Number 1

D STATES DEPARTMENT OF AGRICULTURE

Soil Survey
of
Gates County, North Carolina

By

W. A. DAVIS

North Carolina Department of Agriculture and North Carolina Agricultural Experiment Station, in Charge

and

R. E. DEVEREUX

United States Department of Agriculture

Bureau of Chemistry and Soils

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

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SOIL SURVEY OF GATES COUNTY, NORTH CAROLINA

By W. A. DAVIS, North Carolina Department of Agriculture and North Carolina Agricultural Experiment Station, in Charge, and R. E. DEVEREUX, United States Department of Agriculture

COUNTY SURVEYED

Gates County is in the northeastern part of North Carolina, on the Virginia State line. (Fig. 1.) Chowan River forms its western and about half of its southern boundary, and Catherine Creek and Warwick Creek separate it from Chowan and Perquimans Counties on the south. A part of Dismal Swamp occupies the eastern edge of the county and separates it from Pasquotank and Camden Counties. Gatesville, the county seat, is about 30 miles south of Suffolk, Va., and 36 miles west of Elizabeth City. The area of the county is 340 square miles, or 217,600 acres.

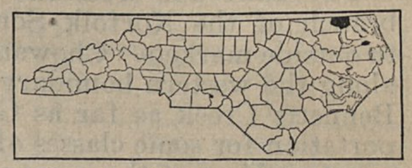

FIGURE 1.—Sketch map showing location of Gates County, N. C.

In general the surface relief of Gates County is level, undulating, and gently rolling, the rolling areas being interspersed with many small swamps and slight depressions. The larger and more conspicuous level areas lie in the western, north-central, and southeastern parts of the county, and include Whiteoak Pocosin, Black Mingle Pocosin, the region between Middle Swamp and Bennetts Creek, Hall Pocosin, and the region around Beckford Junction. Smaller flat areas occur throughout the county. The eastern part of Gates County embraces about 40 square miles of Dismal Swamp, and a belt of low swampy land lies along Chowan River on the southwestern boundary. The gently rolling and rolling areas occur along Chowan River on the western boundary, along the Virginia State line, along Dismal Swamp, and along the larger streams throughout the county.

The greater part of the gently rolling and rolling land has fairly good surface drainage, but practically all the level and flat areas require artificial drainage, which in many places is accomplished by open ditches.

The elevation of the county, as shown by the United States Geological Survey, ranges from 14 to 78 feet above sea level, but the greater part of the county lies about 40 feet above sea level.

The vegetal cover of Gates County consists chiefly of shortleaf pine, white, red, black, and post oak, maple, sweetgum, black gum, dogwood, hickory, juniper, cypress, and poplar, with a scattered undergrowth of briers, myrtle, reeds, gall berry, and other bog vegetation. The distribution of trees is definitely related to the soils in this county. Oak, pine, maple, sweetgum, dogwood, hickory, and a few scattered cedars grow on the Craven, Norfolk, Ruston, and Onslow soils; oak, black gum, dogwood, pine, sweetgum, and maple

grow on the Bladen, Lenoir, and Portsmouth soils; and juniper, cypress, poplar, white maple, and a few pines grow on peat and swamp land.

Gates County was formed in 1779 from parts of Hertford, Chowan, and Perquimans Counties. The early settlers were chiefly of English descent. The population of the county as reported by the Federal census of 1930, is 10,551, all classed as rural.[1] The average density of the population is 29.4 persons a square mile, and settlement is well distributed over the county except on the larger, flat, poorly drained areas. Most of the present population is native white.

There are no large towns or cities in the county. Gatesville is the county seat. Other towns are Sunbury, Gates, Hobbsville, Eure, Drum Hill, Roduco, and Trotville. These towns are local markets for the agricultural products of the county, and the principal outside markets are Edenton, Suffolk, and Norfolk. Hogs are sold in Suffolk and Richmond.

Two railroads cross the county, the Atlantic Coast Line and a branch of the Norfolk Southern, furnishing ample transportation to outside markets. Chowan River is navigable throughout its course along the western boundary of the county, and small boats navigate Bennetts Creek as far as Gatesville, furnishing cheap water transportation for some classes of freight. Four State highways cross the county. Most of the county roads and private roads are good in dry weather, but in rainy weather and during the winter they are impassable in many places. Telephone service in the county is poor, but rural mail delivery reaches all parts, and churches and schoolhouses are conveniently located. Well water is available at a depth ranging from 10 to 50 feet, and artesian water is obtained at a depth of 150 feet.

CLIMATE

The climate of Gates County is oceanic—that is, it is affected by the proximity of the Atlantic Ocean. The winters, as a rule, are mild, but a few days occur during the winter when the temperature stays below freezing. The summers are long and hot. The average length of the frost-free season is 210 days, from April 3 to October 30, but killing frosts have occurred as late as April 26 and as early as October 11.

The rainfall is well distributed throughout the year, the greater part falling during the growing season. The fall months are usually dry, thus allowing the farmers good weather in which to harvest their crops. The abundant moisture and length of the growing season render Gates County climatically a good agricultural region. Cover crops and a few hardy vegetables can be grown throughout the winter, and farm labor can be carried on at all times of the year.

Table 1 gives the normal monthly, seasonal, and annual temperature and precipitation as recorded at the Weather Bureau station at Edenton, in Chowan County, south of Gates County.

[1] Soil survey reports are dated as of the year in which the field work was completed. Later census figures are given whenever possible.

TABLE 1.—*Normal monthly, seasonal, and annual temperature and precipitation at Edenton, Chowan County, N. C.*

[Elevation, 30 feet]

Month	Temperature			Precipitation			
	Mean	Absolute maximum	Absolute minimum	Mean	Total amount for the driest year (1915)	Total amount for the wettest year (1922)	Snow, average depth
	°F.	°F.	°F.	*Inches*	*Inches*	*Inches*	*Inches*
December	43.3	75	5	3.61	2.90	5.80	1.9
January	42.6	78	1	3.49	3.60	4.18	1.3
February	42.4	79	0	4.40	1.55	9.85	3.2
Winter	42.8	79	0	11.50	8.05	19.83	6.4
March	51.3	90	17	2.94	2.20	6.95	1.2
April	58.8	94	25	3.60	2.50	3.30	.1
May	68.1	95	35	4.69	3.00	5.50	.0
Spring	59.4	95	17	11.23	7.70	15.75	1.3
June	75.1	99	46	5.26	6.00	10.30	.0
July	79.1	100	50	7.10	4.45	11.10	.0
August	78.2	99	50	5.21	1.90	7.90	.0
Summer	77.5	100	46	17.57	12.35	29.30	.0
September	72.1	98	40	3.43	2.60	2.20	.0
October	61.8	87	28	3.07	3.53	2.37	.0
November	51.1	84	20	2.33	1.30	.62	.4
Fall	61.7	98	20	8.83	7.43	5.19	.4
Year	60.3	100	0	49.13	35.53	70.07	8.1

AGRICULTURAL HISTORY AND STATISTICS

The agriculture of Gates County had its beginning more than 200 years ago. The first settlers occupied the well-drained sandy lands along Chowan River and the larger streams, and early agriculture consisted of the growing of corn, wheat, potatoes, and garden vegetables. Hogs and beef cattle were introduced at an early period, and pork, beef, rice, flour, indigo, various lumber products, and other commodities were sold for export trade. With the invention of the cotton gin cotton became the principal money crop. The plantation system of farming prevailed until the Civil War period, and the plantations were practically self-supporting.

Table 2, compiled from the reports of the Federal census, gives the acreage and yield of the principal crops for the years 1879, 1889, 1899, 1909, 1919, and 1924.

TABLE 2.—*Acreage and yield of principal crops in Gates County, N. C., in stated years*

Crop	1879		1889		1899	
	Acres	*Bushels*	*Acres*	*Bushels*	*Acres*	*Bushels*
Corn	21,946	170,642	20,348	194,554	21,232	264,490
Oats	1,210	10,016	1,187	15,256	293	2,750
Wheat	708	4,187	21	150	30	90
Sweetpotatoes	972	87,494	1,272	170,987	1,176	104,881
Peanuts			1,073	33,791	5,457	219,271
Dry peas					975	11,649
				Bales		*Bales*
Cotton			6,601	2,216	3,251	1,646
		Tons		*Tons*		*Tons*
Hay and forage	189	128	1,145	1,189	143	158
		Pounds		*Pounds*		*Pounds*
Tobacco	3	620			3	2,000
	Trees	*Bushels*	*Trees*	*Bushels*	*Trees*	*Bushels*
Apples			18,621	46,349	18,880	8,922
Peaches			2,600	2,012	4,350	2,187

Crop	1909		1919		1924	
	Acres	*Bushels*	*Acres*	*Bushels*	*Acres*	*Bushels*
Corn	18,327	169,456	15,831	254,297	13,347	241,751
Oats	326	4,095	163	1,964	11	143
Wheat			62	496	16	340
Sweetpotatoes	1,175	115,809	986	67,570	885	62,778
Peanuts	8,340	280,720	7,152	254,314	8,158	345,745
Dry peas	431	4,420	708	7,652		
		Bales		*Bales*		*Bales*
Cotton	5,350	2,426	7,796	3,879	9,363	4,780
		Tons		*Tons*		*Tons*
Hay and forage	128	141	1,433	1,559	1,752	889
		Pounds		*Pounds*		*Pounds*
Tobacco			86	37,306	116	61,850
	Trees	*Bushels*	*Trees*	*Bushels*	*Trees*	*Bushels*
Apples	11,528	22,207	9,610	276	9,546	7,571
Peaches	5,262	2,659	6,623	50	6,474	2,493

From Table 2 it is observed that in 1889 there were 1,073 acres planted to peanuts and 6,601 acres to cotton. Peanuts proved a successful crop and by 1899 their acreage had increased about 500 per cent, and the acreage planted to cotton had decreased one-half. By 1919 the acreages of peanuts and cotton were almost equal, each of these crops being grown on more than 7,000 acres. The acreage planted to corn in 1924 was only 61 per cent of the acreage in 1879, but the yield had increased by 42 per cent. The acreage of small grains in 1924 was so small as to be practically negligible.

Commercial fertilizer is used on nearly all the cultivated land in the county, and most of the fertilizer is bought ready mixed. According to the United States census, $57,292 was spent for fertilizer (including lime) in 1924. The grades in general use are 3–8–3,[2] 4–8–4, 2–10–4, 5–7–5, and 4–10–4.

Labor in Gates County is scarce. Day laborers are paid from 75 cents to $1 with board. Laborers hired by the month receive from $25 to $30 and board.

[2] Percentages, respectively, of nitrogen, phosphoric acid, and potash.

The farms range in size from 3 acres to more than 500 acres, most of them including between 10 and 175 acres. The average size of farms in 1925 was 65.2 acres.

According to the 1925 census, 61.1 per cent of the farms were operated by owners and 38.8 per cent by tenants. Under the prevailing share-rental system, when the landlord furnishes one-half the fertilizer, teams, plows, and seed, he receives one-half of the crop, and when he furnishes one-third of the fertilizer and seed he receives one-third of the crop.

The farmhouses on the better farms are large and well constructed, and most of them are painted. The ordinary farm equipment consists of 1-horse plows, 2-horse plows, riding plows, riding cultivators, disk plows, tractors, hayrakes, spike-tooth harrows, cotton, corn, and peanut planters, manure spreaders, peanut threshers, and stalk cutters. The work animals are horses and mules. Most of the hogs are Berkshire, Poland China, and Duroc-Jersey, and the milk cows are of the Jersey and Guernsey breeds.

The price of general-farming land with good improvements ranges from $40 to $60 an acre, and the light sandy land can be purchased at prices ranging from $15 to $30 an acre. The price of flat swampy and poorly drained land, as a rule, is governed by the quality and stand of timber, and if well timbered it sells for as much as general-farming land.

SOILS AND CROPS

Perhaps not more than 30 per cent of the soils, not including peat and swamp, in Gates County are under cultivation. The extensive areas of cut-over and forested land consist mainly of peat, swamp, Bladen clay loam, and Norfolk sand. Most of the merchantable timber, except in the peat and swamp areas, has been cut, but there is much second growth which will, within a few years, produce merchantable timber. The main reason that some of the soils have not been cultivated is because of inadequate drainage. The peat, swamp, and much of the sand areas are suited only to forestry under present economic conditions, and the reclamation of these lands is not warranted at the present time.

The county includes a wide variety of soils due largely to local differences in relief and drainage, and as a result of these differences soils have developed that differ widely both in physical and chemical composition. The light-colored well-drained soils occur in definite geographic and topographic positions and are the soils which have reached the stage of normal development. The agriculture of the county is influenced largely by drainage conditions, as some of the soils with good potential capacity are poorly drained and are not used for agricultural purposes. For instance, Portsmouth loam and Bladen loam are good soils for corn but are not used on account of poor drainage, and many farmers plant corn on light sandy land, which is low in fertility, because it is well drained and easy to handle.

The agriculture of Gates County consists principally of the production of peanuts, cotton, and corn, and to less extent, sweetpotatoes, potatoes, tobacco, oats, and soybeans.

In 1924, corn was grown on 13,347 acres and yielded 241,751 bushels, but not enough corn is produced in the county to supply the local demand. It is used to feed work animals and fatten hogs, and a small amount is ground into meal for home consumption.

Tobacco was grown on only 116 acres in 1924. It is grown on only one soil, Norfolk fine sandy loam, but other crops are grown on practically all the cultivated soils in the county.

In 1924, peanuts were grown on 8,158 acres with a total yield of 345,745 bushels, and 9,363 acres planted to cotton produced 4,780 bales. Peanuts and cotton are the two important cash crops of the county, and their large acreage is accounted for because the soils and climate favor their production and because they produce the greatest cash return and the largest acre profit of any crops that can be grown under present economic conditions. Both of these crops are, to some extent, not perishable; that is, they can be held by the farmers for a considerable length of time and need not be rushed to market as soon as harvested. One of the reasons for the large acreage of peanuts is probably because Suffolk, Va., which is only 30 miles distant from Gatesville, is the largest peanut market in the world. This city provides a convenient cash market for peanuts at all times, as it is accessible by good roads, and the crop can easily be marketed by trucks. Peanuts have been grown for more than 40 years and the farmers know from experience how to handle the crop. Cotton has been grown for a longer time and is a crop that the farmers understand handling under all weather conditions and a crop that does well on all the naturally well-drained and artificially drained soils of the county. It is a crop that can be sold for cash at any time. Both peanuts and cotton are crops on which credit can be obtained by the growers, and the financial status of the county is dependent on these crops. Peanuts fit well in the farming system in general practice, especially in the raising of hogs, as many farmers turn their hogs into the peanut fields to be fattened.

Some areas of soil in this county are especially adapted to the production of early truck crops, but because of lack of cheap and fast transportation facilities and nearness to market these crops are not grown. Large areas of soils, especially the Bladen soils and Portsmouth loam, could produce fair yields of corn but the market price does not warrant its production at present. Although some of the soils not especially adapted to their production are producing peanuts and cotton, farmers feel that they must have a cash crop, and these crops meet the demand better than any other crops known to them.

A considerable number of hogs is sold annually. Most of the farmers raise from 5 to 20 or more. The hogs are turned into the peanut fields to fatten, after which they are fed on corn for two or three weeks before they are marketed.

Considered agriculturally the soils of Gates County may be divided into three groups. The first group includes the light-colored well-drained soils; the second group, the light-colored poorly drained soils; and the third group, the dark-colored or black poorly drained soils and the organic soils.

In the following pages of this report the soils of Gates County are described in detail and their agricultural importance is discussed; their distribution in the county is shown on the accompanying soil map; and their acreage and proportionate extent are given in Table 3.

TABLE 3.—*Acreage and proportionate extent of soils mapped in Gates County, N. C.*

Type of soil	Acres	Per cent	Type of soil	Acres	Per cent
Norfolk fine sandy loam	9,024	4.1	Bladen loam	9,600	4.4
Norfolk fine sandy loam, deep phase	6,720	3.1	Bladen clay loam	12,480	5.7
Norfolk loamy fine sand	4,160	1.9	Portsmouth fine sandy loam	832	.4
Norfolk sand	13,888	6.4	Portsmouth loam	4,480	2.1
Craven fine sandy loam	31,104	14.3	Portsmouth sand	2,624	1.2
Onslow fine sandy loam	15,360	7.1	Peat	43,456	20.0
Ruston fine sandy loam	1,152	.5	Swamp	10,944	5.0
Lenoir very fine sandy loam	41,216	18.9			
Bladen very fine sandy loam	10,560	4.9	Total	217,600	

LIGHT-COLORED WELL-DRAINED SOILS

The first group, or light-colored well-drained soils, may be termed the Norfolk group, and it includes all the soils of the Norfolk, Craven, Onslow, and Ruston series mapped in the county. The total acreage of these soils is 37.4 per cent of the total area of the county, or 81,408 acres, a large proportion of which is under cultivation. Most of the original merchantable timber has been cut, and the second growth consists of shortleaf pine, white, red, black, and post oaks, maple, sweetgum, and some dogwood, hickory, and a few scattered cedars.

The topographic and geographic position of these soils in the county is well defined as they occur on the breaks to the streams and on the undulating and gently rolling areas. These are by far the best-drained soils in the county, and because of their favorable surface relief occupy a position suitable for agriculture and lend themselves admirably to the use of improved farm machinery. They are very easy to cultivate especially with hand tools and light machinery and implements.

These soils are characterized by light-gray or grayish-yellow surface soils which range in texture from sand through fine sandy loam to very fine sandy loam. The subsoils range from yellow friable sands or fine sandy clays to reddish-yellow fine sandy clays in the Norfolk, Onslow, and Ruston soils, respectively. The subsoils of the Craven soils are much heavier in texture and structure than those of the Norfolk or Ruston soils. The subsoils in all these soils, except the sands, are such as to retain a considerable proportion of the rainfall, thus maintaining good moisture conditions for growing plants.

Because of the texture of the surface soils and the friability of the subsoils these soils warm up early in the spring and are the first in the county on which agricultural operations begin. All these soils are naturally low in organic matter, as their light color indicates, and they are leached of most of the soluble plant food, but their physical properties are so favorable that they respond readily to fertilization and produce the most profitable crops of any soils in the county.

These soils are rightly considered the best in the county for the production of bright tobacco, cotton, peanuts, and truck crops. In fact, practically all the tobacco produced in Gates County is grown on the Norfolk soils. There appears to be no reason why a wide variety of truck crops can not be produced on these soils, as similar soils are used for trucking in many places along the Atlantic coast.

Norfolk fine sandy loam.—Norfolk fine sandy loam is the best soil in the county for the production of bright tobacco, peanuts, cotton, and truck crops, and is one of the most desirable soils developed in the Atlantic coastal-plain region. The surface soil is gray loamy fine sand or light fine sandy loam to a depth ranging from 2 to 4 inches, underlain by grayish-yellow or pale-yellow loamy fine sand which extends to a depth of 12 to 15 inches. The subsoil is friable and crumbly yellow fine sandy clay which continues to a depth ranging from 30 to 34 inches. It is underlain by mottled light-gray or light-red and yellow heavy fine sandy clay material. In a few places the surface soil extends to a depth of 18 or 20 inches, and in a few other places the sandy clay may come within a few inches of the surface. The subsoil of the flatter areas, or those areas that are not so well drained, shows slight mottlings of gray at a depth of 28 or 30 inches. In areas of this soil adjoining Craven fine sandy loam, the subsoil is slightly heavier than typical.

Norfolk fine sandy loam embraces an area of 14.1 square miles or approximately 9,000 acres in the county. It occurs mainly in the northwestern part west of Drum Hill and in the vicinity of Willeyton, and small areas are mapped in the southern part.

The chief crops are peanuts, cotton, corn, and tobacco, and some sweetpotatoes, potatoes, oats, soybeans, and garden vegetables are also grown. The greater part of this soil is under cultivation. About 40 per cent is devoted to peanuts, 40 per cent to cotton, 15 per cent to corn, 2 per cent to tobacco, and 3 per cent to the other crops mentioned.

Peanuts yield from 40 to 90 bushels an acre, corn from 20 to 40 bushels, cotton from one-half to 1 bale, tobacco from 600 to 900 pounds, and sweetpotatoes from 60 to 100 bushels.

Peanuts receive from 400 to 600 pounds of 2–8–4 or 4–8–4 fertilizer, cotton from 600 to 900 pounds of a 4–8–4 mixture with an application of 75 or 100 pounds of nitrate of soda as a top-dressing, corn from 300 to 400 pounds of 4–8–4 with 75 pounds of nitrate of soda as a top-dressing, and tobacco from 800 to 1,200 pounds of 3–8–3 or 3–8–5. About 300 pounds of land plaster is used on peanuts during the latter part of July when the plants are in bloom. The available stable manure is used on all kinds of crops.

Norfolk fine sandy loam, deep phase.—Norfolk fine sandy loam, deep phase, includes an area of 10.5 square miles or 6,720 acres. It occurs in close association with typical Norfolk fine sandy loam, although more areas of the deeper soil are in the extreme southern part of the county and in the eastern part near Dismal Swamp. This deep soil differs from typical Norfolk fine sandy loam mainly in the depth at which the fine sandy clay subsoil is reached and also in that the deep sandy surface soil is slightly lighter in texture and color than the surface soil of Norfolk fine sandy loam. Soil of the phase is not such a good soil as the typical fine sandy loam, but it is

a better soil and can be built up to a higher state of productivity than Norfolk loamy fine sand. It is a good trucking soil and is also well suited to the production of bright tobacco and peanuts. The crops grown on this soil are the same as those on the typical fine sandy loam, and the fertilizer treatment and cultural methods are about the same, but crop yields are slightly less.

Norfolk loamy fine sand.—Norfolk loamy fine sand includes an area of 6.5 square miles, or 4,160 acres. It occurs only in several small areas in the southern and eastern parts of the county, the largest areas lying around Sandycross. The surface soil is light-gray loamy fine sand to a depth of 6 or 8 inches. It is underlain by pale-yellow or yellow loamy fine sand or fine sand to a depth of about 28 or 30 inches, below which is yellow light fine sandy clay or heavy loamy fine sand. Norfolk loamy fine sand is a stronger and better soil than Norfolk sand but is not nearly so good as Norfolk fine sandy loam and can not be built up to the same state of productivity. The same crops are grown on Norfolk loamy fine sand as are grown on Norfolk fine sandy loam, deep phase, and the fertilizer treatment is about the same, but crop yields are lower.

Norfolk sand.—The 6 or 8 inch surface layer of Norfolk sand is gray or yellowish-gray sand. It is underlain by yellow or pale-yellow loose mellow sand to a depth ranging from 40 to 60 or more inches. The total area of this soil is 21.7 square miles, or 13,888 acres. It occurs almost exclusively in the western and southern parts of the county bordering the peat area along Chowan River. Practically all the land is forested with second-growth pine, together with scrub oaks. Under present economic conditions, it would seem that forestry is the best use for this soil. The soil leaches badly, and because of the looseness and openness of the soil and subsoil it is difficult to build up and maintain in a productive condition.

Craven fine sandy loam.—Craven fine sandy loam is differentiated from Norfolk fine sandy loam because of the heavy character of its subsoil as contrasted to the friability of the Norfolk subsoil. The surface soil of Craven fine sandy loam is dull-gray or yellowish-gray fine sandy loam from 3 to 5 inches thick, underlain by pale-yellow fine sandy loam which extends to a depth ranging from 8 to 12 inches. The subsoil, to a depth ranging from 22 to 30 inches, is yellow or pale-yellow heavy tough clay or heavy plastic and sticky fine sandy clay. It is underlain by yellow, mottled with steel gray and yellowish brown, heavy tough clay which extends to a depth of several feet. The material in both the subsoil and the underlying layer cracks and breaks into irregular-shaped lumps on drying.

Included with this soil in mapping are a few small areas which have gray surface soils and yellowish-brown or reddish-yellow heavy clay subsoils. In places the surface soil of Craven fine sandy loam is only 6 or 8 inches deep, especially where some surface erosion has taken place, and in other places the accumulation of fine sandy material over the subsoil may reach a depth of 15 or 20 inches.

Craven fine sandy loam is one of the more extensive and more important agricultural soils of the county, covering an area of 48.6 square miles or 31,104 acres. It is well distributed over the county,

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occupying as it does the breaks and gently rolling areas bordering the swamps and passing gradually into the flatter areas of Lenoir very fine sandy loam, with which it is closely associated. Craven fine sandy loam does not drain out so readily or warm up so quickly as does Norfolk fine sandy loam, owing perhaps to the fact that the subsoil does not allow as free passage of rain water.

The chief crops are peanuts, cotton, and corn, and some sweetpotatoes, oats, and soybeans are grown. Perhaps 40 per cent of Craven fine sandy loam is cultivated, and about 30 per cent of the cultivated acreage is devoted to peanuts, 40 per cent to cotton, 25 per cent to corn, and 5 per cent to sweetpotatoes, oats, and soybeans. Peanuts yield from 45 to 65 bushels an acre, cotton from one-half to 1 bale, and corn from 20 to 35 bushels. Peanuts receive from 200 to 600 pounds of fertilizer analyzing 2-8-4, 4-8-4, or 3-8-3, together with an application ranging from 300 to 400 pounds of land plaster on the plants at blooming time; cotton from 600 to 800 pounds of 4-8-4 or 3-8-3, with from 125 to 200 pounds of nitrate of soda as a top-dressing; and corn from 200 to 400 pounds of 3-8-3 or 4-8-4, together with an application of nitrate of soda when the corn is from knee to waist high.

Onslow fine sandy loam.—Onslow fine sandy loam differs essentially from Norfolk fine sandy loam in that a slightly compact brown layer has developed within the first few inches of the surface soil and also in that the color is paler gray than that of the Norfolk soil. The surface soil of Onslow fine sandy loam is dull-gray or pale-gray fine sandy loam or loamy fine sand from 4 to 6 inches deep. In most places the underlying material is brown slightly compact friable fine sand and silt from 1 to 3 inches thick. There is no uniformity in the thickness, hardness, or compactness of this layer, as in some places the material has formed a rather hard crust and in other places it is merely a brown-stained layer. The cementing material is either iron or organic matter, the organic matter apparently predominating. The subsoil, to a depth ranging from 14 to 20 inches, is grayish-yellow friable and crumbly fine sandy clay, having a lifeless, mellow feel. It is underlain by light-yellow or grayish-yellow, mottled with brown and white, heavy fine sandy clay material which is slightly sticky when wet.

In cultivated fields the brown layer has in many places been broken up and small brown concretions are scattered over the surface and intermixed with the surface soil. In a few places no brown layer is present in wooded areas nor do any concretions occur in the fields, but the color, texture, and structure of the subsoil and the underlying material are typical of the Onslow soils. Onslow fine sandy loam is not so well drained as the Norfolk soils. The areas range from level to gently rolling, and in many places open ditches are necessary for adequate drainage.

Onslow fine sandy loam embraces an area of 24 square miles. The largest bodies occur in the extreme northern part of the county in the vicinity of Drum Hill and in the eastern part bordering Dismal Swamp.

Cotton, corn, and peanuts are the chief crops grown, and sweetpotatoes, potatoes, and garden vegetables are grown mainly for home use. Only a small acreage of this soil is cultivated, and about 40

per cent of the cultivated acreage is devoted to cotton, 30 per cent to corn, 25 per cent to peanuts, and 5 per cent to potatoes and garden vegetables. Cotton yields from one-fourth to three-fourths bale an acre, corn from 15 to 30 bushels, and peanuts from 30 to 70 bushels. The fertilizer treatment is about the same as for Lenoir very fine sandy loam, which is described in subsequent pages of this report.

Ruston fine sandy loam.—Ruston fine sandy loam is one of the least extensive soils in the county, occupying only 1,152 acres. It occurs in the southern part in several small areas, the largest of which are around Gatesville and around Carter. This is one of the good soils of the Atlantic coastal plain.

The surface soil of Ruston fine sandy loam consists of a 3 to 5 inch surface layer of gray fine sandy loam underlain by grayish-yellow or brownish-yellow fine sandy loam, which continues to a depth ranging from 12 to 15 inches. The subsoil to a depth of 36 or 40 inches is reddish-yellow or yellowish-brown fine sandy clay which is friable, crumbly, and of uniform color and structure throughout. This layer is underlain by reddish-yellow, mottled with reddish brown and gray, fine sandy loam material. Locally the fine sandy loam surface soil is deeper and in some places it is shallow, owing to the accumulation of material in one place and to its removal in another. In some places the subsoil extends to a depth of only about 2 feet below the surface.

With the exception of tobacco, the crops grown on this soil, the fertilizer treatment, and the yields obtained are similar to those on Norfolk fine sandy loam.

LIGHT-COLORED POORLY DRAINED SOILS

The second group, or the light-colored poorly drained soils, may be called the Lenoir group. They comprise 115.4 square miles, or nearly 34 per cent of the area of the county. This group includes all the soils of the Lenoir and Bladen series. The forest growth consists of oaks, black gum, sweetgum, pine, and maple. These soils are well distributed throughout the greater part of the county, the largest individual area being that of Bladen clay loam west of Roduco. Soils of this group lie for the most part on the flatter areas adjoining the Norfolk, Craven, and Ruston soils. The surface relief ranges from that of broad smooth level areas to that of undulating and gently sloping areas. Part of the Lenoir soil has an undulating or very gently rolling surface relief. Extensive level areas, particularly of the Bladen soils, have not been invaded by natural drainage ways, and retain, in a general way, the original constructional form as it was lifted from the ocean. All of these soils are benefited by artificial drainage, and the large flat areas require canals supplemented by open ditches to render them suitable for agricultural use. Open ditches are lasting and serviceable in all these soils because the walls of the ditches stand up exceptionally well in the heavy subsoils. Because of the heavy texture and rather tough consistence of the subsoils, water does not readily penetrate these clays and most of the drainage is from the surface, so that surface ditches are essential throughout all areas of these soils.

Most of these soils have light-colored surface soils and contain a small amount of organic matter, but areas of Bladen loam have a

dark-gray surface soil and a rather high content of organic matter. Soils of this group have heavier-textured surface soils and the subsoils are much heavier both in texture and structure than in the well-drained soils of the first group. The texture of the surface soils is dominantly very fine sandy loam, with some areas of clay loam, and the subsoils are heavy slightly plastic tough clays, mottled gray and yellow in the Lenoir soils and steel gray with brownish-yellow streaks in the Bladen soils. The mottled condition of the subsoils indicates poor drainage and incomplete oxidation of the iron salts. These soils, because of their dominantly flat surface, are easy to handle with improved machinery. They do not warm up so early in the spring as the light-colored well-drained soils, and they can not be cultivated quite so early or so soon after a rain as the well-drained soils. They are not so well suited to truck crops as are the lighter-textured and better-drained soils. In this region, which is characterized by a long growing season, they are well suited to such general farm crops as corn, cotton, soybeans, and peanuts. In dry seasons the best crops in the county are obtained on these soils, especially on the Bladen soils.

Probably not more than 20 per cent of the total area of the soils of this group is under cultivation, and the main crops are corn, soybeans, cotton, and peanuts. Wherever they occur, from North Carolina to Florida, the Bladen soils are especially suited to the production of potatoes and soybeans. When economic conditions warrant increased production of crops, all the Bladen and Lenoir soils in Gates County will be farmed. Cotton and peanuts are grown on some soils of this group that are not suited to their production, because these crops meet the needs of the farmer for cash crops.

Lenoir very fine sandy loam.—Lenoir very fine sandy loam is one of the extensive and agriculturally important soils of the county. It includes an area of 64.4 square miles, or 41,216 acres, and is developed on the level or undulating areas adjoining the Craven and Norfolk soils. It occurs in large areas of irregular outline throughout all parts of the county, but particularly across the central part from east to west. Some of the larger and more important bodies are in the vicinity of Roduco, Eason Crossroads, Sunbury, Savage, Bosley, and Topsy.

The surface soil of Lenoir very fine sandy loam, to a depth of 4 or 6 inches, is dull-gray very fine sandy loam which passed into light-gray, mottled in places with brownish yellow, very fine sandy loam extending to a depth ranging from 9 to 14 inches. The subsoil, to a depth ranging from 30 to 36 inches, is mottled light-yellow, light-gray, and yellowish-brown heavy clay, which when wet is plastic and sticky but on drying cracks and breaks into irregular-shaped hard lumps. Below this is light-gray, mottled or streaked with brownish yellow, rather heavy sticky silty clay. Included with this soil as mapped are small areas in which the subsoil is drab heavy tough clay, and in a few places the surface soil is brownish-gray silt loam or silty clay loam.

Because of the dominantly flat surface of this soil and also because of its very fine texture, rain water does not drain off so readily and the soil does not warm up so quickly as do the fine sandy loams

which occupy more rolling areas and are more open and friable. This is one of the good soils of the county, and when plowed and cultivated under proper moisture conditions it breaks up into a good tilth.

The main crops are cotton, peanuts, and corn; and some oats and soybeans are grown. Probably about one-third of the land is farmed at the present time, about 40 per cent of the cultivated acreage being devoted to cotton, 25 per cent to peanuts, and 35 per cent to corn. Cotton yields from one-half to three-fourths bale an acre, peanuts from 45 to 65 bushels, and corn from 15 to 35 bushels. The fertilizers used are about the same as on Craven fine sandy loam.

Bladen very fine sandy loam.—The surface soil of Bladen very fine sandy loam consists of a 4 to 6 inch layer of gray or brownish-gray mellow and friable very fine sandy loam, underlain by light-gray very fine sandy loam, slightly mottled with rust brown, which extends to a depth of 12 or 15 inches. The subsoil is steel-gray or light-gray, mottled or streaked with yellowish brown or ocherous colored, heavy plastic clay or very fine sandy clay which extends to a depth ranging from 4 to 5 feet. The clay is plastic and sticky when moist, and on drying becomes very hard. Included with mapped areas of this soil are small areas of Bladen fine sandy loam, in which the only difference is the slightly coarser texture of the surface soil. In a few places the very fine sandy loam covering over the heavy subsoil ranges from 18 to 24 inches in thickness. In some of the wooded areas the first inch or two of the surface soil is grayish brown and it contains considerable organic matter, but after continued cultivation and subsequent leaching the surface soil becomes light gray in color.

Bladen very fine sandy loam occupies a total area of 16.5 square miles, or 10,560 acres. It occurs in the southeastern and central parts of the county in several irregular-shaped areas. Although the areas are level or slightly undulating, this is the best drained of the Bladen soils in Gates County.

The chief crops are cotton and corn, and in addition a few peanuts and soybeans are grown. Of the cultivated acreage about 40 per cent is devoted to cotton, 50 per cent to corn, and 10 per cent to peanuts and soybeans. Cotton yields from one-half to three-fourths bale an acre and corn from 20 to 40 bushels. Cotton receives from 400 to 600 pounds and corn from 200 to 400 pounds of 3–8–3 or 4–8–4 fertilizer, together with an application of nitrate of soda.

Bladen loam.—Bladen loam differs from Bladen very fine sandy loam only in texture and color of the surface soil, the first 6 or 8 inches being dark-gray or almost black loam. The high organic-matter content causes the dark color.

Bladen loam occupies a total area of 15 square miles. It occurs in fairly large bodies in the southeastern and central parts of the county.

Most of the areas mapped are flat or slightly depressed, in some places swampy. Most of the land is forested, only a very small percentage being in cultivation. Corn, cotton, and a few soybeans are the principal crops. However, this is naturally one of the best soils in Gates County, and if properly drained could produce excellent yields of the crops commonly grown in the county.

Bladen clay loam.—The surface soil of Bladen clay loam is gray or dull-gray clay loam about 10 inches thick, and the subsoil is dull-gray heavy plastic clay mottled or streaked with yellow and brown.

This soil occupies flat or slightly depressed areas and is practically all in forest. It is very poorly drained. It comprises a total area of 19.5 square miles. The largest bodies are in the western and central parts of the county, the largest single body being in Whiteoak Pocosin. Other large areas are in Hall Pocosin and Between Gatesville and Piny Grove Church.

DARK-COLORED POORLY DRAINED SOILS

The third group, or the dark-colored poorly drained soils and the organic soils, includes the soils of the Portsmouth series, peat, and swamp. These soils cover a total area of 97.4 square miles, or almost 29 per cent of the county. The Portsmouth soils occupy only a small acreage, the largest areas occurring northeast of Eason Crossroads and in the vicinities of Sandycross and Bosley. Peat occurs in two large areas, one along Chowan River and the other including most of Dismal Swamp on the east side of the county. The material mapped as swamp is distributed in the first bottoms along the streams.

The Portsmouth soils occupy level or slightly depressed areas in which natural drainage has not been established, and artificial drainage is necessary in order to reclaim the soils for agricultural use. Only a few spots of the Portsmouth soils are under cultivation, owing to the extremely poor drainage conditions. One of the chief characteristics of these soils is the black color of the surface soils, which is due to the presence of a large amount of organic matter that has accumulated through the decay of vegetation over a long period of time when the areas were in a swampy condition. The surface soils are naturally acid and require fairly heavy applications of lime for best results. Areas that are drained and limed are suited to the production of corn, soybeans, cabbage, potatoes, and truck crops.

Portsmouth fine sandy loam.—The surface soil of Portsmouth fine sandy loam consists of a layer of dark-gray or black fine sandy loam, high in organic matter, from 8 to 12 inches thick, underlain by light-gray fine sandy loam to a depth of about 20 inches. The subsoil is mottled yellow and gray friable fine sandy clay which extends to a depth of 3 or more feet.

The surface relief is almost level or flat, and on account of poor drainage only a small acreage of this soil is farmed. This is the least extensive soil mapped in the county. It occurs 2 miles northeast of Eason Crossroads.

Cotton, corn, and soybeans are grown, the acreage of cotton and corn being about the same. Cotton yields about one-half bale an acre and corn from 20 to 40 bushels. Cotton receives from 300 to 600 pounds of 4–8–4 or 3–8–3 fertilizer and corn about 300 pounds of 3–8–3.

Portsmouth loam.—The surface soil of Portsmouth loam consists of a 10 or 12 inch layer of black mellow loam, containing a large amount of organic matter, underlain by very light-gray loam which is free from organic matter and extends to a depth of about 20 inches. The subsoil, to a depth of 36 or more inches, is light-gray, mottled with yellowish brown, heavy fine sandy clay which is friable though slightly sticky.

Portsmouth loam occurs almost exclusively in the southeastern part of the county, the largest areas lying east of Bosley and around Sandycross. Practically all the land of this kind is forested, only a few acres being in cultivation. When drained and reclaimed this soil would produce good yields of corn, potatoes, and cabbage.

Portsmouth sand.—The surface soil of Portsmouth sand, to a depth ranging from 8 to 15 inches, is dark-gray or black sand containing a large amount of organic matter. The subsoil is light-gray or white medium sand to a depth of 3 or more feet.

This soil in its present condition is nonagricultural, practically all of it being in forest. Portsmouth sand occupies an area of 4.1 square miles. It occurs in the southern and western parts of the county in close association with Norfolk sand.

Peat.—Extensive areas of peat lie along Chowan River in the southern and southwestern parts of the county, and a belt 2 or 3 miles wide extends across the eastern side of the county and includes a part of the well-known Dismal Swamp. The total area of peat in the county is 67.9 square miles, or 43,456 acres. The peat land is saturated or covered with water during the greater part of the year. None of it is under cultivation but is forested with juniper and cypress, together with some poplar, white maple, and a few pines.

Peat consists of brown rather fibrous partly decomposed organic matter ranging in thickness from 3 to 7 feet. It is underlain by black sticky finely divided organic matter having the consistence of muck to a depth of 10 feet, or more in some places. In the Dismal Swamp area, logs or boughs of trees are buried in this material at different depths below the surface. Here and there along the borders and even within the peat areas are small bodies of black well-decomposed vegetable matter carrying a noticeable amount of fine mineral material and covered by a dense growth of water-loving grasses and reeds which are used for pasture.

Swamp.—Swamp occupies first bottoms along the small streams and consists of alluvial material deposited during overflows. This land is subject to frequent overflow and is covered with water the greater part of the year. It is variable in texture, structure, and color, but most of it is dark-gray or black loam or fine sandy loam below which the material is mottled gray, yellow, and brown heavy sandy clay or silty clay.

Swamp includes an area of 17.1 square miles. It occurs in continuous areas ranging in width from a few hundred feet to a mile or more. The largest areas are along Cole, Bennett, and Trotman Creeks, and along Duke and Taylor Swamps.

Swamp has no present agricultural use and is commonly sold in connection with adjoining uplands, the forest growth determining the value of the land.

RECOMMENDATIONS FOR THE IMPROVEMENT OF GATES COUNTY SOILS

Fertilizer recommendations by the North Carolina Agricultural Experiment Station for the major crops grown on the leading soils of Gates County are given in Table 4. The amounts given are acre applications.

TABLE 4.—*Fertilizer recommendations for leading crops on the principal soils of Gates County, N. C.*

Soil type	Fertilizer recommended—		
	For cotton	For corn	For peanuts
Lenoir very fine sandy loam.	About 600 pounds of a 4–10–4 mixture.	About 400 pounds of a 4–8–4 mixture.	From 300 to 400 pounds of a 2–6–4 or 2–8–4 mixture.
Norfolk fine sandy loam.	From 600 to 700 pounds of a 4–10–4 mixture supplemented by a side application of 50 to 100 pounds of nitrate of soda or its equivalent of sulphate of ammonia immediately after chopping.	About 400 pounds of a 4–6–4 mixture supplemented by a side application when the corn is about knee-high of 50 to 75 pounds of nitrate of soda or its equivalent in sulphate of ammonia. If the corn has a good dark-green color this application will not be necessary.	From 300 to 400 pounds of a 2–8–4 mixture.
Portsmouth fine sandy loam.	600 pounds of a 4–10–4 mixture.	400 pounds of a 4–8–4 mixture.	From 300 to 400 pounds of a 1½–8–4 mixture.
Craven fine sandy loam.	From 600 to 700 pounds of a 4–10–4 mixture to be supplemented with a side application of nitrate of soda or its equivalent of sulphate of ammonia at the rate of 50 to 100 pounds immediately after chopping.	About 400 pounds of a 4–6–4 mixture supplemented by a side application of 50 to 65 pounds of nitrate of soda or sulphate of ammonia, if needed.	From 300 to 400 pounds of a 2–8–4 mixture.
Onslow fine sandy loam.	From 600 to 700 pounds of a 4–10–4 or 5–10–4 mixture.	400 pounds of a 4–8–4 mixture.	Do.
Bladen very fine sandy loam.	600 pounds of a 4–10–4 mixture.	do.	About 300 pounds of a 1½–8–4 mixture.

Where lime has not been added recently, it is recommended that a broadcast application at the rate of 1 or 1¼ tons of ground limestone, or its equivalent, be made every three or four years over the land, or its equivalent in small annual applications in the drill, to be mixed thoroughly with the soil before adding the fertilizer and planting.

On all these soils at the present time the use of from 1,000 to 1,200 pounds an acre of a fertilizer mixture analyzing 5–7–5 is suggested for potatoes. Experimental results thus far obtained will not allow more than making this general recommendation for all the soils. It will be well, also, to state that not less than one-third of all the ammonia contained in the mixture should be derived from some high-grade organic material like cottonseed meal, tankage, or fish scrap, and the remaining ammonia may be derived from sulphate of ammonia, nitrate of soda, or a mixture of the two. The potash should be derived mainly from muriate of potash or sulphate of potash.

The following crops and varieties of each are recommended as adapted to Gates County soils: Cotton—Mexican Big Boll, Carolina-

Foster, and Coker-Cleveland (1$\frac{1}{16}$-inch staple); peanuts—Virginia Bunch, Virginia Runner, Jumbo Runner, Spanish, and North Carolina; corn—Latham's Double, Indian Chief (yellow), and Bigg's Prolific; tobacco—Cash, Whitestem Orinoco, and Jamaica; oats—Fulghum and Appler for fall sowing and Burt for spring sowing; rye—Abruzzi; soybeans for seed—Herman, Mammoth Yellow, Tokyo, Biloxi, and Otootan; soybeans for soil improvement—Herman, Mammoth Yellow, Tokyo, Mammoth Brown, and Otootan; and soybeans for hay—Laredo, Otootan, Tokyo, Herman, and Mammoth Yellow.

The following crop rotations are especially suitable for the lower part of the Atlantic coastal plain which includes Gates County:

Three-year rotation, No. 1.—First year, corn (for grain) with velvetbeans (for grazing), Abruzzi rye broadcast over the land in fall (for grazing and turning under); second year, corn (for grain) with soybeans (for seed and grazing, with vines turned under), oats and vetch in fall; and third year, oats and vetch (for hay), soybeans (for seed or hay), peanuts (for hay or grazing), or sweetpotatoes, Abruzzi rye and vetch or crimson clover in fall (for turning under).

Three-year rotation, No. 2.—First year, corn (for grain); second year, potatoes, corn (for grain) or soybeans (for hay); and third year, soybeans (for seed, vines turned under).

Two-year rotation (to be used in connection with No. 1 on the lighter land of the farm).—First year, tobacco, cowpeas after removal of tobacco crop (for turning under); and second year, cotton, Abruzzi rye in fall (for turning under).

Most of the soils in the county need organic matter, especially the Lenior, Craven, and Norfolk soils. This can be supplied by growing and turning under leguminous crops, such as vetch and soybeans. Soybeans are probably the most practical crop to work in with the rotations. If they are cut for hay little or nothing can be turned under for soil improvement, but if the seed is harvested with a harvester and the remainder of the crop plowed into the land, considerable improvement in the organic-matter and nitrogen supply of the soil and in its producing power should result. Where this is done the amount of nitrogen needed to be added in the fertilizers may be reduced for the first year from one-fourth to one-half; and later on, if the practice of growing soybeans on the land is continued, the seed harvested, and the residue plowed under, a time may come within a few years when it will be unnecessary to purchase any nitrogen from commercial sources.

Deep plowing is hardly necessary on any of the light-textured soils of Gates County, as breaking to a depth of 6 or 8 inches is all that is necessary, but the heavier soils require stronger work animals and heavier machinery. Terracing of the land, except on some of the slopes near the larger streams, is unnecessary.

Many of the soils in the county require better drainage to render them suitable for agricultural use. Open ditches may be used most satisfactorily, provided small drains are constructed through the fields to carry off the excess water in back lands.

Some of the soils are adapted to crops not grown in the county at present. Norfolk sand and Norfolk loamy fine sand could be used

in the production of truck crops and peaches. As the county is close to good markets, these products would probably be rapidly absorbed at fair prices. These two soils, being sandy, naturally warm up quickly in the spring and should be used for early truck crops. Norfolk loamy fine sand and especially Norfolk fine sandy loam should produce a good grade of bright tobacco.

Most of the soils in Gates County are acid, and applications of lime would prove very beneficial for some crops, especially legumes. The amount of lime used should be based on an acidity test of the soil. More legumes should be grown for soil improvement and also for hay and seed.

Following is a list of bulletins and circulars which will prove helpful in the cultivation of Gates County soils. Address all communications requesting these bulletins to C. B. Williams, State College Station, Raleigh, N. C.

Crop rotations for the coastal plain section of North Carolina. (N. C. Agr. Col. Ext. Circ. 165.)

How to use lime on the farm. (N. C. Agr. Col. Ext. Circ. 24.)

Soybean growing in North Carolina. (N. C. Agr. Col. Ext. Circ. 127.)

Farm practice with soybeans. (N. C. State Dept. Agr. Bul., April, 1920.)

Soybeans, a future economic factor in North Carolina. (N. C. Agr. Col. Ext. Circ. 57.)

Results of soil building demonstrations in North Carolina. (N. C. Agr. Col. Ext. Serv. Agron. Inform. Cir. 11.)

Gates County, with its peculiar advantages in the way of climate and transportation facilities, as well as its proximity to large markets, offers good opportunities to prospective settlers.

SOILS AND THEIR INTERPRETATION

Gates County lies in the gray-soil region along the Atlantic seaboard, within what is known as the flatwoods section of the Atlantic coastal plain. The elevation of the county ranges from 14 to 78 feet above sea level. Natural drainage of large areas in the west-central and southeastern parts has not been well established, and in such areas the surface relief maintains the constructional form of the land as laid down by the sea. These areas are, in general, higher than the surrounding soils, but they have not been invaded by streams and are so flat that the rainfall runs off very slowly.

The soils of Gates County may be divided into mineral soils and cumulose, or organic soils. The mineral soils constitute practically four-fifths of the area of the county. About one-third of the soils of the county are well drained and have light-colored, that is, gray or grayish-yellow, surface soils, and the remainder have dark-gray imperfectly drained surface soils. All the soils in the county have been developed under forest cover, and in the wooded areas there is a thin layer of leaf mold, or the soil to a depth ranging from 1 to 3 inches is darkened by an admixture of partly decomposed organic matter. The soils having dark-gray or black surface soils have remained in a wet or semiswampy condition for a long time, and vegetation has flourished. The cumulose, or organic, soils occupy an area

of almost 70 square miles, or about one-fifth of the county. This material has been classed as peat and contains only a very small amount of mineral matter and the organic matter is more or less fibrous. All the soils range from slightly acid to strongly acid, the more poorly drained and dark-colored soils being the most strongly acid.

Active leaching aided by heavy rainfall and mild temperature, has been and is still going on. However, very little erosion has taken place except on the steeper slopes and breaks bordering the streams or swamp areas.

Over the greater part of the county the soils are young; that is, they have not developed a normal soil profile. The various stages of soil development, constituting an ascending series from the youngest to the most mature, are swamp, Portsmouth, Bladen, Lenoir, Craven, Norfolk, and Ruston soils. Not more than one-third of the soils are naturally well drained, and even in this third only small areas of normally developed soils occur. Norfolk fine sandy loam and Ruston fine sandy loam may be considered the normally developed soils of Gates County.

The most striking feature of the texture profile of all the well-developed soils in the county is the presence of a comparatively light-textured surface layer, a second layer of heavier texture (in many places much heavier), and a third layer which may vary considerably in texture, but which is prevailingly lighter than the second layer but in most places heavier than the first. The actual texture of the surface layer, horizon A, ranges from very fine sandy loam to sand, and of the second layer, horizon B, from clay to very light sandy loam or sand. The third layer, horizon C, consists of unconsolidated geologic material and may be extremely variable in texture, structure, and color. The thickness of the different layers also ranges widely.

Considerable eluviation has taken place in the normally developed soils as is evidenced by the light texture of the A_1 and A_2 layers. The B horizon indicates the illuvial action; that is, the accumulation of finer material which is uniform in color, texture, and structure.

The soils of the county have been derived from beds of unconsolidated clays, sandy clays, and sands, and the color, texture, and structure of this partly weathered material is not uniform, but it is noticeably different in color under the well-drained soils and under the poorly drained soils. Most of this material is rather hard and compact but very brittle, breaking easily, and in some places showing slight stratification or bedding. The parent material under the Norfolk, Ruston, and Onslow soils is more friable and contains more fine sand than that under the Craven, Bladen, and Lenoir soils. Under the last-named soils the material of the C horizon is heavier and in most places is steel-gray clay containing mottlings of yellow or rust brown. Because of poor drainage, aeration, and oxidation the Lenoir, Bladen, and Portsmouth soils have not developed a normal soil profile, as the soil-forming processes have not had an opportunity to act on the original material and produce uniform color, texture, or structure. The yellowish-red or yellowish-brown color of the B horizon of the Ruston soils evidently shows a further stage of oxidation of the iron salts than does the Norfolk subsoil, and,

therefore, the Ruston may be considered the most mature soil of the county.

The soils of Gates County can best be interpreted by individual profile descriptions at definite locations for the important soils, as follows:

In a sample of Norfolk fine sandy loam, 3 miles north of Gates, the A_1 horizon, from 0 to 3 inches, is gray loamy fine sand containing a slight amount of organic matter; the A_2 horizon, from 3 to 14 inches, is grayish-yellow loamy fine sand. These two layers constitute the A horizon. The B horizon, from 14 to 30 inches, is yellow fine sandy clay. It is friable and crumbly, of uniform color, and shows no definite soil structure but readily crumbles into a friable mealy mass. The C horizon, from 30 to 44 or more inches, is mottled light-gray, yellow, and light-red fine sandy clay material. The light-gray or dingy-white material is heavy in texture and has a slick feel, whereas the redder part is more friable.

Norfolk fine sandy loam in this county has not developed such a thick B horizon as it has in the higher parts of the coastal plain, and the material of the C horizon is slightly heavier and shows more of the light-gray and dingy-white material. This is due either to the nearness of the water table or to the heavier parent material.

The Ruston soils differ essentially from the Norfolk in that the B horizon consists of yellowish-red or reddish-brown friable and crumbly fine sandy clay. The underlying material, or horizon C, is reddish-yellow, mottled with reddish brown and gray, fine sandy loam material.

The Craven soils have slightly paler-gray surface soils than have the Norfolk soils. The principal difference between the Craven and Norfolk soils is in the B horizon which consists of heavy plastic tough clay in the Craven soils. This clay is plastic and sticky when wet but breaks into irregular-shaped lumps and is very hard on drying. The B_2 horizon is yellow, mottled with steel gray and yellowish brown, heavy tough plastic clay. The C horizon consists of light-gray, mottled with yellow or reddish brown, clay or silty clay material.

The Onslow soils are characterized by a brown slightly compact but usually friable layer of fine sand and silt, the silty material being either iron or organic matter. This brown layer usually occurs from 3 to 6 inches below the surface and ranges in thickness from 1 to 3 inches. On exposure to air it hardens and in plowed fields breaks up into small lumps or concretions. The B horizon consists of grayish-yellow or dull-yellow friable and crumbly fine sandy clay. The color throughout the soil is dull as compared with the distinct gray and yellow colors of the Norfolk soils.

In a sample of Lenoir very fine sandy loam, 4½ miles west of Roduco, the A_1 horizon, from 0 to 5 inches, is dark-gray very fine sandy loam containing a considerable amount of organic matter. A large number of small lateral roots and grass roots occur in this layer. The A_2 horizon, from 5 to 8 inches, is light-gray, faintly mottled with brownish yellow, very fine sandy loam. A few roots are present in this layer. The B_1 horizon, from 8 to 30 inches, consists of mottled yellow, light-gray, and yellowish-brown heavy clay which breaks into irregular-shaped lumps and finally crumbles into a fine mass. When wet the material is plastic and sticky. The B_2 horizon, from 30 to 60 inches, is light-gray, mottled or streaked with brownish yellow, rather heavy sticky silty clay. With increase in depth the material shows more gray and less yellow and brown mottlings.

In a sample of Bladen loam, 4 miles south of Sunbury, the A_1 horizon, from 0 to 8 inches, is dark-gray loam carrying a large amount of organic matter. The material is almost black when wet but dries out to a brownish-gray color. The A_2 horizon, from 8 to 15 inches, is light-gray heavy fine sandy loam with a few yellowish-brown stains or blotches. The B horizon, from 15 to 44 or more inches, is steel-gray, mottled with yellowish brown or ocherous colored, heavy plastic clay, which, in places, extends to a depth of several feet. This clay is so sticky and plastic that the querls can readily be pulled from the channels of the auger.

The Portsmouth soils are black or dark gray in the surface layer, and they contain a large amount of organic matter. The subsurface layer is very light-gray material. Below this is light-gray, mottled with yellow or rust brown, heavy friable though slightly sticky fine sandy clay.

Peat has developed in Dismal Swamp and along Chowan River. It consists of brown rather fibrous organic material underlain at a depth of about 7 feet by black slightly sticky finely divided or well-decomposed organic matter having the consistence of muck.

Swamp consists of alluvial material of variable texture, color, and structure in the first bottoms along most of the streams. It is permanently wet or saturated.

SUMMARY

Gates County is in the northeastern part of North Carolina, bordering the Virginia State line. The land consists of extensive level areas and undulating, gently rolling, and in a few places rolling areas interspersed with many small swamps and slight depressions. Most of the drainage is into Chowan River. Only about one-third of the county is naturally well drained, but most of the land can be drained by canals and open ditches leading into the natural drainage ways.

The climate is mild, and the rainfall is abundant and well distributed throughout the growing season. The driest months are usually in the fall at the time of crop harvest.

The agriculture consists chiefly of the growing of peanuts and cotton and a small amount of tobacco as cash crops, and the production of corn as a major subsistence crop, together with some oats, sweetpotatoes, potatoes, and soybeans. The main crops, such as cotton, peanuts, and corn, are grown on practically all the cultivated soils.

The soils of Gates County are divided into three main groups. The first group comprises the light-colored well-drained soils, including all the soils of the Norfolk, Ruston, Craven, and Onslow series. Of these, Norfolk fine sandy loam and Craven fine sandy loam are the most important agriculturally. These soils are the best suited of any soils in the county to the production of truck

crops, bright tobacco, peanuts, and cotton. Some corn is also grown. The second group, or light-colored poorly drained soils, comprising all the soils of the Lenoir and Bladen series, are used primarily for the production of corn and soybeans, although some peanuts and cotton are produced. The Bladen soils are naturally fertile soils, and when adequately drained they will produce good yields of corn and soybeans. The third group, or the dark-colored poorly drained soils, includes the soils of the Portsmouth series. Practically none of these soils is under cultivation. Peat and swamp may be considered as classifications of organic and miscellaneous alluvial material, and at present they are not used for agriculture.

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[PUBLIC RESOLUTION—No. 9]

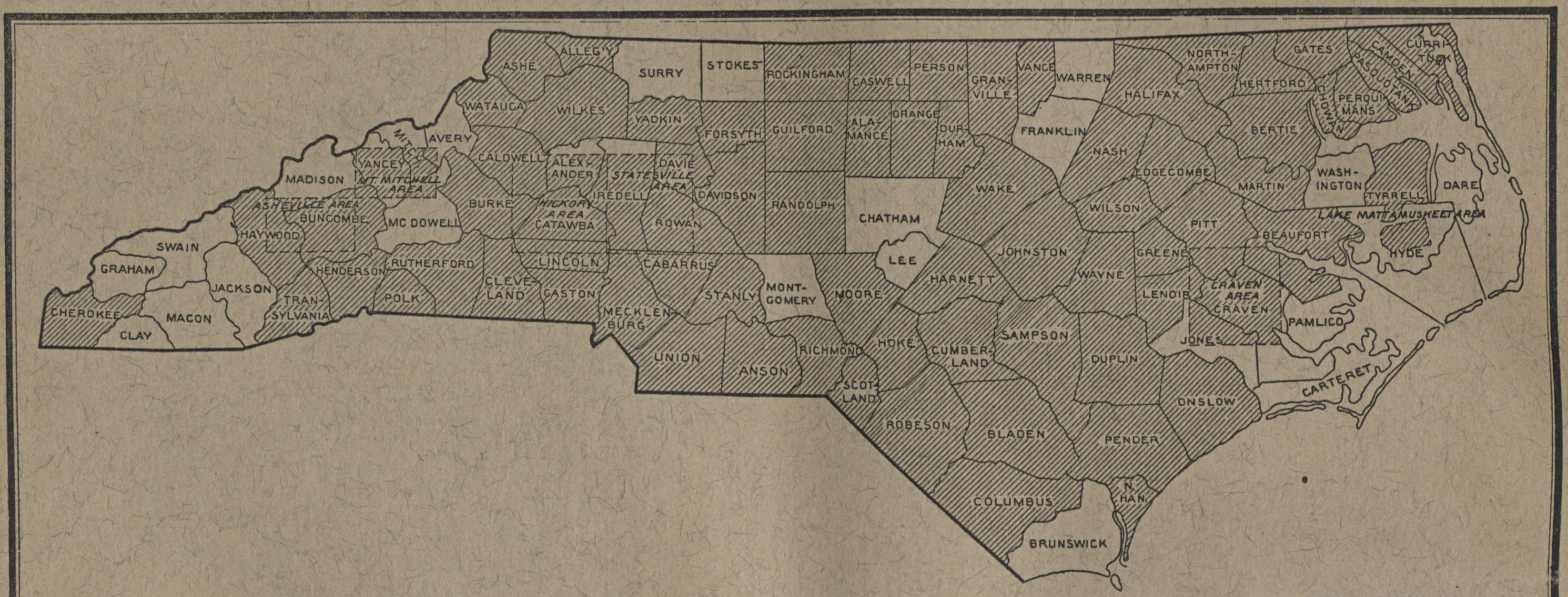
JOINT RESOLUTION Amending public resolution numbered eight, Fifty-sixth Congress, second session, approved February twenty-third, nineteen hundred and one, "providing for the printing annually of the report on field operations of the Division of Soils, Department of Agriculture."

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

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, and on July 1, 1927, the Bureau of Soils became a unit of the Bureau of Chemistry and Soils.]



Areas surveyed in North Carolina, shown by shading

U. S. GOVERNMENT PRINTING OFFICE: 1931