SOIL SURVEY OF CHESTERFIELD COUNTY, VIRGINIA.

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DESCRIPTION OF THE AREA.

Chesterfield County is situated in the southeastern section of Virginia, on the boundary line between the Piedmont Plateau and the Coastal Plain. It is bounded on the north and northeast by the James River, on the southeast and southwest by the Appomattox

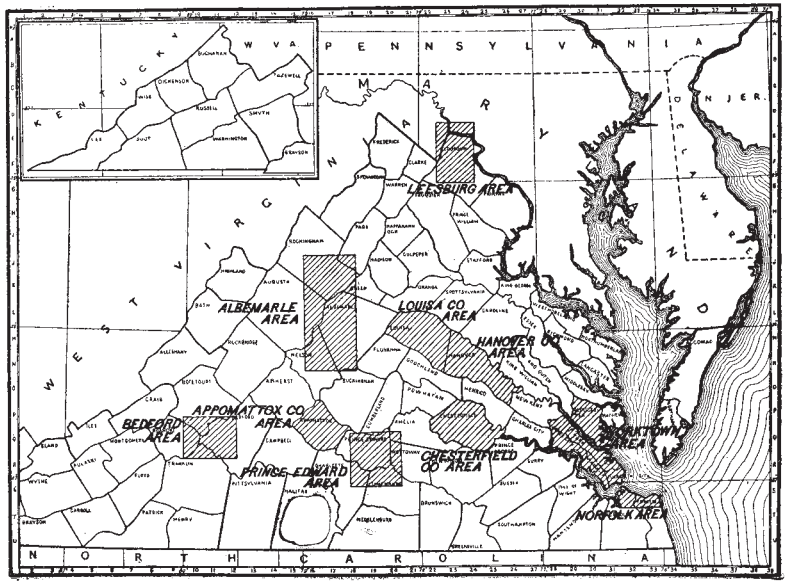

FIG. 5.— Sketch map showing location of the Chesterfield County area, Virginia.

River, and on the northwest by Powhatan County. These two rivers almost surround the county, and if it were not for the land on the northwestern side the county would be in the form of an island.

The elevation of Chesterfield County varies from tide water, in the southeastern part, to about 400 feet in the western part, but the greater proportion of the surface lies from 200 to 250 feet above

sea level. The topography varies from comparatively rough and broken to level. The roughest areas are found along the James River in the vicinity of Bon Air and north and south of this point, this section being frequently cut by narrow V-shaped valleys leading into the James River. This broken topography extends back from the river for 2 or 3 miles, following the course of the stream. The hills are frequently cut by the streams and form bluffs from 50 to 100 feet high. Below Manchester the topography changes, the slope being much more gradual and the descent to the river being in the form of clearly defined terraces. The Appomattox River, which forms the southern and part of the western boundary of the county, is a much smaller stream than the James River, and has not cut its bed as deep nor formed as steep bluffs as the James. In the vicinity of Skinquarter, where the Appomattox has cut the Piedmont formations, the country is comparatively rolling and broken adjacent to the stream, but it assumes a more level topography farther down the river and continues to become less rolling until the level Coastal Plain is encountered, a little above Petersburg. The corner of the county between the Appomattox and the James rivers is the largest level area found in the county. The elevation of this corner ranges from tide water to about 100 feet above tide. The drainage of this section is very good, and it is only in local spots that artificial drainage would be an improvement.

The topography of the interior of the county is generally rolling, though not rough or broken to any great extent, the rougher areas being found along the streams. Between the streams usually occur comparatively broad and gently rolling table-lands, though these may be varied occasionally by small and poorly drained depressions.

The natural drainage of Chesterfield County is good, and while there are some areas that need artificial drainage, there is a comparatively small amount of waste lands due to this cause. The James River receives the entire drainage of Chesterfield County through its numerous branches. The drainage in the northern and northwestern parts of the county is through small streams having their source in the county. Swift Creek, which flows across the central part of the county in a southeasterly direction, drains this section, and the Appomattox River drains the southern and southwestern sections. Swift Creek flows into the Appomattox River several miles below Petersburg and the Appomattox empties into the James River in the southeastern corner of the county.

The first inhabitants of Chesterfield County came from English colonies in other parts of America or direct from the mother country, and for the most part the present white population are direct descendants of the early settlers. For the last twenty years a few

settlers have come from the Northwest, but in such small numbers as to make no material change in the population or customs of the section. The negro population of the rural districts has been rapidly diminishing during the last ten years, many of them going to the near-by cities and some of them to the North.

Chesterfield, the county seat, has only about 100 inhabitants, and is located 3 miles from the railroad. Manchester, across the James River from Richmond, is the largest town in the area, and is the only town that has more than 1,000 population.

There are four railroads entering the county. The Southern Railway passes through the northern part, the Tidewater and Western Railroad extends east and west across the central part, and the Seaboard Air Line Railway and the Atlantic Coast Line Railroad parallel each other across the eastern part in a north and south direction. The Richmond and Petersburg electric line connects Richmond and Petersburg. Boats run up the James River as far as Richmond, and up the Appomattox River as far as Petersburg. The eastern part of the county has excellent transportation facilities, but in the western section the facilities are not so good.

CLIMATE.

Chesterfield County has a desirable and healthful climate and one well suited to agriculture. Both the summer and winter temperatures are comparatively mild, and extremes of heat or cold are seldom experienced. At Bon Air and in that vicinity are quite a number of summer homes owned principally by people of near-by cities. The following tables show the normal monthly and annual temperature and precipitation and the dates of first and last killing frosts:

Normal monthly and annual temperature and precipitation.

Month.	Richmond.		Petersburg.		Month.	Richmond.		Petersburg.	
	Temperature.	Precipitation.	Temperature.	Precipitation.		Temperature.	Precipitation.	Temperature.	Precipitation.
	°F.	In.	°F.	In.		°F.	In.	°F.	In.
January	38.6	2.73	38.0	2.68	August	78.0	4.81	77.0	3.84
February	36.9	3.43	39.4	3.55	September	71.1	3.61	71.0	4.02
March	49.4	4.22	47.3	4.63	October	59.4	3.40	58.6	3.57
April	55.8	3.56	56.5	3.82	November	48.9	2.60	49.3	4.49
May	67.2	3.09	66.7	5.01	December	41.5	3.24	40.1	2.73
June	74.1	3.63	72.9	4.00	Year	58.4	43.19	57.9	47.09
July	79.4	4.87	77.8	4.75					

Dates of first and last killing frosts.

Year.	Richmond.		Petersburg.	
	Last in spring.	First in fall.	Last in spring.	First in fall.
1898	Apr. 6	Nov. 15	Apr. 6	Oct. 16
1899	Mar. 21	Nov. 13	Apr. 2	Oct. 1
1900	Apr. 5	Nov. 10	Apr. 26	Nov. 10
1901	Mar. 17	Nov. 6	Mar. 29	Oct. 26
1902	Mar. 26	Oct. 30	Mar. 26	Oct. 30
1903	Apr. 5	Nov. 7	Mar. 8	Oct. 27
1904	Apr. 20	Oct. 28	Apr. 22	Oct. 16
Average	Apr. 1	Nov. 7	Apr. 4	Oct. 22

AGRICULTURE.

The territory now lying within the limits of Chesterfield County formed a part of Henrico County until 1748. Agriculture had been carried on long before the establishment of the county, and some of the soils have been cultivated for two centuries or more. The first crops grown were corn, wheat, oats, flax, cotton, and tobacco. The first lands to be cleared were the uplands bordering the James River south of Manchester, these being selected chiefly because the river was the only means of transportation in the early days.

Every farmer grew certain quantities of the products mentioned, since all of them were almost absolute necessities. The cotton and flax were grown for home consumption, and were made into clothes. Wheat and tobacco were the principal market crops. Manchester was at one time noted for its flour manufacturing. Vast quantities of wheat were brought to this point from the surrounding country, much of it from a good distance. For many years the flour that was not used for home consumption was shipped to the Tropics and exchanged for coffee. This made Manchester a coffee-distributing point for a large section of the eastern United States.

The methods of agriculture were crude and reckless. Little care was taken in preparing the soil, and no attention given to preserving its fertility. The soil was simply cultivated until it failed to produce good yields, and then abandoned and new land cleared. Flax and corn were planted on the newly cleared land, while tobacco and cotton were planted on old land. The tobacco grown was a dark, heavy grade, known as "shipping tobacco," which was used for navy tobacco. All meat necessary for home use was raised on the farm.

These conditions of agriculture remained practically the same up until the civil war, although the quantity of products gradually increased as the county became more thickly settled and transportation facilities developed. The war was very disastrous to Chesterfield County, and after this period agriculture, as well as all other indus-

tries, had to be started anew, and many adjustments made to suit the changed conditions. Thousands of acres of land that were once under cultivation were left idle. Much of this has not been utilized up to the present day and is now covered with a second growth of timber. Where the last crop grown on these abandoned lands was corn or some other crop which necessitated the ridging of the land, these ridges or rows may frequently be seen to-day in heavily timbered areas. It is claimed that there was probably over twice as much land under cultivation before the war as there is at the present time. The freeing of the slaves caused some of the crops to be abandoned. Cotton and flax, used almost exclusively for manufacturing clothing for the slaves, have not been grown to any extent since the war. As the county is situated along the northern border of the cotton belt, where the growing season is short, cotton can not be so profitably grown on a large scale as it can farther south. Wheat and tobacco have not been so extensively grown since the war.

The general agriculture of the county since about 1870 has changed but little, although some new crops have been introduced and the methods of cultivation have changed somewhat. About 1880 grasses were introduced and took the place of wheat and oats to a certain extent. The principal varieties were herd's-grass, orchard grass, and timothy. The first two were sown on the uplands, while the last was sown on the bottom lands. These grasses were grown principally for hay, but were sometimes used for grazing. In the last ten or fifteen years they have been replaced to a large extent by German, or crimson, clover. The clover is much more beneficial to the soil and has been used to great advantage by the progressive farmer. Peanuts have been grown for the last twenty years, but the acreage has increased considerably in the last ten years.

The most important crops grown at the present time are corn, wheat, oats, peanuts, and tobacco. Of these, corn is the most important, and the acreage is larger than that of all the other crops combined. It is well distributed over the county, although it is most generally grown on the river bottoms and in the northern and central parts. The small quantity of tobacco grown is found in the western and northwestern parts of the county. The acreage of this crop seems to be decreasing, and it is now of very little importance to the agriculture of the area. Peanuts have proved profitable in the southeastern part of the county. The Coastal Plain soils are found in this section of the county, and it is on these light sandy soils that the peanut flourishes. The Spanish variety is grown almost exclusively. The peanut industry centers around Petersburg, which point affords a good market. The price ranges from 90 cents to $1.05 per bushel. Small quantities of truck are also grown in this section of the county.

The hay crops are principally peas, clover, timothy, and redtop. Of these the pea-vine hay is most extensively grown. The timothy and redtop are confined principally to the bottom lands. Practically no timothy is grown on the uplands, as it does not do well on account of the lack of moisture in the summer. Clover is also most successful on the bottom lands, and is not grown for hay on the uplands to any great extent.

The old method of growing corn on ridges has been abandoned for level cultivation by a great many of the farmers. Clover is sown at the last cultivation of the corn and remains through the winter as a cover crop. It is turned under in the spring in preparing the soil for the crop to follow. Sometimes it is grazed in the early spring before turning under. As a result of this practice of sowing clover in the corn this crop has taken the place of cowpeas to a certain extent. The clover increases the yield of corn year after year, and land has been brought to a high state of productiveness by this method alone. Where the land is very poor 200 to 300 pounds of fertilizer may be used the first or second year with good results.

The supply of labor in Chesterfield County is one of the most serious problems the farmer has to deal with. Practically all the labor is colored. Wages have gradually increased in the last ten or fifteen years from 40 or 50 cents a day to 75 cents and $1.25 a day, and it is frequently hard to secure labor even at these prices during the harvesting season. The laborer used to be hired by the month, but the greater proportion of them at present prefer to work by the day.

According to the Twelfth Census the total number of acres in farms in Chesterfield County was 194,489 and the average-sized farm was 130.2 acres. Of these farms 65 per cent were operated by the owners. The value of land and improvements (except buildings) was $1,919,200. The expenditures for labor were $69,050 and for fertilizer $11,340. The conditions have changed greatly since 1900, as everything has rapidly increased in value and new land is constantly being brought into cultivation.

The price of farm lands ranges from $7 to about $25 an acre, according to location. Where well-improved farms are near the cities they are worth from $50 to $75 an acre, and there are some unimproved farms, not well located, that can be bought for $5 an acre.

Land is usually rented for a share of the crop, the river-bottom land renting for one-half and the upland soils for one-fourth. Where the owner furnishes land, teams, implements, etc., the tenant gets half of the crop. There are thousands of acres of uncleared land in the county. The greater proportion of the finest timber has been

cut, but there still remain large quantities of good timber, and many sawmills are in operation throughout the county.

Where modern methods of farm management are followed the farmers of Chesterfield County are, as a rule, in a prosperous condition. Under the present conditions and methods practiced by a majority of the farmers the cost of growing the present crops leaves only a small margin of profit. Land and labor and all other necessaries for farming have so advanced in price that careless methods can not be followed profitably. This emphasizes the importance of giving more attention to the improvement of the soil and to the use of labor-saving machinery. All the soils in the county would be greatly benefited by an increase in their organic matter. By the adoption of a systematic rotation of crops, in which cowpeas and German clover have an important place, and by the more careful husbanding of stable manure, the productiveness of the soil can be maintained and the profits to the farmer increased.

Considerable commercial fertilizer is used in the area, although many of the most prosperous farmers either do not use it at all or else only in small quantities. The use of small quantities where rotation is practiced is beneficial, but it should not be depended upon entirely. Practically all the hay produced is consumed in the county. This crop could be grown in large quantities at a good profit and at the same time improve the soil. A few fields of alfalfa were seen, the most of it being around Hallsboro. It produces from 3 to 4 tons per acre, is a very profitable crop, and should be grown more extensively. There is practically no attention given to the growing of fruit. Grapes, apples, and peaches do well and could be grown for the market if desired. Dairy farming and trucking are followed on a small scale in the vicinity of Manchester and Petersburg. With such excellent local markets these should be made among the most profitable industries of the county.

SOILS.

The peculiar situation of Chesterfield County gives rise to a great complexity of soil types. The line of contact of the Coastal Plain and the Piedmont Plateau crosses the southeastern part of the county, and, in addition to this, all but about 10 miles of the county boundaries consists of rivers. The complications resulting from the overlapping of the two geologic provinces, together with the variations caused by river action, have resulted in a diversity of gradations and peculiarities in the soil materials.

The following table gives the name and extent of each of the twelve soil types established in the area:

Areas of different soils.

Soil.	Acres.	Per cent.	Soil.	Acres.	Per cent.
Chesterfield sandy loam	95,680	31.1	Congaree loam	9,984	3.3
Bradley sandy loam	59,072	19.3	Norfolk fine sandy loam	8,832	2.9
Chesterfield gravelly sandy loam	34,304	11.2	Norfolk silt loam	5,952	2.0
Norfolk sandy loam	32,704	10.7	Wickham loam	5,952	2.0
Meadow	25,088	8.2	Swamp	2,432	0.8
Elkton fine sandy loam	14,656	4.8	Total	305,856	
Norfolk sand	11,200	3.7			

About four-fifths of the county lies within the Piedmont region, and here the soils are principally the Chesterfield gravelly sandy loam, Chesterfield sandy loam, and Bradley sandy loam. The Coastal Plain section of the county is included between the James River on the east and the Appomattox River on the south, and has an area of approximately 125 square miles. The line of contact between these two provinces, which here consists of a rather broad gradation, extends from about 1 mile north of Farrar Island, in the James River, through Chester and irregularly southwest to the Appomattox River, about 10 miles west of Petersburg. Much difficulty was experienced in placing the line of separation between the soils in this part of the county. The principal types of the Coastal Plain are the Norfolk sand, the Norfolk sandy loam, and the Norfolk fine sandy loam.

None of the important soils of the county are as typically developed as in areas that lie exclusively in the Piedmont Plateau or in the Coastal Plain. It would appear that the greater part of the county was at some time in the past covered by a mantle of Coastal Plain material, which has since been partly removed by erosion. Rounded or waterworn gravel was found scattered over a large proportion of the county, and it is this gravel that chiefly predominates in the Chesterfield gravelly sandy loam. The subsoil may have this rounded gravel scattered through it, or the gravel may be entirely absent. A section in a road cut was observed where the soil was very gravelly, the subsoil a few feet from the surface contained seams of rounded gravel, and immediately below this occurred outcrops of the native granite. This is a fair illustration of the complexity which exists at the juncture of the Piedmont and the Coastal Plain, at least in this part of Virginia. The Chesterfield sandy loam, one of the principal soils of the Piedmont area, is derived from a thin layer of Coastal Plains material over granites, gneisses, and arkose sandstones. This type and the Norfolk sandy loam are very similar and differ little, save in origin and topography. The presence of granite bowlders and outcrops indicates the Chesterfield sandy loam, and where these were

not found the soil was mapped as Norfolk sandy loam. The Bradley sandy loam occupies considerable territory in the county, being one of the chief types of the Piedmont. It represents areas where the sedimentary material has been almost or entirely removed. It would seem that the weathering has not been sufficient to give the typical red color, which changes to a lighter tone as the rotten granite is approached. The Norfolk sand has not as great a depth here as in other areas, seldom extending below 4 feet, while in other areas it frequently has a depth of from 5 to 10 feet, or even more. The average depth of the type in this county is probably between 30 and 40 inches.

The Norfolk sandy loam occupies the greater proportion of the Coastal Plain. It is typically developed in some localities and presents the usual variations, according to topography.

All of the soils of the area are light textured, being sands, sandy loams, and loams, and generally well drained. The region is thus one of easily handled lands, which at the same time are capable of being maintained in a state of high productiveness under proper methods of management.

WICKHAM LOAM.

The soil of the Wickham loam to a depth of 10 inches is yellowish-brown or chocolate-colored loam, resting on a loam of lighter color and slightly heavier texture, which becomes heavier with increasing depth and grades into a clay loam at about 30 inches. Both the soil and the subsoil contain numerous fine particles of mica. During cultivation the soil forms clods, especially if the land is plowed when wet. These clods, however, are not very compact and are easily broken up into a mellow loam by the use of a light harrow.

A phase of this soil occurs in a small area south of Bermuda Hundred, where the soil is a brown heavy sandy loam to a depth of 12 inches, underlain by a brown sandy clay loam, lighter in color than the soil. Had this phase been found at all extensively, a separate type would necessarily have been established.

The Wickham loam occurs along the James River, generally as a narrow strip, paralleling the stream. The most extensive area is in the vicinity of Bermuda Hundred. The type occupies in all only a few square miles. It is very closely related to the Congaree loam, occupying, as it does, the second terraces adjoining that type. The former, however, is not subject to overflow, is a little lighter in color, and has a slightly heavier subsoil. In origin the type is probably the same as the Congaree loam, the material having been washed down from the Piedmont and deposited by the river during seasons of overflow. It was no doubt at one time the flood plain of the James River, with the usual natural terrace bordering the stream. Through the process of erosion the channel of the stream has been deepened until

this soil is now elevated above high-water mark and the lower flood plain developed, on which the Congaree loam is found.

The Wickham loam is locally known as "second bottom," and there is rather a distinct line of separation from the first bottom, in the form of a rather abrupt drop of from 10 to 20 feet. The soil is darker and more productive along its junction with first bottom, gradually becoming lighter in color and slightly less productive, with increasing distance from the river. This variation is, however, very slight, and the type as a whole is comparatively uniform both in texture, structure, and agricultural value. The topography is approximately level, with an occasional slight elevation or very slight depression. The greater proportion of the type is naturally well drained, although some few open ditches are necessary in the depressed areas.

The Wickham loam is a desirable soil for cultivation and is next in agricultural value to the Congaree loam, and when well cared for is probably just as desirable. Cultivation for many years with little or no attention to rotation has removed a part of the organic matter originally in the soil, thereby decreasing somewhat its natural productiveness. The yearly river deposit over the Congaree loam constantly renews this element of fertility, and this is about the only advantage the lower lying type possesses. The yields on the Wickham loam are not quite so good as those on the first bottom, but this is offset, at least so far as areas directly bordering the river are concerned, where crops are sometimes damaged by the overflow. Corn yields from 40 to 60 bushels, wheat from 15 to 25 bushels, oats from 30 to 40 bushels, and timothy from 1 to 2 tons per acre. The soil is considered more desirable for wheat and oats than the Congaree loam, as the straw growth is less luxuriant and the grain production larger than on the latter type.

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

Mechanical analyses of Wickham 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.*
16002, 16004	Soil	0.2	3.8	5.4	26.6	17.1	34.3	12.3
16003, 16005	Subsoil	.1	2.4	3.9	24.9	15.4	29.9	23.3

CHESTERFIELD SANDY LOAM.

The soil of the Chesterfield sandy loam is a light-gray sandy loam from 4 to 6 inches deep, below which and extending to a depth of from 12 to 24 inches is a very light sandy loam, having a slightly yellowish color. In many cases this underlying material is almost a pure sand. The slightly darker color of the surface soil is due to the presence of decayed organic matter, which also causes the

more loamy texture. The grade of the sand predominating in the material varies generally from medium to fine, although there is frequently a high percentage of coarse sand and some gravel. The subsoil, found at depths varying from 12 to 24 inches, varies from a yellow to a bright yellow or light-orange stiff sandy clay. The bright yellow or light-orange material is usually found along the boundary line between this type and the Bradley sandy loam, or on some of the more elevated ridges and knolls. Where the topography is almost level or gently rolling, the subsoil is found to be very uniformly yellow. The productiveness of this type in a general way is said to vary with the color of the subsoil, the areas where the bright yellow occurs being better than where the pale yellow is found. The sandy material found between soil and subsoil is also deeper over the pale yellow than that over the brighter phase. Occasionally the pale-yellow subsoil gives way at a depth of from 30 to 36 inches to the red clay material found typically beneath the Bradley sandy loam.

There occur in the Chesterfield sandy loam numerous spots of Bradley sandy loam too small to be represented on a map of the scale used in the survey. The alternation from the yellow to red and from red to yellow subsoil takes place frequently in a very short distance. In road cuts this condition is frequently well defined, showing on one side the yellow subsoil and on the other side the red subsoil. These spots of Bradley sandy loam are most numerous along the slopes of stream courses, where they occur as outcrops, and they are also found as narrow ridges or knolls slightly elevated above the adjacent soil. Where the Chesterfield sandy loam merges into the Bradley sandy loam the change from the yellow subsoil to the red is sometimes so gradual and the transitional zone so broad that the line of separation was drawn somewhat arbitrarily.

There is a phase of the Chesterfield sandy loam frequently found along the slopes, where the subsoil is a whitish yellow color with irregular white streaks running through it. The surface soil here is usually not so deep and slightly heavier than that of the main type. Such spots are frequently eroded to some extent, or they may support a scattering growth of scrub pine and broom sedge.

The Chesterfield sandy loam is the most extensive type mapped, being found irregularly scattered throughout at least three-fourths of the county. The greater part of the type, however, is confined principally to the central, western, and southwestern sections. It usually occurs in broad and uniform areas, broken by small areas of other types, principally the Bradley sandy loam and the Chesterfield gravelly sandy loam.

The topography of this type ranges from moderately rolling to level. The most rolling areas are found near the stream courses,

where they occupy narrow V-shaped valleys. This topographic feature is particularly marked in the north and northwestern areas, small streams being most numerous there. With an average yearly rainfall the greater proportion of the type has sufficient drainage for agricultural purposes, though some areas need artificial drainage before they can be successfully cultivated. The more rolling areas have good surface drainage, but on the undulating or level areas it is rather poor. In the latter areas the loose and open structure of the soil enables the drainage water rapidly to find its way into the ground, where it is held by the compact clay subsoil, and during a wet year crops frequently suffer from an excess of moisture.

The exact origin of the Chesterfield sandy loam is rather difficult to determine. In some places it is undoubtedly derived from a thin layer of sedimentary material, as is shown by the presence of underlying beds of waterworn gravel. In other places bowlders of granite and gneiss point to a residual origin. In the part of the county occupied by the Triassic basin the underlying sandstone seems to have contributed to its formation also. These are arkose or granitic in character and the weathered product is very similar to that formed directly from the older rocks. In general it seems that the surface soil is largely sedimentary, while the subsoil, especially the deeper subsoils, has been formed from the breaking down of the underlying granites, gneisses, and arkose sandstones. In any case the material has been so little changed by reworking that the resultant soil is fairly uniform over the entire county.

The lower lying areas are covered almost entirely by pine, though occasionally a scattering growth of gum is found. The more elevated areas frequently show the growth of a variety of oaks as well as pine, and often the hardwood growth predominates.

There is considerable variation in the crop yields on the Chesterfield sandy loam. The soil is usually low in organic matter, and the addition of such material is necessary to secure the most profitable returns. Naturally it is very sandy and possesses a loose, open texture. The most productive areas are found south, southwest, and west of Manchester. The soil here appears to have been given more attention than in most other parts of the county. Corn, wheat, and oats are the principal products. Small areas are sometimes devoted to the cultivation of tobacco. When in good physical and cultural condition the Chesterfield sandy loam will produce from 25 to 30 bushels of corn, 12 to 20 bushels of wheat, 30 to 40 bushels of oats, and from 500 to 800 pounds of tobacco per acre. The usual average of corn is 12 to 20 bushels, wheat 8 to 12 bushels, and oats 20 to 30 bushels.

The table on the following page gives the average results of mechanical analyses of samples of the soil and subsoil of this type.

Mechanical analyses of Chesterfield 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.*
15982, 15984.....	Soil	3.5	18.0	14.5	21.1	8.5	26.5	8.0
15983, 15985.....	Subsoil.....	1.5	14.4	8.9	20.1	7.6	20.4	26.5

BRADLEY SANDY LOAM.

The Bradley sandy loam consists of a dark-gray sandy loam, underlain to a depth of from 6 to 14 inches by a light-gray or yellowish material of approximately the same texture. The differences between the surface soil and that immediately below it are due to an admixture of decayed vegetable matter in the first 6 inches, and the difference in color in the surface soil varies greatly with the methods of cultivation. The most productive areas present the darkest color, while where the soil is very poor there is only a very slight difference in the color of the first few inches of soil and that immediately underlying it. The texture of the sandy material varies from a medium to fine sand, with now and then some coarse sand and both angular and rounded quartz gravel. The gravel, varying from the size of a pea to several inches in diameter, is principally found near or along stream courses, although it occurs occasionally on knolls or some of the high ridges.

The subsoil of the Bradley sandy loam, extending from 14 to 36 inches, is a stiff red to yellowish-red clay, frequently containing mica particles and some sand and increasing in tenacity with depth. The subsoil as a whole does not have a bright red color, though there are many areas where such is the case. This variation made it difficult at times to separate this type from the Chesterfield sandy loam.

The depth of the soil and the color of the subsoil usually vary with the topography, the former being shallower and the latter brighter in the more rolling and elevated areas. Frequently on some of the knolls and ridges there is no gradation between the soil and the subsoil. In such cases the soil is only from 6 to 8 inches deep. Occasionally local spots were encountered where erosion had removed the surface soil, thus exposing the red clay subsoil and giving rise to the Cecil clay. Such areas, however, were too small to represent on the map.

The soil in the northern and northwestern parts of the county is frequently a very heavy sandy loam, and in some local spots almost a loam. This phase is underlain at a depth of from 6 to 10 inches by an extremely tenacious red clay containing very little sand, and is more retentive of moisture and more productive than where the soil is more sandy and deeper. From this section toward the south and until the junction of the Coastal Plain is reached there is a gradual

change in the material until it becomes a light sandy loam from 12 to 14 inches deep, underlain by a pale red sandy clay, more friable when dry and containing more sand. There is another phase of this type, found usually at the foot of slopes and sometimes on small level or valleylike areas, where the soil is deep, reaching 18 to 24 inches below the surface, and the texture of the soil is rather coarse. This phase, which sometimes approaches a coarse sand, is the result of erosion processes, the finer material having been washed out.

The Bradley sandy loam does not occupy any very extensive areas, but is found scattered over about three-fourths of the county in irregular and broken areas. It is found principally in the northern, central, and western sections, in the Piedmont region, usually as narrow strips bordering stream courses, or on narrow ridges or knolls between the streams. The greater proportion of it occurs along Swift Creek and its tributaries and the Appomattox River. The largest areas are along the river and extend back from the stream from 1 to 3 miles. Only very small spots occur in the eastern part of the area. In some sections of the county it occurs along the slopes adjacent to the streams, following them for some distance without a break. In other cases it may simply occur as outcrops along the slopes.

The topography varies from rolling to undulating. Where it is found along the streams, the slopes are usually comparatively gentle, although it may form bluffs rising 40 to 50 feet above the streams. The drainage is excellent, and in no case is artificial drainage necessary.

The Bradley sandy loam is derived from igneous or metamorphic rocks, principally granite and gneiss, the various stages of disintegration being well defined along bluffs and in road cuts. It has been modified to some extent by an admixture of sedimentary material, but in general it represents areas where this has been almost or entirely removed.

The timber growth consists of several varieties of oak, pine, and a scattering growth of cedar and dogwood. The growth of hardwood is characteristic, and even where the type occurs irregularly in small spots surrounded by other types it may usually be identified in this way. Occasionally, however, the growth is almost entirely pine.

The type is devoted to general farming, the principal crops being corn, oats, and some wheat. The yields vary according to the methods of cultivation. Where the soil has been well cared for corn will yield from 25 to 35 bushels, wheat from 12 to 20 bushels, and oats from 35 to 40 bushels per acre. The general average is somewhat less than this and will range about as follows: Corn, 15 to 25 bushels; wheat, 10 to 15 bushels, and oats, 20 to 35 bushels.

The table on page 19 shows the average results of mechanical analyses of samples of the soil and subsoil of this type.

Mechanical analyses of Bradley 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.*
15986, 15988	Soil	7.2	19.0	8.1	16.7	4.8	32.1	12:4
15987, 15989	Subsoil	2.2	10.4	4.6	10.1	3.7	23.5	45.7

CONGAREE LOAM.

This soil to a depth of 15 inches is a chocolate or brown, mellow loam, rich in organic matter, containing some fine sand and numerous particles of mica. The subsoil, from 15 to 36 inches, has somewhat the same characteristics as the soil, although lighter in color and heavier in texture, varying from a loam to a light clay loam. Some mica occurs in the subsoil, but the proportion is not as great as in the soil. Occasional seams of fine sand, 1 or 2 inches thick, are also encountered, and small local spots are found where both the soil and subsoil are a heavy sandy loam. In this phase the quantity of mica scales is probably in excess of the content of the main type. These areas are usually found as small knolls or as terraces a few yards in width, bordering the river. There is another important variation where the soil is heavier, darker, and less micaceous, and very little difference exists in the material of the soil and of the subsoil.

While the Congaree loam is one of the heaviest soils in the area, it is comparatively easy to cultivate. It usually forms clods on breaking, except in areas of the sandy phase, but unless the soil is plowed too wet these clods can easily be worked into good tilth by means of light harrows. It is therefore necessary in plowing to observe carefully moisture conditions in order to get the best results. Where this can be done very little difficulty is experienced. Occasionally during a wet season in the late winter planting is delayed until late spring, but as the soil is very productive and the crops mature rapidly this does not materially affect the yield. The Congaree loam occupies a small percentage of the area and is found entirely along the James River and the Appomattox River, the most extensive areas being adjacent to the James, between Manchester and Bermuda Hundred. A narrow marginal strip follows the Appomattox River almost its entire length, as it meanders around the western and southwestern boundaries of the county. The broadest part of this area is probably not over one-half mile and it varies from this width to strips too narrow to be shown on the map. There are usually spots of several acres at the mouths of the small streams. On the opposite bank of the James River, however, there are broad areas of this type.

The topography of the Congaree loam is comparatively level, though there is a difference of a few feet between the highest and the

lowest elevations. In the broader areas the most elevated points are usually found next to the stream on one side and the bluffs on the other, leaving between these a depression or a series of narrow depressions, which are interspersed with slight elevations. The less the width of this type the higher the adjacent bluffs. The bluffs are usually very steep and rise from about 50 to 100 feet above the normal water level. Where the broadest areas are found the topography is not so steep, but there is usually a distinct drop of about 15 to 30 feet from the uplands.

The Congaree loam is an alluvial soil, which has been deposited during periods of inundation, the material having been washed down from the hills of the Piedmont. This type is one of the most productive of the area. It is especially adapted to corn, yielding from 40 to 75 bushels per acre. Wheat and oats grow well, but they usually give a heavy growth of straw and a light yield of grain. Wheat yields from 15 to 25 bushels per acre and oats from 30 to 40 bushels. The grain is usually sown on the more elevated lands, while the lower lying areas are used for corn and hay. Timothy and clover produce good yields, averaging about 2 tons per acre. Practically the only objection to this soil is that it is subject to overflow, but this usually occurs during the winter months and rarely ever causes any extensive loss.

The following table gives the average results of mechanical analyses of typical samples of the soil and subsoil of the Congaree loam:

Mechanical analyses of Congaree 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.*
16022, 16024.....	Soil	0.1	0.6	2.5	13.6	6.5	52.6	23.7
16023, 16025.....	Subsoil.....	.1	.8	1.5	13.1	10.6	49.9	23.7

NORFOLK FINE SANDY LOAM.

The soil of the Norfolk fine sandy loam, to a depth of from 6 to 8 inches, consists of a gray fine sandy loam, underlain to a depth of from 15 to 20 inches by a more compact yellowish material of about the same texture. The subsoil is a yellow fine sandy clay, friable, but yet possessing a somewhat clammy feel, and often containing a percentage of coarser-grained sand and some gravel. This coarse material often underlies the soil at a depth of about 30 inches. The surface soil is somewhat darker than the underlying material, due to the presence of decayed organic matter. Where the drainage is good it is easily cultivated, being a comparatively light soil. In the event of excessive rainfall, the lower-lying areas generally suffer to such an extent that crops are greatly damaged.

The Norfolk fine sandy loam occurs chiefly in two areas, one in the southern section of the county in the neighborhood of Petersburg and the other in the eastern section, on the neck of land included between the James River and the Appomattox River. The southern area, covering some 5 or 6 square miles, adjoins the Norfolk sandy loam and the Norfolk silt loam; the eastern area, somewhat smaller in extent, adjoins the Norfolk sandy loam, Elkton fine sandy loam, and Wickham loam. The topography of the type is gently rolling to level. The rolling areas, generally in the neighborhood of stream courses, possess good natural drainage, and as a rule the soil is productive. It retains moisture very well and crops seldom suffer from drought. On the lower-lying areas, drainage is not so good and crops often deteriorate because of excessive moisture. Artificial drainage is often necessary for the flat areas. In this position the type will often show a heavier structure and a mottled yellowish subsoil, the result of poor aeration. Where a good system of drainage is carried on, the soil is in striking contrast with the undrained areas.

The material of the Norfolk fine sandy loam was derived from the Piedmont, having been transported and deposited while the area was submerged below the sea. There has probably been little change in the soil since the uplift. Its topography prevents any extensive erosion.

While the type occupies a very small section of the Coastal Plain, it is probably one of the best soils of the county. In its native condition the soil does not evidence marked productiveness, but where a good system of cultivation has been carried on it shows great capacity for improvement. Several farmers have demonstrated this fact. When plowed, the soil will often break into clods, especially if plowed when wet, but these clods can be very easily broken by the use of a light harrow. A proper attention to the physical condition of the soil is one of the imperative demands in handling this type. Where this is done and where a system of crop rotation, including cowpeas, grains, and hay, is followed, the yields are very good, corn giving about 25 to 35 bushels, oats 35 to 40 bushels, wheat 15 to 20 bushels, peanuts 40 to 60 bushels, and hay from 1 ton to 2 tons per acre.

General farming is the usual practice on this type, especially over the lower-lying areas, though peanuts are probably the chief money crop. Mainly commercial fertilizers are used, but where the farmer handles more or less live stock much care is taken to conserve and apply the stable manure. In the neighborhood of Petersburg is a bulb farm of considerable size, the soil showing itself well adapted to this industry.

The Norfolk fine sandy loam has not the natural drainage of the Norfolk sandy loam and is therefore not so warm; but where the drainage is properly adjusted it has a greater yielding power both

for trucking and general farming crops. Its ready and lasting response to the application of manures also makes it a more desirable soil. Occupying as it does only a few square miles of territory, the type is not of great agricultural importance here.

The following table gives the average results of mechanical analyses of samples of the Norfolk fine sandy loam:

Mechanical analyses of Norfolk 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.*
16018, 16020	Soil	0.6	3.6	4.7	23.1	20.3	40.1	7.5
16019, 16021	Subsoil	.1	2.1	2.7	16.0	12.2	35.9	30.7

NORFOLK SANDY LOAM.

The soil of the Norfolk sandy loam, to a depth of from 6 to 10 inches, consists of a rather loose and incoherent gray sand or sandy loam of medium texture, underlain to a depth of from 15 to 20 inches by a more compact material, somewhat lighter in color and presenting, as a rule, approximately the same texture as the surface soil, though occasionally showing the presence of some finer textured sand. The lighter color of this underlying material is due to the absence of organic matter which is found in the surface soil. The subsoil to a depth of 36 inches is a friable yellow sandy clay, usually becoming heavier with increased depth, and in localities of poor drainage presenting a clammy sticky characteristic. The predominating sand constituent is usually coarse to medium in texture and gives the material a harsh feel. In localities, however, there may be found a sufficient amount of finer sand to overcome this harshness. Both in the soil and subsoil are consistently found varying quantities of rounded waterworn pebbles. The topography of the type, its open structure, and sandy texture render it easy of cultivation.

The Norfolk sandy loam occupies a great proportion of the Coastal Plain area of the county, or that section between the James River on the east and the Appomattox River on the south. The total area is approximately 32,704 acres, or about 51 square miles. While the Norfolk sandy loam is the predominating type, there may be found, irregularly scattered throughout, small areas of Norfolk sand, Norfolk silt loam, Elkton fine sandy loam, and to a less extent along the stream courses Bradley sandy loam. With the exception of its juncture with the Norfolk sand, extending from about Farrar Island in the James River to the vicinity of Chester, the type adjoins the Piedmont soils on its northern and western boundary. The type gives way to a rather extensive area of Norfolk fine sandy loam along the

Appomattox River in the neighborhood of Petersburg and to the first and second terraces of Congaree loam and Wickham loam, respectively, along the James River and the Appomattox River east of Petersburg. The Norfolk sandy loam, in its western extent, has an elevation of over 200 feet, which declines toward the east to an elevation of 50 or 75 feet adjoining the river terraces. From its highest elevations with a gently rolling surface, it gradually runs into the comparatively level Coastal Plain. The general topography of the soil, its sandy texture, and loose open structure afford good drainage. In localities where the sand content is high and the organic matter low, the moisture supply which would ordinarily be sufficient is inadequate, and crops often suffer deterioration from drought. Little erosion is suffered by this type, as its open structure permits a ready absorption of the rainfall. There are areas of Norfolk sandy loam, however, occupying very level stretches or slight depressions, where a system of drainage would conduce to better results. The drainage outlets are Old Town Creek, Swift Creek, Timsberry Creek, and Ashton Creek, all flowing in an east-southeast direction.

The material constituting the Norfolk sandy loam was originally derived from the Piedmont, having been washed down and deposited while the Coastal Plain was submerged. During the uplift the deposit ranged from the finer heavier material in deep water to the coarser material during the shallow water period, thus giving the heavy subsoil and the light sandy surface soil. While some areas, or parts of areas, of the type have been reworked, the material remains much as in the original deposition, except that much of the finer material has been washed from the slopes to the lower elevations.

There are some local variations in the soil. Along the steeper slopes occurs the sandier phase. Through the process of erosion, the finer material has been deported leaving the soil more open structured and coarser grained than is ordinarily the case. Where the phase is found on the stream slopes, there is generally present a quantity of gravel. The subsoil of this light, open-textured phase is often of a reddish color, due to better aeration and the oxidation of the underlying material. Rainfall is readily absorbed by this phase of the Norfolk sandy loam, and little erosion is suffered. Areas with sunny exposure are adapted to the growing of fruits and vegetables for early market. General farming on this phase is little practiced, as the soil is too light to return profitable yields. Peanuts are the principal crop grown, of which the soil will produce about 40 to 60 bushels per acre, with an average value of from 90 cents to $1.05 a bushel. Pine is the principal timber growth of the sandy phase. The heavier phase of the type is found on the more level or flat areas, or in slight depressions. The finer material transported from the elevation has been

carried to these localities, forming the most productive areas of the type, where the drainage is good. General farming is followed on this phase with such crops as corn, oats, clover, cowpeas, and peanuts. Peanuts are the principal money crop, however, and good yields are procured on this soil. This phase is more retentive of moisture and crops are less liable to suffer from drought.

The Norfolk sandy loam, occupying as it does a position between Richmond and Petersburg, has been cultivated for many years, though little attention has been paid to crop rotation or improvement of the soil, save through the agency of commercial fertilizers. The trucking phase of the type in particular is given heavy application of fertilizers, as well as some barnyard manure. Here and there individual farmers are improving their soil by the growth of clover, cowpeas, and the consistent application of stable manures. The soil being recognized as naturally deficient in organic matter, these crops judiciously used in a system of rotation will result most beneficially, increasing the capacity for retaining moisture and substantially improving the yields.

The Norfolk sandy loam is the best peanut soil in the area. The crop is planted about the same time as corn, cultivated up to the time of blooming, and harvested during October and November. The nuts are air dried in shocks for two or three weeks and then thrashed. From 1½ to 2½ bushels of unshelled peanuts are planted to the acre in rows from 30 to 36 inches apart. During a favorable season about 50 bushels of nuts and 2 tons of straw are produced per acre. Petersburg offers a market for the crop, there being several factories where the nuts are cleaned, graded, and prepared for sale. Peanuts are sometimes planted as pasturage for hogs. Corn, the crop next in importance, yields on an average from 15 to 35 bushels per acre; oats, from 15 to 30 bushels, though these are generally cut and fed to the stock in the straw. Cowpeas and clover give profitable returns. Tobacco is grown very little, though in former years it was produced quite extensively.

The following table gives the average results of mechanical analyses of samples of the Norfolk sandy loam:

Mechanical analyses of Norfolk sandy loam.

Number.	Description.	Fine gravel.	Coarse sand.	Medium sand.	Fine sand.	Very fine sand.	Silt.	Clay.
		Per cent.	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*
16014, 16016.....	Soil	2.5	21.9	16.9	24.7	6.9	20.9	6.1
16715, 16017	Subsoil.....	1.7	17.0	9.4	19.7	7.7	20.1	24.1

NORFOLK SAND.

The Norfolk sand consists of 6 inches of gray sand, containing some organic matter, underlain to a depth of from 30 to 36 inches by a yellowish and incoherent sand, of varying texture, though as a rule the coarse to medium textures prevail. The first 6 inches of this soil is darker in color than the underlying material, owing to the presence of organic matter, and as a result is somewhat loamy. At a depth of from 30 to 36 inches the color becomes more pronounced, varying from yellowish to orange yellow, the material becoming decidedly sticky. There are localities, however, where this is not true, the sand showing no appreciable change to a depth of 3 feet. The change in color in the deeper subsoil is due to the admixture of the immediately underlying reddish-yellow clay of the Lafayette formation. The arrangement of these several zones of material is well brought out in road cuts. In areas where erosion has been sufficiently active, the yellowish sticky material is reached within 3 feet.

The Norfolk sand areas seem to mark in a general way the northern boundary between the Piedmont and Coastal Plain soils as the Norfolk sandy loam does in the vicinity of Chester and farther on to about Farrar Island, in the James River. The type covers approximately 18 square miles, principally in the northern part, though smaller areas are scattered throughout the Coastal Plain, generally occupying the slopes or level elevations in the neighborhood of streams. The topography is rolling to gently rolling, and the drainage is naturally good. Proctor Creek in the north, Redwater Creek in the east, and Ashton Creek in the south afford drainage outlets.

The materials giving rise to the Norfolk sand were derived originally from the Piedmont, having been washed down and deposited in the sea during the submergence of the Coastal Plain region. The large proportion of sand in these materials is due to tidal and wave action during the shallow-water period of the uplift. Little change has taken place in the original sediments, though erosion has been instrumental in thinning the mantle of sand overlying the Lafayette formation with its heavy material.

The productiveness of the Norfolk sand depends in great measure on the position of the soil, the lower-lying areas being more productive than the slopes and elevations. The latter are excessively drained, which, together with the loose open structure of the sandy material, renders it of low value for general farming. In this position the soil is light and warm and best suited for the growing of fruits and vegetables. Peanuts are the principal crop on these areas, as well as over the entire type. The yield is good—from 35 to 60 bushels per acre, with an average value of about $1 per bushel. On the lower-lying areas, where the soil is more retentive of mois-

ture, general farming is practiced in a small way. Corn, oats, and wheat may be occasionally grown, of which corn is the principal crop, giving low yields—from 5 to 12 bushels per acre. Wheat and oats may be planted in small fields, but the yield is so poor that little attempt is made to grow them. The type has undergone little improvement and is of little importance in the area, occupying as it does a very small section of the county. In the production of crops commercial fertilizers are chiefly used, though occasionally some stable manure is applied to the fields. For a soil of this class where the organic material is low, the value of barnyard manure and of cowpeas for green manuring can not well be exaggerated. The principal timber growth is pine.

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

Mechanical analyses of Norfolk sand.

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.*
16010	Soil	2.6	18.3	12.1	31.5	10.8	18.8	5.2
16011	Subsoil	4.2	23.0	11.5	29.9	9.5	15.6	6.4

NORFOLK SILT LOAM.

The Norfolk silt loam is a variable type. The first 8 inches usually consists of a yellowish-gray loam, containing a rather high percentage of silt and very fine sand. As a general rule the soil passes into the subsoil abruptly, and the line of separation is frequently clear and well defined. The subsoil is usually a stiff yellow and sometimes pale-red clay. There are no extensive areas with the pale-red subsoil, though in a few places, notably around Manchester, there are numerous local areas in which the subsoil is very much mixed, showing different shades of yellow, drab, and red. The surface soil has a lighter color where the subsoil is yellow, becoming a little darker in color and lighter in texture as the red subsoil is approached. A considerable quantity of rounded quartz gravel is found in the soil and in the subsoil of the more elevated areas of this type. Small spots are found where the gravel content is sufficient to warrant its classification as a gravelly loam, were they large enough to represent on the map. There are also a few local spots where the soil is a heavy sandy loam, and still another phase, unimportant in extent, was observed where the material was rather whitish in color. The soil of this phase, to a depth of 10 inches, is a gray tenacious silt, similar, when dry, to powdered chalk. The subsoil is a dark-gray or drab silty clay. The

phase occupies depressions and is poorly drained, water frequently standing on it the greater portion of the year. Water oak is one of the characteristic growths.

The wide variation in the Norfolk silt loam is due to the fact that it is an intermediate type, or broad gradation from the uplands to the bottom lands along the James River, and not only composed of a mixture of the Coastal Plain and Piedmont material, but also modified more or less by river action at some former stage. The greater part of this type is found as a narrow strip, varying in width from one-fourth to 1 mile and running parallel to the river at an average distance of about 1 mile from the stream. Occasionally, however, it borders the stream.

This type occupies only a small percentage of the area, covering a few square miles. The most extensive areas are found in the neighborhood of Manchester and just across the Appomatox River from Petersburg. Some very small areas may be found scattered irregularly in the vicinity of the river courses in the southern part of the county. One area lies adjacent to the James River in the extreme northern section of the county.

The topography of this soil varies from level to undulating, the level areas being next to the stream courses, with a gradual rise inland until the higher uplands are reached. Where it borders the Chesterfield sandy loam or the Bradley sandy loam there is frequently a comparatively abrupt rise, clearly marking the line of separation. The soil of the level or lower lying areas is heavy and is usually underlain by a yellow clay subsoil, while on the more elevated areas the soil is lighter and contains more sand, the subsoil presenting a brighter color and being of a slightly more friable nature. The drainage of most of this type is comparatively good, though there are small areas, in the form of depressions, where artificial drainage will have to be adopted before the soil can be utilized for agriculture.

The soil is easily cultivated, though it generally breaks into clods when plowed, especially in areas of the heavier phase. These clods, however, are easily broken up into a mellow seed bed, except when the soil is too wet, when they bake very hard. Moreover, owing to the topography and the impervious nature of the subsoil, this type can not be cultivated as soon after a rain as some of the lighter soils, and greater care must be exercised on this account. Very little of the type has been artificially drained. The poorly drained areas are uncultivated, as well as much of those well drained and suitable for agricultural use. The latter are covered with timber growth, consisting principally of pine. Areas formerly cultivated and now abandoned are covered with broom sedge, Japan clover, and a scattering growth of scrub pine. The broom sedge and Japan clover afford fair grazing

during the summer months. The crop yields on this type are only fair—corn from 20 to 30 bushels, wheat from 12 to 15 bushels, and oats from 20 to 30 bushels per acre.

The following table gives the average results of mechanical analyses of samples of the Norfolk silt loam:

Mechanical analyses of Norfolk silt loam.

Number.	Description.	Fine gravel.	Coarse sand.	Medium sand.	Fine sand.	Very fine sand.	Silt.	Clay.
		Per cent.	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*
15998, 16000	Soil	0.5	0.9	1.0	8.1	15.1	60.0	14.3
15999, 16001	Subsoil	.1	.4	.5	5.7	8.9	48.4	35.8

ELKTON FINE SANDY LOAM.

The soil of the Elkton fine sandy loam to a depth of 10 inches is a heavy dark-gray medium to fine sandy loam, frequently containing a rather high percentage of silt and having a slightly sticky feel. Below this, to a depth of from 15 to 20 inches, is a very light yellow fine sandy loam, sometimes almost white and not quite so heavy as the surface soil. The subsoil is mottled gray or bluish sandy clay, varying occasionally, both in texture and color, showing a yellowish or drab color spotted or streaked with iron stains. The surface soil of the type is occasionally found in small areas where the sand content is so low that it becomes almost a silt loam, presenting a very light color and underlain by a light bluish gray impervious clay subsoil. Such areas are found usually in the lowest and poorest drained areas. In the southeastern section of the county, the soil appears to contain a little more sand than in the other sections, owing to the influence of the sandy material of the Coastal Plain.

The Elkton fine sandy loam is found as small areas in the form of depressions, scattered throughout the Chesterfield sandy loam, Bradley sandy loam, and the Norfolk sandy loam. Numerous spots of this type were found covering only a few acres and were not represented on the map. It occurs usually around stream sources and is known as "crawfish" lands.

Being a wet and poorly drained soil, little of the type is under cultivation, and then on areas of small extent adjoining the surrounding elevations. A system of drainage must be introduced before agriculture can be successful, and the difficulty of accomplishing this is so great as to render it impracticable, especially on the more extensive areas. Occasionally small areas are found where drainage has been introduced, but most of the type remains in its wet, cold condition. Even when drained crop yields are only fair.

The average results of mechanical analyses of this soil type are given in the table on page 29.

Mechanical analyses of Elkton 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.*
16006, 16008.....	Soil	1.3	8.3	6.1	26.1	14.2	32.5	11.2
16007, 16009.....	Subsoil.....	1.2	7.8	6.1	21.0	11.1	26.2	26.1

CHESTERFIELD GRAVELLY SANDY LOAM.

This type to a depth of 6 inches is a dark gray or brownish-gray gravelly sandy loam, and occasionally, where the sand content is low, a gravelly loam. Below this surface soil, and extending to a depth of from 10 to 12 inches, is a lighter colored material having practically the same texture, although it contains less organic matter and is not quite so loamy. The subsoil to a depth of 36 inches varies in color from a stiff red to a yellowish gravelly clay, though apparently not so gravelly as the soil. The soil does not vary as much as the subsoil, retaining practically the same appearance whether underlain by a yellowish subsoil or a red subsoil; still it may be slightly heavier where the yellowish clay subsoil is found. The greater proportion of the type was found to contain such a high content of gravel that it was impossible to take a boring 3 feet deep, and where borings were taken it was done with much difficulty. The character of the subsoil had to be determined principally from road cuts and eroded slopes. Areas of cleared land, subject to a free surface drainage, often present spots of almost pure gravel several inches deep, the finer material having been washed out. Another variation in the type is occasionally found, presenting a surface soil containing much gravel and showing the underlying subsoil quite free from gravel. The more gravelly areas of the type are usually found on the crests of ridges or knolls, and the subsoil of such areas is generally red. The red and the yellowish subsoils are frequently confused, and change from one to the other. The yellowish subsoil, as a rule, however, is found more extensively along the lower slopes, but the gravel content is greatest on the crests of the ridges or knolls.

The Chesterfield gravelly sandy loam is generally uniform, although it may occur as many small areas separated from one another by narrow strips of other soils, the whole showing, however, a predominance of this type. There are numerous spots promiscuously scattered in the Chesterfield sandy loam and in the Bradley sandy loam which are too small to be represented on the map. This type is rarely ever used for agricultural purposes, as great difficulty is experienced in its cultivation. Occasionally areas of a few acres in size are found under cultivation, and these are less gravelly than the type in general.

The topography of the Chesterfield gravelly sandy loam is the most rolling and broken of any in the county. The slopes of the greater part of it are sufficiently steep to prohibit cultivation. The type is generally found near stream courses, although it occurs as narrow strips or ridges in the interstream areas. While it is found scattered over about three-fourths of the county, the greater proportion of it occurs along the James River and its tributaries north of Manchester. Along most of the streams it occurs as a narrow strip, sometimes too narrow to represent on the map. It occupies the crests of the ridges which form the V-shaped valleys.

So little of the type is under culitvation that an estimate of crop yields is impracticable, though they are said to be very good. The type is well drained and very retentive of moisture, thus affording a soil where crops neither suffer from drought nor from excessive moisture. The timber growth is principally hardwood, such as white oak, post oak, red oak, with some hickory, and a scattering of pine.

The results of mechanical analyses of this soil are given in the following table:

Mechanical analyses of Chesterfield gravelly 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.*
15994	Soil	14.3	25.4	6.9	10.4	2.8	25.4	14.2
15995	Subsoil	3.7	9.7	2.9	3.9	1.4	21.8	55.8

MEADOW.

This type has a broad variation, both in texture and agricultural value. The soil ranges from a sand to a heavy loam, and the subsoil from a sand to a clay or a clay loam. As a general rule there is very little difference in the texture of the soil and the subsoil, although the latter is usually slightly heavier and lighter in color. Meadow is found as very narrow strips on each side of the small streams, on an average varying from about one to two hundred yards to one-eighth of a mile in width.

The wide variation of this soil is due to the fact that it has been deposited by the streams and consists of the numerous kinds of material that have been washed down from the higher lands. The type is of comparatively little importance and it is only occasionally that a few acres are cultivated. It is generally poorly drained and subject to overflow. While these strips along the streams are represented on the maps as being very narrow in places, they have probably been exaggerated to some extent. This type does not occur uniformly, as in some places the Meadow may be entirely on one side of the stream, while the hills on the opposite side may border the

water's edge, and in other instances the continuity may be interrupted by the hills closing in on both sides of the stream, entirely cutting out the Meadow.

SWAMP

There are only a few small areas of Swamp in the county, and these are found along the James River and as islands occurring in this stream in the southeastern part of the county. It is of no agricultural value, and a great proportion of it is covered by water at high tide.

SUMMARY.

Chesterfield County is located in the southeastern section of Virginia between the Piedmont Plateau and the Coastal Plain. It is almost surrounded by the James River and the Appomattox River and is about 250 feet above sea level. The regional drainage is good.

The population are descendants of the English colonists, and very few settlers have come into the county from other parts of the country. Chesterfield is the county seat and Manchester is the largest town. There are four railroads in the county and boats run up the James River, affording good transportation facilities.

The climatic conditions of the county are pleasant, extremes of heat or cold being rare.

Some of the soils of the county have been cultivated for about two centuries, corn, wheat, oats, flax, cotton, and tobacco being grown. These were the principal crops up to the sixties. Since then thousands of acres of land that were once under cultivation have been left idle. Grasses are grown to a certain extent, taking the place of wheat and oats. The most important crops at the present time are corn, wheat, oats, peanuts, and tobacco. Labor is scarce and practically all colored. There are thousands of acres of uncleared land in the county, and sawmills are in operation throughout the county.

Twelve types of soils were established in the county. All of the soils are light textured, being sands, sandy loams, and loams, and are generally well drained.

The Wickham loam is a desirable soil for cultivation and gives good yields of corn, wheat, oats, and timothy.

The Chesterfield sandy loam, the most extensive type mapped in the county, is a light-gray sandy loam, usually deficient in organic matter, and the addition of such material is necessary to make the soil productive.

The Bradley sandy loam consists of a dark-gray sandy loam. It is not found in any very extensive areas, but is scattered over about three-fourths of the county. General farming is practiced on this soil, and the yields of corn, oats, and wheat are fair where the soil has been well cared for.

The Congaree loam, an alluvial type found along the James and Appomattox rivers, is a chocolate or brown mellow loam, rich in organic matter. The soil is heavy, but is easy to cultivate if moisture conditions are carefully observed. The corn yields are large and wheat and oats do well. The only objection to this soil is the fact that it is subject to overflow, but as the floods generally occur during the winter months they rarely ever damage the crops.

The Norfolk fine sandy loam consists of a gray fine sandy loam and as a rule is a productive soil, retaining moisture very well. Where a good system of cultivation has been carried on it shows great capacity for improvement. When a proper system of crop rotation is followed, consisting of cowpeas, grains, and hay, the yields are very good. General farming is practiced on this type, the principal money crop being peanuts.

The Norfolk sandy loam occupies a great proportion of the Coastal Plain area of the county. Areas of this type with sunny exposure are adapted to the growing of fruits and vegetables for early market. General farming is little practiced, as the soil is too light to return profitable yields. Peanuts are the principal crop grown, and this is the best peanut soil in the county.

The Norfolk sand consists of a gray sand, containing some organic matter. The productiveness depends in a great measure on the position of the soil, the lower-lying areas being more productive than the slopes and elevations.

The Norfolk silt loam is a gradation from the uplands to the bottom lands along the James River and is composed of a mixture of the Coastal Plain and Piedmont material, being more or less modified by river action at a former stage. The soil is easily cultivated, though it generally breaks into clods when plowed. Areas formerly cultivated and now abandoned are covered with broomsedge, Japan clover, and scrub pine. The crop yields of this type are only fair.

The Elkton fine sandy loam is found in the form of depressions scattered throughout the Chesterfield sandy loam and the Norfolk sandy loam. It is a poorly drained soil and little of it is under cultivation.

The Chesterfield gravelly sandy loam is rarely ever used for agricultural purposes, as great difficulty is experienced in its cultivation. The slopes are steep and the type generally occupies the crests of ridges.

The Meadow type is of very little importance, being poorly drained and subject to overflow, and it is only occasionally that a few acres are cultivated.

There are only a few small areas of Swamp in the county, and it is of no agricultural value, being generally covered by water at high tide.

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