U. S. DEPARTMENT OF AGRICULTURE,
BUREAU OF SOILS—MILTON WHITNEY, Chief.

SOIL SURVEY OF RICHLAND COUNTY, SOUTH CAROLINA.

BY

CORNELIUS VAN DUYNE, IN CHARGE, W. E. McLENDON, AND THOMAS D. RICE.

W. E. McLENDON, INSPECTOR, NORTHERN DIVISION.

[Advance Sheets—Field Operations of the Bureau of Soils, 1916.]

WASHINGTON:
GOVERNMENT PRINTING OFFICE.
1918

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LETTER OF TRANSMITTAL.

U. S. DEPARTMENT OF AGRICULTURE,
BUREAU OF SOILS,
Washington, D. C., August 30, 1917.

SIR: In the extension of the soil survey in the State of South Carolina during the field season of 1916 a survey was undertaken in Richland County.

I have the honor to transmit herewith the manuscript report and map covering this work and to request their publication as advance sheets of Field Operations of the Bureau of Soils for 1916, as authorized by law.

Respectfully,

MILTON WHITNEY,
Chief of Bureau.

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

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SOIL SURVEY OF RICHLAND COUNTY, SOUTH CAROLINA.

By CORNELIUS VAN DUYNE, In Charge, W. E. McLENDON, and THOMAS D. RICE.—Area Inspected by W. E. McLENDON.

DESCRIPTION OF THE AREA.

Richland County lies near the geographical center of the State of South Carolina. It is bounded on the north by Fairfield County, on the northeast by Kershaw County, on the east by Sumter County, on the south by Calhoun County, and on the southwest and west by Lexington County. The Congaree River separates it from Calhoun County and in part from Lexington County. The Saluda River also forms a part of the Lexington County boundary. The Wateree River forms the Sumter County boundary line. The county is irregular in outline, with an extreme length of approximately 50 miles in a northwest-southeast direction and an average width of about 16 miles. It comprises an area of 745 square miles, or 476,800 acres.

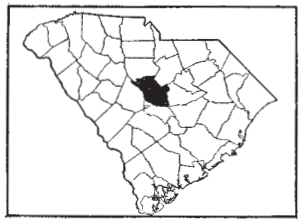

FIG. 1.—Sketch map showing location of the Richland County area, South Carolina.

The physiography of Richland County is typical of the belt of country lying along the fall line between the Coastal Plain and the Piedmont Plateau. The northern two-thirds of the county is a fairly high, rolling to hilly, dissected plateau or plain, while the southern third is a level to undulating plain. The valley of the Broad River is the most prominent topographic feature of the county. It is comparatively narrow and deep, and has little or no flood plain. The Congaree and Wateree Rivers do not occupy conspicuous valleys.

On the bases of topographic features and elevation the county may be divided into five sections, which are shown on the accompanying sketch map (fig. 2). These are the Piedmont region, the Sandhill region, the Red Hill region, the level Coastal Plain belt, and the river-bottom and terrace division.

The Piedmont division has the appearance of a high, gently sloping plain, much dissected by a network of drainage ways. Aside from the rivers, the Piedmont streams in this county are compara-

tively short. They have fairly steep gradients and comparatively narrow flood plains. The upland slopes are for the most part gradual, being steepest in the belt adjacent to the rivers and the lower courses of the tributary streams. The crests of the ridges lie 50 to 200 feet above the stream levels, and the elevation in general ranges from 200 to 400 feet above sea level. This section lies for the most part to the north and west of a line drawn north from Columbia to Blythewood and thence southeast to the Kershaw-Richland County line midway between Twentyfivemile and Rice Creeks.

The Sandhill region lies east and south of the Piedmont and to the north of a line drawn southeast from a point near Columbia to the

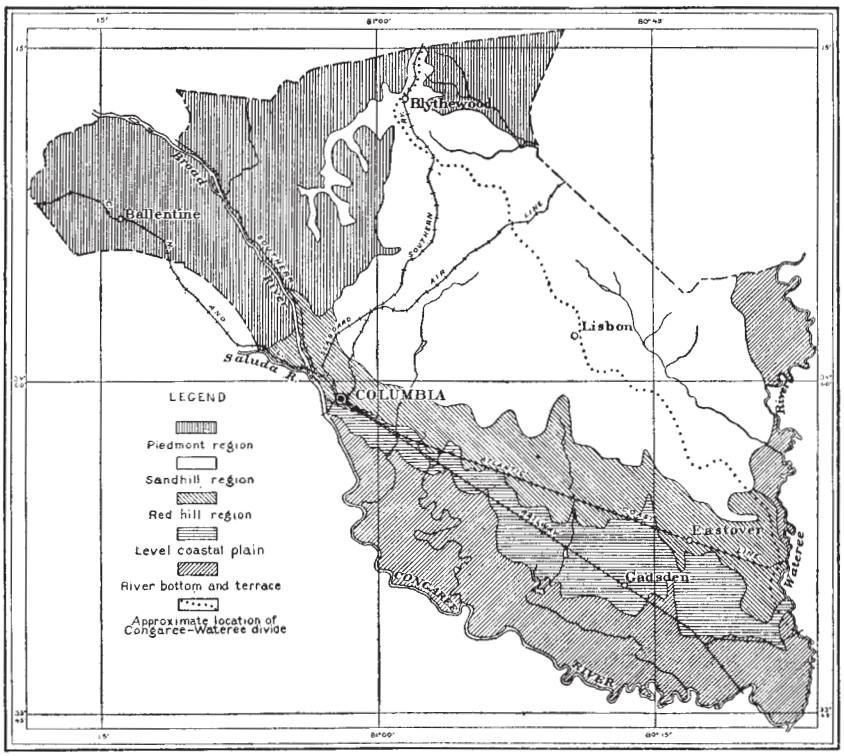

FIG. 2.—Sketch map showing physiographic divisions of Richland County.

Wateree River. It covers approximately one-third of the total area of the county. The topography as a whole is gently rolling to rolling, or even hilly where the streams are most numerous and have cut most deeply. The basins of Colonels Creek and the country facing the first bottom of the Wateree River show the greatest diversity of elevation. In the upper courses of the streams the valleys are narrow and V-shaped. As a rule they widen gradually, and rather low areas are developed, but the Colonels Creek valley is an exception in this re-

spect. The streams are longer and straighter than those of the Piedmont region, and there is not such a thorough network of drainage ways. Springs are numerous and most of the streams of the county head within the Sandhill region. The range in elevation is from 250 to 500 feet above sea level, this division being the highest in the county.

The Red Hill region comprises a belt 2 to 4 miles in width, extending southeasterly from a point a few miles northwest of Columbia to the Wateree River. The surface is gently sloping to sloping. The Red Hill belt constitutes a foothill area between the Sandhill region and the level Coastal Plain to the south. It is one of the least extensive physiographic divisions of the county, but one of the most important agriculturally. Few streams rise within this area, but a number follow narrow valleys from the Sandhill section on the north. The elevation ranges from 150 to 250 feet above sea level.

The level Coastal Plain covers a belt of irregular width extending southeasterly from Columbia to the Wateree River. It is widest in the vicinity of Hopkins, Weston, and Gadsden. The surface has the appearance of a vast terrace or plain, dotted with small, poorly drained depressions. The streams rising to the north cross this belt in narrow, shallow valleys, with practically no tributaries. There is little range in elevation in this belt. It lies about 150 to 250 feet above sea level.

The river-bottom and terrace division is largely represented in a belt, 4 to 6 miles in width, bordering the Congaree River below Columbia and in two developments along the Wateree River north of the Atlantic Coast Line Railroad crossing. The terraces lie above overflow, being situated 10 to 25 feet above the first bottoms, and range from 1 to 1½ miles in width. The first-bottom land lies only a few feet above the normal level of the rivers and is subject to overflow. The elevation of this lowland division ranges from 75 to 150 feet above sea level.

The Wateree River system drains the northeastern one-fourth of the county and the Broad-Congaree River system the remainder of its area. A few square miles drain into the Saluda River, and thence into the Congaree. The divide between the two main drainage systems extends southeasterly across the Sandhill region from the vicinity of Blythewood to a point within 2 or 3 miles of the Wateree River, where it turns southward and parallels the river to the Congaree bottom lands.

The Piedmont division is practically everywhere well drained, the run-off being excessive. In the Sandhill region, especially on the broad divides, there are fairly extensive tracts without visible surface drainage. The loose, sandy soil types here absorb all the rainfall, and the run-off is very slight. There are numerous springs.

The Red Hill division is practically everywhere well drained. There is little run-off, however, and in a few depressed areas the soil is poorly drained. In the level Coastal Plain belt the soils are porous and readily absorptive of the rainfall. Few streams head within this division. Small, circular depressed areas without surface outlets are numerous, but aside from these the country is well drained. The terrace areas lying above overflow, are moderately well drained. Few streams or tributaries head within this terrace belt, but it is narrow and the water finds its way through the soil material. The first bottoms or flood plains are characteristically poorly drained. The streams have little fall and the rivers frequently overflow their banks. Sloughs and old river channels are common in the first-bottom areas.

Artificial ponds are numerous along the many streams in the Coastal Plain division of the county. They are used to develop power for running small grist mills. The Wateree River in its course along this county has a sluggish current and is practically a grade stream. The Congaree River below Columbia is of the same general character. Its elevation near Columbia is 110 feet above sea level, and approximately 50 miles below, at its junction with the Wateree River, 70 feet. The Piedmont streams have considerable fall. In the Broad River and in the Saluda River near Columbia there are series of rapids, whose combined fall exceeds 35 feet. A canal 3 miles long takes water from the Broad River above the rapids and carries it to Columbia, where it is used to develop electricity for lighting and power purposes.

Richland County was created from the old Camden District about 1795. It was later known as a "district," the name of "county" being restored in 1868. Recent additions of territory have been made from Lexington and Fairfield Counties. Settlement began early in the 18th century, the first immigrants coming from the coast section of the State, from Virginia, and from other communities to the north. English, German, Scotch, and Irish nationalities were represented. The present white population, especially outside the city of Columbia, consists largely of descendants of the early settlers. Ninety-nine per cent of the total population is of native birth.

All parts of the county except the lowest areas of the river bottoms are settled. Settlement is most dense in the southern part and thinnest in the Sandhill section. There is a large suburban population around Columbia. Negroes constitute more than one-half the total population. The 1910 census reports the population of the county as 55,143,[1] of which 52.3 per cent is classed as rural. The population increased by nearly 30 per cent between 1900 and 1910.

[1] This does not include the population of the territory since added to Richland County from Lexington and Fairfield Counties.

Since the 1910 census was taken there has been a marked increase in population in Columbia and its vicinity, resulting in part from annexation of territory.

Columbia, the county seat and the capital of the State, had a population of 26,319 in 1910. Its present population is estimated as 56,992. Columbia is the second largest city in the State. It is an important commercial, railroad, and industrial center. Several lines of railroad radiate from this city, and boats afford water transportation to the coast. The abundant water power of the rivers at or near the city is only partly developed. Columbia has six cotton mills, several fertilizer factories, three oil mills, and numerous other plants. There are several colleges within or near the city limits.

Eau Claire, College Place, Olympia, and Colonial Heights are among the suburbs just beyond the city limits of Columbia. These communities are growing rapidly. Eastover, 22 miles southeast of Columbia on the Atlantic Coast Line Railroad, with a population of 237, is an important trading and marketing point for the southeastern part of the county. Blythewood, Hopkins, and Gadsden are smaller towns and trading centers. Congaree, Wateree, James Crossing, Horrell Hill, Lykesland, and Kingville are local trading points in the southern part of the county, and Killian, Littleton, Ballentine, White Rock, Hilton, and Pontiac are trading centers in the northern part.

Lines of railroad extend from Columbia in all directions and afford good transportation facilities to outside markets. The Seaboard Air Line Railway and the Southern Railway afford communication with Savannah and intermediate points on the south, and with northern South Carolina, North Carolina, and other points on the north. Both the Atlantic Coast Line Railroad and the Southern Railway have lines extending to Charleston. The Southern Railway also has a line to Augusta. The Columbia, Newberry & Laurens Railroad affords communication with points in the northwestern part of the State. From Kingville a branch of the Southern Railway extends eastward into Sumter County. The distance by rail to Charleston is 130 miles; to Savannah, 142 miles; to Augusta, 85 miles; to Greenville, 144 miles; to Spartanburg, 95 miles; to Wilmington, 190 miles; and to Charlotte, 109 miles. With the exception of part of the Colonels Creek basin between Eastover on the Atlantic Coast Line Railroad and Pontiac on the Seaboard Air Line Railway, all parts of the county are within easy reach of railroads.

The Congaree River is navigable to Granby Boat Landing, just below Columbia. The Broad and Saluda Rivers above Columbia are navigable for some distance. Some freight is handled on the Wateree River, but very little to points in Richland County. The freight handled by water amounts to a considerable tonnage.

The public-road system is fairly adequate for the present needs of the county. The roads are constantly being extended and improved. The main highways which radiate from Columbia are kept in good condition. The settlement or neighborhood roads are very crooked and in poor condition. In general, the roads in the vicinity of Columbia and in the southern part of the county are better kept than elsewhere. A bridge opposite Columbia and a ferry near the southeastern corner of the county afford the only means of communication by road with points across the Congaree River. The only bridge over the Broad River is within a short distance of Columbia. Garners Ferry affords the only means of highway communication with Sumter County, across the Wateree River.

Telephone service is maintained between the principal towns and villages, but there are few rural telephone lines. Rural mail-delivery service reaches practically all parts of the county. The rural-school system is fairly good and churches are numerous.

Cotton and other market crops grown on farms within a radius of about 10 miles are disposed of directly at Columbia. From the remainder of the county much of the cotton reaches Columbia after being originally marketed in the small towns and local trading points. Cotton for export is shipped from Columbia to Charleston. A large part of the production finds a ready market in the local cotton mills. The small towns afford only a small market for other products. Cotton is practically the only crop shipped to outside points.

CLIMATE.

The climate of Richland County is characterized by short, mild winters, long, warm summers, and abundant rainfall. The growing season is sufficiently long to mature all the common crops and in some cases to grow more than one crop on the same field in a season. Farming operations may be carried on without much interruption during the winter months, and the hardier crops can be grown the year round. The rainfall is usually well distributed, so that crops seldom suffer severely for moisture. In general, the climate favors more extensive agricultural development than exists at the present time.

The mean annual temperature is 63.2° F. Seasonal mean temperatures range from a winter mean of 46.7° to a summer mean of 79.7°. In the winter months a range has been recorded from a maximum of 82° to a minimum of —2°. Temperatures as low as freezing or lower seldom occur and continue for only a few hours. Snow falls in some winters and remains on the ground for short periods. Recorded summer temperatures range from 106° to 47°. Summer weather begins from the middle to the last of May and continues

into September. The spring and fall seasons are short, but mild and pleasant.

The mean annual precipitation is 46.62 inches. The rainfall is quite evenly distributed throughout the year, but is heaviest during the summer season. The rainfall in the driest year on record amounted to 33.76 inches and in the wettest year 63.25 inches.

The average date of the last killing frost in the spring as recorded at Columbia is March 22, and that of the first in the fall, November 8. The average growing season is thus 231 days in length. The date of the earliest recorded killing frost in the fall is October 19, and that of the latest in the spring, April 17.

The following table, compiled from the records of the Weather Bureau station at Columbia, gives normal monthly, seasonal, and annual temperature and precipitation data applicable to the county as a whole:

Normal monthly, seasonal, and annual temperature and precipitation at Columbia.

Month.	Temperature.			Precipitation.		
	Mean.	Absolute maximum.	Absolute minimum.	Mean.	Total amount for the driest year.	Total amount for the wettest year.
	°F.	°F.	°F.	*Inches.*	*Inches.*	*Inches.*
December	47.2	77	9	3.10	2.38	2.62
January	45.1	78	10	3.34	2.62	3.85
February	47.8	82	−2	4.30	3.01	4.60
Winter	46.7	82	−2	10.74	8.01	11.07
March	54.0	93	20	3.73	2.63	2.21
April	62.8	96	28	3.22	1.23	1.85
May	71.8	101	40	3.81	1.00	10.09
Spring	62.9	101	20	10.76	4.86	14.15
June	78.2	103	47	4.50	3.05	5.66
July	81.1	105	54	5.86	3.21	7.50
August	79.5	106	56	6.14	7.69	9.74
Summer	79.7	106	47	16.50	13.95	22.90
September	73.7	104	42	3.78	2.50	9.70
October	64.0	92	32	2.46	2.33	.80
November	53.8	85	21	2.38	2.11	4.63
Fall	63.8	104	21	8.62	6.94	15.13
Year	63.2	106	−2	46.62	33.76	63.25

AGRICULTURE.

The earliest agricultural efforts in this territory were made by more or less permanent hunters and trappers or owners of herds of cattle and sheep, who made small clearings in the pine woods and grew corn, wheat, and vegetables for their own use. The first permanent settlements, made about the middle of the eighteenth century, mark the beginning of agricultural development. Early progress was very slow on account of the lack of markets and of transportation facilities. Stock raising continued to be an important industry, but as better means of communication with outside markets became available more attention was given to the growing of sale crops, and cotton early became an important money product. Wheat was grown either to be shipped to outside markets or ground into flour for home use. Corn was grown mostly for home and farm use. Other crops at one time important were indigo and tobacco. Rather diversified farming on a small scale was carried on, as it was necessary to produce all supplies needed on the farm.

Prior to the Civil War the best sections of the county were included within plantations, where operations were conducted on a large scale under wasteful farming methods. The war was followed by a long period of depression, from which agriculture has gradually emerged as the leading interest of the county with the development of markets and transportation facilities. The prevailing one-crop system of farming dates back to the time when cotton began to command a high price. Other crops were discontinued or reduced greatly in acreage. During this period of agricultural development the turpentine and lumbering industries began to assume importance. They retarded the extension of farming by affording a more ready source of income and by absorbing the labor available for farm work. With the decline of these industries attention was again turned toward farming, and gradual development of the agricultural resources has continued to the present time.

The censuses of 1880, 1890, and 1910 show a gradual increase in the acreage devoted to nearly all crops now produced, as well as in the acreage of improved land per farm and in the value of all kinds of farm property. At present the market conditions are improving, and the farmers are adopting improved methods of soil preparation and cultivation. An increasing interest is taken in maintaining and increasing the productiveness of the soils and in the selection of seed for planting. Many farmers are diversifying crops in a small way.

The following table, compiled from the census, shows the acreage and production of the leading crops in 1909:[1]

[1] The census figures apply to Richland County as constituted before the recent additions of territory from Lexington and Fairfield Counties.

Acreage and production of principal crops in 1909.

Products.	Area.	Production.
Cereals:	*Acres.*	*Bushels.*
Corn	27,311	366,283
Oats	6,019	108,384
Wheat	122	1,271
Rice	2	10
Other grains and seeds:		
Dry peas	5,253	15,415
Dry beans	2	25
Peanuts	89	859
Hay and forage:		*Tons.*
All tame grasses	1,046	1,184
Wild or prairie grasses	190	440
Grains cut green	5,250	4,195
Coarse forage	306	1,213
Vegetables:		*Bushels.*
Irish potatoes	214	18,485
Sweet potatoes	648	54,106
All other vegetables	665	.....
Special crops:		*Bales.*
Cotton	37,259	17,476
Sugar crops:		*Tons.*
Sugar cane	15	83
Sorghum	36	208

The value of all crops produced in 1909 is reported as $2,079,422, as compared with $201,446 received from live-stock sources. The census reports the value of crops by classes as follows: Cereals, $433,414; other grains and seeds, $31,844; hay and forage, $100,354; vegetables, $100,082; fruits and nuts, $19,273; and all other crops (including cotton), $1,394,455. Of the receipts from live-stock sources, dairy products amounted in value to $67,571, poultry and eggs to $59,843, and animals sold or slaughtered to $74,032.

Cotton is the money crop of the county, the other crops being grown for farm and home use. The revenue from cotton has to cover most of the farm expenses, and in case of light yields or of low prices for the crop, farming may be conducted at a loss. Only sufficient stock is kept to perform the farm operations. The quantity of stable manure produced is small, and certain soils are used for cotton which are better adapted to other crops. Crop rotations are impracticable under the prevailing system of agriculture, resulting in unwarrantedly light yields, and there is a greater expense for fertilizer than would be the case under a system of diversified farming.

Cotton occupies a greater acreage than any other crop on each soil type. It is the chief crop on both rented and owner-operated farms. At least three-fourths of the fertilizer expense of the county is for cotton. The average yield is slightly less than one-half bale per acre, but yields range from one-fifth to over 1 bale per acre. The average return is practically the same as for other cotton-growing counties of the State. The results obtained by the better farmers indicate that yields of three-fourths bale to 1½ bales per acre are possible under good methods. The present average yields are not

profitable when the price of cotton is low. At present there is a tendency among the more progressive farmers toward the intensive rather than the extensive cultivation of cotton, and the number of acres worked with one plow is gradually being reduced. Both long and short staple cotton are grown, the yields of the former being somewhat lighter. The cotton crop is generally sold as soon as gathered.

Corn is the second crop in acreage and importance. It is grown in all parts of the county and on practically every soil type, with little or no attention to soil adaptation. Corn is the chief feed for work stock and cattle, and in addition it is used extensively for food in the home. The production is not sufficient to supply the local needs. Some farmers have a surplus to sell, but others have to buy during the spring and summer months when the price is high. Only a few farmers have silos or save the fodder, but a large number pull the corn leaves for use as forage or rough feed during the winter and spring. Corn is gathered by pulling the ears, which are stored in bins or cribs unhusked. Fertilizer is commonly used on corn, smaller applications being made than for cotton. Many of the better farmers use the Williamson method or some modification thereof in growing corn. The average yields are lower than the inherent productiveness of most of the soils warrant, owing to inadequate preparation of the seed bed and inadequate cultivation and the lack of attention to the selection of seed. A gradual improvement in the farming methods is resulting in an increase in yields. Since the 1910 census there has doubtless been an increase in the corn production.

In 1909 there were 6,019 acres devoted to oats, in addition to which this crop occupied the greater part of the 5,250 acres reported in grains cut green. Oats are grown mainly on farms operated by owners. The fields are usually small. The crop is sown without fertilizer, late in the fall. Applications of nitrate of soda are made in the spring. A period of dry weather occasionally interferes with the growth of this crop. When the grain does not appear to be filling well, a greater acreage is cut for hay. Of the part of the crop allowed to mature, only a small proportion is thrashed, the remainder being fed in the bundle. Practically no oats are sold. The crop is followed by cowpeas the same season. The best yields of oats are obtained on shallow, sandy soil types, in well-drained depressions and bottoms. The value of this crop for forage and as a step in rotations is becoming more generally recognized.

At one time considerable wheat was grown in Richland County, but in 1909 only 122 acres were devoted to this crop, and the present acreage is probably little larger. Of the other cereals, rye is grown on a few farms as a winter cover crop.

Cowpeas are an important forage crop. They are either sown between the corn rows after the last cultivation or seeded following oats. In some cases the crop is allowed to ripen and the seed is gathered; otherwise it is cut green for hay. Cowpeas are grown on all types of soil.

Sweet potatoes are grown mainly for home use, but a few farmers have a surplus to sell in the local markets. Good yields of sweet potatoes of fine quality are produced. Irish potatoes for home consumption are planted in small patches. Vegetables of many kinds are grown in gardens. Truck crops are grown on a few farms in the vicinity of Columbia in sufficient quantity to supply the local market.

Peaches receive little attention on a commercial scale. A few small orchards have been set out in the Sandhill section. Apples and grapes are not commercially important. The 1910 census reports 20,893 peach trees, 7,928 apple trees, and 1,408 grapevines in the county. A number of pecan orchards have been set out, and the trees are making a good growth. The plantings are on the Norfolk sandy loam and the Marlboro sandy loam.

Stock raising is relatively unimportant. A few farmers graze cattle on the river bottom lands. Fenced upland pastures are few and scattered. The grade of stock kept is rather poor. Large areas of bottom land are available for pasture, and conditions favor the extension of cattle raising. Additional feed is sometimes necessary in the winter months. Most farmers raise hogs to supply meat for home use, and some have a few to sell. Hogs range in the river bottoms. Horses and mules for work stock are largely imported.

Dairying is an important and profitable industry on a few farms that supply dairy products to the city of Columbia. On most farms one or two cows are kept to furnish milk and butter for home use. The scarcity of feed and pasture crops under the present system of farming is not favorable to dairying.

Poultry raising as a special industry receives little attention. A small flock of hens is kept on most farms, but the production of poultry and eggs is not sufficient to supply the local demand.

The lumber industry, once a prominent source of income, is now relatively unimportant. No large tracts of untouched timber remain in the uplands, but in the bottoms there are still extensive areas of good timber. A number of small sawmills are operated in different sections of the county. One large mill near Columbia operates a tramroad extending for 10 miles or more into the Congaree River bottoms. In the vicinity of Columbia, especially in the Sandhill section, many farmers receive some income from the sale of fuel wood in that city. In the more remote sections wood is shipped in carload lots to outside points.

Topography does not markedly influence the kind of crops grown from place to place, although it has determined to some degree the location of the cultivated areas, and to a greater extent the adoption of the contour system of farming on the steeper slopes. Practically all the soils are used for the same crops, but yields vary with differences in the depth of the sandy soil mantle, in the moisture-holding capacity of the soil, and in the inherent productiveness. As a result of differences in these respects, in proximity to markets, and in other factors, some types are mainly in cultivation, while others are practically all in timber.

Only a general recognition is given the adaptation of the soils to different crops. The prevailing system under which cotton is grown so extensively as the money crop and corn on an almost equal acreage for feed prevents the selection of the best adapted soils for certain crops. The dark-colored, poorly drained soils of the uplands and terraces, when artificially drained, are regarded as better adapted to corn and grain than to cotton. The more shallow, sandy upland soils are better adapted to cotton and to grain than are the deeper sandy soils but are not well suited to corn. The heavy-textured river-bottom soils are considered much better for corn and grain than for cotton.

In preparing the seed bed the land is generally broken to a depth of 3 to 4 inches with one-horse plows and bedded up for either cotton or corn without harrowing. Some farmers, however, break to a greater depth with two-horse implements, in which case the land is usually harrowed before bedding and planting. The plowing season begins in late fall and continues until planting time, in March and April. Cotton is put in with planters, and corn by hand. Cultivation begins as soon as the crops are of sufficient height and continues until they are laid by, in June or July. Crabgrass is the most troublesome weed. Cotton is picked by hand and either hauled directly to the gin or stored in barns until several bales are gathered. Baled cotton is in some cases held for a higher price. Cowpeas, which are usually sowed in cornfields at the last cultivation, are picked before the corn is pulled. After the corn is gathered cattle and hogs are allowed to forage in the field. All the cultivated land except that in grain is allowed to lie bare during the winter months.

The pastures are fenced, and land is cultivated in the open. Line fences between farms are very uncommon. The fields in most cases extend close to the house and barn, and little or no space is left for the yard and farm lot. The stumps have been removed from all except the most recently cleared fields.

The value of all farm property combined more than doubled in the decade between 1900 and 1910. The 1910 census reports the

average value of all property as $2,339 per farm. This low figure is due in part to the classing of tenancies as farms. Many of these have almost no buildings, implements, or farm stock. Considering the county as a whole, the average value of all farm property is comparatively low, the land alone representing a relatively higher percentage of the whole than in sections where agriculture has reached a greater development. In the case of the average farm the land alone constitutes 68.7 per cent of the total valuation, buildings 16.5 per cent, implements 3.7 per cent, and domestic animals 11 per cent. Many of the farms are well equipped, while others have very poor equipment. The number of farms with an adequate supply of improved farm machinery is small. On much the greater number of farms the old-style one-horse implements are used. As a rule, the houses and other farm buildings are small. The work stock is of fairly good grade.

The farmers quite generally recognize that the rotation of crops would be of great benefit to the soils, but a definite rotation is practiced by very few farmers, and by them only on a small acreage. Wherever a systematic rotation has been followed it has increased the productive capacity of the soil. The prevailing system of agriculture is unfavorable to the rotation of crops. Cotton is grown in the same field for a number of years or cotton and corn are alternated in an irregular way, with oats grown now and then. Cowpeas are quite commonly sown in the corn fields after the last cultivation, and cowpeas often follow oats the same season. Almost the only form of rotation in use consists of cotton one or two years, followed by corn, and then by oats and cowpeas.

In the 1910 census 78.5 per cent of the total number of farms in the county report expenditure for fertilizer, the outlay averaging $96 per farm reporting. The total expenditure was almost four times that reported in 1900. Until the 1915 and 1916 seasons there was probably an increase in the amount expended over that of 1910. In 1915 the prevailing low price commanded by the cotton crop of the previous year, together with the lack of available credit, caused a lessening of the acreage devoted to cotton and of the amount of fertilizer used. In 1916 the scarcity of potash resulted in the use of fertilizers without the potash ingredients. Under normal conditions complete preparations are in general use. Only a few farmers buy the raw materials and mix their own fertilizers. Practically all the crops grown are fertilized. There is a tendency toward the use of high-grade mixtures, but the preparations used range in analysis from 8–2–2 to 10–4–4.[1] The quantity of fertilizer used and the methods of application vary with the crop, soil, dis-

[1] Respective percentages of phosphoric acid, nitrogen, and potash.

tance to railroad, and other factors. For cotton the heaviest fertilization is given at the time of planting, when acreage applications of 300 to 800 pounds are made. Some farmers prefer to apply a small proportion of the fertilizer used about the time cotton is in bloom. Fertilizer applications for corn are somewhat lighter, ranging from about 100 pounds an acre at planting time to 300 or 400 pounds during the period of crop growth. Nitrate of soda is not used as a top-dressing except on oats. All the available stable manure is utilized, and pine straw raked up in the forests is applied to fields before planting the crops. Lime is used on a very small scale. Green-manure crops are not grown to any important extent.

According to the census, 1,195 farms, or 43.5 per cent of the total number in the county, made an expenditure of $259,784 for labor in 1909, the outlay averaging $217.39 per farm reporting. Labor can usually be obtained without difficulty at 75 cents to $1 a day, $3.50 to $5 a week, or $10 to $15 a month with board and house furnished. As a rule the wages paid are higher near the cities. The laborers are only moderately efficient, consisting largely of negroes, especially in the southern part of the county. On the small tenant farms the tenants and their families perform practically all the labor, while on farms worked by the owners the labor is largely done by hired help. Fifty cents per hundred pounds is paid for picking cotton and $2.50 a bale for ginning, with bagging and ties included.

The 1910 census reports 53.1 per cent of the total area of the county as in farms. The average size of the farms is 75.5 acres, of which 36 acres is improved land. Over 25 per cent of the total area of the county thus consists of improved land, only part of which, however, is cultivated. The average size of land holdings is considerably greater than the average size of farms reported, since the census classes each tenancy as a farm. Some land owners parcel out their holdings to 50 or more tenants. A few individuals own nearly all the Congaree River bottom land, some of the holdings amounting to 20,000 acres or more. In the uplands many individual holdings range from 500 to 1,500 acres or more. In general, the size of the tenant farms ranges from 25 to 50 acres, and that of the farms operated by owners from 60 to 200 acres.

About two-thirds of the farms are operated by tenants. The proportion has remained fairly constant within the last 30 years. The share system of tenantry probably prevails. Cash rentals range from $3 to $10 an acre, averaging about $4 or $5. Various systems of share renting are in use. When the owner furnishes land, seed, and fertilizer, and the tenant the implements, labor, and stock, the crops are divided equally, the owner keeping up the repairs. In many cases the land is planted under the direction of the owner.

In some cases the owner takes all the cotton seed produced and the tenant is allowed to grow a patch of corn or potatoes for himself. The owner in some instances furnishes the stock and implements in addition to the land, the seed, and all or a part of the fertilizer, and the crop is divided equally except for the cotton seed and pea-vine hay, which go to the owner. Negro tenants are in the majority, especially in the southern part of the county. In parts of the Sandhill and Piedmont sections the tenants are largely white persons.

The 1900 and 1910 censuses report the average acreage value of farm land as $8.03 and $21.29, respectively. The rapid increase in the value of agricultural land during the decade 1900–1910 has continued since the last census was taken. The most desirable land near railroads in the southern part of the county and near Columbia is held at $75 to $100 or more an acre. In the remote sections of the Sandhill region the price ranges from $10 to $25 an acre. Values in general range between these extremes.

SOILS.

Richland County is a region of varied geological formations and soils. Three well-defined soil provinces are represented: (1) The Piedmont Plateau province, in which the soils are residual; (2) the Coastal Plain province, which includes old sedimentary soils and may be subdivided into (a) the old, high Coastal Plain or well-known Sandhill region, (b) the Red Hill belt, and (c) the later, low and level Coastal Plain or the Upper Pine belt; and (3) the River Flood Plains province, including recent-alluvial and terrace soils. These soil provinces conform closely to the main topographic divisions of the county shown in figure 2.

The Piedmont Plateau province covers the northwestern and the extreme northern parts of the county, embracing nearly one-third of its total area. The soils of this province have been derived from the underlying consolidated rocks. The various agencies of weathering have resulted in the disintegration and decomposition of these rocks into sandy, silty, and clayey soils, the texture varying with the character of the parent rock, the thoroughness of the weathering process, and the degree to which the finer particles have been washed out of the original material. Drainage conditions also have had an important influence in the development of the various soils. The depth of the fine-earth mantle varies from a few to many feet and is the resultant of the effects of weathering and of erosion of the weathered material acting through a long period of time. Erosion has been active throughout the whole Piedmont area. The underlying rocks in this county are almost exclusively light-gray to bluish-gray, fine-grained slates, known as "Carolina slates." These

rocks carry in places numerous veins of quartz, fragments of which occur upon the surface in places. The surface rock in small areas near Columbia and in an approximately circular area at Montgomery is a medium to coarse grained gray granite.

The Sandhill division of the Coastal Plain province in this county is a part of the Sandhill belt which extends interruptedly from Alabama through the intervening States into Virginia. The northern part of the Sandhill area in this county has a general level or plainlike topography. Evidence of its former extent over considerable areas of present Piedmont soils exists in the capping of Coastal Plain material on many of the divides and isolated hills in the adjacent sections of the Piedmont area. The original upper or northern limit of the Coastal Plain can not be determined, but it is certain that marine deposits over a considerable area have been removed by erosion. The Sandhill belt is the highest of the Coastal Plain surface formations. The sedimentary material was derived from the rocks and soils of the higher Piedmont Plateau and Appalachian Mountains to the north. The present character of the soils has resulted from the reworking and assorting action of shore currents, waves, and tides; from erosion of the original surface material; and from the washing away of the finer particles. Wind action may also have had some influence in determining the present texture and topography.

The Red Hill division of the Coastal Plain province lies to the south of the Sandhill division and extends from a point beyond Columbia southeasterly to the Wateree River. The term "Red Hill" is not equally applicable to all parts of this belt from the standpoints of color and topography, but there is a similarity throughout its extent in the character of the material and to a less extent in color and surface features. This belt represents a transition between the Sandhill region and the level Coastal Plain belt to the south. It rises gradually toward the north until it merges with the Sandhill belt. On the south a fairly well defined, continuous break, a few feet in height, marks its boundary with the level Coastal Plain. The soil material consists of water-deposited sediments derived from the same general region as those giving rise to the soils of the Sandhill division. Erosion and the removal of the fine material from the surface layers have largely determined the present soil textures. Weathering, oxidation in particular, has greatly influenced the color of the soil types.

Lying to the south of the Red Hill belt and to the north of an extensive area of alluvial bottom land is the low, level belt of Coastal Plain which extends southeasterly from the vicinity of Columbia to the Wateree River. There is a marked line of separation between this belt and the terraces to the south. Streams from the north

cross it in narrow valleys depressed 10 to 25 feet below the general level. This region has the appearance of a very old terrace. The material is of the same origin as that of the higher lying Coastal Plain divisions. Subsequent modification by erosion has been slight. The washing away of fine material has caused the present prevailingly light texture of the surface soils. Oxidation resulting from the fairly good drainage has developed the typical yellow color of the subsoil material.

The River Flood Plains province includes soils in both a flood-plain (or first-bottom) and terrace position along the rivers and the large creeks. Aside from their extensive development along the Congaree and Wateree Rivers, the soils of this province are comparatively inextensive in this county. The bottom-land developments along the interior streams are long and narrow. The alluvial land along the Congaree River includes a belt of terrace ranging from one-half mile to about one mile in width, lying well above overflow. Along the Wateree River the terrace soils are by far the more extensive on the opposite side of the river from Richland County, but in one or two places the river swings to the eastern margin of the valley. The soil material of the terraces is apparently derived from the formations of the Piedmont Plateau and of the Coastal Plain, and was deposited when the streams were flowing at higher levels than at present. The origin of the material of the first bottoms is more clearly indicated. In the narrow bottoms along the larger interior streams the soil consists of sediment washed from their respective basins and deposited along their courses during overflows. It has been much modified under conditions of poor drainage. Along the streams heading within the Piedmont region material of different character is developed. The color and character of the material in the extensive river-bottom areas indicate that it is largely of Piedmont origin, though in places there has been modification by Coastal Plain sediments.

The soils of the various provinces are separated into soil series and the series into types. The type is the unit of classification, and is determined by the relative proportion of the different-sized particles of material which make up the soil mass. The series includes types having common characteristics in origin, color, structure, topography, and drainage.

In the Piedmont region the soils of slate origin are classed in two series, the Georgeville including types with red subsoils, and the Alamance including those with yellow subsoils. In the areas of underlying granite formations the Cecil series is developed. In the Coastal Plain region the Norfolk, Marlboro, Ruston, Orangeburg, Greenville, Hoffman, and Portsmouth series are developed. On the alluvial terraces the Cahaba and Kalmia series are developed in the

fairly well drained or well-drained areas, and the Leaf and Myatt series in the poorly drained situations. The first-bottom soils through the Piedmont, derived largely from crystalline-rock material, are mapped in the Congaree series; those along the creeks draining areas of the Georgeville and Alamance soils are classed in the Wehadkee series, and those along creeks carrying sediment from Coastal Plain soils in the Johnston series.

The Georgeville series is characterized by brownish-gray to reddish-brown surface soils and heavy, red subsoils. Fragments of quartz rock are common on the surface in places. The surface is undulating to rolling. Run-off is excessive, and the prevention of erosion is a serious problem over extensive areas. Two types represent this series in Richland County, the Georgeville silt loam and silty clay loam.

The Alamance series is characterized by gray surface soils underlain by yellow subsoils, of heavier texture. The surface is mainly gently undulating or nearly level, but in places these soils occur on short slopes. Drainage is usually imperfect. This series is easily distinguished from the Georgeville by its difference in color, due to less complete oxidation of the material. One type, the Alamance silt loam, is mapped in this county.

The Cecil series is characterized by gray to brownish, or in case of the heavy types red, surface soils and red, heavy subsoils. The surface ranges from gently rolling to hilly, and drainage is adequate to excessive. These soils are residual from the weathering of granite and gneiss, in contrast to the Georgeville soils, which are derived from fine-grained slates. The coarse sandy loam is the only member of the Cecil series recognized in this survey.

The Norfolk series is characterized by gray, loose sandy surface soils and yellow, friable subsoils of sandy to light sandy clay texture. The organic-matter content is low. These soils occupy nearly level to rolling areas in Coastal Plain uplands. Drainage ranges from adequate to excessive. The Norfolk sand, coarse sandy loam, sandy loam, and fine sandy loam types are recognized in this county. The sand type is mapped with a sandhill phase.

The Marlboro series consists of light brownish gray to light-brown and brownish-yellow sandy surface soils grading into a yellowish sandy subsurface layer, except in the shallower phases, and resting on a heavy, sticky, sandy clay subsoil, yellowish brown to a depth of 2 to 2½ feet and mottled red and yellow beneath. The depth to clay ranges from 5 to 15 inches. The sandy loam type occurs in Richland County.

The types of the Ruston series have brownish-gray surface soils and reddish-yellow or reddish-brown, friable subsoils. They occur in the undulating to rolling sections of the Coastal Plain, and have

thorough drainage. Three types are mapped in Richland County, the Ruston loamy sand, sandy loam, and fine sandy loam.

The Orangeburg series consists of gray to grayish-brown surface soils underlain by red, friable, moderately heavy sandy clay subsoils. The surface is undulating to rolling, and drainage is well established. Only the sandy loam type with a shallow phase is encountered in this county.

The surface soils of the Greenville series are reddish brown to dark red in color, and generally loamy. The subsoils are red, friable, sandy clays. In distribution the Greenville series is closely associated with the Orangeburg. The surface is level to rolling or sloping, and the drainage is good. Only one type, the Greenville clay loam, is recognized in this survey.

The Hoffman series includes gray surface soils and pink or mottled pink, yellow, and gray, friable subsoils. The topography ranges from gently sloping to rolling and steeply rolling. The drainage is thorough. Two types are mapped in Richland County, the Hoffman coarse sandy loam and sandy loam.

The Portsmouth series is characterized by dark-gray to nearly black surface soils and gray to mottled yellow and gray subsoils. The soils are high in organic matter, though rather compact in structure. The subsoils, where heavy, are plastic when wet and stiff when dry. These soils occupy flat or slightly depressed areas and are more extensively developed in the flatwoods section of the Coastal Plain than elsewhere, although scattered areas occur in the Upper Pine belt. They are characteristically poorly drained. One type, the Portsmouth loam, is mapped in this county.

The Cahaba series is characterized by brownish-gray to gray surface soils and yellowish-red to reddish-brown subsoils. The series is developed in the best drained areas of the terraces on which it occurs. In Richland County the Cahaba fine sandy loam, with a heavy phase, is mapped.

The surface soils of the Kalmia series have a gray color. The subsoils are yellow, with either red or gray mottlings in the lower part of the 3-foot section. The soils are low in organic-matter content. The surface is usually level and moderately well drained. These soils are composed of sediments derived mainly from Coastal Plain formations in the basins of the streams along which they occur. They resemble the soils of the upland Norfolk series, although type for type they have heavier and more compact subsoils. The Kalmia sandy loam, fine sandy loam, and very fine sandy loam are recognized in Richland County.

The Leaf series is characterized by gray surface soils and mottled gray, yellow, and red, heavy subsoils. The surface soils are compact, while the subsoils are stiff and impervious. A level surface is typical

of the series. The drainage is poorly established. Only the Leaf very fine sandy loam is mapped in this county.

The surface soils of the Myatt series are gray, while the subsoils are gray to mottled gray and yellow. In the sandy loam members of the series the subsoils are usually quite stiff and impervious. The surface of the Myatt soils is practically flat and drainage is poorly established. The material consists of reworked Coastal Plain sediments. In this county only one type, the Myatt sandy loam, is recognized.

The Congaree series is characterized by brown surface soils and subsoils. The subsoils are rather high in mica content. In the lighter members the subsoil is comparatively loose, while in the heavy members it is usually stiff and brittle. The Congaree soils occupy flat first-bottom situations along streams which head within the Piedmont and Appalachian Mountain regions. They are subject to overflow and are in general poorly drained, although the internal drainage of the lighter members is adequate during the greater part of the year. The Congaree fine sand, fine sandy loam, silt loam, and silty clay loam are mapped in Richland County.

The Wehadkee series includes gray to brownish-gray surface soils and yellow and gray mottled subsoils. The surface is level and drainage is poorly established. Overflows occur at intervals. The silt loam is the only representative of the series in this county.

The Johnston series is distinguished by the dark-gray to black color of the surface soils and by the gray to mottled yellow and gray color of the subsoils. These soils occupy level first bottoms. Overflows are frequent and certain areas are saturated with water the greater part of the year. In this county the Johnston material is mapped as the sandy loam type.

Some of the roughest, badly eroded areas along the Broad River, in the northwestern corner of the county, and elsewhere are mapped as Steep broken land.

The agriculture of the county is largely associated with a comparatively few groups of soils. In the Piedmont region the Georgeville silt loam and silty clay loam are the principal types. In the Sandhill region the Norfolk sand, sandhill phase, is by far the most extensive soil, but most of the farming is done on the Norfolk sand, coarse sandy loam, and sandy loam, and on the two Hoffman soils. In the Red Hill region and in the lower, level Coastal Plain the Norfolk sandy loam is the predominating agricultural soil. Nearly all the farmed terrace land is included in the Cahaba and Kalmia series, the Leaf and Myatt soils here, as well as the Portsmouth loam of the upland, being largely undeveloped.

In the following pages of this report the various soils are described in detail and their relation to agriculture discussed. The distri-

bution of the soils is shown on the accompanying map, and the table below gives the actual and proportionate extent of each:

Areas of different soils.

Soil.	Acres.	Per cent.	Soil.	Acres.	Per cent.
Norfolk sand	14,528	20.9	Cahaba fine sandy loam	2,112	0.9
Sandhill phase	85,056		Heavy phase	2,048	
Congaree silty clay loam	57,280	12.0	Ruston sandy loam	4,032	.8
Norfolk sandy loam	50,240	10.6	Portsmouth loam	4,032	.8
Georgeville silty clay loam	46,336	9.7	Myatt sandy loam	3,520	.7
Georgeville silt loam	40,320	8.5	Cecil coarse sandy loam	3,136	.7
Norfolk coarse sandy loam	24,000	5.0	Steep broken land	3,072	.6
Hoffman sandy loam	23,488	4.9	Kalmia very fine sandy loam	2,560	.5
Orangeburg sandy loam	16,768	4.1	Kalmia fine sandy loam	2,432	.5
Shallow phase	2,624		Ruston loamy sand	1,920	.4
Johnston sandy loam	16,640	3.5	Greenville clay loam	1,536	.3
Marlboro sandy loam	16,320	3.4	Norfolk fine sandy loam	1,344	.3
Alamance silt loam	10,880	2.3	Leaf very fine sandy loam	1,280	.3
Wehadkee silt loam	9,600	2.0	Ruston fine sandy loam	1,024	.2
Hoffman coarse sandy loam	8,960	1.9	Congaree fine sand	832	.2
Kalmia sandy loam	8,512	1.8			
Congaree silt loam	6,144	1.3	Total	476,800	
Congaree fine sandy loam	4,224	.9			

GEORGEVILLE SILT LOAM.

The surface soil of the Georgeville silt loam is a brownish-gray to light grayish brown silt loam, 5 to 7 inches deep. The subsoil consists of a red silty clay, resting at a depth of 3 to 10 feet or more upon partially decayed grayish schists or slates of the Carolina slate formation. In the shallower developments the surface soil is distinctly brownish, with occasionally a reddish tinge, and the change from surface soil to subsoil is abrupt, while as the depth to clay increases the soil is proportionately grayer in color at the surface and yellowish to reddish brown in the subsurface layer, which grades heavier as the subsoil proper is approached. Quartz fragments ranging from quite small pieces to stones 4 or 5 inches in diameter are abundant on the surface, but, except in spots, not in quantities sufficient to interfere seriously with cultivation. Some quartz also occurs throughout the soil material and the numerous quartz veins that originally intruded through the parent rock remain largely intact in the subsoil. The soil is deficient in organic matter, both where it is under cultivation and in the timbered areas.

This type and the Georgeville silty clay loam dominate the agriculture in the Piedmont section of the county. Large areas occur north of Columbia between Crane and Cedar Creeks and west of the Broad River in the section recently annexed from Lexington County. Along the northern border of the county and in some of the

rougher areas along the Broad River this soil gives way largely to the Georgeville silty clay loam, which is mainly an erosional type developed where the silt mantle has been partly removed. In flat or gently sloping areas with imperfect drainage the type gives way to the Alamance silt loam. Patches of Georgeville silt loam are included in nearly all the areas of the Alamance soil under cultivation.

The surface of the Georgeville silt loam is gently to strongly rolling. There is considerable local surface relief as a result of the intricate system of drainage, and some slopes are too steep to be cultivated successfully. As is the case throughout the Piedmont region where a subsoil of close-structured clay lies near the surface, a very large proportion of the rainfall is not absorbed, and much damage is done by erosion.

Probably as much as 60 per cent of the type is cleared and under cultivation. There are some large well-kept farms, operated by owners, but the greater part of the type is handled by tenants in small to medium sized farms on which the improvements are poor and the agricultural practices rather inefficient. Some of the areas not under cultivation are practically waste land. Others support a second growth of shortleaf pine, while in places the original growth, consisting of pine with scattered oak, hickory, and dogwood trees, is still standing.

Cotton is the only money crop of importance. Corn is the chief subsistence crop, occupying an acreage almost equal to that of cotton. Oats and cowpeas are grown to some extent, but on only a few farms are they important crops. A few hogs are kept on the majority of the farms. No attention is given to dairying or the raising or feeding of beef cattle. Cotton yields from one-fourth to three-fourths bale and corn from 10 to 25 bushels per acre.

No systematic rotation of crops is followed. Cotton may be grown uninterruptedly on the same land for a long term of years, or may be alternated with corn at irregular intervals. Oats in some cases follow corn or cotton in the fall, and cowpeas may be seeded after oats and cut in the fall for forage.

Commercial fertilizers are used by all the farmers in the production of cotton. From 150 to 600 pounds per acre is applied, usually while the land is being prepared for planting. The so-called complete fertilizers, usually an 8–2–2 or other low-grade combination, are in most general use. Some farmers apply a home mixture of cottonseed meal and acid phosphate, or these elements supplemented by kainit. Similar fertilizers, usually in smaller quantities, are used in the production of corn.

The average selling value of land of the Georgeville silt loam ranges between $15 and $30 an acre.

The present practice of using this type almost exclusively for the production of cotton and corn, with little or no attention given to the rotation of crops and the raising of hogs and cattle, is unfavorable to the development of a prosperous agriculture. Much of the land now devoted to cotton could be used to much better advantage as pasture, particularly the steep slopes and other areas that have become eroded. All areas kept under cultivation should be carefully terraced so as to reduce erosion to a minimum. Heavier implements should be used in breaking and preparing the seed bed, and the systematic rotation of crops, with legumes grown at frequent intervals, would be beneficial. The type is well adapted to a mixed system of agriculture which would include dairying or the raising of beef cattle as important industries. The land under cultivation could thus be kept in a high state of productiveness without heavy fertilization, and the net profits would be greater and less fluctuating than is now the case with cotton constituting almost the only source of income and most of the revenue going to defray fertilizer and subsistence expenses.

GEORGEVILLE SILTY CLAY LOAM.

The surface soil of the Georgeville silty clay loam, to a depth of 3 to 6 inches, is a brownish-red, heavy silt loam to silty clay loam. The subsoil consists of a tough silty clay, deep red in color, which extends to a depth of several feet and rests upon grayish slates and schists of the same general character as those giving rise to the Georgeville silt loam. Quartz fragments in small quantities occur on the surface and throughout the soil section.

The Georgeville silty clay loam is an extensive type in the Piedmont section, occurring in large areas along the northern border of the county and in a number of smaller areas farther south where the Georgeville silt loam is the predominant soil. The type is rolling to hilly in topography and erosion is active in nearly all the cleared areas.

The areas along the Broad River on both sides are mostly of a steep, hilly character, much dissected by small drainage ways and largely uncleared, but 50 per cent or more of the type as a whole is under cultivation. Pine is the chief growth on the areas not cleared.

Cotton and corn are the chief crops on all the farms. Oats are grown in a small way. Cowpeas, which should play an important part in the agriculture, are not grown extensively. The average acreage yield of cotton ranges from one-fourth to three-fourths bale and of corn from 10 to 25 bushels.

As in the case of the Georgeville silt loam, a large proportion of the type is in the hands of tenants and the improvements are usually

poor. Fertilizers are in general use. No systematic rotation of crops is practiced and the raising of live stock is of little importance.

The selling value of land of this type ranges from $15 to $30 an acre, with some of the better improved areas held at prices as high as $50 an acre.

Methods effective in the improvement of the Georgeville silt loam are equally applicable to this type. Care should be taken to prevent erosion. A deeper soil should be worked up and enough organic matter incorporated to give a loamy, mellow consistency. Excellent crops of cotton, corn, and hay could be produced under proper farming methods. The areas too steep or too badly gullied to be cultivated could be converted into good pasture land by planting to Bermuda grass. Medium to heavy farm equipment is necessary in the proper handling of this soil.

ALAMANCE SILT LOAM.

The surface soil of the Alamance silt loam is a light-gray to pale-yellowish silt loam, 5 to 9 inches deep. In cultivated fields gray is the characteristic color, but in the timbered areas only the immediate surface layer is gray, the underlying material being pale yellow to almost white. The subsoil is a yellow, brittle to moderately plastic silty clay, resting at a depth of 2 to 4 feet upon partially decayed schist and slate similar to those giving rise to the Georgeville soils. Quartz fragments are scattered over the surface and through the soil section, and some small iron concretions are encountered.

Small areas included with this type have a tough, plastic clay subsoil, dull yellowish in color, like that of the Iredell clay loam. One such area occurs along the Columbia, Newberry & Laurens Railroad about 3 miles west of Columbia. Other areas with subsoils intermediate in heaviness between the typical Alamance silt loam and the Iredell clay loam occur in various places.

The area mapped as this type on the north side of Crane Creek, about 6 miles north of Columbia, and a part of the area just across the Broad River from the mouth of Crane Creek are characterized by a gray sandy loam surface soil strewn with quartz fragments, and a yellow, moderately friable clay subsoil. Had this soil been more extensive it would have been mapped as a sandy loam type.

The Alamance silt loam is of rather small extent. The largest areas occur west of the Broad River, extending from the State Farm to Irmo, in Lexington County, and north of Ballantine and Whiterock. Only a few small areas are mapped east of the Broad River. The type is developed on the crests of level to very gently rolling ridges, in slight depressions about the heads of streams, and on gentle slopes at lower levels where there may be slight seepage or imperfect

drainage. As indicated by the color of the soil material and the presence of iron pellets or concretions in considerable numbers, the drainage is less perfect than in the Georgeville soils. In fact, nearly all areas of the type would be benefited by artificial drainage.

The type is of little importance in the agriculture of the county. Only a small proportion of it is under cultivation, and cotton and corn, the chief crops, give light and uncertain yields. The sandy areas included give about the same yields as the Norfolk sandy loam.

The selling value of the land ranges from $10 to $20 an acre.

Possibly the best use of a large proportion of the type is as pasture land. Lespedeza would apparently thrive on this soil.

CECIL COARSE SANDY LOAM.

The Cecil coarse sandy loam consists of a 6 to 12 inch layer of brownish-gray to light-brown coarse sandy loam, underlain by a red, gritty clay. Except for a few granite bowlders, occurring mainly on the steeper slopes, the type is practically free from stone.

The Cecil coarse sandy loam is developed in small areas on the slopes along the Broad and Saluda Rivers near Columbia and in three areas, aggregating about 1,500 acres, near Montgomery. It is rolling to steep, hilly, and broken in topography, and has good to excessive drainage.

About one-third of the type is under cultivation, cotton and corn being the chief crops. Average yields are about the same as those obtained on the Orangeburg sandy loam. The roughest areas are still timbered with a mixed growth of oak, other hardwoods, and some pine.

The selling value of the land ranges from $15 to $40 an acre.

NORFOLK SAND.

To an average depth of 6 inches the soil of the Norfolk sand is a gray, incoherent sand. The subsoil consists of a loose, yellow sand which continues to the heavy substratum of yellow sandy clay, encountered at depths ranging from 3 to 8 feet below the surface. Medium quartz sand comprises the bulk of the material of the type.

The color of the surface soil varies from light gray or nearly white to medium gray and in extreme cases dark gray. This range may in some cases be seen within one field. In the best drained places, where oxidation is most complete, the soil tends toward a light-gray or nearly white color. Where there is more soil moisture, as in slight depressions or rather flat tracts, less decomposition of the organic matter has taken place and the soil tends to have a medium-gray, and in some cases a dark-gray color. In forested

areas or recently cleared fields the soil is usually medium gray in color, but it becomes lighter after a few seasons of cultivation.

The type also has a range in subsoil color and texture, independent of surface-soil variations. The subsoil ranges in color from yellowish gray through pale yellow and yellow to reddish yellow, depending upon the content of fine material. The strength of color varies with the proportion of fine material, and this is generally larger where the depth to the underlying sandy clay is less. Where the Norfolk sand is associated with other types which have red subsoils the color of its subsoil frequently has a reddish tinge. Near the margin of the areas of the type the underlying sandy clay may come within the 3-foot section. In places the material grades rather coarse. A number of rather small areas in which the subsoil is coherent and loamy enough to permit the classing of the soil as Norfolk loamy sand are included with the type.

The largest area of Norfolk sand extends east, south, and southwest from Blythewood, in the northern part of the county, covering more than 10 square miles. Other areas occur on the divide stretching south from Belleview School, and on other divides in the same vicinity. Several areas occur in and about the city of Columbia. A number of small areas are mapped throughout the Sandhill region and in the flat Coastal Plain section to the south.

The type occurs on flat-topped divides or isolated hills. The surface is level to very gently undulating. There are few steep slopes, and drainage ways are rather far apart. As the streams grow larger they cut down into the underlying sandy clay or still lower formations and other soil types are formed. The surface soil of this type readily absorbs all the rainfall and the loose subsoil permits its rapid movement downward, so that there is no run-off. The areas of deeper soil are frequently excessively drained.

Practically all of the Norfolk sand is cultivable, and 75 per cent of its total area is farmed, the remainder supporting a growth of scattered pine and small oak trees. The organic-matter content is deficient, and the type in its natural condition is only moderately productive. The productiveness increases with the content of fine material in the surface soil and subsoil, and is greatest where the sandy clay substratum lies at or just below a depth of 3 feet. As a rule moisture sinks beyond the reach of growing crops. This is the earliest soil in the county.

Cotton and corn are the leading crops, occupying approximately equal acreages. Oats, potatoes, vegetables, cowpeas, and other forage crops are grown to some extent. On a comparatively small acreage east of Columbia truck crops are grown successfully for the local market. Unimproved areas are used to some extent as pasture land.

Cotton and corn generally give light and uncertain yields under

the present methods of farming. The average yield of cotton does not exceed one-half bale per acre, and that of corn is only about 15 bushels per acre. On a few farms where the soil has been given special preparation in the way of green manuring, liming, and heavy fertilization, and where efficient farming methods are followed, acreage yields average about 1 bale of cotton and 25 to 50 bushels of corn. Good yields of sweet potatoes of fine quality are obtained. Winter oats yield well when the spring season is not too dry. Under good farming methods, truck crops, including watermelons, cantaloupes, asparagus, peas, sweet potatoes, Irish potatoes, and beans give the best returns on this soil. A few small peach orchards produce a good grade of fruit.

The farming methods on this type differ little from those followed on the sandy loams and heavier soils. Practically no effort is made to increase the content of organic matter or to prevent leaching during the winter months. Only a small supply of stable manure is available. This is applied either broadcast or to the rows just before the planting of the crops. For cotton the fertilizer is usually applied before planting. In the case of corn part is distributed at the time of planting and the remainder later. The amount of fertilizer used varies widely in different years, depending upon the price of cotton the previous year, the cost of fertilizer, and its availability. Acreage applications of 400 to 700 pounds of mixtures ranging from 8–3–3 to 10–2–5 are made. Heavy applications of both commercial fertilizer and stable manure are made for the special crops.

The sale value of land of this type varies widely with the location and improvements. Land developed for special crops sells for $100 or more an acre, while outlying tracts unimproved or poorly developed sell for $10 or less an acre.

The turning under of some green crop, to increase the supply of organic matter and better the moisture-holding capacity, is absolutely essential in the improvement of this type. The best green-manure crops are the legumes, such as cowpeas, vetch, and soy beans. Applications of lime should be made in conjunction with green manuring. The common practice of leaving the surface bare during the winter months results in the leaching away of plant food. This may be avoided to some extent by the use of winter cover crops, such as winter oats, rye, or wheat. Heavy applications of high-grade fertilizer would be beneficial.

Norfolk sand, sandhill phase.—The sandhill phase of the Norfolk sand corresponds closely to the typical soil in color, texture, and structure, but differs in topography and depth of sandy material. The soil consists of a gray, loose medium sand which grades at a depth of about 6 inches into a pale-yellow to yellow, loose medium sand extending to a depth of 3 feet or more. The depth to the under-

lying sandy-clay stratum ranges from 5 to 25 feet or more, generally exceeding 10 feet. The depth varies widely within short distances.

The surface soil usually contains enough organic matter to have a gray color, but the immediate surface material over a large part of the phase is nearly white. This color is especially noticeable after the land has been burned over in the early spring. In a few depressed areas the surface layer has a darker color.

As mapped, this phase includes small areas of loamy sand, differing from the remainder of the phase in its slightly loamy subsoil, which is usually of an orange-yellow color. This soil is somewhat more productive than the phase, but the areas are not separated on the map, on account of their indefinite and irregular occurrence and small size. The phase also includes areas where the texture of the soil grades toward a coarse sand. A separation between coarse and medium sand in the Sandhill region would in most cases necessarily be arbitrary and unsatisfactory, and on account of the little difference in agricultural value it is considered advisable to include the two textures under the one phase separation.

The sandhill phase of the Norfolk sand predominates in the Sandhill region, and is the most extensive soil in the county. It occupies broad, rolling interstream areas, including the Congaree-Wateree divide, which extends practically across the county in a northwest-southeast direction. In detail the divides are broadly rolling to rolling, rapidly becoming more rolling and hilly as the drainage ways cut deeper into the underlying formations, which give rise to other types. The phase in only a few places extends to the stream courses. Large basinlike areas occasionally occur on the broad divides, the soil here differing only in having a slightly more loamy texture.

Although many small streams head in the areas of this phase there is practically no surface run-off. All the rainfall is absorbed and finds its way downward through the subsoil to the heavier underlying formations, the moisture coming to the surface again in numerous springs, which are the sources of the various streams. Practically all the creeks of the county, except those of the Piedmont section, head in areas of this phase.

Only about 5 per cent of the phase is in cultivation, but on account of its extent and wide distribution it is fairly important in the agriculture of the county. The percentage of improved land in the areas near the railroad lines does not greatly exceed that in the areas remote from markets and transportation facilities. The unimproved land supports a medium to thick growth of scrub oak, with scattered small pine trees. In places where the sandy material only slightly exceeds 3 feet in depth there is a fairly good stand of longleaf pine, with small oak and underbrush.

The phase is very low in organic matter and in ability to hold moisture. It is easily tilled, and is one of the earliest soils in this region. Its natural productiveness is rather low, owing in part to excessive drainage, and this accounts for the large proportion of unimproved land. The cleared acreage is gradually being extended. The type is very sparsely settled. Settlement in the Sandhill region is largely on associated types in the valleys.

The principal crops grown on the Norfolk sand, sandhill phase, are cotton and corn. About the same acreage is devoted to each. Oats, cowpeas, and other forage crops, sweet potatoes, watermelons, cantaloupes, and other vegetables are grown in small quantities for home and farm use. Several peach orchards have recently been planted. Some pasturage is afforded by the native grass.

Unless the soil is manured and heavily fertilized the returns are usually light. Cotton yields range from one-fifth bale per acre on the least productive and more poorly managed areas to one-half bale per acre on the better areas. Yields of over 1 bale per acre have been obtained with the liberal use of high-grade fertilizer and careful management, but such returns are far above the average. Corn commonly yields from 5 to 20 bushels per acre, but yields as high as 60 bushels per acre are reported. The yield of oats varies widely with the season and management. Sweet potatoes give fair yields of good quality. Peaches yield well and the fruit is of fine quality.

A large part of the cultivated acreage is farmed in a rather inefficient manner. Little or no attention is given to maintaining or increasing the productiveness of the land. The supply of stable manure is small and the use of fertilizer has declined in the last two seasons. The tracts now in cultivation include the best land of the phase, and range in size from a few acres to 200 acres or more. In the Sandhill section of the county most of the farms on this soil are operated by owners, but the farm improvements are, as a rule, poor and the equipment inadequate. The methods of preparation for crops, their care after planting, fertilizer practices, and other farming methods are the same as in the case of the typical Norfolk sand and the Norfolk sandy loam.

Land values on this phase range in general from $5 to $25 an acre. Near the small towns on the railroad and within a few miles of Columbia the value is $30 to $40 an acre.

One of the greatest needs in the improvement of this type is to increase the supply of organic matter by the use of green-manure crops, such as cowpeas, vetch, and soy beans. Green manuring would also enable the soil to hold more moisture within the reach of growing crops. Every possible means should be taken to reduce soil leaching to a minimum. One of the most effective means is the

growing of cover crops such as winter oats, wheat, and rye, to be plowed under the following spring. A system of crop rotation should be followed to meet the needs of the soil and to fit the individual system of farming.

NORFOLK COARSE SANDY LOAM.

To a depth of 6 inches the soil of the Norfolk coarse sandy loam is a gray coarse sand. This grades into a subsurface layer of yellow, loamy coarse sand, 8 to 10 inches in thickness. The subsoil consists of a yellow, coarse sandy clay extending to a depth of 3 feet or more. Frequently the surface soil is a loamy coarse sand; in such case the subsurface layer has the texture of a coarse sandy loam. The surface soil and subsurface layer are loose in structure, while the subsoil is moderately friable. Red mottlings appear in the lower few inches of the 3-foot section, especially in areas of the type adjacent to the Marlboro sandy loam. Rounded quartz gravel particles are present in small quantities in places, but fine angular fragments of quartz, slightly coarser than coarse sand, are much more common within and near the Sandhill region. On the whole the depth to the sandy clay stratum is greater than in the case of the sandy loam of the series. In areas near the sandhill phase of the Norfolk sand the soil is usually deeper than typical and the sandy clay may not be encountered within 20 inches of the surface.

The Norfolk coarse sandy loam has a fairly wide distribution over all parts of the county except the northeastern section and the Piedmont region. The largest area lies 2 to 4 miles south of Blythewood, in the vicinity of Level School, and another occurs about 1 to 2 miles north of the same town. The type is developed quite extensively to the north of Columbia and in the basins of Jackson and Big Jackson Creeks and the South Branch of Crane Creek. It also caps a divide north of Crane Creek extending northward for more than 6 miles to Belleview School. Other areas occur in a more or less continuous belt between the Marlboro sandy loam and the sandhill phase of the Norfolk sand, extending from a point about 2 miles northwest of Lykes to near Horrell Hill. The type also occurs in the level section south of the Atlantic Coast Line Railroad, especially on the slope toward the Congaree River terrace. The soils with which the type is most closely associated are the sandhill phase of the Norfolk sand and the Norfolk sandy loam.

The surface of the Norfolk coarse sandy loam is level to gently sloping, or, in some of the areas within the Sandhill region, gently rolling. Steep slopes occur toward the stream courses. Drainage over all parts of the type is good.

At least 85 per cent of the land is in cultivation, the remainder supporting a timber growth of pine and oak. Much of the unim-

proved land is as well adapted to cultivation as that now in crops. In some cases unfavorable topography has retarded development. Cotton is the leading crop, with corn a close second. Oats, cowpeas, vegetables, and fruit are grown for farm or home use. Cotton is practically the only source of income. The yields average lower than on the sandy loam of the series, and heavier fertilization is necessary for the same returns. The average cotton yield is about one-half bale per acre. Corn under the prevailing methods yields about 10 to 20 bushels per acre. Oats give light yields.

The organic-matter content of the type is low. It has a relatively high moisture-holding capacity, is easily tilled, and warms up rather early in the spring. In some of the areas of deeper soil crops sometimes suffer in the dry periods, but, as a rule, the type holds enough moisture for growing crops. The land may be cultivated under a fairly wide range of moisture content. The type is handled in the same way as the Norfolk sandy loam. The surface relief necessitates the use of terraces in cultivated fields and the adoption of the contour system of farming over a considerable total area.

The sale value of land of this type ranges from $15 to $50 an acre.

With an acreage application of 500 to 700 pounds of an 8–3–3 or 8–4–4 fertilizer the yields of cotton may be increased to three-fourths bale, or, on the best managed farms, to 1 bale per acre. With similar treatment corn yields may be raised from 20 to 40 bushels per acre. The content of organic matter in the soil should be increased, not only to improve its physical condition and enable it to hold more moisture, but also to insure better returns from the fertilizer used. Another need of the type, in places, is better terracing of fields where the slopes have become gullied under the usual methods of farming. The type is a good special-purpose soil, and areas which have favorable transportation facilities could well be developed to special crops. With proper fertilization and management truck crops should give good yields, and peaches and grapes should do well in sheltered situations. Each farmer should adopt a rotation of crops suited to the needs of the soil and to his type of farming.

NORFOLK SANDY LOAM.

The surface soil of the typical Norfolk sandy loam consists of a gray medium sand, about 7 inches deep, grading quickly into a subsurface layer of light-yellow loamy sand, which extends to a depth of 14 to 20 inches. This is underlain abruptly by a yellow, friable sandy clay, which continues to a depth of 3 feet or more. Red mottlings are occasionally encountered in the lower part of the 3-foot section. A yellow sandy clay substratum underlies the type to a depth of several feet.

The greater part of the type as mapped in this county conforms closely to the typical description, but certain variations occur. In its rather extensive development in the Sandhill region the soil differs somewhat from its occurrences in the level section of the Coastal Plain to the south of the Atlantic Coast Line Railroad, in position and, to a less extent, in topography. In the Sandhill section the surface soil is almost invariably a light-gray to gray sand, seldom loamy. The depth to the sandy clay subsoil is, as a rule, slightly greater than in the more level sections, frequently amounting to 20 inches and occasionally reaching 30 inches near areas of the sandhill phase of the Norfolk sand. The surface, although rolling, does not show sufficient relief to warrant classification of the soil as a rolling phase. Over the level areas of the type to the south of the Sandhill region the soil tends to assume a loamy texture and a medium gray color. The proportion of medium sand is not as great as in the Sandhill section, there being more fine sand and other fine material. Coarse sand grains are present, but not in sufficient quantities to give a coarse sand texture except in included small, indefinite bodies. In only a few places does the texture grade toward a fine sandy loam. One of these occurrences is on the Kershaw-Richland County line in the vicinity of Spears Creek. The type in places in the same locality has a semiterraced topography, and these areas may merge into well-defined terraces farther to the east. In the level Coastal Plain section the type includes small circular areas of Portsmouth sandy loam or loam, too small to show on the soil map. In the Sandhill section areas of this character are not included, but the type here does include small and rather indefinite areas of Hoffman coarse sandy loam and sandy loam.

The Norfolk sandy loam is one of the most extensive and widely distributed soil types in the county. It is developed in all parts of the Coastal Plain province, and within the Piedmont province it caps the highest hills adjacent to the Sandhill region. The type covers an extensive belt south of the Atlantic Coast Line Railroad and north of the terrace along the Congaree River, extending from near the city of Columbia almost to the Wateree River, interrupted only by narrow strips of first bottom along the several streams which traverse the type from north to south. In the Piedmont region the type occurs on the crests of hills, surrounded by the Georgeville silt loam or silty clay loam. In the Sandhill section it is associated with the Norfolk sand and coarse sandy loam and the Hoffman sandy loam. It occurs in only a few places in the belt occupied mainly by the Marlboro sandy loam. In the level Coastal Plain section it is practically the only type, except for areas of Portsmouth loam in the numerous circular depressions.

The extensive areas of the Norfolk sandy loam lying between the Congaree River terrace and the Atlantic Coast Line Railroad are practically level. The land has much the appearance of a terrace. Few drainage ways head here. The several large streams which cross from north to south have well-defined bottoms ranging from 500 feet to one-half mile in width and lying 10 to 25 feet below the level of the surrounding country. The slope toward these bottoms is usually short and abrupt. A well-defined terrace line separates the type from the terrace soils to the south. In the Sandhill section the type either occupies moderately low lying, gently sloping approaches toward the main stream courses, as along Gills Creek and its branches, along the South Branch of Crane Creek, and along Spears Creek and Sandy Run, or it occurs on divides, ridge crests, or slopes as isolated areas where the sandy mantle is thinnest.

The Norfolk sandy loam is fairly well drained. Owing to its position on slopes or divides, the excess water drains away quite readily. The loose surface soil is absorptive of rainfall, and the subsoil permits the excess water to find its way downward, retaining enough moisture for the use of growing crops. In places within the level areas the type requires artificial drainage. In parts of the Sandhill section springs and seepage water from the higher lying sandhill phase of the Norfolk sand cause local wet areas.

Practically all the type is under cultivation, except in the Sandhill region, where approximately 50 per cent of it is in crops. The remainder supports a forest cover of pine, oak, and other trees. The unused land is, on the whole, as well adapted to the production of crops as are the areas already improved. Drainage, topographic conditions, and the location of the greater part of the type outside the Sandhill region have favored its development. Much of it lies within driving distance of Columbia, and in the southern part of the county none of the land lies more than 4 miles from markets and railroad stations.

The organic-matter content is rather low, but the type holds sufficient moisture for growing crops, except in seasons of long-continued drought. It is easy to till and warms up comparatively early in the spring. With the exception of a few areas in the Sandhill section, where terracing and contour plowing are necessary, erosion is not serious. The type is strong and productive and responds readily to careful management.

Cotton is the leading crop. Its acreage probably exceeds that of all other crops combined. Corn is an important crop, and oats and cowpeas are growing in importance. Sweet potatoes and Irish potatoes are produced for home use. Trucking is carried on in a small way. Several small orchards of pecans have been set out recently.

Much of the type is farmed under the tenant system, and the average yields are lower than its productiveness warrants. Cotton averages about one-half bale per acre, with a range from one-fourth to over 1 bale. A considerable acreage in cotton is devoted to the long-staple varieties, which yield about one-half bale per acre on the average. Corn yields from 15 to 50 bushels per acre and oats from 20 to 40 bushels.

The better farmers on this type use two-horse machinery for part of the farm operations, but on the tenant farms only one-horse plows and other implements are used. The fields are either plowed as a whole or laid off in lands the width of the crop rows. In the former case the land is usually harrowed before the rows are laid off. Cotton and corn are given frequent cultivations and laid by about the latter part of June. Many farmers then sow cowpeas in the corn, the seed being picked before the corn is pulled. Oats are sown in October or December, either broadcast or by drills. The crop is sown either on the furrows or after one harrowing. It usually ripens in June and is cut either for forage or for the grain. Cowpeas are frequently sown after oats are harvested, to be cut for hay. The fields are kept in continuous cultivation for many years, one crop following another with only a change from corn to cotton or vice versa. The land is left bare during the winter months and little attention is given to the turning under of organic matter.

Prior to the last two seasons there was a gradual increase in the amount of fertilizer used. As a rule acreage applications of 300 to 700 pounds of mixtures ranging in analysis from 8–3–3 to 7–5–4 are made for cotton and applications about two-thirds as large for corn. Some farmers apply all the fertilizer used before planting, while others apply part before planting and the remainder after the crop is up. No fertilizer is used for oats at the time of sowing, but nitrate of soda is applied in the spring. In 1915 less than the usual amount of fertilizer was used on account of the low price commanded by the previous year's cotton crop. In the spring of 1916, owing to the scarcity of potash, the fertilizers used were either reduced or lacking in this ingredient. Stable manure is being used more extensively, either spread broadcast or applied directly to the rows before planting. In some cases pine straw is used as manure. Some farmers prefer to prepare their own fertilizer from cottonseed meal, acid phosphate, kainit, and other ingredients.

In the southern part of the county and in the vicinity of Columbia the sale value of land of this type ranges from $50 to $100 or more an acre. In the more remote sections of the Sandhill region its value ranges from $10 to $25 an acre.

The typical Norfolk sandy loam is adapted to several general and special crops which are grown either not at all or only for home

use. It is not well suited to small grains and grasses. It is a good cotton and corn soil where the depth to the sandy clay subsoil is not too great. Near transportation lines the type can best be used for growing medium and late season truck crops. It is not used for trucking in this county, but in the trucking districts of this State, North Carolina, and Virginia extensive areas are devoted to truck production. The type in Florence, Darlington, and Clarendon Counties is used for the production of bright-leaf tobacco, which would succeed here under careful management. The type produces sweet potatoes of fine quality, and this crop could well be grown on a commercial scale. The incorporation of organic matter is one of the principal needs of this type. Leguminous crops, such as cowpeas, vetch, soy beans, velvet beans, and crimson clover, should be used for this purpose as far as possible. Winter grain crops would serve the double purpose of protecting the surface during the winter months and furnishing organic matter when plowed under in the spring. The use of lime in connection with green manuring would be of great benefit in hastening decomposition. The use of improved two-horse farm implements and machinery is necessary for best results on this soil, and systematic crop rotations should be followed as closely as possible. Better and deeper plowing and improved methods of cultivation would increase the yields. A diversity of crops should be grown, so that cotton would not be the only source of farm income.

In several areas shown on the map with gravel symbols the soil varies from the typical Norfolk sandy loam in having a considerable gravel content. It consists of a gravelly sand to loamy sand about 6 inches deep, grading into a subsurface layer of yellow gravelly loamy sand, which at a depth of 14 to 18 inches is underlain by a gravelly sandy loam or sandy clay. Gravel fragments frequently occur on the surface in fairly large quantities. In places reddish mottlings appear in the lower part of the 3-foot section. This soil is inextensive and occurs in only a few localities. Areas are mapped about 3½ miles north of Columbia and in the fork of the Broad and Saluda Rivers. The surface is gently rolling. Drainage ranges from adequate to excessive. Practically all the land is farmed in conjunction with surrounding types. The same crops are grown, and yields average about the same.

NORFOLK FINE SANDY LOAM.

The Norfolk fine sandy loam consists of a gray fine sand extending to an average depth of 6 inches, underlain by a light-yellow loamy fine sand which, between the depths of 14 and 18 inches, grades into a yellow fine sandy clay. This reaches to a depth of several feet.

In some places the soil approaches a very fine sandy loam in texture, while in others the percentage of medium sand increases and the type merges gradually into the Norfolk sandy loam. The color is uniform and typical to a depth of about 30 inches below the surface, where red mottlings frequently appear and continue to a depth of 3 feet or more.

The Norfolk fine sandy loam is not extensive or widely distributed. It covers a total area of approximately 2 square miles south of Hopkins, both east and west of Cabin Branch, and adjoining the terrace soils along the Congaree River. Its position is lower than that of the adjoining Norfolk sandy loam to the north. The surface is practically level, with here and there a slight rise or swell or a circular depression. Drainage, both surface and subsurface, is good.

This is an important soil type in the section of the county where it occurs. About 95 per cent of the land is in cultivation, the remainder supporting a growth of pine and brush. The soil is one of the most desirable in the county, not only for general farming but also for certain special crops. It has a fairly good moisture-holding capacity, is easily tilled, and warms up rather early in the spring. The organic-matter content is low.

A slightly larger acreage is devoted to cotton than to corn. Oats and cowpeas, the latter sown in cornfields after the last cultivation, are minor crops. Potatoes and other vegetables are grown for home use.

The crop yields, the farming methods, and the fertilizer practices on this soil are practically the same as in the case of the sandy loam of the series.

Land of the Norfolk fine sandy loam is valued at prices ranging from $25 to $75 an acre.

The greatest need of the type is an increase in organic-matter content, which can be effected by green manuring. The growing of nitrogen-gathering crops, such as cowpeas, vetch, and bur clover, would be beneficial and, together with the adoption of a systematic crop rotation and improved cultural methods, would result in greatly increased yields.

MARLBORO SANDY LOAM.

The surface soil of the Marlboro sandy loam is a light-brown to brown loamy sand or sandy loam, extending to a depth of 6 to 8 inches. Immediately underlying this is a subsurface layer of yellowish-brown, heavy sandy loam to loam, ranging from 5 to 6 inches in thickness. The subsoil proper consists of a yellow, rather heavy, friable sandy clay, extending to a depth of 25 to 28 inches and underlain by a mottled yellow and red, heavy sandy clay which continues to a depth of 3 feet or more. Reddish material of the same texture and structure as the lower subsoil, underlain at a depth of 6 to

10 feet below the surface by a light-gray to mottled yellow and gray stratified clay, composes the substratum.

The soil of this type closely resembles the Orangeburg sandy loam in texture and structure, and variations toward the latter type naturally occur. This type grades more frequently toward shallow than deep. In the areas of shallower soil the texture is always heavier and the color more pronounced brown than typical. With increase in depth of surface and subsurface soil the material approaches the Norfolk sandy loam in characteristics. A fairly high content of coarse sand is typical of the greater part of the type.

This soil is derived from material similar in texture and origin to that giving rise to the Orangeburg sandy loam. It differs from the Norfolk sandy loam in color and depth of the surface soil and subsurface layer. The upper subsoil is of the same color as that of the Norfolk sandy loam, but it is heavier in texture. The lower subsoil has a decidedly red, mottled color which does not occur in the Norfolk sandy loam in this county. The type differs from the Ruston sandy loam mainly in the color of its subsoil, which is yellow, underlain by red and yellow mottled material, in contrast to the reddish-brown or reddish-yellow subsoil of the Ruston type.

The Marlboro sandy loam occurs in a belt 2 to 3 miles wide, extending from Gills Creek to Acton and continuous throughout its east-to-west extent except for short breaks caused by stream bottoms. It is associated with the Orangeburg sandy loam more frequently than with other types.

The topography is very gently sloping to undulating or very moderately rolling. This soil is one of the best drained in the county, but drainage is in few places excessive. A number of small streams head within the type and several larger ones from the Sandhill region to the north traverse it.

The Marlboro sandy loam is one of the most important soil types in the county. The drainage and topographic conditions have favored agricultural development, and practically all the land is cultivated. The type is productive, has good moisture-holding capacity, and is favorably located with respect to markets.

The leading crops are cotton and corn, the former occupying the larger acreage. Oats, sweet potatoes, Irish potatoes, and cowpeas for seed and forage are minor crops. Oats are probably grown more extensively than on the other sandy upland soils. Vegetables and fruit are grown for home use. Dairying and cattle raising are not well developed, and hog raising is given little attention. Cotton is the money crop. The greater part of the corn produced is used for feed on the farm, the excess being sold in near-by markets. The other crops are usually consumed on the farm.

Cotton yields from one-half to over 1 bale per acre, and corn from 20 to 50 bushels or more. As in the case of the other types, yields vary with the rainfall, the grade and quantity of fertilizer used, and the cultivation given.

Probably a greater proportion of this type is farmed under the supervision of the landowners than of any other in the county. As a result the farming methods are better than the average. Many of the best farms in the county are on this type. The use of 2-horse implements is more common than on the lighter and deeper soils. Many of the fields are plowed as a whole, then harrowed, and later the rows marked and bedded. The fertilizer is applied and the cotton planted on ridges. Corn is planted either on ridges or in the furrow. Crops are given frequent cultivation and laid by about the latter part of June. Cowpeas are sown in the corn fields by many farmers, the seed being picked in the fall. Oats are usually followed by a crop of cowpeas. The fields are left bare during the winter season. No definite system of crop rotation is practiced. Cotton and corn either alternate or are grown uninterruptedly on the same field for several seasons.

The fertilizer practices are about the same as on the other sandy soils. Under normal conditions an acreage application of 300 to 700 pounds of fairly high grade fertilizer is made for cotton and a slightly smaller application for corn. Some farmers apply all the fertilizer at the time of planting, while others apply a part at this time and the remainder after the crops have made a good start. All the available stable manure is applied to the fields either broadcast or in the rows.

The value of land of this type ranges from $75 to $100 or more an acre. All the land is well located, well drained, and productive, and this type commands as high a price as any other soil in the county.

The Marlboro sandy loam is adapted to general farming as well as to the growing of late special crops. It is better adapted to grains and grasses than are the lighter and deeper sandy types. It is also suited to cotton and corn.

It would be advisable to arrange the system of farming on this soil so that cotton would be a surplus product, enough of the other crops being produced to meet the needs of the farm and home. The expenditure necessary for fertilizer could be lessened by growing legumes to supply nitrogen and organic matter. Cover crops should be grown to prevent the leaching away of plant food during the season when other crops do not protect the surface. These would also serve to reduce erosion and when plowed under would add to the supply of organic matter. Systematic rotations should be adopted.

The use of 2-horse implements in plowing and cultivating is advisable.

RUSTON LOAMY SAND.

The Ruston loamy sand consists of a brown loamy sand extending to an average depth of 8 inches, underlain by a yellowish-brown to reddish-brown loamy sand, which continues to a depth of several feet. The structure is moderately loose throughout the 3-foot section. There is practically no variation in the type as mapped.

The largest area of this type, slightly less than two square miles in extent, lies south of the city of Columbia. Another area is mapped north of the junction of Broad River and Crane Creek, and a third occurs north of Nipper Creek, southeast of Montgomery.

The surface of the largest area is practically level, resembling a terrace, with a rather steep slope toward the river bottom. The other areas have a gently sloping surface. There is no run-off, the rainfall largely finding its way downward through the soil and substratum.

Nearly all of the type is used for farming purposes, but owing to its small extent it is not important in the agriculture of the county as a whole. The type has a medium organic-matter content, holds moisture fairly well, and is easy to till. It warms up early in the spring.

Cotton leads in acreage, followed by corn. These crops give good yields in favorable seasons. A tract of approximately 100 acres in the area south of Columbia is devoted to pecans. Crops are grown among the trees. The land has recently been cleared and scattered young hickory trees budded or grafted to pecans. Small pecan trees have been planted on a small acreage of this tract.

The handling of the soil and the fertilizer practices are the same as in the case of similar upland soils.

This type of land is valued at $75 to $100 an acre. The areas in the Broad River Valley north of Columbia may be purchased for $20 to $30 an acre.

RUSTON SANDY LOAM.

To an average depth of 10 inches the soil of the Ruston sandy loam consists of a grayish-brown sand, slightly loamy in texture and loose in structure. This material grades quickly into a yellowish-red to reddish-brown sandy, rather heavy, clay, which extends to a depth of 3 feet or more. In the lower part of the subsoil red mottlings frequently appear, increasing in number with depth. The subsoil has a moderately friable structure.

The type is fairly uniform in color, texture, and structure throughout its extent. Where the depth to the sandy clay exceeds 9 or 10

inches the surface soil consists of about 6 inches of brownish-gray sand underlain by 4 to 6 inches of yellowish-brown loamy sand to sandy loam. On the other hand, in places where the sandy mantle is shallow no subsurface layer is developed, and the soil is more decidedly brown in color, as well as distinctly loamy in texture.

The Ruston sandy loam is an intermediate type between the Norfolk and Orangeburg sandy loams. The subsoil color ranges between the yellow of the Norfolk series and the red of the Orangeburg. In texture the subsoil is typically heavier than that of the Norfolk soil and a little lighter than that of the Orangeburg.

The Ruston sandy loam occurs within a belt a few miles wide, extending along the Atlantic Coast Line Railroad from Congaree to the Wateree River. The type is also mapped between Acton and Wateree. It is not developed in the Sandhill region or in the flat areas occupied predominantly by the Norfolk sandy loam.

The surface is gently undulating to gently rolling. The type is everywhere well drained, but does not show any effects of erosion. It is not traversed by drainage ways. Water is readily absorbed by the surface soil and finds its way downward through the subsoil.

Practically all of the Ruston sandy loam is under cultivation, and the type is of considerable agricultural importance locally. Topographic and drainage conditions, as well as location, have favored its development. The type is regarded as productive and desirable for general farming.

Cotton and corn are the leading crops. Oats, cowpeas, potatoes, and other vegetables are grown on a comparatively small total acreage. Yields vary with the farming methods and fertilizer practices. Cotton yields one-half to over 1 bale per acre, corn from 15 to 50 bushels, and oats from 30 to 75 bushels. Leguminous crops give satisfactory yields.

Under normal conditions an acreage application of 300 to 800 pounds of an 8–3–3 mixture is made for cotton, and smaller applications for corn.

The sale value of land of this type ranges from about $50 to $100 an acre.

The soil may be improved by the same means that are suggested for the Norfolk sandy loam.

RUSTON FINE SANDY LOAM.

To an average depth of 7 inches the soil of the Ruston fine sandy loam consists of a brownish-gray or grayish-brown, loamy fine sand. This grades quickly into a yellowish-brown to reddish-yellow, fine sandy clay subsoil, which extends to a depth of 3 feet or more. The surface soil is comparatively loose in structure and is deficient in

organic matter. The subsoil, though somewhat sticky when wet, is in general moderately friable when dry.

There is little variation in the surface soil. Where the sandy mantle is deepest the surface material has assumed a more grayish color and a lighter texture than typical, and a subsurface layer of yellowish-brown loamy fine sand is developed, but this stratum is less common than in the Ruston sandy loam. Where the sandy surface layer is shallowest, the yellowish-brown color of the surface soil is accentuated and the subsoil color more nearly approaches red than yellow. In places red mottlings appear in the lower few inches of the 3-foot section. Small circular, depressed areas of Portsmouth loam are included with the type as mapped, lying 3 to 10 feet below the general level and ranging from a few acres to 100 acres or more in extent.

The type differs from the Norfolk fine sandy loam in the typically shallow depth to the fine sandy clay subsoil and in the characteristic brownish color of the surface soil. The subsoil color is intermediate between the yellow of the Norfolk and the red of the Orangeburg.

The type occurs in practically only one area, about 2 square miles in extent, lying 4 to 5 miles southeast of Eastover. It is closely associated with the shallow phase of the Orangeburg sandy loam in position and topography, and lies slightly higher than the Norfolk sandy loam to the south and west.

A level to very gently undulating surface is characteristic of this type. As the soil usually absorbs all the rainfall, the run-off is very slight and practically no streams are developed within the limits of the type. The internal drainage is good.

The Ruston fine sandy loam is locally important, and approximately 90 per cent of the land is in cultivation. The timbered areas support a growth of pine. The type is productive and retentive of moisture. It is commonly regarded as an excellent cotton soil. Cotton and corn are the leading crops, the former occupying the larger acreage. Oats, cowpeas, potatoes, and other vegetables are grown to some extent. The type is farmed in small tracts by tenants, and no special crops are grown.

Yields vary with the thoroughness of cultivation, the season, and the quantity of manure and fertilizers used. Cotton yields from one-half to more than 1 bale per acre and corn from 15 to 40 bushels. Oats yield satisfactorily in seasons of favorably distributed rainfall.

The methods of fertilization and of farming in general differ little or not at all from those in the case of the Ruston sandy loam and the Marlboro sandy loam.

From $40 to $75 an acre covers the range in value of land of this type.

The organic-matter content of this soil should be increased by the use of green-manure crops, preferably the legumes. Better methods of cultivation, including deeper plowing, more thorough preparation of the seed bed, and more careful cultivation would result in larger yields.

ORANGEBURG SANDY LOAM.

The surface soil of the typical Orangeburg sandy loam is a brownish-gray loamy sand, extending to a depth of 6 to 10 inches. This grades into a reddish, sandy loam subsurface layer, which changes quickly at a depth of 10 to 14 inches into a red, friable sandy clay that continues to a depth of 3 feet or more. The surface soil ranges from a gray sand similar to that of the Norfolk sandy loam to a fairly brown loamy sand. In a few patches the brownish surface soil rests directly upon the subsoil, and in a less number of places the red clay subsoil is exposed. The color and texture of the subsoil are uniform.

The type differs from the Ruston sandy loam mainly in subsoil color. It differs from the typical Norfolk sandy loam not only in color but also in texture of subsoil, which is slightly heavier. The type resembles the Marlboro sandy loam in color and texture of surface soil and texture of subsoil, but differs in subsoil color.

The Orangeburg sandy loam is not widely distributed, being largely confined to a belt extending from a point north of Columbia almost to the Wateree River. The city of Columbia and a number of its suburbs are situated largely on this type. Two areas occur in the fork between the Broad and Saluda Rivers. Others lie to the north of the junction of Crane Creek with Broad River. A few areas occur in the Sandhill region. This type is most closely associated with the Marlboro sandy loam.

The surface over the greater part of the type ranges from nearly level to gently rolling. A few fairly steep slopes occur, but none of the land is too steep or rough for the use of improved farm machinery. All the type is well drained, but erosion is active in only a few places.

Its high productive capacity makes this a relatively important type. Practically all of it is in cultivation, except the areas occupied by the city of Columbia and its suburbs. The type has only a moderate content of organic matter, but its power to hold moisture is comparatively good and it is easily tilled. It responds readily under good farming methods, and is one of the best general farming soils in the State, being especially adapted to cotton.

Cotton is the leading product and the money crop. Corn follows closely in acreage, with oats and cowpeas next in importance, the former usually being cut for forage. The type is not used for truck-

ing to any considerable extent. Peaches are grown on a small scale for home use. Cotton ordinarily yields from one-half to 1 bale per acre, but as much as 1½ bales per acre has been produced by a few farmers. Corn under good management yields from 25 to 50 bushels per acre, but the average return is between 15 and 20 bushels. Oats yield from 20 to 35 bushels per acre. The yield of cowpea hay ranges from 1 to 2 tons per acre.

The farming methods and fertilizer practices on this soil differ little from those on the Norfolk sandy loam. No cover crops are grown, and green-manure crops are grown by only a few farmers. Cowpeas are quite commonly grown in cornfields and after oats, but the seed is gathered and the vines are either pastured or cut for hay, so that the full benefit of a green-manure crop is not obtained. No other legumes are grown. In cotton and corn growing little or no care is used in the selection of seed. The only change in crops is from cotton to corn, with cowpeas or oats occasionally intervening. Most of the steeper slopes are terraced, but in some places the terracing has been poorly done. A large part of the type is farmed by tenants.

The sale value of farm land of this type ranges from $50 to $100 an acre, except in the immediate vicinity of Columbia, where it is held at a much higher price.

The subsoil structure of this type is such that there is considerable run-off unless the surface is nearly level. All slopes subject to erosion should be farmed under the contour system. If this is not effective in checking erosion, terraces should be constructed at frequent intervals. Slopes too steep to protect by terracing should be used for permanent pasture or reforested. A good means of protecting the surface is the growing of winter cover crops, such as winter grains, cowpeas, and vetch. The vegetation not only serves to protect the surface from erosion, but contributes to the organic-matter content when plowed under in the spring. The use of lime would be beneficial in connection with green manuring. Deeper and better plowing and frequent shallow cultivation of crops would make the soil more retentive of moisture. The adoption of systematic crop rotations on this soil is advisable, and a greater diversity of crops should be grown, so that cotton would be a surplus product and other crops be grown extensively enough to supply the home and farm needs. Fruits, especially peaches, could well be grown commercially. Peach orcharding has proved successful on this type elsewhere in this State and in Georgia.

Several small areas of this type shown on the map with gravel symbols constitute a gravelly variation. The soil here consists of a brown, gravelly loamy sand, 8 to 12 inches deep, resting upon a subsurface layer of reddish gravelly sandy loam which quickly

grades into a red, gravelly sandy loam to sandy clay that continues to a depth of 3 feet or more. The coarse material comprises rounded quartz gravel and iron concretions. This gravelly soil occurs in several areas between the Broad and Saluda Rivers, north of Simms, and 1½ miles northwest and about 4 miles northeast of Eastover. The surface is undulating and drainage is well established. All the land is in cultivation. Cotton and corn, practically the only crops grown, give good yields in favorable seasons. The gravel content in places interferes with cultivation.

As mapped, the Orangeburg sandy loam includes a soil which if more extensive would be separated as the Amite sandy loam. This soil occurs in three areas south of Wateree and two southwest of Hopkins, occupying a terrace position. It consists of a reddish-brown sandy loam, 6 to 8 inches deep, underlain by a subsoil of red, heavy sandy loam to sandy clay which extends to a depth of several feet. Both surface soil and subsoil have a friable structure. In the places of most shallow soil the color of the surface material is a more pronounced red and its texture approaches a loam. The soil of this variation is all under cultivation. It has about the same agricultural value as the shallow phase of the Orangeburg sandy loam, which it closely resembles.

Orangeburg sandy loam, shallow phase.—The Orangeburg sandy loam, shallow phase, consists of a brown sandy loam, 5 to 6 inches deep, resting directly upon a red, heavy sandy clay which extends to a depth of 3 feet or more. The subsoil material is brittle, but not thoroughly friable. Reddish spots, developed where the surface soil is especially shallow or where the underlying clay is exposed, are fairly common.

The shallow phase differs from the typical soil mainly in the absence of the subsurface layer, the surface soil resting directly upon the subsoil. The surface soil is a brown sandy loam instead of a gray to brownish-gray loamy sand, and the subsoil appears to be slightly heavier and less friable than that of the typical soil. The phase is intermediate between the typical Orangeburg sandy loam and the Greenville clay loam, the latter being developed by the erosion of the Orangeburg type. The soil has in places a reddish cast, which, as a rule, has resulted from the plowing up of the subsoil material where the surface soil is shallow. Included patches of loam and fine sandy loam soil occur.

The shallow phase of the Orangeburg sandy loam occurs east, northeast, and southeast of Acton, in the southeastern part of the county. It covers a total area of approximately 3 square miles. The surface is gently undulating to gently sloping, with possibly less relief than in the case of the typical soil. Drainage is everywhere good. The loose surface soil is shallow, and the subsoil is

moderately impervious. In some seasons not enough moisture is retained for crops.

The Orangeburg sandy loam, shallow phase, is favorably situated with respect to market and transportation facilities. The soil has a fairly good organic-matter content. It is considered productive and well suited to general farming, for which purpose it is mainly used. It has an important agricultural value locally, all the land being under cultivation. Cotton leads in acreage and in importance, followed by corn, oats, and cowpeas. Potatoes, other vegetables, and various minor crops are grown for home use. The yields of all crops are practically the same as in the case of the typical soil, except that the returns from corn average slightly higher. The farming methods and fertilizer practices are identical with those followed on the typical Orangeburg sandy loam.

The sale value of land of the phase ranges from $50 to $75 an acre. Practically none of the land is changing hands. The phase is held in large tracts and farmed largely by tenants.

The soil of this phase can be improved by the same means that are suggested for the typical Orangeburg sandy loam. More attention should be given to the prevention of erosion, as the soil is shallower. Terraces are probably not necessary, but the contour system of farming should be used as far as practicable.

GREENVILLE CLAY LOAM.

The Greenville clay loam consists of a dark-brown to reddish-brown loam to clay loam 4 to 5 inches deep, underlain by a red heavy sandy clay subsoil which extends to a depth of 3 feet or more. In patches the red clay subsoil has been exposed by erosion, while occasionally in protected situations there is a sandy surface mantle a few inches deep.

This type occurs in association with the Orangeburg sandy loam. Areas are mapped to the northeast, east, and southeast of Eastover and to the north of Columbia in the Broad River Valley.

The surface ranges from undulating to rolling. Part of the type covers moderately steep or steep slopes toward the river bottoms. The surface material does not absorb water readily; the run-off during and after rains is excessive, and in places the slopes are somewhat gullied. In average seasons, however, the type holds enough water for growing crops.

Practically all the land is cleared. The areas of favorable topography are farmed, while the remainder support a growth of grass and small brush. The difficulty of handling the soil, the tendency to erode, and the rather steep slopes make the development of part of the type rather improbable. A number of the areas now farmed

are narrowly terraced at frequent intervals. Cotton and corn are the only crops of importance. Cotton gives good yields under careful management. Corn is somewhat less successful. Few fields are wholly on this type.

The soil is rather intractable. It can be worked only at the proper moisture stage. An increase in the organic-matter content and the use of lime would put the soil in better physical condition. All slopes should be terraced to prevent washing. The type is adapted to cotton, corn, oats, and forage crops.

HOFFMAN COARSE SANDY LOAM.

The Hoffman coarse sandy loam consists of a gray, coarse sand to loamy coarse sand, 8 to 10 inches deep, underlain by a pink to pinkish-red, or a mottled yellow, pink, and gray, sandy clay subsoil, which continues to a depth of 3 feet or more. Where the subsoil is nearly solid pink in color it is much heavier and finer in texture than elsewhere. The surface soil is loose and incoherent, while the subsoil is moderately friable. The surface soil generally grades abruptly into the subsoil, but in places a subsurface layer of yellow to pinkish loamy sand, 4 to 5 inches in thickness, intervenes. Quartz gravel and fragments of ferruginous sandstone are encountered in a few places. In some eroded patches the underlying sandy clay is exposed.

The Hoffman coarse sandy loam occurs largely in the basin of Colonels Creek, in the eastern part of the county. Several small areas are mapped in the basin of Gills Creek. The type is associated with the Hoffman sandy loam and with the sandhill phase of the Norfolk sand.

The surface is on the whole less rough than that of the Hoffman sandy loam. The type frequently occupies the lower slopes, some of which have been built up by sediments eroded from the hilly country farther from the stream course. The drainage is thorough and in seasons of drought excessive.

This type is of much smaller extent than the sandy loam member of the series. Less than 50 per cent of it is in cultivation. The unimproved areas support a cover of pine, oak, hickory, and other trees. In many localities this type marks the limits of the cultivated land. The organic-matter content of the soil is low, and it is only moderately retentive of moisture. The type is not as productive as a number of the other upland types, and is in general situated at a considerable distance from markets. The rough and undeveloped character of much of the surrounding country has been unfavorable to its agricultural development.

Cotton and corn are the leading crops. Other crops are produced only for home use. The yields of cotton range from two-fifths to

three-fourths bale per acre, and of corn from 10 to 25 bushels per acre.

The soil is handled in the same way as the sandy loams of this and other upland series. The farming methods are on the whole rather poor. Very little of the land is terraced, and no effort is made to increase its productiveness. Little stable manure is available.

The sale value of the land ranges from $10 to $25 an acre. Prices are determined largely by the value of the adjoining types, the development of the particular locality, and the distance from market.

This type may be improved in the same way as the Hoffman sandy loam. The greatest need is the addition of organic matter, which may be supplied by the use of green-manure crops, preferably the legumes. Green manuring would also improve the capacity of the type to hold moisture. Lime should be applied in connection with green manures. Fields where there is sufficient slope to permit washing should be carefully terraced. Practically all the type is capable of improvement.

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

Mechanical analyses of Hoffman coarse sanay 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.*
242778	Soil	14.2	29.6	9.9	27.6	7.5	5 8	5.6
242779	Subsoil	9.8	25.4	8.5	20.4	6.0	8.1	22.1

HOFFMAN SANDY LOAM.

The soil of the Hoffman sandy loam consists of a gray sand, about 6 inches deep, underlain by a subsurface layer of light-yellow loamy sand which extends to a depth of 14 to 16 inches. The subsoil is a mottled yellow, gray, and pink sandy clay, extending to a depth of 3 feet or more. The mottling usually becomes more intense with increase in depth.

The type is subject to some variation. The subsoil in some places shows the characteristic pink color only in the form of mottlings, while in other places it is pale pink, with faint mottlings of other colors. Where pink is the prevailing color, both the surface soil and subsurface layer frequently show a pinkish cast, especially where the subsoil is encountered at a shallower depth than typical. In places the subsoil is pinkish red in color, and again white mottlings may appear. In patches, especially where the soil is shallow, the subsoil is a pink, stiff silty clay loam to silty clay, smooth or greasy to the touch.

In places the surface and subsurface soil grade toward a loamy sand in texture, in others the texture is coarser than sandy loam, and

in places it is arbitrarily separated from the coarse sandy loam of the series. In places the subsoil texture is coarse, while that of the surface soil is medium to fine, and vice versa. Occasionally quartz gravel and fragments of ferruginous sandstone are mixed with the fine particles of soil.

The Hoffman sandy loam occurs in all parts of the Sandhill region south of the Seaboard Air Line Railway. It is most extensive northeast of Columbia and in the valleys of Gills, Cedar, and Colonels Creeks.

Over about 90 per cent of its extent the type occurs on gently sloping to moderately steep slopes, extending from the deep sandy material of the hills, where the sandhill phase of the Norfolk sand is developed, to the stream bottoms. The remainder of the type occurs on knolls and ridges. The type has greater surface relief than any other in the county.

The position and the soil structure insure good drainage. Water from seepage and springs gives rise to some wet areas, while in places the type is inclined to be excessively drained.

A greater proportion of the land is forested than in the case of any of the other coarse sandy loam and sandy loam upland types. The forest growth consists of pine, oak, hickory, and dogwood. Most of the merchantable timber has been cut, though less than 50 per cent of the land is farmed. Idle fields are quite common. On the whole this type is less productive than the other sandy loam soils, but certain well-farmed tracts here and there are as productive as the Norfolk soils. Much of the unimproved land is subject to erosion, but quite a large total area could be farmed under careful methods without much loss from this cause.

The leading crops are cotton and corn, about an equal acreage being devoted to each. Oats, cowpeas, forage crops, potatoes, other vegetables, and fruits are grown for home use. Part of the type is used for pasture. The yields of all crops are generally low, partly on account of poor farming methods. Cotton yields from two-fifths to three-fourths bale per acre, and corn from 10 to 25 bushels.

The soil is handled in the same way as the other sandy loam types. Attempts have been made to terrace a considerable proportion of the cultivated area, but in many cases the terraces are poorly constructed and the fields are frequently gullied. Some fields have not been terraced and are not farmed under the contour system. Many of these have been almost ruined for farming. Practically no attention is given to increasing the low organic-matter content.

Land of this type ranges in value from $10 to $50 an acre, depending upon the distance to market, the state of cultivation, and the surface features.

Two needs of the type stand out conspicuously—namely, an increase in the organic-matter content and more general terracing. Numerous green-manure crops can be easily grown. Green manuring would not only enable the soil to hold more moisture and improve its physical condition, but would also make the effects of fertilizer greater and more lasting. Terracing entails little expense. Winter cover crops would assist in preventing erosion, and when plowed under in the spring would add to the organic-matter content of the soil.

PORTSMOUTH LOAM.

The Portsmouth loam consists of a 6 to 8 inch layer of dark-gray to nearly black loam to silty loam, underlain by gray clay loam to clay, which extends to a depth of 3 feet or more. The organic-matter content of the soil is high, and in undrained and uncultivated areas the immediate surface material is frequently mucky. The surface soil when dry is moderately friable. The subsoil is somewhat plastic when quite moist, but when fairly dry it is stiff and tough. Red mottlings are not common, but in some places yellow mottlings occur below the depth of 20 inches. The areas of this type are surrounded by higher lying sandy soils, and a narrow belt of sandy loam usually forms the outer margin. Some small areas of sandy soil are included, the sandy loam of the series being regarded as too inextensive to warrant separate mapping. In places the type includes soils heavier than a loam, ranging from silty loam to silty clay loam. The soil material is apparently heavier in the shallower areas.

The Portsmouth loam occurs almost exclusively to the south of the Sandhill region. The type is widely distributed. It is closely associated with the Orangeburg sandy loam, the Norfolk sandy loam, the Marlboro sandy loam, and the Ruston fine sandy loam. The areas are usually circular or elliptical in outline and range in extent from 1 or 2 acres to over 200 acres. Many areas, covering less than 6 to 8 acres, can not be shown on the soil map. In the case of a few conspicuous areas the size is slightly exaggerated in order to make mapping possible.

The type occupies more or less well defined depressions, lying 3 to 10 feet or more below the general level of the surrounding soils. As a rule, the depressions are most pronounced where the type occurs in association with the Orangeburg sandy loam and the Marlboro sandy loam. A marked slope separates the Portsmouth soil from the typical well-drained, higher lying sandy loams. On this slope, which is usually too narrow to show on the map, the sandy mantle is generally shallow and a red or moderately red color is typical of the subsoil, which is exposed in many places. The subsoil of the surrounding type is not exposed nor is the red color developed immediately adjacent to the Portsmouth soil.

The natural drainage of this type is poor. The surface material is too fine and compact to absorb water readily, and the heavy texture and dense structure of the subsoil greatly retard the downward movement of water. Undrained areas resemble typical swamp. At present some provision has been made for artificially draining by far the greater part of the type. The smaller areas are quite well drained, but some of the larger have not been so thoroughly reclaimed. Open ditches, in some cases 10 to 12 feet deep, have been principally used. Frequently several depressions are connected by open ditches and drained into a natural channel.

The Portsmouth loam is at present of relatively little agricultural importance. Approximately 20 per cent of the type is cleared and the greater part of the cleared land is farmed. The forest consists of pine and black gum, with a thick undergrowth. Development has been retarded almost entirely by the poor drainage. Oats and corn are practically the only crops grown. Both yield well in favorable seasons where the fields are thoroughly drained. Unimproved areas are valued mainly for their timber.

Land of this type is usually sold as a part of farms which include a much larger acreage of well-drained, higher lying soils.

All the areas of this type may be drained and reclamation is warranted by the crop-producing capacity of the soil. The extension and improvement of the drainage systems are necessary for successful farming on this type, and its close association with a number of the best soils of the county makes its reclamation necessary for good results on surrounding areas. The use of tile ditches between the open ditches would be advantageous. Better drainage would permit the earlier planting of crops. Liming would correct the natural acidity of the soil.

CAHABA FINE SANDY LOAM.

The surface soil of the Cahaba fine sandy loam is a gray, light fine sandy loam, averaging about 7 inches in depth. The subsoil, extending to a depth of 3 feet or more, is a heavy fine sandy clay, ranging in color from red finely streaked with yellow to mottled red and yellow. In structure it is fairly stiff and impervious. The change from surface soil to subsoil is abrupt.

The surface soil in some places approaches the texture of a very fine sandy loam. The redness of the subsoil increases near cuts, draws, and terrace fronts and the clay is exposed on the slopes in such situations. In places where there has been considerable erosion of the narrow terraces, the soil assumes a reddish or reddish-brown color and the subsoil is nearly as red as that of the Orangeburg series. In an area about 1 mile south of Wateree the texture of the soil is a medium sandy loam.

Scattered areas of the Cahaba fine sandy loam occur near the inner margin of the Congaree River terrace from Gills Creek to the Wateree River, ranging in size from 25 acres to several hundred acres. The most extensive development of the type is near the junction of the Congaree and Wateree Rivers. Several areas are mapped in the Broad River Valley above Columbia. The type occurs associated with its heavy phase and with the Kalmia soils.

The surface is level to gently undulating. The terrace fronts near the river bottoms are steep and frequently gullied. A rather uneven topography is developed where the terrace is narrow, but this is seldom the case. The surface drainage and internal drainage are fairly good. The type lies 15 to 25 feet or more above the first bottoms and is never flooded. On account of its situation near the margin of the terrace it has better drainage than its topography and structure would otherwise insure.

This soil is moderately productive. It is easy to till and has a fairly good moisture-holding capacity. The organic-matter content is rather low. About 95 per cent of the type is cultivated. Cotton and corn are almost the only crops grown. Cotton yields from one-half to 1 bale per acre and corn from 15 to 45 bushels.

The type is farmed by tenants. It is handled in the same way as the more extensive upland soils. It does not warm up quite as early as the deeper and better drained soils, but crops are planted about the same time.

Land of this type sells for $15 to $50 an acre, depending upon the location and the farm improvements.

This type needs more organic matter, which may be supplied by growing and turning under green-manure crops, preferably the legumes. Deeper and better plowing, the use of more improved farm machinery, more thorough cultivation, and the rotation of crops would all tend to increase the yields.

Cahaba fine sandy loam, heavy phase.—The heavy phase differs from the typical Cahaba fine sandy loam only in its finer texture. It consists of 6 to 7 inches of very fine sand to very fine sandy loam, underlain to a depth of 3 feet or more by a clay loam to clay subsoil, red or red mottled with yellow. The subsoil is stiff, though fairly brittle when dry. A number of patches of clay loam soil, red in color throughout the 3-foot section, are included.

The heavy phase occurs closely associated with the typical soil. The largest area, 2 miles south of Gadsden, is 3 miles in length. Other areas occur along or near the Bluff Road for a distance of about 2 miles west of Cedar Creek.

About 50 per cent of the land is in cultivation. The remainder supports a growth of timber, very little of which is merchantable. Practically the same crops are grown as on the typical Cahaba fine

sandy loam, and the yields are about the same. The soil can be improved by the same means.

KALMIA SANDY LOAM.

The Kalmia sandy loam consists of a light to medium gray sand or loamy sand, about 6 inches deep, grading into a light-yellow loamy sand which is underlain at a depth of 12 to 18 inches by a yellow sandy clay. The latter, which usually shows brick-red mottlings below the depth of 24 inches, continues to a depth of 3 feet or more.

A few variations from the typical soil occur. In some places small gray mottlings appear in the lower subsoil, the type here representing a gradation toward the more poorly drained Myatt sandy loam. Practically all areas of the type in places contain sand grains coarser than a medium grade. Occasionally the content of such material is sufficient to give the type a coarse texture. A number of areas of coarse sandy loam, a few acres in extent, are included with this type, principally on the terraces on the west side of Mill Creek between the Atlantic Coast Line Railroad and the Bluff Road. Some areas of the type within the Sandhill region, associated with the Hoffman soils, show a slightly pinkish cast in the subsoil material. Small areas of Kalmia sand are included.

The Kalmia sandy loam is the most widely distributed terrace soil in the county. It is not extensively developed in the Congaree River terrace except where tributary streams from the uplands have deposited material. The type is practically the only terrace soil in the interior of the county. The most important areas occur along Gills, Back Swamp, Mill, Cedar, Toms, Griffins, and Colonels Creeks. The areas range from small to large. The type usually occupies the whole terrace. In places it is associated with the Kalmia fine sandy loam and less frequently with soils of the Leaf, Cahaba, and Myatt series.

The surface ranges from level to very gently sloping. A conspicuous terrace line usually marks the descent to the first bottom, which lies 5 to 20 feet below. As a rule the type is not subject to overflow, but at times of extremely high water a few of the areas may be inundated for short periods. The soil absorbs the normal rainfall quite readily, and water does not stand on the surface after rains. Seepage water from the adjacent uplands causes small wet areas in places. The water table is comparatively close to the surface at all seasons. The subsurface drainage of the smaller areas is good, but some of the larger ones are rather slowly drained.

Approximately 50 per cent of the type is devoted to farm crops. The remainder supports a timber growth of shortleaf pine, oak, gum, and other trees. Native grass makes a good growth where the

timber stand is not too dense. The type is moderately productive, although deficient in organic matter. It is easily cultivated and warms up comparatively early in the spring. It is considered slightly less desirable than the Norfolk sandy loam, which it so closely resembles.

Cotton and corn are the leading crops. Oats, potatoes, and forage crops are grown for home use. Cotton is practically the only money crop. No live-stock or other special industries are developed on this type.

The yields of cotton range from one-third to nearly 1 bale per acre, depending upon the season, the fertilizer treatment, and the care given the crop. Corn yields from 10 to 25 bushels per acre.

The type is handled in the same way as the extensive Norfolk sandy loam of the uplands. The fertilizer practice is also the same.

Much of the type is necessarily sold with surrounding soils on account of its local distribution. On the larger tracts there are some farms located wholly on the type, but they are operated by tenants, and no sales have recently taken place.

Artificial drainage is necessary in some areas of the type to permit earlier planting and to lessen the danger of reduction of yields in wet seasons. The use of green-manure crops to increase the low organic content is advisable. Deeper and more thorough plowing, better methods of cultivation, and the rotation of crops would be beneficial.

KALMIA FINE SANDY LOAM.

To a depth of 6 to 8 inches the soil of the Kalmia fine sandy loam is a light to medium gray fine sand to fine sandy loam. This grades quickly into a light-yellow loamy fine sand or fine sandy loam, which extends to a depth of 14 to 16 inches. The subsoil consists of a yellow, friable fine sandy clay, in which rich red mottlings frequently appear below the depth of 24 inches and continue to a depth of 3 feet or more. In some places the lower subsoil has scattered gray mottlings. In others the red predominates over the yellow. Occasionally the type is coarser, and in certain areas on the Congaree River terrace the lower subsoil is heavier than typical, resembling that of the Leaf series.

Practically the only development of this type is on the Congaree River terrace between Cedar Creek and the Wateree River. An area lies along the Wateree River about $1\frac{1}{4}$ miles east of Wateree Station, and a few small areas are scattered over the interior sections of the county. The type is associated with the Kalmia sandy loam, the Myatt sandy loam, and the Cahaba fine sandy loam.

The surface is usually level. The type lies well above normal overflows, and is separated from the first bottoms by a definite slope.

The surface soil is rather compact and absorbs water quite slowly. Subsurface drainage is slow, on account of the level surface of the type and the compact structure of the subsoil, especially in the lower part. Seepage waters from adjacent uplands give rise to some poorly drained areas. Water seldom stands on the surface for any considerable length of time after rains, but certain areas have been benefited by artificial drainage.

At least 50 per cent of the type has been cleared and is in cultivation. A large total area was formerly in crops and is now without forest growth. The forest consists of shortleaf pine, oak, gum, and other trees. The unused land may be improved at comparatively small expense. Development has been retarded by the rather inadequate drainage and by the small demand for land in the sections of the county where the type occurs. The soil is moderately productive, though low in content of organic matter. It holds a good supply of moisture for growing crops and is easily tilled.

Cotton and corn are the principal crops. Vegetables, grain, and forage crops are produced in a small way for home use. Some areas afford considerable pasturage.

Yields on this soil are practically the same as on the Kalmia sandy loam. The farming methods and the fertilizer practices are the same as in the case of the Norfolk sandy loam and fine sandy loam.

The sale value of land of this type ranges from $15 to $30 an acre.

Suggestions made for the improvement of the Kalmia sandy loam apply equally well to this type. Artificial drainage is slightly more essential.

KALMIA VERY FINE SANDY LOAM.

The soil of the Kalmia very fine sandy loam, to a depth of 6 to 8 inches, consists of a gray very fine sand to very fine sandy loam. This changes abruptly into a yellow, heavy fine sandy clay, which continues to a depth of about 24 inches and is underlain to a depth of 3 feet or more by a mottled red and yellow clay. The soil is remarkably uniform in depth and color. It is naturally rather compact, but assumes good tilth under cultivation. The upper subsoil is stiff but rather brittle, while the lower subsoil is stiff and impervious.

The type is markedly uniform throughout its extent. In some small, unimportant areas the shallow surface soil has been partly removed by erosion, so that the underlying clay is exposed. The material grades toward a silt loam rather than a coarser texture. The subsoil is somewhat heavier and stiffer than that of the other Kalmia soils. The first 24 inches of the type consists of almost typical Kalmia material, but the lower subsoil approaches the character of that of the Leaf soils.

Several areas of this type occur on the Congaree River terrace between Gills and Cedar Creeks. Another body is mapped about 2½

miles southeast of Gadsden. These areas range in size from 200 acres to 2 square miles or more. The most extensive development of the type is 2 to 3 miles southwest and south of Hopkins. The Cahaba fine sandy loam usually occurs on the river side and the Leaf very fine sandy loam or the Myatt sandy loam on the upland side.

The surface of the type is fairly level. There are a few gentle slopes, caused by erosion along short incoming streams. The type lies 10 to 25 feet or more above the first bottoms, and is not subject to overflow. The compact character of the surface soil and the rather impervious structure of the subsoil and substratum, together with the level surface, render the surface and internal drainage slow.

Practically all the type is cleared and at least 95 per cent is in cultivation. The soil is fairly productive and holds moisture well, but it is low in organic-matter content. It is slow to warm up in the spring. Cotton and corn are the leading crops. Vegetables, forage crops, potatoes, and other crops are grown for farm use. Cotton yields vary with the farming methods. They are lower than the productiveness of the type warrants. This crop ordinarily yields one-fourth to three-fourths bale per acre and corn from 10 to 30 bushels.

The farming methods on this type are the same as those on the other terrace soils and very similar to those on the upland soils. No fixed crop rotations are followed. No cover crops are grown, and practically no green-manure crops. The type can not be worked under as wide a range in moisture content as can the other members of the Kalmia series.

The sale value of land of this type ranges from $15 to $50 an acre, depending upon the nearness to market and the farm improvements. The greater part of the type is held in large tracts and farmed by tenants.

Artificial drainage is necessary on this soil, especially in seasons of greater rainfall than normal. Even in normal seasons artificial drainage would be beneficial in permitting earlier planting and insuring a better stand of cotton and corn. Open ditches extending to the main drainage ways would suffice and comparatively short ditches would serve in most cases. An increase in the organic-matter content is an imperative need of this type. Green-manure crops should be grown and turned under in connection with liming. A gradual increase in the depth of plowing for a series of years would render the soil heavier in texture and improve its productiveness.

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

Mechanical analyses of Kalmia very fine sandy loam.

Number.	Description.	Fine gravel.	Coarse sand.	Medium sand.	Fine sand.	Very fine sand.	Silt.	Clay.
		Per cent.	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*
242717	Soil	.6	2.7	1.4	22.4	40.6	24.9	7.0
242718	Subsoil	.2	.9	.6	12 6	21.0	15.8	49.0

LEAF VERY FINE SANDY LOAM.

The surface soil of the Leaf very fine sandy loam consists of a light-gray, compact very fine sandy loam, extending to a depth of 5 to 7 inches. The subsoil is a mottled gray, yellow, and red clay loam to clay, continuing to a depth of 3 feet or more. The change from the surface soil to the stiff and impervious subsoil is abrupt.

Variations within the type are few and unimportant. In places the soil is medium gray in color. The mottling varies, the red predominating in some areas and the gray in others. The yellow mottling is always present. The soil in a few places approaches in texture a silt loam, and it invariably carries a high percentage of silt.

The largest area of this type occurs about 2 miles west and southwest of Hopkins. An area is mapped 1 mile northeast of Wateree, another 1½ miles southeast, and a third about 1 mile southwest. The total extent of the type does not exceed 2 square miles. It occupies a terrace position above overflow, and has a characteristic "flatwoods" surface. No drainage ways are developed. The structure of the type is such that there is little underground drainage, and water stands on the surface for long periods after heavy rains.

The type supports a forest of shortleaf pine and gum, with scattered oak. Only a few acres are in cultivation. Some areas support little or no large timber and are utilized as pastures. Grass grows abundantly on this soil where the trees are small or the stand is thin.

In conjunction with other soils, land of this type is sold for $10 to $30 an acre.

The foremost need of the type is artificial drainage. This would not entail great expense; as the areas are mainly small, and short, comparatively shallow ditches would suffice. The soil is sour and would be benefited by liberal applications of lime. The organic-matter content is low and must be increased before profitable yields can be obtained. With improvement the type may be expected to give profitable yields of the staple crops.

In the following table are shown the results of the mechanical analyses of samples of the soil and subsoil of the Leaf very fine sandy loam:

Mechanical analyses of Leaf very fine sandy loam.

Number.	Description.	Fine gravel.	Coarse sand.	Medium sand.	Fine sand.	Very fine sand.	Silt.	Clay.
		Per cent.	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*
242786	Soil	1.3	4.4	2.0	14.6	29.1	40.4	8.3
242787	Subsoil	.4	.6	.4	2.8	6.8	22.9	66.1

MYATT SANDY LOAM.

The surface soil of the Myatt sandy loam is a gray, light sandy loam, 6 to 10 inches deep. The subsoil is a gray, moderately friable sandy clay to stiff clay loam or clay, extending to a depth of 3 feet or more. Similar material apparently underlies the type to a depth of several feet. In some places yellow mottlings are developed in the subsoil, and in others rusty-yellow or brownish mottlings occur. As mapped, the type includes material of fine sandy loam texture. In places the color of the immediate surface material grades rather dark; the soil here, if extensive enough, would be mapped in the Okenee series.

The Myatt sandy loam is confined to terraces along the Congaree and Wateree Rivers and a few of the larger interior streams in the southern part of the county. The areas range in size from a few acres to more than 200 acres. The type usually occurs on the upland side of the terrace. The surface is mainly level. Few streams traverse the type. A few areas are slightly depressed with respect to adjoining terrace soils. During excessively high-water stages the low-lying areas facing the first bottoms are inundated. Run-off is slow, as a result of the level surface, and underdrainage is retarded by the compact structure of the subsoil. Practically none of the land is artificially drained.

Small tracts here and there have been cleared and devoted to crops. Except for an area southwest of Garners Ferry, practically none of the land is cultivated at present. A large acreage has been cleared of the greater part of its forest and this land furnishes pasturage for cattle and hogs. By far the greater part of the type supports a forest cover of loblolly pine, gum, and underbrush, but very little merchantable timber remains. The type has a relatively low selling value.

Poor drainage is the factor retarding the development of this soil. As a rule, the areas are of convenient size to drain and are sufficiently elevated above the first bottoms to give the needed fall. Their improvement would cost comparatively little. Without artificial drainage farming is uncertain. The use of lime would be beneficial on this soil.

CONGAREE FINE SAND.

The Congaree fine sand consists of a light-brown to brown fine sand which shows little change in color, texture, and structure to a depth of 3 feet or more. The type carries mica, but in less quantities than the Congaree fine sandy loam. Both surface soil and subsoil are for the most part loose and incoherent. The type in general has a uniform texture, but in places the material is a medium sand. Back from the stream the type grades into the fine sandy loam and other types of the series. A gray color predominates where the surface is covered with recent deposits from overflows. In places such areas have little vegetation, and the surface material is shifted by the winds.

Three areas of the Congaree fine sand occur in the comparatively narrow bottoms of the Broad River and five are mapped along the Congaree River within a distance of 6 miles below Granby Landing. The type is developed usually next the river and occupies the highest parts of the bottoms. Surface and internal drainage are good, except during periods of overflow, which are infrequent and usually of short duration.

The type is not extensive or important from an agricultural standpoint, and less than 10 per cent of it is in cultivation. Some areas are wholly or partly cleared and used as pastures. The topography is favorable for farming, but the light texture and loose structure of the soil and the danger of floods have discouraged farming. The chief use of this type is for pasture. Only a few acres are devoted to cotton, which gives rather light yields. Little fertilizer or manure is used. Under present conditions the type is best adapted for pasture or forest lands.

CONGAREE FINE SANDY LOAM.

The Congaree fine sandy loam consists of a brown fine sandy loam which extends to an average depth of 10 inches and is underlain by a light-brown to grayish-brown loamy fine sand to fine sand that continues to a depth of several feet. Both surface soil and subsoil have a considerable content of finely divided mica flakes.

Variations within this type are toward a light fine sandy loam or a very fine sandy loam rather than toward material of medium grade. Several small areas of very fine sandy loam soil near Mill Creek, in the Congaree River bottoms, are included with the type as mapped. The subsoil here is in most places a very fine sandy loam. The surface soil is of a lighter brown color than in the typical areas, and the immediate surface material of cultivated fields has a grayish cast. In places within the typical soil, strata of very fine sand and very fine sandy loam are frequently encountered.

The Congaree fine sandy loam is most extensively developed in discontinuous areas in the narrow bottoms of the Broad River from the north county line to Columbia. A small area occurs along the Saluda River. Below Columbia the type occurs in narrow areas on the river side of the rather wide Congaree River bottoms. It is mapped in one area near the southeastern corner of the county between the terrace and Bates Ferry. The type is closely associated with the Congaree fine sand and silt loam, the former lying at a slightly higher elevation nearer the river bank and the silt loam occurring at a slightly lower level farther from the stream course.

The surface is practically flat, but the areas are usually highest nearer the river, sloping gradually back toward either the uplands or other bottom soils. In places the type resembles a natural levee. As a result of the light texture of the soil the drainage is good. The type is subject to overflows after heavy rains, but it is one of the first bottom soils to dry out.

At present this type is not as important agriculturally as its productiveness and crop adaptations warrant. Approximately one-half its total area is cultivated. A mixed growth of pine and hardwoods constitutes the native forest. In the Congaree River bottoms practically all the type is under cultivation, while in the Broad River valley only a small percentage is cultivated. The danger of occasional overflow discourages more complete use.

Cotton and corn are practically the only crops grown. In favorable seasons the yields are good. In some years crops are damaged by floods, while in others yields are reduced by drought. Cotton yields from one-half to 1 bale per acre, and corn from 25 to 40 bushels.

The Congaree fine sandy loam is handled in much the same way as the upland soils, except that plowing and planting are generally later. Practically all the area under cultivation is farmed by tenants. The soil is easily tilled, but the methods usually are indifferent.

Improved land of this type has a higher value than areas of other bottom soils, but the Congaree fine sandy loam is seldom sold alone.

The greatest need of this type is protection against overflows. The extent of bottom land along the Broad River in places is not sufficient to warrant the construction of levees, but in the wide bottoms of the Congaree River a few miles below Columbia the productiveness of the soils and the extent of alluvial land justify a considerable expense for reclamation. This could be accomplished only by cooperation among the landowners.

CONGAREE SILT LOAM.

To a depth of 6 or 8 inches the surface soil of the Congaree silt loam is a brown silt loam of friable structure. The subsoil consists of a brown, stiff silty clay loam extending to a depth of 24 to 28

inches and underlain by a light-brown very fine sandy loam, which continues to a depth of 3 feet or more. Flakes of mica are abundant, especially in the surface soil and lower subsoil. The heavy upper subsoil and light lower subsoil are considered typical of the type as mapped in this county.

In places the soil seems to have a slightly reddish brown color. Adjacent to Mill Creek the color is light brown and the surface of cultivated fields is quite gray. In texture there is a range from light silt loam on the river side to silty clay loam nearer the uplands. In places the heavy upper subsoil has a dark-brown to nearly black color, apparently representing a former surface soil over which material has been recently deposited.

The most extensive development of this type is in the Congaree River bottoms, 4 to 8 miles southeast of Columbia. Other areas occur in the narrow valley of the Broad River. The type is associated with the fine sandy loam and silty clay loam of the same series.

The surface is practically level, but some areas are traversed by old stream channels. The land is subject, nearly every season, to overflows of brief duration. While drainage, both surface and internal, is rather slow, in most areas artificial drainage is unnecessary in average seasons. Levees have been built in some places to protect the land from overflow.

At least 75 per cent of the Congaree silt loam is in cultivation. The remainder supports a mixed forest. Some areas are used for pastures. The type is of considerable agricultural importance locally, a larger proportion of it being cultivated than of any other first-bottom soil. It is productive and regarded as desirable for general farming. Its moisture-holding capacity is good.

Corn, followed closely by cotton, is the leading crop. Oats are quite important, and hay and forage crops are grown to some extent. In favorable seasons good yields are obtained. Crops seldom suffer from drought, but overflows sometimes result in loss or damage. Cotton gives particularly good yields when the season is not too wet, the returns ranging from one-third to over 1 bale per acre. Corn yields from 20 to 30 bushels per acre.

In preparing the seed bed the land is plowed as early as possible in the spring, with 2 and 3 horse implements. After harrowing, the rows are laid off, and crops are planted as soon as possible. There is quite a range from year to year in the time of planting on account of overflow periods and differences in the character of the season. The type can not be worked under as wide a range of moisture conditions as can the sandy soils of the uplands. When worked while too wet the soil clods and bakes badly. Commercial fertilizer or stable manure is seldom used.

The type is practically all held in large tracts. No sales have taken place recently, but the estimated selling value of the land

ranges from $10 to $50 or more an acre, depending upon the distance from market and the farm improvements.

The foremost need of the type is a system of levees to afford protection from overflows. Reclamation can be accomplished only by cooperation among the land owners. In providing for artificial drainage it would be necessary to dispose of the rainfall on the area diked and of the run-off from the types to the north. The soil is well adapted to grains and grasses, and these crops should be grown more extensively.

CONGAREE SILTY CLAY LOAM.

The Congaree silty clay loam consists of a brown silty clay loam surface soil, 8 to 10 inches deep, underlain by a brown silty clay loam to silty clay subsoil which extends to a depth of 3 feet or more. Typically the subsoil is slightly lighter colored, heavier, and more compact than the surface soil. The substratum consists of a stratified deposit of sand, silt, and clay. Mica is commonly present in both surface soil and subsoil.

Variations within the type are mainly in the subsoil, which is in places mottled yellow, rusty brown, and gray or drab. Occasionally the light-textured material typical of the lower subsoil of the Congaree silt loam is encountered in the lower section of the subsoil. Variations from the typical color usually occur in the most poorly drained areas of the type. On account of the difficulty of making detailed examination of the soil over much of this type, especially that part south of Cedar Creek, it includes in places soil of other textures than silty clay loam, ranging from a fine sand on the banks of old river channels or cut-offs to silty clay in basinlike depressions.

This is the most extensive first-bottom soil in the county. The largest area, over 25 miles in length and 2 to 4 miles in width, occupies the greater part of the Congaree River bottoms from Gills Creek to the Wateree River. Other developments occur in the vicinity of Mill Creek, above Gills Creek, and in the Wateree River bottoms.

The surface is flat, and the slope in the direction of the stream flow very slight. There are numerous depressions, sloughs, and old river channels, and several creeks from the uplands cross the type in shallow channels. Drainage is very slow, on account of the close, compact structure of the soil and the level surface. The type is overflowed nearly every season and in some seasons more than once, though the areas are not all equally subject to overflow. In places the flood waters cover the type to a depth of 10 feet or more. They recede rather slowly, and parts of the type are inundated for quite long periods. In places levees have been built, but a number of these are now unserviceable.

Although one of the most extensive types of the county, the Congaree silty clay loam is at present one of the least important from the viewpoint of agriculture. About 99 per cent of the type is forested with a mixed growth of gum, oak, ash, maple, and various small trees and shrubs. The merchantable timber has been removed from at least one-third of the type and lumbering is being carried on over large tracts. In some areas there is a good growth of cypress. The type is used extensively during the greater part of the year as pasture land. In the unimproved part of the type only a few scattered fields are in cultivation, these often representing narrow included areas of silt loam or very fine sandy loam adjacent to the river. A tract of several hundred acres, 2½ to 4 miles south of Columbia, has been improved by the construction of levees and drainage ditches. There are evidences of more extensive cultivation of the type in times past, certain old fields being now grown up in small trees and underbrush.

Corn, oats, and cotton are the chief crops grown on this type. Dairy farming is carried on to some extent, corn being used for ensilage. Oats are grown for feed on the farm, and cotton as a money crop. There is a tendency for cotton to run to weed. The yields of all crops are good in favorable seasons.

Land of this type is handled quite differently from the sandy soils of the uplands and terraces. It is plowed as soon as the water content will permit, and thoroughly harrowed and pulverized before seeding. The soil is rather difficult to handle. It clods and bakes unless worked at the proper moisture stage, and seeding and other farm operations are often delayed by poor drainage and flood conditions, the factors which have largely retarded development. Two-horse machinery is largely used.

Improved land is valued at $50 to $100 an acre. The forest tracts are held for about the value of the timber. Areas which have no merchantable timber and are not improved for cultivation are valued at only a few dollars an acre. There is no present demand for land of this type for farming.

With diking and draining this type could be highly developed. Stretches of levee have been built by individual landowners to protect comparatively small tracts, but the expense of reclamation in this way is usually prohibitive, and cooperation among the landowners in the improvement of large tracts is necessary. Where reclaimed the type is adapted to corn, grain, grass, and forage crops. Cotton would also be successful. The soil is rather difficult to handle, but could be somewhat improved in this respect by liming and by increasing the organic-matter content.

WEHADKEE SILT LOAM.

The surface soil of the Wehadkee silt loam is a brownish-gray silt loam, 8 inches deep. The subsoil is a yellow and gray mottled loam to silt loam, extending to a depth of 3 feet or more. In places, especially when moist, the soil assumes a more brownish cast, and in most areas yellow is the predominant color in the subsoil. Both surface soil and subsoil are usually compact in structure. The type differs from the Congaree silt loam in soil and subsoil color, and in its lower mica content.

Within the region where only the highest hills remain capped with sandy material the soil in small, unimportant areas is lighter in texture than a silt loam. Within the region of Piedmont soils the type tends to appear more brownish in color than typical and slightly heavier in texture.

This type is confined to the bottom lands of creeks within the Piedmont section and creeks which have cut deeply into the Piedmont material in regions where only the highest hills remain capped with sandy Coastal Plain soils. The most extensive areas occur along Crane and Twentyfivemile Creeks. The type is developed in long strips, ranging in width from 300 feet to about one-fourth mile.

The surface is flat, with a slight slope in the direction of stream flow. Drainage is in general rather poorly established. The streams are more deeply intrenched than those of similar size in the Coastal Plain section, and as a rule have somewhat more fall. The bottoms are subject to overflow after heavy rains in the surrounding country.

Less than 5 per cent of the type is in cultivation. The remainder supports a mixed growth of pine, oak, maple, gum, and underbrush. The heavy timber growth, poor drainage, and small extent of the areas have retarded development, but the results obtained on the small cultivated tracts indicate that the type is adapted to the staple crops. Corn, cotton, and oats are grown, and in favorable seasons give good yields. Little fertilizer is used. Part of the type is used as pasture.

The value of this land is, as a rule, the same as that of adjoining, extensive soil types, ranging from $10 to $40 an acre. It is rarely if ever sold alone.

The greatest need of the Wehadkee silt loam is better drainage. This in most cases may be accomplished by straightening the stream courses. There is usually fall enough to enable the streams to deepen their channels and keep them clear. The type where drained is especially adapted to corn and grain.

JOHNSTON SANDY LOAM.

The Johnston sandy loam consists of a dark-gray to nearly black sandy loam to loam or silty loam, which either continues with little

change to a depth of 3 feet or more or is underlain at an average depth of 15 inches by a gray sandy loam to sandy clay or clay loam. The surface soil when dry is quite compact. The subsoil is fairly plastic when wet but becomes stiff when dry. It is quite impervious to water. The soil naturally contains a high percentage of organic matter. As the content of this decreases the color gradually becomes lighter.

As in the case of most of the recent-alluvial soils there is a wide variation in this type in texture and structure and a considerable range in color. Practically all textures of soil occur within very small areas, but little, if any, material belongs to other soil series. Yellow and drab mottlings occur in places, but the subsoil color is nowhere sufficiently yellow to be representative of the Thompson series.

As mapped the type includes certain areas which have been cleared and drained and put under cultivation. The surface soil here is a moderately dark gray, friable loam, 8 to 10 inches deep. The subsoil is a gray to mottled gray, rather stiff sandy clay to clay, extending to a depth of 3 feet or more. These included areas occur along Smiths Branch, north of Columbia, along certain stream branches within the city limits, along Dry Branch, between the Bellewood and Gadsden Schools, and along a number of comparatively small branches south of the Sandhill region.

The Johnston sandy loam is confined to low-lying, flat strips, from 200 feet to one-half mile or more in width, along streams throughout the Coastal Plain region. It does not occur along the rivers, as the material here is of Piedmont origin. Along the upper course of many streams the areas of this type are too narrow to show on the soil map, and are included with the adjoining types. The largest and most important areas occur along Gills, Mill, Cabin, Cedar, Toms, and Colonels Creeks.

The surface is practically flat, and the slope in the direction of the stream flow usually very slight. Both surface drainage and subsurface drainage are very poorly established. The type receives seepage water from the adjacent uplands and remains in a saturated condition much of the year. It stands only slightly above the stream level, and is frequently overflowed. Water often stands on the surface for long periods after floods.

In some of the comparatively narrow bottoms the strips of this soil have been cleared and the stream channels straightened. Lateral ditches are not used here, as the streams, when straightened, deepen their channels sufficiently to drain the narrow areas. About 99 per cent of the type supports a forest of pine, gum, oak, sycamore, maple, and tupelo, with an undergrowth of vines and shrubs. Cypress knees are common. The type in places affords some pasturage, but

it is largely unused at present. Corn and oats, the chief crops grown, give good yields. The narrow areas cultivated are usually cropped as parts of fields consisting largely of upland soils.

This type is held in connection with adjoining soils. Alone it has little value except for the timber. Clearing and ditching greatly increase its value.

Artificial drainage is essential to the development of this type for farming. In the narrow bottoms the straightening of the stream channels is sufficient for reclamation, but in the wider ones the construction of laterals is also necessary. This type with improvement would be of much importance in the agricultural development of the county. It is especially adapted to hay and other forage crops which are not grown in sufficient quantity to supply the local needs.

STEEP BROKEN LAND.

Areas having a steep, gullied or eroded surface are classed as Steep broken land. Within the Piedmont section the surface soil is a red silty clay loam, underlain by a subsoil of similar but heavier material. The underlying rocks outcrop in numerous exposures, and the depth of the fine-earth mantle ranges from a few inches to a few feet. Within the Sandhill section the surface soil and subsoil consist of a red to pinkish sandy clay. In places remnants of the sandy mantle occur.

Steep broken land occurs largely on some of the lower slopes to the Broad River, mainly near the mouth of Little River. It is also mapped in the basin of Colonels Creek, occupying areas around the heads of tributaries and narrow divides where erosion has been especially active. In the Piedmont section it is associated with the Georgeville silt loam and silty clay loam, and in the Sandhill section with the Hoffman coarse sandy loam and sandy loam and the Norfolk sand, sandhill phase. Its total extent is comparatively small.

Drainage over this type is excessive. The land is used only for the scant pasturage it affords. In the Piedmont section it supports a growth of timber, while in the Sandhill region scrub oak and small shrubs comprise the native vegetation. The best use of the type at present is for forestry. The land has no ascertainable selling value, being included in sales with adjoining types.

SUMMARY.

Richland County is situated in the central part of South Carolina. It has an area of 476,800 acres, or 745 square miles, and lies partly in the Piedmont Plateau and partly in the Coastal Plain. The topography ranges from level to hilly. Drainage is well established.

The population in 1910 was 55,143, about one-half of which is

classed as rural. Settlement is densest in the vicinity of Columbia and in the southern part of the county.

Columbia, with a population in 1910 of 26,319, is the county seat and the capital of the State. It is the second largest city in the State and an important commercial, railroad, and industrial center.

Six lines of railroad radiating from Columbia afford good passenger and freight service. Water transportation on the Congaree and Wateree Rivers is of commercial importance. The county has a fairly good road system, which is being extended and improved. Rural mail delivery service reaches nearly all sections.

Columbia is the marketing center for the whole county, either directly or through the small towns. Cotton is the chief sale crop. Lumber is also exported.

The climate of Richland County is marked by short, mild winters and long, hot summers. There is a long growing season. The mean annual rainfall is 46.62 inches.

There has been a gradual extension of the cultivated area until 53.1 per cent of the county is in farms, and approximately one-half the farm land is improved. In some sections practically all the land is cleared, while in others nearly all is in small timber. The average size of the farms, including tenancies, is 75.5 acres. About one-third of the farms are operated by owners.

Cotton is the money crop. Corn is grown on an almost equal acreage for use on the farm. Oats, cowpeas, sweet potatoes, Irish potatoes, and other vegetables are minor crops.

There is little recognition of the adaptation of soils to crops. Farming methods are undergoing a gradual improvement, but much of the land is still farmed with one-horse implements, and little or no attention is given to maintaining or increasing the productiveness of the soils, except by the use of fertilizer. No definite rotation of crops is practiced.

Land values range from $25 or less an acre in the more remote sections to $100 or more an acre for good land near the railroads.

Three soil provinces are represented in Richland County, namely, the Piedmont Plateau, with residual soils; the Coastal Plain province, including old sedimentary soils; and the River Flood Plains province, with recent-alluvial and terrace soils.

The Georgeville, Alamance, and Cecil series are developed in the Piedmont region; the Norfolk, Marlboro, Ruston, Orangeburg, Greenville, Hoffman, and Portsmouth, series in the Coastal Plain; and the Cahaba, Kalmia, Leaf, Myatt, Congaree, Wehadkee, and Johnston series in the River Flood Plains province.

The Georgeville silt loam is a fairly extensive type, well drained, and fairly productive. About 60 per cent of it is cultivated. It is adapted to general farm crops.

The Georgeville silty clay loam is the most extensive of the Piedmont soils. It includes many slopes too steep for farming. Approximately 50 per cent of its total area is cultivated. Yields range from fair to good.

The Alamance silt loam occurs on divides and on a few slopes. A very large proportion of the type is not farmed. The areas under cultivation give only light or fair yields.

The Cecil coarse sandy loam is an inextensive and unimportant type. The areas not too steep for cultivation are cropped to cotton and corn, with fair success.

The Norfolk sand is largely under cultivation, but it is suited to the growing of special crops rather than to general farming. The sandhill phase of this type is the most extensive soil in the county. Only a small percentage of its area is in cultivation.

The Norfolk coarse sandy loam is quite extensively developed in parts of the Sandhill section. Fair yields of cotton, corn, and other staple crops are obtained.

The Norfolk sandy loam is one of the most important types in the county. It is well drained, has a favorable topography, and is practically all in cultivation. Cotton, corn, oats, and other crops grown give good yields.

The Norfolk fine sandy loam is an inextensive type. It is adapted to practically the same crops as the Norfolk sandy loam, and gives about the same yields.

The Marlboro sandy loam is an important and productive type. Cotton is the chief crop on this type.

The Ruston loamy sand is a well-drained type, productive and adapted to a variety of crops.

The Ruston sandy loam is practically all in cultivation and gives good average yields. The type is suited to general farming.

The Ruston fine sandy loam occurs mainly in one area in the southeastern part of the county. All of the type is cultivated. Good yields are obtained.

The Orangeburg sandy loam and its shallow phase are well-drained soils, practically all under cultivation. These soils are adapted to general farming and some special crops.

A considerable proportion of the Greenville clay loam is undeveloped, on account of the intractable nature of the soil, the rather steep slopes, and the tendency to erode. Cotton gives good yields under favorable conditions.

The Hoffman coarse sandy loam occurs within the Sandhill region. Yields are moderately low, but the productiveness may be increased by improved methods of farming.

The Hoffman sandy loam is fairly extensive, but less than one-half its area is cultivated. Moderately low yields of cotton and corn are obtained.

The Portsmouth loam occupies small depressions in the southern part of the county. A large total area is artificially drained and a considerable acreage is under cultivation. Where well drained the type is adapted to various crops.

The Cahaba fine sandy loam and its heavy phase are developed on terraces in the Congaree and Broad River valleys. These soils are fairly well drained and are not overflowed. Cotton and corn, the leading crops, give fairly good yields.

The Kalmia sandy loam occupies terraces above overflow. Its surface drainage and internal drainage are moderately good. Average yields of cotton and corn are obtained.

The Kalmia fine sandy loam is a fairly well drained terrace soil utilized to a considerable extent in the production of cotton, corn, and other crops. Moderately good yields are obtained.

The Kalmia very fine sandy loam occupies terrace positions above overflow and is only fairly well drained. The type is practically all under cultivation and gives fairly good yields.

The Leaf very fine sandy loam is an inextensive type of little agricultural importance. It has a terrace position above overflow but is poorly drained.

The Myatt sandy loam is a poorly drained terrace soil. With improvement in drainage it would be adapted to a number of general-farming crops.

The Congaree fine sand covers a small total area in the first bottoms of the Congaree and Broad Rivers. It is subject to overflow, but is otherwise well drained. The type is mainly in pasture land and forest.

The Congaree fine sandy loam has good drainage except during flood periods, and good yields are obtained in favorable seasons.

The Congaree silt loam is largely in cultivation. Drainage is fair except immediately after floods. Yields are good in favorable seasons.

The Congaree silty clay loam is the most extensive first-bottom soil in the county, but it is at present of small importance agriculturally. In places it is inundated for long periods.

The Wehadkee silt loam is developed mainly along streams within the Piedmont region. Drainage is poor and little of the type is farmed.

The Johnston sandy loam is a poorly drained first-bottom soil, subject to overflow. It is practically all in forest, but with reclamation would be adapted to the production of corn, oats, and other crops.

Steep broken land occurs in severely eroded areas along streams, and is of little use except for timber.

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[PUBLIC RESOLUTION—No. 9.]

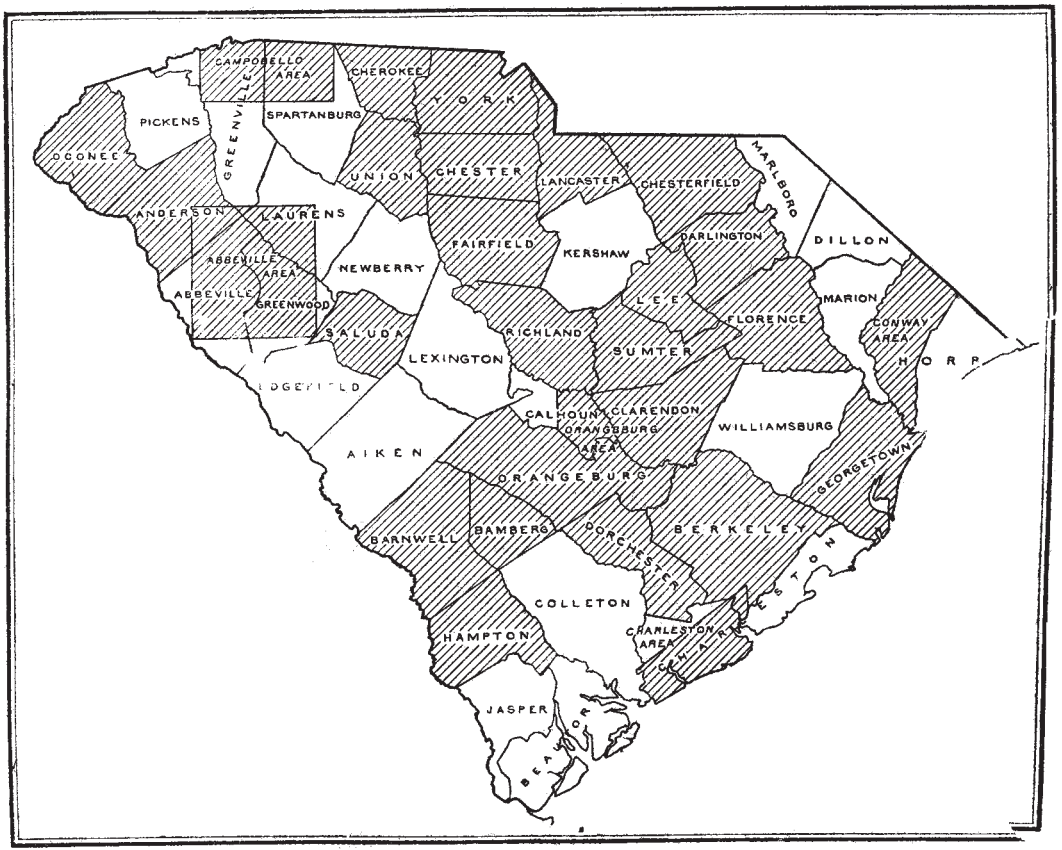
JOINT RESOLUTION Amending public resolution numbered eight, Fifty-sixth Congress, second session, approved February twenty-third, nineteen hundred and one, "providing for the printing annually of the report on field operations of the Division of Soils, Department of Agriculture."

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.]



Areas surveyed in South Carolina.

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