent that the resulting soil closely resembles a muck. In the surface 8 to 14 inches of the soil there is only a small percentage of mineral matter, this being a fine sand. Underlying the mucky material is a compact white sand of medium texture which is in turn underlain by a drab-colored, iron-stained clay containing a little sand.

Other bodies of this phase are found in the southern part of the county about 5 miles southeast of Gibson. This phase of Portsmouth clay loam occurs as low-lying, poorly drained areas representing old lake basins. None of it is under cultivation. A thick growth of small cypress is the principal vegetation. If cleared and drained, it will produce corn, celery, and onions. It is especially adapted to onions.

A representative body of a second variation from the typical Portsmouth clay loam is found just north of the Atlantic Coast Line Railroad at Hasty. Here the soil consists of 12 to 14 inches of a black heavy loam of high organic matter content and uniform texture. The large proportion of decayed vegetable matter contained in this soil, together with its fine texture, enables it to retain much water, and at 10 to 12 inches it is almost saturated. The subsoil is a pale bluish-gray silty clay, plastic and wet, showing iron stains in its lower depths.

Poor drainage conditions, due to topographic position, prevents this phase of the Portsmouth clay loam from being of agricultural importance.

The following table gives the results of mechanical analyses of the soil and subsoil of the Portsmouth clay loam.

Mechanical analyses of Portsmouth clay 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.*
21783	Soil	3.1	8.9	7.8	15.8	16.0	13.9	34.3
21784	Subsoil	5.2	11.1	10.4	22.9	17.6	3.5	29.3

HOFFMAN SANDY LOAM.

In the Hoffman sandy loam the first 2 or 3 inches of the soil contains enough organic matter to give it a grayish color. Below this, to a depth of 6 to 8 inches, the soil is composed of a pale yellow or slightly pinkish incoherent sand, which ranges in texture from medium to coarse. The subsoil is composed of a slightly friable coarse sandy clay, varying in color from deep pink to light red, often slightly mottled with white, drab, or yellow. On bare knolls, where the subsoil has been exposed to the atmosphere, it is usually mottled brick-red, owing to the oxidation of iron compounds. Iron concretions and fragments of ferruginous sandstone are of frequent occurrence on such exposed knolls. In deep road cuts, where oxidation has been most thorough, the subsoil presents a variety of colors, the most prominent being brick-red, pink, purple, orange, yellow, and white. The type occupies ridges and knolls overlooking stream courses in the western and northern sections of the county. It is closely associated with the Sandhill phase of the Norfolk coarse sand. The areas are of small extent, and owing to their topographic position usually well drained.

Between the Swamp or the Portsmouth soils, which fringe the streams, and the Hoffman sandy loam, which occupies the ridges, there is usually found an intermediate type or phase whose surface is for the most part level. On account of its limited representation this phase has been included in the Hoffman sandy loam. The soil of such areas is as a rule darker colored, finer textured, more loamy in structure, and less well drained than the more elevated areas of Hoffman sandy loam. The subsoil of this phase has a waxy appearance, is of a lighter and more uniform color, and contains less sand.

The type owes its origin to the weathering of the sands and sandy clays of the Columbia formation. On account of the topographic position of the type erosion has kept so nearly apace with weathering that the subsoil is in many places either bare or covered by only a thin mantle of loose sand. This fact has resulted in the development of the present type.

The Hoffman sandy loam supports a scrubby growth of round-leaf and forked-leaf blackjack oak, together with a few longleaf pines.

On the less rolling areas near streams small-sized black gums and sweet gums are frequently seen. At one time the entire type was forested to longleaf pine, but all the merchantable timber has been removed.

Very little of the Hoffman sandy loam is under cultivation. A small acreage of it is devoted to cotton and corn, but this is confined chiefly to the flat areas. The average yield of corn is not over 10 bushels per acre, while cotton yields about one-third bale per acre.

As an individual soil type the Hoffman sandy loam has no especial value. Like the other types of the Sandhill region, it brings from $5 to $10 an acre. It is not considered a desirable agricultural soil.

The following table gives the average results of mechanical analyses of the soil and subsoil of this type:

Mechanical analyses of Hoffman 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.*
21755, 21757.....	Soil.....	6.6	21.5	16.3	26.3	16.1	3.7	9.5
21756, 21758.....	Subsoil.....	10.3	25.7	11.3	16.8	12.7	3.4	19.9

COXVILLE CLAY LOAM.

The Coxville clay loam has a very limited representation in Scotland County. In origin, in many of its properties, and in the position it occupies, it bears a close relation to the Portsmouth clay loam, but it differs from the latter in being somewhat closer textured and in having an entirely different subsoil. The surface 4 to 8 inches of the soil consists of a dark-gray to black plastic clay loam, resting on 4 inches of a pale bluish-gray stiff clay. The subsoil to a depth of 14 inches consists of a plastic yellow clay, very wet, underlain by a stiff clay of variegated colors, the predominating shades being brownish red, brick red, and white. Both soil and subsoil have a smooth, greasy feel.

Only three bodies of this type were mapped. One of these, covering an area of 100 acres, is found 2 miles southeast of Gibson, a second of nearly the same size occurs 5 miles southeast of Gibson, and the third, which covers an area of only 40 acres, is located 7 miles southeast of Laurinburg, on the Laurinburg and McColl (S. C.) road.

The soil occupies old lake beds and its natural drainage is poor. During long rainy seasons the basins become filled with water, in which case they are known as ponds. In one or two instances these ponds have been partly drained by means of large open ditches cut across the surrounding Norfolk soils to neighboring streams. The materials of which the soil is composed have been deposited from standing water during Recent time. These materials came principally from the Piedmont Plateau, being composed of the weathered products of granite, gneiss, and other crystalline rocks. Since the basins have ceased to be permanent lakes vegetation has flourished, and in this way much organic matter has been added to the soil.

The rims of these basins support a thick undergrowth of loblolly pine, while nearer the center the native vegetation consists of scattering cypress, with an undergrowth of grasses. During the early spring and summer months these grasses afford good pasturage. Owing to its topographical position and consequent poor drainage, none of the type is under cultivation. In the case of these partially drained areas complete drainage could be established at reasonable expense by cutting small laterals into the main ditch. If this were done the soil could be made to produce good yields of corn and oats. The soil is acid and would have to be limed to put it in condition for cropping.

The following table gives the results of mechanical analyses of the soil and subsoil of this type:

Mechanical analyses of Coxville clay 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.*
21753	Soil	1.3	9.2	7.0	10.1	6.0	27.1	38.6
21754	Subsoil	4.2	11.8	6.8	9.6	9.5	14.4	43.8

SWAMP.

The Swamp of Scotland County includes land lying along stream courses and subject to overflow. The materials composing the soil are of a heterogeneous nature. In some instances these consist of coarse, loose sand, gray to black in color, and saturated with water. The subsoil is usually a lighter colored sand, frequently almost white. Along some of the larger streams where the Swamp is broad and flat the soil is composed principally of organic matter of a dark-brown color, closely resembling muck. The subsoil of such areas consists of beds of medium sand, coarse sand, fine gravel, and water-rounded pebbles, with little or no organic matter.

The largest Swamp areas occupy the low, flat lands along Lumber River and Gum Swamp, Jordans, Juniper, and Shoe Heel creeks. The soil is of alluvial origin. In its present condition it can not be used for agriculture.

Areas of Swamp are forested with cypress, black gum, sweet gum, and other water-loving trees, with a dense undergrowth of reeds and briers. Practically all of the merchantable timber has been removed. Those areas on which the principal undergrowth is reeds afford good grazing when the land is not flooded.

SUMMARY.

Scotland County, with an area of 205,440 acres, or 321 square miles, is situated in the southern part of North Carolina along the North Carolina–South Carolina State line. It lies in the Coastal Plain Province. It has two physiographic divisions, the Flatwoods section, occupying the southern part, with a level to gently undulating surface, and the Sandhill section, with rolling to hilly topography. The drainage is through local streams into Lumber River.

Scotland County was organized in 1899 from parts of Richmond and Robeson counties. The population in 1900 was 12,553. Laurinburg, the chief town and county seat, is situated near the center of the Flatwoods section. It is a thriving town and has several manufactories.

Three railroads, the Seaboard Air Line, the Atlantic Coast Line, and the Laurinburg and Southern, now under construction, afford means of transportation.

Agriculture has developed rapidly since 1890. Besides the staple crops of cotton and corn, important cantaloupe, watermelon, and asparagus industries are found, and these have encouraged better methods of rotation, fertilization, etc. This is one of the leading counties of the Carolinas in the up-to-date character of its agriculture.

The soils of Scotland County are derived from the Columbia formation, which here gives members of the Norfolk and Portsmouth series, two miscellaneous types, and Swamp.

The Norfolk sandy loam is the most important soil type in the area both in extent and agricultural value. It is adapted to a wide range of crops, many of which are not grown at present. For cotton, corn, cantaloupes, and watermelons it is the best soil in the area. Cotton averages 1 bale and corn between 30 and 60 bushels per acre. There is a deep phase of the type not altogether so productive, though a fair soil for cotton, corn, cantaloupes, and watermelons.

The Norfolk coarse sand in less rolling areas gives fair yields of cotton and watermelons. Corn yields are comparatively light. This would be a good soil for fruits suited to this section of the country.

The Norfolk coarse sand, Sandhill phase, is the predominant soil of the northern section of the county. As a whole it is a very light and droughty soil and is unfit for the general farm crops. It is well suited to the production of peaches, grapes, dewberries, and raspberries.

The Hoffman sandy loam occupies the rolling areas overlooking stream courses in the Sandhill region. It is not a valuable agricultural soil.

Of the Portsmouth soils the coarse sandy loam type has the greatest extent and the highest agricultural value. Corn yields 40 to 60

bushels per acre. Cotton is rarely planted on this soil and it is not suited to cantaloupes and watermelons.

Only small areas of the Portsmouth sandy loam are found. In its present condition it is not a desirable type.

The Portsmouth clay loam, when drained, is an excellent soil for corn and oats. In a few instances it has produced 60 bushels per acre of corn. On account of its location that body near Laurinburg is held in high esteem.

The Coxville clay loam is a nonagricultural soil. The Swamp comprises a variety of materials, the basis of separation being its overflowed condition. If reclaimed, Swamp would be valuable for a number of different crops.

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