

SOIL SURVEY OF CABARRUS COUNTY, NORTH CAROLINA.

By RISDEN T. ALLEN, of the U. S. Department of Agriculture, and E. W. THORNTON and HUBERT HILL, of the North Carolina Department of Agriculture.

DESCRIPTION OF THE AREA.

Cabarrus County lies in the west-central part of the State of North Carolina. It is bounded on the north by Rowan and Iredell Counties, on the east by Stanly County, on the south by Union and Mecklenburg Counties, and on the west by Mecklenburg County. It contains 235,520 acres, or 368 square miles.

The topography of the county has been greatly modified since its formation as a high upland plateau through the agencies of erosion. The surface conditions can best be described by dividing the county

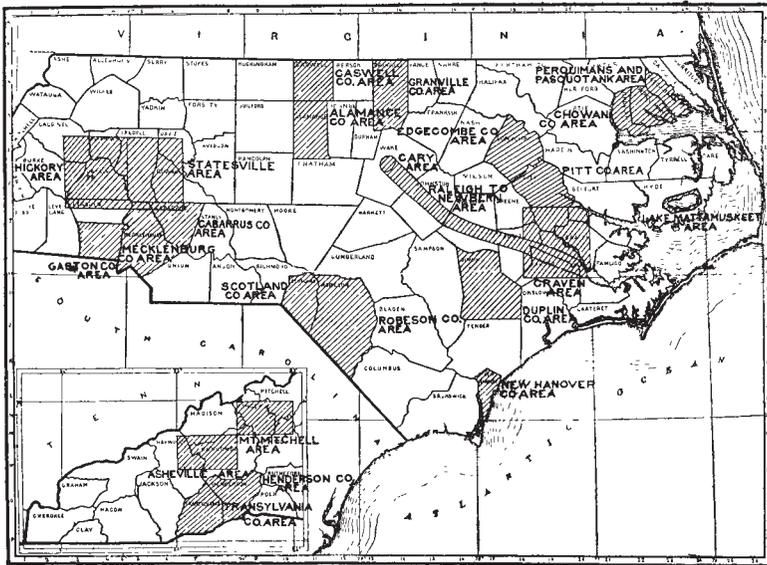


FIG. 8.— Sketch map showing location of the Cabarrus County area, North Carolina.

into three physiographic divisions. The first and largest division extends in a northeast and southwest direction across the central part of the county and along the Mecklenburg County line. It consists of gently rolling to rolling and broken surface features, with small areas of low, flat bottom lands along a number of the streams. The more rolling and broken areas occur along the larger streams and adjacent to the bottom lands. It is generally recognized throughout the county that the soils of this division are the best for general farming purposes. The second division extends inward from 3 to 5 miles from the eastern county line. This division is characterized by ridges of gently rolling to rolling surface features and includes those soils recognized throughout the county as "lean" or poor soils.

The third and smallest division occurs in the vicinity of Harrisburg and south to Pioneer Mills. This division is characterized by flat to undulating surface features, and includes soils next in importance to the soils of the first division. In general the county consists of wide, gently rolling interstream areas that lie admirably for farming.

The general slope of the county is revealed by the drainage system of which Rocky River is the principal channel. This stream enters the county in the extreme northwest corner, flows in a southeasterly direction, and passes out at the extreme southeast corner. The various creeks and branches in all cases find their way into this river.

The highest elevations so far determined in the county are in the northern part from Concord north and west along the Davidson Road. The elevation at Concord is 704 feet, farther west near Rocky River 716 feet, and there is a gradual descent to 668 feet near the county line. Other elevations in the county are Flows Store, 678 feet, and Rocky River, near Harrisburg, 568 feet.

Practically all the streams of the county have long stretches of bottom land varying in width from a few rods to three-fourths of a mile. As a rule the bluffs bordering the narrow bottom lands rise abruptly to heights from a few feet to 60 feet or more, while the larger areas of bottom lands, especially in the northwest section of the county, are flanked by escarpments which slope gradually to the uplands. The channels of practically all the streams of the county are winding, shallow, and narrow, and in times of heavy rainfall render the bottom lands unfit for agriculture by the frequency of overflows. Along the rivers and many of the larger creeks water power is developed and used for grinding corn, wheat, ginning cotton, and in one instance at Pattersons Mill on Coddle Creek the power developed has been used as an auxiliary power with steam to operate a small cotton mill.

The forest growth throughout the county consists principally of pines and hardwoods. Among the pines are found the shortleaf and loblolly, with an occasional white pine on the colder northern slopes. Among the hardwoods are found the white, red, post, and black-jack oak, with an occasional scarlet or Spanish oak. Hickory is an important species, while black walnut, persimmon, and black gum are found in small numbers. The lowland or bottom-land growths consist principally of river birch (*Betula nigra*), willow oak, red gum, and sycamore close along the stream courses, and cork elm and poplar farther away where the land is not too wet. Throughout the county are located numerous sawmills, which are rapidly cutting away the little original growth remaining.

Cabarrus County was originally a part of Mecklenburg County, but was given separate organization by the State legislature in 1793. Settlement began between the years 1730 and 1740 by a colony from

Switzerland. This colony settled in the eastern part of the county, and differed materially from the later settlers in origin and agricultural pursuits. Shortly after the Revolutionary War the Dutch, Germans, and Hessians occupied a large part of the eastern portion of the county, coming in large numbers from Pennsylvania. At about the same time the Scotch-Irish Presbyterians immigrated from Pennsylvania also, but settled chiefly along the western border of the county. Settlement advanced rather slowly up to the nineteenth century and even until the close of the Civil War, when a great impetus was given by the high prices of cotton, corn, and wheat. At present the population, with the exception of a considerable part of that employed in the cotton mills of the county, is composed principally of the descendants of the original settlers.

Concord, the county seat, is situated on the main line of the Southern Railway, just to the north of the center of the county. The town is supplied with electricity generated on the Catawba River and has all modern conveniences. It is principally a cotton-mill town, with a population of about 8,715.

Mount Pleasant is the next town of importance and is located 9 miles due east of Concord, with a population of about 750. There are located here two cotton mills and one small knitting mill.

Harrisburg, Glass, and Kannapolis are railway villages. Located at Kannapolis is the largest towel mill in this country. Other villages are Bosts Mills and Georgeville.

The northern portion of the county is supplied with fairly good transportation facilities. The main line of the Southern Railway enters the county in the north-central part and traverses the western part of the county. A branch line of this road crosses the northeast corner and affords transportation facilities for a limited number of farmers in that section. A large part of the county, however, is still badly in need of railway facilities. Railways are especially needed in the eastern and southwestern sections. The wagon roads are being macadamized throughout the county. At present there is a total of 25 or 30 miles of graded macadam roads leading out of Concord.

Rural free delivery routes are in operation throughout all parts of the county. Local telephone exchanges are also in many sections. Numerous churches, schoolhouses, and homes neatly painted and well kept are evidences of general prosperity.

Concord and Mount Pleasant are the principal markets for cotton, corn, truck, and fruits. All cotton grown in the county is manufactured into cloth or yarn by the local mills. Besides the local cotton production, which amounts to from about 12,000 to 15,000 bales, there is imported for the mills of the county from 75,000 to 100,000 bales annually. The employees of these mills furnish a market for practically all fruits and garden vegetables grown.

Throughout a number of the formations, and especially the quartz veins of the slates, the mining industry was of considerable importance in Cabarrus County during the nineteenth century. This industry, however, has been abandoned, the abandonment being due in part to the failure of the present mining machinery to extract from low-grade ores sufficient finely divided gold to make milling a paying investment. The occurrence of gold in a very fine state is characteristic as a rule of North Carolina gold.

CLIMATE.

The climate of Cabarrus County is well suited in general to the successful production of the crops now grown in the county. The average date of the last killing frost in spring is April 1 and of the first in fall November 4, giving a growing season of 218 days. The mean temperature for this period is 69° F.

There being no Weather Bureau station located in the county, it is necessary to refer to the records of the nearest outside station, which is at Charlotte, 10 miles west. The following table, compiled from records of this station, doubtless represents very closely the weather conditions of Cabarrus County:

Normal monthly, seasonal, and annual temperature and precipitation, at Charlotte, N. C.

Month.	Temperature.			Precipitation.			
	Mean.	Absolute maximum.	Absolute minimum.	Mean.	Total amount for the driest year.	Total amount for the wettest year.	Snow, average depth.
	° F.	° F.	° F.	Inches.	Inches.	Inches.	Inches.
December.....	43	76	- 5	3.8	1.9	5.7	2.2
January.....	41	77	- 1	4.3	2.3	7.6	1.9
February.....	44	79	- 5	4.6	5.4	6.4	2.9
Winter.....	43			12.7	9.6	19.7	7.0
March.....	51	85	14	4.8	1.6	9.2	0.6
April.....	59	94	26	3.4	1.9	5.4	0.1
May.....	69	97	38	3.9	1.7	4.8	0.0
Spring.....	60			12.1	5.2	19.4	0.7
June.....	76	102	45	4.6	3.4	9.5	0.0
July.....	79	102	55	5.3	6.4	7.9	0.0
August.....	77	100	53	5.2	1.0	2.1	0.0
Summer.....	77	101	51	15.1	10.8	19.5	0.0
September.....	72	99	38	3.3	4.7	3.6	0.0
October.....	61	92	30	3.4	1.0	1.5	T.
November.....	51	80	18	3.0	3.7	4.7	T.
Fall.....	61			9.7	9.4	9.8	T.
Year.....	60	102	- 5	49.6	35.0	68.4	7.7

From this table it is seen that the hot summer months are also the months of the greatest precipitation. The annual rainfall varies from 35 to 68.4 inches and is well distributed. Droughty conditions seldom occur, and damage to crops is rarely suffered, except in the porous soils of the slate belt. In this section also farmers claim that killing frosts occur from 10 days to 2 weeks earlier in the fall and later in the spring than in any other section of the county, lessening the length of the growing season as stated for Charlotte by 20 to 30 days.

The average temperature and precipitation for the months in which cotton and corn, the two principal crops, are grown indicate excellent growing weather. As a rule the climate may be said to be very healthful.

AGRICULTURE.

In the early days of settlement the main crops were wheat, corn, oats, and some flax. A few cattle and later many sheep and hogs were raised. The wool was manufactured into cloth and the corn in excess of that necessary for home consumption was manufactured into whisky. Later, with an influx of settlers, the agriculture was broadened. The individual plantation of the western settlers of the county comprised a larger acreage than those of the eastern settlers, thereby giving those settlers a better opportunity to diversify their crops. The large open "prairies" or glades in the western part of the county were covered with a luxuriant growth of grasses which afforded excellent and extensive pastures for cattle and sheep. These were driven in large droves to Columbia and Fayetteville and sold.

Until a few years before the Civil War the growing of corn, small grains, and various home supplies continued to increase with the influx of new settlers. Practically no cotton was produced in the eastern half of the county prior to the war, but a considerable acreage was devoted to that crop throughout the western part of the county. The growing of cotton, however, lessened the surplus product of the corn and grains, and in some instances it was necessary to import some of these articles into the cotton belt. The live-stock interests declined as cotton assumed more importance.

According to the census for 1860 Cabarrus County produced about 124,000 bushels of wheat, 368,000 bushels of corn, 33,000 bushels of oats, about 5,000 bales of cotton, about 5,000 tons of hay, and 6,000 bushels of peas, together with a large quantity of sweet and Irish potatoes, some rye, and a large number of live stock. Until 1880 there was practically no change in the production of corn, while the quantity of oats grown was almost double that of 1860, and the amount of cotton had increased to 7,500 bales. The quantity of wheat produced decreased considerably, as only 84,000 bushels were reported in 1880.

Following the war many of the large plantations were divided or small tracts sold off and consequently the size of individual holdings of land had greatly diminished. This tendency continued until 1900, when the average size farm in Cabarrus County was about 102 acres. By 1900 the amount of cotton produced in the county had increased to 8,000 bales and wheat to 127,000 bushels, but the production of corn had diminished to 284,000 bushels. The quantity of oats produced remained practically the same as in 1880. During the period from 1890 to 1900 agriculture was being carried on upon a more scientific basis and a much greater variety of products were grown. A small acreage was devoted to the production of clover, millet, tame grasses, and forage crops, while the value of vegetable and orchard products greatly increased.

At the present time cotton is the important money crop. Too much attention is being paid to its production in proportion to the other crops grown. While it is well to grow this money crop, the present production could well be secured from a smaller acreage, thereby giving a larger acreage to other crops, providing an opportunity for greater diversification and promoting more scientific methods of soil management.

Corn ranks next in importance to cotton and is grown in all parts of the county on practically every soil type. More wheat is produced now than formerly and its production is on the increase. Oats and rye are grown to much smaller extent than wheat. Until recently cowpeas were grown only to a limited extent, but now quite a large acreage is devoted to this crop. A small acreage of soy beans and crimson clover were reported. Sorghum cane is grown in small patches on nearly every farm, to be used in the manufacture of sirup for home use. Tobacco is also grown in small patches on a number of the farms to supply home demands. Irish potatoes, sweet potatoes, and cabbage, together with a large variety of other garden vegetables, are grown in all parts of the county. A considerable number of goats, sheep, hogs, and some cattle are raised. Of the fruits apples are grown to the largest extent, while peaches, pears, cherries, damsons, figs, and a few grapes are also produced for home use and the local markets.

By far the greater number of farmers in the county do not pay sufficient attention to the adaptation of the various soil types to certain crops. It has been generally recognized that the bottom soils are best suited to the production of corn and grasses and that the sandy loams and lighter areas of clay loams, particularly of the Cecil series, give the more profitable yields of cotton.

The "red lands" (Mecklenburg and heavy types of Cecil), "black-jack lands" (Iredell), and certain areas of the "slate lands" (Alamance and Georgeville), are admirably adapted to the production of

wheat, corn, and oats, as well as clover, cowpeas, and soy beans. The lighter areas of the sandy loams and the slate soils give the best returns from apples, peaches, pears, damsons, grapes, and other fruits grown in the county.

In general practically no regular crop rotation is practiced. A few farmers follow definitely planned cropping systems which could be profitably applied to most of the soils throughout the county where general farming is the rule. A good rotation in present use is: First year, cotton; second year, corn, sowing cowpeas at last plowing; and third year, wheat, oats, or other small grain, sowing cowpeas on the grain stubble. By this method cotton, a clean-cultivated crop, follows a nitrogen-gathering crop. The soil should show improvement from year to year with such treatment. In those sections where cotton is not grown to any extent it would be well to rotate corn with grains and grasses and not to plant the same land to any one crop for more than one or two years at a time. Of course an exception to this method would be the bottom-land soils, which are naturally productive and upon which corn and grasses can be produced for a long time without causing much soil deterioration, as compared with the lighter upland soils.

There has been no marked change in the methods of preparing the land or in cultivating the crops from those of earlier years. The one-horse plow, hand hoes, and ordinary spike-tooth harrows are the ordinary implements used. Nevertheless a gradual change is taking place, and more modern methods are gaining ground with the better class of farmers. In many instances disk plows, two-horse turn plows, and sulky plows are supplanting the less efficient type, and large drag harrows, wheat drills, sulky cultivators, binders, mowing machines, and hay tedders are being used more and more. This modern machinery enables the farmers to plow deeper, to prepare the soil more thoroughly, and to cultivate the growing crops more easily and cheaply. Its use also results in much larger yields.

Practically all crops are fertilized to a greater or less extent. The consumption of commercial fertilizers is gradually increasing. A majority of the farmers buy the "complete" mixtures, chiefly brands of 8-2-2 or 8-3-3 formulas. Fertilizers are applied to crops regardless of kind and of type of soil upon which they are to be produced. Some of the farmers buy cottonseed meal, acid phosphate, and kainit and mix them at home. It is a well-established fact that the more humus the soil contains the larger the quantity of fertilizer that can be profitably used. Applications of lime unquestionably would benefit the clayey and silty soils, especially where these tend to assume a compact structure. An acreage application of something like 1 ton of burnt lime following the turning under of a green¹ or partially

¹ See Farmers' Bulletins Nos. 77 and 278, U. S. Dept. of Agr.

matured crop, as cowpeas or rye, would certainly benefit the heavy upland soils.

As a general rule there is a comparatively small amount of labor employed upon the farms in Cabarrus County. More labor is used in the western half of the county on the larger plantations than elsewhere. Farm labor consists largely of negroes, who receive, when hired by the month, about \$15 with board. Day laborers are paid from 75 cents to \$1.25 a day, the higher wage ruling during the busy seasons, and on farms near the larger towns.

Throughout the eastern half of the county, particularly in the slate belt and also in many parts of the western half of the county, the farms are operated directly by the owners, while many of the larger farms are looked after by managers. Some farms are leased for cash rent or a definite quantity of cotton, or it may be on a share basis. On a share basis the landlord furnishes the land, stock, feed for stock, implements, and one-half the fertilizer and receives one-half the crops. Where the tenant furnishes stock and fertilizers the landowner receives only one-third the products.

The farms vary in size for different parts of the county, the largest ones being confined principally to the western part. Some of the larger estates contain from 300 to 900 acres and a few contain even greater acreages, the largest about 1,800 acres. The greater number of farms, however, range in size from 20 to 100 acres, the average being about 100 acres.

The land values of the county vary with nearness of railway facilities and local markets. The best farming lands within a radius of 5 miles of Concord and near Harrisburg and Kannapolis are valued at about \$60 an acre, while the same lands at greater distances from the markets, particularly in the northwest and southwest parts of the county, sell for \$20 to \$50 an acre. The lands throughout the slate belt in the eastern half of the county range in value from \$8 to \$15 an acre, the greater proportion being nearer the higher price.

In handling the soil problems of Cabarrus County one of the essential needs is the draining and reclaiming of the large areas of bottom land lying along the river and larger creeks. Although these areas in their present condition are practically worthless, except for pasture and some hay, they could be made productive through drainage, which could be accomplished by dredging and straightening the stream courses and cutting lateral ditches leading into these natural drainage ways. The soils of the stream bottoms if reclaimed would produce large yields of corn, oats, and sorghum.

In many sections of the county the slopes and hillsides have become gullied and eroded, but with the exception of a few of the steeper and more severely eroded hillsides, practically all of Cabarrus County could be farmed, and even these now abandoned rough spots could

either be reforested or shaped up and used for pasture lands. Some terracing of the hillsides is now practiced to prevent washing. This may be necessary on the steeper slopes, but existing terraces could often be eliminated by deeper plowing and by seeding the land to winter cover crops, such as crimson clover, vetch, or even rye, thus returning to profitable cultivation areas now lying idle.

There is nothing that will give the farmers larger returns for the labor expended than would deeper plowing and a more thorough preparation of the seed bed on the heavy types of soil. Deep plowing in the fall will aid the proper tillage of these soils, the desirable tilth being more easily secured after the frosts have acted upon the rough furrow slices. Fall plowing, however, leaving the soil unoccupied, can only be recommended upon lands that are not subject to erosion. These stiff, intractable soils need to be loosened up and aerated in order to give the plant roots a larger feeding zone. Such manipulation allows more of the rainfall to be absorbed, thus insuring a better supply of moisture during dry seasons and giving better drainage in wet seasons.

Throughout Cabarrus County there are large areas of soil, particularly the light sandy loams and silt loams, which are decidedly deficient in humus. This important element may be supplied by the growing of cowpeas, crimson clover, and vetch, or by applying barnyard manure. The addition of these organic materials tends to make the light soil more loamy in character and greatly increases their power to retain water, while it loosens up the compact, heavy, clayey and silty soils, permitting more complete aeration and easier tillage.

More systematic rotation, growing a greater diversity of crops, should be practiced by a majority of the farmers, especially those who now depend mainly on cotton. While all of the necessary products are grown to some extent for home use, considerable quantities of corn, hay, flour, and meat are shipped into the county. All of these products could be produced on the farms, and Cabarrus County could easily be made an exporting rather than an importing county.

Another important means toward obtaining large yields is the securing of good stands of plants. In order to accomplish this, much attention is necessary to the selection of seed. It is a waste of time and money to cultivate a field with only a partial stand. On some of the soils, particularly the heavy clays and in the slate belt, cotton sometimes fails to mature before the early frosts. It should be the endeavor of every farmer in selecting his seed to secure for such soils an early maturing variety. Varieties suited to the clay soils will not give the best yields on the lighter sandy soils, and vice versa.

The North Carolina Department of Agriculture at Raleigh is now working out varieties of seed adapted to the various soil types and also the fertilizer requirements for these different soils. Anyone can

secure valuable information along this line upon application to that department.

SOILS.

Cabarrus County lies wholly in the Piedmont Plateau and the upland soils have all been formed through the weathering of the varied rock formations occurring within its limits. The rocks of many of these formations are so unlike in their physical and chemical composition that the products resulting from their disintegration and decay are varied in character and give rise to considerable differences in the resultant soils.

Lying to the west of the slate belt, which occupies a strip along the eastern boundary of the county, granites and intrusive rocks, such as diorite and diabase, constitute the predominant formations. Two distinct series of soils have been derived from the granites. The Cecil series, which is characterized by gray to red surface soils and brittle red clay subsoils, have been formed largely through the weathering of fine to coarse-grained granites, carrying in addition to feldspars and quartz a relatively high percentage of iron-bearing minerals, chiefly mica and hornblende, while the Durham series, which includes types with gray surface soils and yellow friable sandy clay subsoils, is derived from granites of a more siliceous character and usually lower in iron-bearing minerals.

Differences in the textures of granites and in the completeness and depth of weathering have resulted in the formation of soils differing in texture. Further differences have been brought about through erosion, which has especially influenced the depth of sandy material overlying the clay subsoils. For example, a number of areas occurring along slopes have had the surface mantle of sandy material removed by surface wash, accentuated by injudicious cultivation, in such a way as to expose the subsoil and to give rise to patches of clay or clay loam. However, much of the area of the heavier soils, such as the clay and clay loam, probably has never had a surface covering of sandy material and represents the products of the more complete weathering of the finer-grained rocks. On the other hand, it would appear that some areas of the sandy loams represent former areas of heavier materials, from the surface portions of which the finer grades of clay and silt have been washed out, the coarser sand grains having withstood the transporting power of water. Again, the coarse sandy loams are soils which have been formed either through the weathering of granites carrying coarse resistant grains of quartz or from materials in which incomplete weathering has left fragments of the parent rock. Other local variations in the granite soils have resulted from the breaking down of quartz veins and dikes of intrusive rocks which have cut through the formation. Some areas carry so many fragments of quartz scattered over

the surface and throughout the soil mass as to be difficult to cultivate. In places stiff plastic clays from the intrusive dike rocks present conspicuous local variations of the soil material.

The Cecil series includes a clay loam, a sandy loam, clay, coarse sandy loam, fine sandy loam, and loam, and the Durham series a sandy loam and a coarse sandy loam, named in order of relative extent.

In the southwestern part of the county there is an extensive belt occupied by soils of the Mecklenburg series, which has resulted from the decay of dark-colored, fine-grained intrusive rocks, principally diorites. These soils are characterized by the reddish-brown to dark-red color of the surface soils and the yellowish-brown to ochereous color and sticky plastic nature of their subsoils. Another distinguishing feature here is seen in the comparatively shallow depth of weathering, the parent rock usually being encountered from 18 to 24 inches below the surface. The clay loam and sandy loam are the only soils of this series occurring in the county.

Soils somewhat related to the Mecklenburg, especially in character of the subsoil material and in origin, have been included in the Iredell series. These occur throughout the county and are derived mainly from diorite occurring in dikes and formed by the intrusion of molten material through the older rock formations. This series is characterized by brownish-gray to nearly black color of the surface soils, and the dingy brown to yellowish-brown or ochereous color, extreme plasticity, and adhesiveness of the subsoils.

Distributed rather generally over the county are considerable areas of the Iredell soils, a series derived from rocks similar in origin and structural characteristics to that giving the Mecklenburg soils but differing widely in color. Small dark-colored iron concretions are abundant on the surface and throughout the soil mass of the Iredell types. These probably form as a result of rather poor underdrainage, due to the impervious nature of the subsoil. As with the Mecklenburg soils, partially decomposed parent rock is encountered at a depth of less than 3 feet. The loam and fine sandy loam are the only types that could be given recognition on the map, the small areas of clay and clay loam being too small to show on a map of the scale used.

In the slate belt already referred to there are two important series of soils differentiated chiefly on the basis of color variation in the soil and subsoil, which probably has been caused by some difference in the composition of the parent slate rock. The Alamance soils have light-gray to nearly white compact surface soils and yellow, compact, brittle subsoils. The parent rocks consist mainly of dense fine-grained blue to grayish slates,¹ which differ essentially from the slaty or

¹ See Bulletin 21, North Carolina Geological and Economic Survey.

schistose rocks, mainly micaceous and sericitic schists, of the other portions of the Piedmont Plateau, giving rise to the inferior agricultural soils of the Louisa and York series, in the compact structure and low content of mica and talcose material. Texturally the soils of the Alamance series are decidedly silty, having in the most important member, the silt loam, a peculiar floury feel. These slate soils differ also from the Louisa and York soils in that their subsoils do not have the characteristic greasy or micaceous feel of the Louisa and York.

The slates giving rise to the Alamance soils are extensively developed throughout the adjoining county of Stanly and the other neighboring counties of Rowan, Randolph, Montgomery, Union, and Anson. Owing to the abundance of the compact slates in these counties, the general region has been called the "Carolina Slate Belt."

Type differentiation of the Alamance series as developed in Cabarrus County is based primarily upon the completeness of weathering of the parent rock. The silt loam is the most important type. This has been divided into two phases, one of which has a depth of soil material averaging 30 inches or more, while in the other the undecomposed or partially decomposed rock is encountered at from 10 inches to 2 feet. Another type, the slate loam, is characterized by the abundance of rock fragment in the soil and the shallow depth to bed rock.

A soil differing from the Alamance soils in the red color of the surface soil and the prevailing higher content of clay is developed in the slate belt. This type is probably derived from a slate carrying a higher content of iron than the Alamance soils. Weathering in this type, the Georgeville silt loam, has taken place to an average depth of 3 feet or more, and it is recognized as having a higher agricultural value than the lighter colored Alamance soils.

Along most of the streams throughout the county occur strips of alluvial soils representing materials washed from the uplands and deposited by overflow water upon the flood plains of the streams. Predominantly the material is reddish brown to chocolate red in color, mellow to only slightly plastic in structure, and quite uniform in physical characteristics to a depth of 2 or 3 feet. This bottom land is subject to frequent overflow and consequently is being added to by successive deposition of material washed down from the uplands. While there are minor variations in the soil, the uniformity is so marked that only one type has been recognized. This has been given the name of Congaree silty clay loam. The Congaree series includes most of the first-bottom lands along the streams of the southern Piedmont Plateau.

In the bottoms of many of the smaller streams there is such variation in the character of the alluvial material as would naturally result

from the usual torrential flow of flood water in these rapidly descending streams and from the deposition or overwash of material from contiguous slopes. Owing to these conditions it was found impracticable to separate the areas into distinct soil types. Bottoms of this kind have been classified as Meadow. They are subject to frequent inundations and the drainage is in most instances less efficient than in case of the Congaree silty clay loam.

The several series of soils outlined above differ from one another not only in physical characteristics, but as well in agricultural value, crop adaptation, susceptibility to improvement, requisite cultural methods for various crops, and usually in the manurial requirements of the corresponding types. These differences are brought out under the type descriptions of subsequent chapters.

The following classification shows the soils of the county grouped according to origin and important physical differences:

Soils derived in place from weathered products of underlying rocks.	{	Mainly from fine to coarse grained granite and gneiss. Gray to red soils, red clay subsoils.	}	Cecil coarse sandy loam.
				Cecil sandy loam.
				Cecil fine sandy loam.
				Cecil loam.
				Cecil clay loam.
		Cecil clay.		
		Mainly from light-colored highly siliceous granite. Gray soils, yellow sandy clay subsoils.		Durham coarse sandy loam.
				Durham sandy loam.
		Mainly from intrusive rocks, as diorite. Reddish soils, yellowish plastic clay subsoils.		Mecklenburg sandy loam.
				Mecklenburg clay loam.
		Mainly from intrusive rocks, as diorite. Dark-brown soils, yellowish waxy clay subsoils.		Iredell fine sandy loam.
				Iredell loam.
		Mainly from fine-grained bluish slate.	{	Gray soils, yellow silty clay subsoils.
				Alamance silt loam.
				Alamance silt loam (shallow phase).
				Alamance slate loam.
		Gray to red soils, red clay subsoils.		Georgeville silt loam.
		Soil washed from uplands and deposited in stream bottoms. Alluvial material subject to overflow.		Congaree silty clay loam.
		Soil washed from uplands and deposited in stream bottoms. Varied textural material undifferentiated. Subject to overflow.		Meadow.

The following table gives the actual and relative extent of the several soils. Their distribution is shown by means of colors on the accompanying map:

Areas of different soils.

Soil.	Acres.	Per cent.	Soil.	Acres.	Per cent.
Cecil clay loam.....	53,632	22.8	Congaree silty clay loam.....	7,360	3.1
Alamance silt loam.....	21,248	13.6	Cecil fine sandy loam.....	7,040	3.0
Shallow phase.....	10,752		Mecklenburg sandy loam.....	6,464	2.7
Cecil sandy loam.....	23,168	9.8	Alamance slate loam.....	5,824	2.5
Iredell loam.....	22,528	9.6	Durham sandy loam.....	5,760	2.4
Georgeville silt loam.....	15,296	6.5	Meadow.....	4,736	2.0
Iredell fine sandy loam.....	13,312	5.7	Durham coarse sandy loam...	3,200	1.4
Cecil clay.....	13,056	5.5	Cecil loam.....	960	.4
Mecklenburg clay loam.....	10,944	4.7			
Cecil coarse sandy loam.....	10,240	4.3	Total.....	235,520	.....

CECIL CLAY LOAM.

The surface soil of the typical Cecil clay loam is a brown to reddish-brown heavy loam to clay loam, ranging in depth from 6 to 10 inches. In the vicinity of Rimer and to the west of Concord the soil is a heavy brown loam, while to the south of Concord the soil is a heavy sandy loam to a depth of from 3 to 5 inches. The latter description applies also to large areas of this type in the north-western part of the county and south along Rocky River, but in all cases where the sandy phase occurs the depth of the surface soil does not extend to a greater depth than 6 inches. On many of the knolls and slopes are very small areas or spots where erosion has removed the surface mantle, leaving exposed spots of typical Cecil clay. Such areas, locally called "gall spots," were of such small extent that they could not be separated. In some areas of this type were found numerous quartz fragments, but not in quantities great enough to interfere with cultivation.

The subsoil to a depth of 36 inches and more consists of a stiff bright red clay, mottled in some localities by yellow iron stains at a depth of 24 inches. As a rule there is a marked difference in the mica content of the Cecil soils to the east and west of Concord. All those areas lying to the west were found to contain large quantities of mica flakes, while those areas to the east contain only a few flakes or none at all.

The Cecil clay loam is one of the most important and extensive soils for general farming purposes in the county. It extends in irregular areas, frequently broken by areas of Iredell and Durham soils, stretching from northeast to southwest across the central part of the county. It is also one of the more important soils in the north-western part of the county. It is well developed to the north of

Harrisburg around Bosts Mills, Sunnyside, Pioneer Mills, Rimer, and to the east and south of Concord. Isolated areas occur along Crozier Branch, McKee Creek, and to the south and east of Mount Pleasant.

The topography of this type varies from nearly level or undulating to rolling and broken, the more level areas occurring in the vicinity of Rimer, Five Pines, and Barrier School. The more rolling and broken areas are found usually along Cold Water, Dutch Buffalo, and Irish Buffalo Creeks and Rocky River. In many instances the smaller branches and tributaries of the larger creeks have deeply gullied the hillsides and given those areas a rather rugged and badly broken surface. This is especially true of the areas between Phoenix Mine and Bosts Mills. Much of this soil, however, lies beautifully for farming purposes, as interstream areas, in the northern part of the county. In forested areas along many of the streams erosion has been greatly checked, as can easily be seen from those areas recently deforested. This type, owing to its topographic features, possesses good natural drainage, the run-off being excessive on the more rolling and hilly areas.

The Cecil clay loam has been derived in the main from granites and gneisses and to a less extent from schists and other igneous rocks. Weathering in the case of these rocks, as with those giving the Cecil clay, has extended to a depth of several feet.

The original forest growth consisted principally of white, red, post, and some chestnut oak, hickory, dogwood, persimmon, and cedar. Among the pines were found pitch pine, loblolly, and forest pine. The pines as a rule occupy the higher ridges throughout the areas of this type.

The crops grown are those common to the other types of this region. Yields of cotton, corn, wheat, and oats as a rule are somewhat better than on the lighter soils. Cotton yields from one-fourth bale to 1 bale per acre, with an average of one-half bale; corn from 15 to 50 bushels, with an average of about 25 bushels per acre; wheat 15 to 25 bushels; and oats from 20 to 30 bushels per acre. Good yields of clover and grasses are secured. This soil is best adapted to the production of wheat, oats, corn, clover, and grasses on the heavier areas. Cotton will do well on the lighter areas, giving a staple of good length and strength. Like the Cecil clay this type can be greatly benefited by the growing and turning under of green crops, such as crimson clover, vetch, cowpeas, and soy beans. Where this practice is followed the productiveness of the fields can be maintained without the use of so much commercial fertilizer, and the average yields materially increased. An application of something like 1 ton of burnt lime or 2 tons of ground limestone per acre would improve the physical condition of the type, especially following the turning under of green manuring crops.

This soil is one of the most valuable soils of the county and brings good prices, except in rare instances where the surface is badly gullied. The average ruling price for this land is about \$40 an acre, the price varying with the proximity to railway facilities and local markets.

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

Mechanical analyses of Cecil clay loam.

Number.	Description.	Fine gravel.	Coarse sand.	Medium sand.	Fine sand.	Very fine sand.	Silt.	Clay.
		<i>Per cent.</i>	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.
24364, 24366.....	Soil.....	1.7	5.2	6.0	16.1	21.3	27.0	22.7
24365, 24367.....	Subsoil.....	.9	2.1	2.3	5.3	8.5	32.2	49.0

CECIL CLAY.

The surface soil of the Cecil clay varies from a reddish-brown to red heavy loam to clay loam or clay, with a depth of 5 or 6 inches. In rare instances small areas of a heavy sandy loam were mapped with this type, but the lighter material is only a thin veneer over the clay. There are a few bodies where gravel and quartz fragments are scattered over the surface. The subsoil in practically all cases consists of a heavy, stiff, bright-red clay, but it is occasionally mottled with streaks of yellow, the result probably of imperfect oxidation of the iron-bearing minerals in the parent rock.

The Cecil clay occurs in irregular areas along many of the streams and in spots scattered throughout the greater part of the county. The largest bodies lie in the southwestern part of the county south of Pioneer Mills along Clear Creek, while other large bodies were mapped just north and east of Mount Pleasant along Irish Buffalo Creek.

The surface of Cecil clay areas varies from rolling to hilly and rugged or broken, the last along the larger streams of the county. As a rule the rougher topography is due to excessive erosion. As a whole the natural drainage is good.

Cecil clay is a residual soil, formed in place by the processes of decomposition and disintegration of gneiss, fine-grained granite, and to less extent schist. These rocks have disintegrated in practically all instances to greater depths than the other rocks found in the Piedmont Plateau region.

A large area of Cecil clay is covered with an original growth of hardwoods and pines, the principal species of the former being white, red, and post oak, some hickory, sweet gum, dogwood, and poplar, and of the latter loblolly and forest. The largest forested areas are found along Clear Creek and north of Mount Pleasant.

Throughout the county the Cecil clay is recognized as one of the soils most susceptible to agricultural improvement and one of the strongest types for the production of general farm crops. It is especially adapted in well-drained areas to clover, wheat, oats, corn, cowpeas, rye, and grasses. Wheat is claimed to give a maximum yield of 40 bushels an acre in favorable years, but an average of about 15 bushels. Oats give from 15 to 35 bushels an acre and corn from 35 to 50 bushels on the best farms, but it rarely exceeds 15 to 25 bushels. Cotton yields from one-third bale to 1 bale an acre, with an average of about one-half bale. On the local market, in which all the cotton grown in the county is marketed, the red-land cotton will not bring the best prices on account of the stain sometimes present. Clover and cowpeas do well and should be grown more extensively.

The most essential need of this soil is more thorough preparation, deeper plowing and cultivation, rotation of crops, and the incorporation of organic matter. An application of about 1 ton of burnt lime will greatly improve the structure, cause the soil to be open and susceptible to aeration, correct the acidity, particularly when a large amount of green organic matter has been turned under, and thereby provide a more sanitary condition in the soil for the spring crops. Smaller applications can be made if desired, say 500 to 1,000 pounds an acre in the fall and subsequently the following year. Probably 1 ton to 1½ tons per acre would be sufficient for a period of 8 or 10 years. The desirability of growing cowpeas and seeding the hillsides to grasses for pasturage purposes can not be emphasized too strongly, especially on the more eroded areas along the streams.

The price of this land varies from \$35 to \$50 an acre, and it can not be bought for \$50 when in a high state of cultivation.

The following table gives the results of mechanical analyses of the soil and subsoil of the Cecil clay:

Mechanical analyses of Cecil clay.

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.	<i>Per cent.</i>
24368.....	Soil.....	0.5	2.8	6.4	16.5	13.3	26.0	33.8
24369.....	Subsoil.....	.2	1.0	1.9	4.2	5.1	36.8	50.8

CECIL COARSE SANDY LOAM.

The soil of the Cecil coarse sandy loam to a depth of about 8 to 12 inches consists of a light-gray to reddish-brown coarse sandy loam containing a considerable amount of small angular quartz fragments.

The soil is loose in structure and is easily cultivated, yet there is present enough silt and clay to impart a decided loaminess. The line of demarcation between the soil and subsoil is not always sharp. The soil grades into a red sandy clay, which at a depth of about 20 to 24 inches passes into the typical red clay subsoil of the Cecil series. Some areas included with the type approach closely a gravelly loam in texture, and are mainly deeper in the surface soil than are the typical areas. In places the subsoil has a yellowish cast or yellowish-red color, but usually the color is a decided brick red. This red clay, so common to the soils of the Piedmont Plateau, is very deep, weathering having proceeded to greater depth than in the case of the other soil series of the county. However, in some localities outcrops of the parent granite occur.

The Cecil coarse sandy loam is developed mainly in and around Kannapolis, around Gillwood Church in the northwest corner of the county, near Bogers Chapel, and east of Center Church. Small areas occur in other parts of the county.

The larger bodies of this type occupy ridges with gently rolling to rolling topography, and consequently possess good surface drainage.

The soil is derived from the disintegration of a coarse-grained porphyritic granite, in which microscopic feldspar is conspicuous.

The greater part of the type is under cultivation, and the remaining area is forested with white oak, red oak, post oak, pine, some persimmon, dogwood, and hickory. The proportions of hardwood and pine are about equal.

The Cecil coarse sandy loam is well adapted to many farm crops, being especially well suited to sweet potatoes and other vegetables and to fruits. At present the principal crops are cotton, corn, wheat, oats, and, although the soil is not especially adapted to them, fair yields are secured. Corn yields from 10 to 15 bushels; cotton, one-third bale; wheat, 5 to 10 bushels; and oats from 15 to 20 bushels per acre. Tobacco has been grown on this soil with success, although the crop has no important place in the agriculture of the county. The close similarity in texture to the Durham coarse sandy loam, which in other parts of the State is extensively used for bright tobacco, would indicate that the Cecil coarse sandy loam could be successfully used for this crop.

Fertilizers analyzing 10-4-5 have been found to give good average results with wheat and oats. For corn an application of 200 pounds per acre of a mixture of acid phosphate and kainit in the proportion of three to one has proven profitable.

The value of this type is about \$20 an acre. Near Kannapolis the prices asked range higher, \$40 to \$60 an acre, on account of the proximity of the railroad.

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

Mechanical analyses of Cecil coarse sandy loam.

Number.	Description.	Fine gravel.	Coarse sand.	Medium sand.	Fine sand.	Very fine sand.	Silt.	Clay.
		Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	<i>Per cent.</i>
24352.....	Soil.....	15.9	23.2	11.0	18.4	4.0	21.9	5.6
24353.....	Subsoil.....	3.8	9.6	6.0	8.4	2.4	25.0	44.8

The following sample contained more than one-half of 1 per cent calcium carbonate (CaCO_3): No. 24353, 1.22 per cent.

CECIL SANDY LOAM.

The surface soil of the Cecil sandy loam is a gray to yellowish-gray or light-brown medium sandy loam, 5 to 10 inches deep. In the vicinity of Shiloh and Gillwood Churches, in the northwestern parts of the county, the soil in spots is rather coarse in texture and shallow in depth. In this vicinity also occur small areas of Cecil clay loam, which could not be represented on account of their slight extent. Wherever this type adjoins the Iredell fine sandy loam, as is the case along Mill and Irish Buffalo Creeks, there is usually a more or less intermingling of the two soils, causing considerable difficulty in establishing satisfactory boundaries. There are spots also where the surface soil has been washed off, exposing the red clay subsoil. Quartz fragments are conspicuous on the surface of an occasional patch. The soil is rather loose in structure and is easily cultivated under proper moisture conditions.

The subsoil, to a depth of 36 inches and more, is a stiff, bright red clay, hard when dry and sticky when wet. In some areas in the western part of the county mica flakes are frequently seen in the subsoil, and occasionally the color is slightly mottled with yellow and gray. Especially is this mottling noticeable to the east of Concord and north of the Mount Pleasant road along Cold Water Creek.

The Cecil sandy loam is one of the most extensive sandy soils suitable for general farming in Cabarrus County. The largest areas are found to the east and north of Concord, to the west of Concord, and south of Rocky River, in the vicinity of Bogers Chapel and Flows Store.

The general surface features vary from undulating to rolling and broken. The more level and undulating areas occur in strips along the interstream ridges in the northern part of the county, and as the streams are approached become badly broken and gullied. The interstream areas and those in the vicinity of Cold Springs Church

lie admirably for farming purposes. On the deforested areas erosive agencies have in numerous places gullied the land to such an extent as to cause its value to be greatly depreciated. As a whole, however, this soil possesses good natural drainage.

The Cecil sandy loam is derived from medium-grained gneisses and granites with some schists and other igneous rocks through the agencies of weathering common to a humid climate. As a rule weathering has proceeded to great depths, as could be seen from numerous sections along the roads. Occurring in these rocks are numerous mica flakes which have resisted weathering, and are now found throughout large areas of the resultant soil.

The native vegetation upon this soil consists principally of hardwoods, white, red, post, and black-jack oaks, with some dogwood, sourwood, persimmon, sweet gum, poplar, and ash. Considerable pine is also found on the areas northeast of Concord in a second growth of old-field pine.

On account of the ease with which the Cecil sandy loam is cultivated and its adaptation to a wide range of general farm crops, it is considered one of the best soils in the county. The lighter phase especially is well suited to the production of a clean, long-staple cotton. The heavier areas are well adapted to corn, oats, clover, cowpeas, and the various farm grasses. Wheat as a rule does not do well, except on the very heaviest areas. Corn under the prevailing methods of culture gives an average yield of about 15 to 20 bushels per acre; on carefully cultivated areas in favorable seasons as much as 75 bushels per acre is frequently secured. Wheat ordinarily yields from 5 to 15 bushels, with an average of about 8 or 10 bushels; and oats from 20 to 35 bushels per acre. Clover, soy beans, and cowpeas thrive. Peaches, plums, and certain varieties of apples, blackberries, raspberries, and dewberries, and Irish and sweet potatoes give very good returns.

The plowing should be gradually deepened from year to year, and more organic matter added by turning under crops like crimson clover, cowpeas, and rye. The ordinary grades of mixed fertilizers are used to a large extent on this soil, though some farmers mix the common ingredients, as acid phosphate, cottonseed meal, and kainit, making varied mixtures to suit the needs of the soil and crops as determined by experience. For the general farm crops, especially corn, the following mixture has been found to give excellent results: One sack nitrate of soda, with equal parts of kainit and cottonseed meal, making 1,000 pounds. By fertilizing corn with moderate applications of such a mixture when about waist-high and again at the time of tasseling, yields of from 50 to 75 bushels an acre have been obtained on this soil.

Along many of the streams cattle raising can be made a profitable industry by seeding the land to grasses, such as Bermuda or redtop, and using it for pastures.

The areas of Cecil sandy loam in the vicinity of Concord are not for sale in many instances, and those areas that can be purchased are held at from \$100 to \$200 an acre. Other areas farther away, occupying fairly level or gently rolling topography, command from \$35 to \$50, and the more broken and eroded areas from \$20 to \$25 an acre.

The following table gives the average results of mechanical analyses of the soil and subsoil of the Cecil sandy loam:

Mechanical analyses of Cecil 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.	<i>Per cent.</i>
24358, 24360.....	Soil.....	7.0	20.1	16.9	22.3	7.4	21.5	5.4
24359, 24361.....	Subsoil.....	2.6	9.9	7.1	9.7	4.7	33.8	32.1

The following sample contained more than one-half of 1 per cent calcium carbonate (CaCO_3): No. 24359, 1.04 per cent.

CECIL FINE SANDY LOAM.

The soil of the Cecil fine sandy loam to a depth of about 5 to 10 inches consists of a light-gray to reddish-brown fine sandy loam, containing relatively large proportions of fine sand and silt. A few restricted areas are quite red in color, owing principally to an admixture of the red clay subsoil. Such areas contain numerous rock fragments in the surface soil.

The subsoil passes gradually from a reddish-brown sandy clay to a stiff bright-red clay at a depth of about 20 inches. Occasionally slight yellow mottling is noticed in the subsoil below 24 inches. The underlying rock is barely encountered within the 3-foot section, except on the badly eroded ridges. Mica flakes are not infrequently seen in the subsoil.

The largest areas of this soil occur in the northern part of the county in the vicinity of Heilmans Mill, Barrier School, south of Harrisburg, and in the vicinity of Poplar Tent Church. Smaller areas occur in the vicinity of Pioneer Mills, Carrikers Store, and scattered throughout the greater part of the county.

The surface features of the type, on account of its wide and scattered occurrence, represent broadly the varied topography of the county, ranging from practically level to rolling and hilly to broken along the stream courses. Except in a few places to the north and east of Heilmans Mill the natural drainage is good.

The Cecil fine sandy loam is derived chiefly from medium to fine-grained granite and gneiss. Some schists and other igneous rocks enter into the composition of the soil in places.

About one-half of the area of this type is either in original or second-growth forest. Of the hardwoods, white, red, and chestnut oak, hickory, and dogwood are the most common.

The Cecil fine sandy loam will produce fair yields of corn, cotton, wheat, and oats, and on the lighter areas is well suited to the production of vegetables. Corn yields on an average from 15 to 18 bushels and cotton about one-half bale per acre. Fair yields of wheat and oats are obtained on the heavier areas.

It has been found by a number of farmers throughout the county living upon this soil type that the best results from fertilization can be obtained by using a mixture proportioned as follows: Acid phosphate 1,000 pounds, kainit 400 pounds, and cottonseed meal 600 pounds. With an application of 500 to 800 pounds an acre of this mixture yields of cotton and corn have been known to be increased one-fourth to one-third. This land can be bought for \$18 to \$30 an acre.

The following table gives average results of mechanical analyses of the soil and subsoil of Cecil fine sandy loam:

Mechanical analyses of Cecil 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.	<i>Per cent.</i>
24354, 24356.....	Soil.....	1.8	7.4	11.0	25.3	17.4	29.8	7.3
24355, 24357.....	Subsoil.....	2.1	4.9	6.3	12.5	7.1	31.5	35.6

CECIL LOAM.

The surface soil of the Cecil loam to a depth of about 5 to 10 inches consists of a gray, light-textured loam in cultivated areas to a darker colored soil in the wooded areas. On the surface occur numerous bowlders of a rather coarse grained rock, and smaller fragments of the partially disintegrated rock are scattered over the surface and disseminated throughout the surface soil.

The subsoil consists of a rather stiff, bright-red, brittle clay, passing usually into the partially decomposed rock at from 18 to 24 inches. Except in cases where the underlying parent rock comes within a few inches of the surface, and in the immediate vicinity of outcrops, the soil is easily tilled.

Only three areas of the Cecil loam are found in the county. These lie to the west and south of Concord, along what is known as "Rock Ridge." White Hall and the Jackson Training School are also located upon this soil.

This type occupies the level upland along the ridges, becoming more rolling near the boundary of other soils. Its undulating to gently rolling topography, coupled with its open structure, insures good natural drainage—in fact the drainage is rather excessive and crops are liable to suffer from lack of moisture in dry seasons.

Numerous outcrops show the soil to be derived from a coarse grained pinkish granite, carrying a large percentage of feldspar. The rock is rich in potassic minerals.

The forest growth consists principally of hardwoods—white, red, chestnut, and black-jack oaks, an occasional dogwood, persimmon, and sweet gum. Considerable forests of loblolly pine are also found. Cotton and corn are the chief crops. Wheat and oats give only moderate yields. Corn in favorable years yields from 15 to 25 bushels, with an average of about 12 bushels per acre. Cotton is more satisfactory than the other crops, especially on the deeper areas, the average being about one-half bale per acre. In favorable years, under good cultivation, as much as 1 bale per acre is secured.

About 400 pounds per acre of an 8-3-3 or an 8-2-2 commercial fertilizer is applied to this soil for cotton and corn. Vegetables, such as cabbage, cucumbers, Irish potatoes, and lima beans, do well with a liberal addition of well-rotted stable manure and fertilizers rich in nitrogen and potash.

On account of the open structure of the soil much improvement results from the turning under of rye, vetch, clover, and cowpeas. The legumes show decided benefit to succeeding crops, as they do on all the upland soils of the county.

The price of this land ranges from \$20 to \$60 an acre. The price is affected by location near towns and its use as building sites.

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

Mechanical analyses of Cecil 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.	<i>Per cent.</i>
24362.....	Soil.....	3.5	5.7	5.8	15.5	17.3	37.6	14.4
24363.....	Subsoil.....	.4	1.5	2.0	6.2	6.0	23.4	60.5

The following sample contained more than one-half of 1 per cent calcium carbonate (CaCO₃): No. 24363, 0.63 per cent.

DURHAM COARSE SANDY LOAM.

The surface soil of the Durham coarse sandy loam consists of a gray to yellowish gray, loose coarse sandy loam, passing gradually into the subsoil at about 8 to 14 inches. There are several areas in

which the depth of the soil is considerably greater, 18 to 24 inches, and the texture coarser than the average of the type. The soil particles here are composed largely of quartz and partially disintegrated feldspar. One such area lies along Rocky River in the northwest part of the county. In other areas, in the vicinity of Kannapolis, the surface soil contains relatively large proportions of very fine sand and silt, with varying quantities of quartz gravel and coarse sand.

The subsoil of the typical areas consists of a yellow friable sandy clay, becoming heavier and stiffer with increase in depth. In practically all instances partially disintegrated rock is encountered within 2 feet of the surface. The subsoil in places has a reddish cast or reddish-yellow color, and is sometimes even mottled with red and white. Flakes of mica are also seen in places. As with a number of types intrusive dikes of diorite cut through a number of areas. These, giving rise to Iredell soils mainly, have forced the mapping of many spots of Iredell with the Durham coarse sandy loam.

The largest areas of this soil occur to the east of Concord, in the vicinity of Kannapolis, and in the northwestern part of the county along Rocky River. Smaller areas occur scattered throughout the larger areas of Cecil coarse sandy loam.

The surface features of the Durham coarse sandy loam vary from nearly level to hilly and broken. The more level areas occur around and east of Kannapolis, while the more broken areas occur along Rocky River and Three Mile Branch. The less rolling areas are more typical of the series, having the characteristic yellow sandy clay subsoil best developed. The more rolling areas are characterized by a deeper soil and less clayey subsoil. In such areas erosion has gullied the lands and greatly depreciated their value for agriculture.

The natural drainage of this type is good on account of the open structure of both the soil and subsoil. In dry years crops on the lighter areas are apt to suffer greatly from lack of moisture.

This type of soil is derived from fairly coarse grained porphyritic granite, showing in fresh outcrops prominent crystals of microcline feldspar and quartz with varying amounts of muscovite mica and hornblende.

The native vegetation consists of oak and pine in about equal proportions, with some sweet gum and persimmon. Approximately one-half the area of the type is now forested.

The Durham coarse sandy loam is well suited to the production of sweet potatoes, truck crops, peaches, plums, certain varieties of apples, and small fruits. In the central part of the State this soil is considered one of the very best soils for bright tobacco, and with proper management it will produce good yields in this section, as has

been shown by the leaf grown on a number of small patches for home use. Melons and peanuts will also do well. At present the principal crops are cotton, corn, sweet and Irish potatoes, wheat, and oats. Cotton gives an average yield of one-fourth to one-third bale per acre. The yield of corn is ordinarily about 15 bushels per acre. Wheat yields seldom run over 8 or 10 bushels in the best years. Oats give from 8 to 20 bushels per acre.

A number of the farmers upon this soil are beginning to realize the importance of the addition of organic matter, and are practicing rotation with cowpeas, turning under the vines. In other instances the fields, after crops are harvested, are allowed to grow up in grasses which are turned under early in the fall. The incorporation of vegetable matter retards the leaching of the commercial fertilizers added in the spring and benefits the crops in this way as well as in general improvement of the physical condition of the soil.

The price of this land varies with proximity of railway facilities, but on an average it may be had for about \$30 an acre. The areas in the vicinity of Kannapolis are held at \$40 to \$60 an acre; those farther away along Rocky River bring from \$15 to \$25 an acre.

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

Mechanical analyses of Durham coarse sandy loam.

Number.	Description.	Fine gravel.	Coarse sand.	Medium sand.	Fine sand.	Very fine sand.	Silt.	Clay.
		Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	<i>Per cent.</i>
24372, 24374.....	Soil.....	12.9	18.1	12.4	23.2	8.2	19.2	5.8
24373, 24375.....	Subsoil.....	9.5	11.1	8.1	15.6	12.1	21.1	22.2

DURHAM SANDY LOAM.

The surface soil of the Durham sandy loam to a depth of about 8 to 15 inches consists of a light-gray sandy loam, containing in local areas a noticeable quantity of quartz fragments. The typical subsoil is a yellow friable sandy clay, containing some quartz gravel. In other areas the subsoil is mottled with streaks of red and gray.

Throughout the type there are occasional small areas in which the soil varies in texture from a fine sandy loam to a sandy loam; others contain more than the usual amount of coarse material. Slight variations in the color of the surface soil are due to variations in the organic matter contained.

Where areas of the Durham sandy loam come in contact with the Iredell and Cecil soils there is a gradual change from one type to another. Small spots of Iredell, too small to map, are included with the Durham.

Practically all of the Durham sandy loam occurs in irregular bodies and strips of varying width along Three Mile Branch, Cold Water Creek, to the east and southeast of Concord, to the west of Mount Pleasant, in the vicinity of Heilmans Mill in the northern part of the county, and along Coddle Creek in the northwestern part of the county.

The topography varies from almost level through gently rolling to hilly and broken. The more nearly level and best farming areas occur west and southwest of Mount Pleasant and on the ridges in the vicinity of Concord; the most broken areas occur along the stream courses. In many instances along Cold Water Creek the surface soil has been entirely removed, exposing the bed rock. The greater part of the type has excellent drainage.

The Durham sandy loam is a residual soil derived from granites of a highly siliceous character and lower in iron-bearing minerals than the granites from which the Cecil soils are derived.

Much of this type is forested with oak, a little persimmon, dogwood, cedar, and pine.

The Durham sandy loam, although too light to give heavy yields of the general crops, gives good crops of corn with proper management and is well adapted to some of the truck crops, for which it is now used. Early cabbage, Irish and sweet potatoes, snap beans, lettuce, melons, and a number of other vegetables can be advantageously grown. Peanuts, crimson clover, rye, oats, cowpeas, soy beans, peaches, plums, certain varieties of apples, and bramble fruits do very well. This type is very extensively used for bright tobacco of the cigarette and granulated pipe smoking type in central North Carolina. A considerable number of plug wrappers of excellent quality are also secured from this soil.

At present cotton has a greater acreage on this type than any other crop. It gives a good white staple and fair yields. As much as three-fourths bale per acre is secured on some areas under the best methods of culture, but the ordinary yields, even in good years, range between one-third to one-half bale. Cabbage is grown to some extent in a few localities, and gives excellent returns, as well as a number of fruits and truck crops.

At present the ordinary brands of commercial fertilizers are used, together with available barnyard manure. Profitable returns are secured even from the prevailingly light applications of low-grade mixtures, indicating that much better returns would be had with heavier applications of better grades or home mixtures, especially in conjunction with the production of leguminous crops and the plowing under of green vegetable matter.

Farms on this type range in value as high as \$35 an acre, but on an average rarely bring more than \$20 to \$25 an acre. The badly broken

and eroded areas along many of the streams are at present practically worthless for farming purposes.

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

Mechanical analyses of Durham 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.	<i>Per cent.</i>
24376.....	Soil.....	6.3	23.7	17.1	17.4	14.0	17.9	3.8
24377.....	Subsoil.....	4.6	12.4	11.2	16.7	12.1	17.7	25.5

IREDELL FINE SANDY LOAM.

The Iredell fine sandy loam, locally known as "blackjack land," consists of a gray to dark-gray fine sandy loam containing varying proportions of coarse material. The most characteristic feature of this type is the widespread occurrence of black iron concretions on the surface and throughout the soil. These concretions consist of particles of clay and sand cemented by iron oxide. The presence of large quantities of these concretions tends to give a rather brownish tinge or cast to the soil in many places. The structure of this type is less open than that of the Cecil fine sandy loam, except in those areas containing a high percentage of coarse material.

The subsoil, beginning at a depth of about 8 to 10 inches, consists of a very sticky or waxy impervious brown clay, yellow in its fresh condition but becoming brownish on exposure to the air. At depths between 24 and 30 inches the subsoil passes into disintegrated rock.

There are small areas of this type which pass gradually into the Durham sandy loam. In such instances the subsoil is more or less influenced in texture and color by the friable, yellow sandy clay of the Durham soils.

The most extensive areas of this type lie north of Concord in the vicinity of Heilmans Mill, Macedonia Church, and along Coddle Creek. Smaller areas occur south and east of Harrisburg, along and south of Reedy Creek, along Rocky River, and scattered throughout the greater part of the county.

The surface is flat or undulating to rolling. The flat to undulating areas lie mainly in the western part of the county, along Coddle Creek, and are poorly drained. The more rolling and better drained areas occur in the vicinity of Glass and west along Irish Buffalo Creek. Erosion has removed a large part of the surface soil in spots along many of the larger streams and so gullied the surface that the land is unfit for agriculture.

The Iredell fine sandy loam is derived through weathering from diorite and diabase rocks. These rocks in partially decomposed condition are in all cases encountered in the lower part of the profile. As in the case of the Iredell loam, the cause of incomplete weathering is without doubt the protection offered by the overlying impervious clay.

The native growth of this type consists of blackjack oak, red oak, white oak, and post oak, with the blackjack oak predominating. There is also some pine and cedar. A thick growth of blackjack oak is nearly always indicative of the Iredell soils.

At present the Iredell fine sandy loam is used for general farm crops. Like the Iredell loam it is best adapted to wheat, oats, corn, and grasses. Wheat gives yields ranging from 8 to 20 bushels; corn from 10 to 15 bushels; and oats from 15 to 35 bushels an acre. Cowpeas do well and fair yields of cotton are reported. Cotton, however, is not a successful crop on this soil, and the acreage planted is being reduced to give place to the small grains. Gullied and broken areas of the type should be abandoned to Bermuda grass, which, besides affording good grazing, would go far toward checking the ruinous washing. The greatest need of the more nearly level areas of the type is better drainage.

In fertilization of the land it has been found that kainit results in markedly increased corn yields, in some cases the increase amounting to 25 to 50 bushels per acre. Liberal applications of this salt, 75 to 110 pounds per acre, will prevent the frenching¹ of corn and reduce the injury to cotton from rust. The discovery that this treatment is effective has resulted in increasing the value of this land. It is now held at a price of \$25 to \$40 an acre.

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

Mechanical analyses of Iredell 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.	<i>Per cent.</i>
24378.....	Soil.....	2.6	7.0	10.5	28.3	16.9	26.2	8.5
24379.....	Subsoil.....	1.0	2.0	3.1	10.2	10.7	20.2	52.7

IREDELL LOAM.

The surface soil of Iredell loam, which is locally called "blackjack land," to a depth of about 8 inches consists of a dark-gray to brown heavy fine sandy loam to loam. Mapped with this type are

¹ By "frenching", as applied to corn, is meant the diseased condition of this plant wherein the blades curl and turn yellow, and only little if any grain is produced. Poor drainage probably has much to do with developing this trouble.

small, irregular areas of soil resembling the typical in color, but containing in some instances a larger proportion of fine sand, and in other instances a larger proportion of coarse material. The depth of the soil in these small areas is not more than 5 or 6 inches, the shallower spots containing the highest percentage of coarse material. Numerous iron concretions are scattered over the surface and throughout the surface soil. Fragments of quartz and diorite are also present on the surface of some areas. There are some small areas in which the soil is a dark-brown to black mellow loam.

The subsoil is a light-brown to yellowish-brown sticky impervious clay, extending to a depth of from 24 to 30 inches, where it usually passes into the soft, disintegrated parent rock. Adjacent to soils of the Cecil series the subsoil of the Iredell loam varies from the above description to a sticky red clay. An occasional outcropping of the subsoil occurs on the knolls and more prominent ridges. In the more typical areas cultivation is fairly easy, the difficulty of plowing increasing with the amount of subsoil turned up.

Important areas of this type are found in the vicinity of Harrisburg and southwest of Concord. Small areas occur scattered throughout the greater part of the county, more plentifully north of Mount Pleasant and west toward Kannapolis.

Areas of this type have for the most part a fairly level surface. This fact, together with the impervious nature of the subsoil, results in poor drainage conditions, especially in the flatter areas. On the hillsides and along the stream courses erosion has in some instances exposed the yellowish-brown subsoil.

The Iredell loam is a residual soil, derived from diabase dikes and sheets which have intruded the older granite rocks. The disintegration of these rocks has not proceeded to as great depths as has been the case with the older granite rocks, owing in part to the resistance offered to the agencies of weathering by the overlying impervious clay. A depth of soil exceeding 30 inches is rarely found.

Blackjack, black, and red oak, and sweet gum form the principal forest growth of this type. A few cedar trees are also found in some of the poorly drained areas. A considerable area of the Iredell loam has been deforested and is now under cultivation.

The Iredell loam is especially well suited to the growing of wheat, oats, and the other small grains. At present the main crops are cotton, corn, wheat, and oats, with a small acreage of rye. The average yields are as follows: Cotton one-third bale, corn 15 to 25 bushels, wheat 10 to 15 bushels, and oats from 15 to 20 bushels per acre. The growing of cowpeas is practiced to some extent in parts of the county, and the yields are claimed to be better than those on the Cecil soils.

Kainit is the principal fertilizer used on this type, applications varying from 90 to 110 pounds per acre. A few farmers are using ordinary commercial mixtures analyzing 8-2-2, with one-third kainit. The type could be improved both physically and chemically by an application of lime. From 1,000 to 2,000 pounds per acre of burnt lime would unquestionably improve the soil, giving it a more open structure, correcting acidity, and otherwise benefiting the land. The practice of liming has been largely neglected by all the farmers of the county.

The price of this land varies with locality and topographic position. Areas near Concord are valued at \$50 to \$65, while other areas farther from Concord can be bought at prices ranging from \$20 to \$30 an acre.

MECKLENBURG CLAY LOAM.

The surface soil of the Mecklenburg clay loam, which is commonly called "red black-jack land," consists of 5 to 8 inches of reddish-brown loam to clay loam. There are small areas, however, in which the surface soil consists of a fine sandy loam, and also a few patches where the surface mantle has been entirely removed, exposing a heavy clay loam or clay. Throughout the typical areas a small amount of black iron concretions occur on the surface. Quartz fragments are also seen in places.

The subsoil of this type is a yellowish-brown to ochreous-yellow and occasionally reddish-brown sticky impervious heavy clay, ranging in depth from 20 to 30 inches. At this depth the sticky clay grades into disintegrated diorite and gabbro or metagabbro rocks. This disintegrated material passes into the solid bedrock at 3 or 4 feet. In a few places a large number of small mica scales are present in the subsoil, particularly where the underlying rock is a mica diorite.

Areas of this type are confined principally to the western part of the county in the vicinity of Harrisburg, with smaller areas east of Concord along the Concord-Mount Pleasant Road, and along Rocky River, Cold Water, Clarke, Reedy, and Coddle Creeks. It is well developed in the vicinity of Fairview Church, Pattersons Mill, and Pharrs Mill.

The surface features vary from nearly level to undulating or gently rolling, the more level and undulating areas being found in the vicinity of Harrisburg, Back Creek, and Fairview Church. Along the boundary of this type with the Cecil soils the topography is more noticeably rolling, especially along the Davidson Road in the vicinity of Poplar Tent Church, Wallaces Store, and Pharrs Mill. The undulating to rolling areas possess good natural drainage; the more level areas need ditching. Owing to the impervious character of the subsoil, the downward percolation of rain water is exceedingly slow,

and for that reason much of the type needs artificial drainage, such as can be satisfactorily secured through open ditches.

The Mecklenburg clay loam is derived from diorite, mica diorite, and gabbro diorite or metagabbro. These are hard, greenish to black colored rocks, carrying varying quantities of iron-bearing minerals, usually plagioclase, feldspar, some apatite, and a small quantity of mica. The weathering of these rocks has not proceeded to any great depth, owing to the protection offered by the superimposed layer of impervious clay. In places these rocks outcrop and large boulders are occasionally seen upon the surface.

Oak, hickory, some cedar, and a little pine form the greater part of the original forest growth, while old-field pine and cedar are commonly found as a second growth in abandoned fields and eroded areas. Among the grasses Johnson grass is prominent throughout the cultivated area.

This type of soil under good treatment is well adapted to cotton, but it is a particularly good type for the growing of wheat, oats, clover, and corn. The best farmers produce as high as 50 bushels of corn, 33 bushels of wheat, and 40 bushels of oats per acre in years of normal rainfall. On the average, however, corn yields from 15 to 25 bushels, wheat from 12½ to 18 bushels, oats from 15 to 35 bushels, and cotton about one-half bale per acre. On the better drained areas clover, cowpeas, and soja beans do well.

The use of fertilizers is general. A great many farmers buy the low-grade complete fertilizers analyzing 8-2-2 or 8-3-3, and some the somewhat better brands with a formula of 8-4-4. The use of kainit is becoming more general. Alone it gives very satisfactory results. Kainit is regarded as valuable as a corrective of cotton rust on this type as on the Iredell soils.

This soil, like the heavier soils of the Cecil series, should be plowed a little deeper each year, fall plowing being preferable in order that the sticky clay exposed to freezing may crumble and form a loose and more friable soil. With careful preparation a better stand of the crops is secured and cultivation is more easily carried on through the growing season. In the eroded areas and in a few of the lighter colored spots which contain less organic matter than the typical soil the growing of cowpeas, clover, and vetch will be found beneficial.

The Mecklenburg clay loam is held in high esteem as a general farming soil, and taken as a whole the land will sell for a greater price than any other type in the county. Well-improved land is held at \$60 to \$100 an acre. There are many areas that can be bought for a much lower price.

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

Mechanical analyses of Mecklenburg clay loam.

Number.	Description.	Fine gravel.	Coarse sand.	Medium sand.	Fine sand.	Very fine sand.	Silt.	Clay.
		Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	<i>Per cent.</i>
24388, 24390.....	Soil.....	7.6	9.7	8.4	20.7	14.8	16.6	23.2
24389, 24391.....	Subsoil.....	3.1	3.8	4.1	10.2	9.1	17.4	52.3

MECKLENBURG SANDY LOAM.

The surface soil of the Mecklenburg sandy loam consists of 6 to 12 inches of dark-brown to reddish-brown light loam to sandy loam. As a rule the heavy sandy loam is characterized by a shallow surface soil, the depth of which rarely exceeds 6 inches. Occurring throughout this type are small areas of a heavy loam to clay loam. Iron concretions are found throughout the type and in many instances give it a coarse feel and an open and porous structure. A few quartz fragments are also present on the surface in some places. The subsoil to a depth of 20 to 36 inches consists of a brownish-yellow or ochereous-yellow sticky impervious heavy clay. With but few exceptions the disintegrated rock is encountered at depths ranging from 20 to 36 inches. A few mica scales occur in the subsoil of some areas.

The largest areas of the Mecklenburg sandy loam occur in the vicinity of Harrisburg and east and west of Coddle Creek, Wallaces Store, and along Back and Caldwell Creeks. Other small isolated areas are mapped along Adams and Cold Water Creeks and in the vicinity of Fairview Church.

The surface of the Mecklenburg sandy loam varies from undulating to gently rolling or rolling. Owing to the position of this type along many of the streams, its topography as a rule is more rolling than the areas of the Mecklenburg clay loam. The surface drainage is fairly good, owing to its open texture and its occurrence on gently rolling ridges and rolling hillsides.

This soil is derived from diorite, gabbro-diorite, or metagabbro and mica diorite, the last-named rock furnishing the mica flakes found in the subsoil of some areas. Erosion has doubtless removed a considerable proportion of the finer material and left a preponderance of the various grades of sand. The native vegetation consists principally of hardwoods, chiefly white, post, red, and black-jack oak and considerable hickory, with some cedar and pine.

The Mecklenburg sandy loam is adapted to the usual crops of the county, and perhaps is better suited to cotton than the other soils

of the group locally known as "black-jack lands." Cotton yields from one-half bale to 1 bale per acre, the latter yield being secured by good cultivation and liberal applications of fertilizers. Corn yields from 15 to 30 bushels, and oats from 15 to 40 bushels per acre. Wheat does fairly well. Cowpeas and soy beans make fairly good growth, but these are not sowed to any great extent.

This soil is somewhat easier to till and warms up and dries out a little earlier in the spring than the clay loam. Cotton matures a little earlier than on the heavier "black-jack lands." Practically the same fertilization and treatment is given this type as employed in the cultivation of the Mecklenburg clay loam. The value of this type varies from \$20 to \$60 an acre.

The following table gives the average results of mechanical analyses of the soil and subsoil of Mecklenburg sandy loam:

Mechanical analyses of Mecklenburg 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.	<i>Per cent.</i>
24384, 24386.....	Soil.....	10.5	12.7	8.5	18.1	13.2	20.1	16.7
24385, 24387.....	Subsoil.....	3.3	5.3	5.4	14.3	11.6	17.9	42.1

ALAMANCE SILT LOAM.

The soil of the Alamance silt loam to a depth of 4 to 7 inches consists of a compact gray to almost white silt loam. The surface 2 or 3 inches is usually a little darker than the subsurface material. Throughout the cultivated fields, however, there are areas where the subsoil has been more or less mixed with the surface material by plowing, giving it a pale yellowish color. Many small slate fragments occur upon the surface, but not to such an extent as to interfere materially with cultivation.

The subsoil is a light-yellow brittle compact silty clay, which gradually passes into the partially decomposed parent rock at 30 to 36 inches. Where the drainage is poor the subsoil has a drab color and is usually mottled with streaks of red and yellow. Again, where intrusive diorite dikes occur some small areas are characterized by a yellowish-brown sticky heavy clay. These diorite areas, however, are of such limited extent that they could not be separated except in rare instances where they were mapped as the Iredell loam.

The Alamance silt loam occurs in strips and in irregular bodies from Union Copper Mine in the extreme northern part of the county along the east line south to the Union County line. Some of the largest and best developed areas occur south of Furr's and along the

Mount Pleasant-Monroe Road, south of Georgeville and to the east of Mount Pleasant. Other small areas occur throughout the slate belt.

The topography in the main varies from almost flat to slightly rolling. The largest bodies of the level to slightly rolling land occur in the extreme northeast part of the county in and around Union Copper Mine. The more rolling areas are developed to the south of Union Copper Mine, extending south to the Union County line. With the exception of a few depressed areas, the type possesses excellent natural drainage.

The Alamance silt loam is derived from the slates of the Carolina slate belt, comprising portions of Cabarrus, Mecklenburg, Union, Anson, Richmond, Montgomery, Stanly, Davidson, Randolph, and Alamance Counties.¹ The predominant soil-forming rock in the case of this type is, where not markedly affected by weathering, a very fine grained blue or light-blue slate of the kind frequently used in this section for whetstones. Other rocks are developed in association with this blue slate, such as rhyolite, andesite, and volcanic breccia.² It is important to note that the prevailing rocks of this belt are markedly different from the micaceous and sericitic schists which in various portions of the Piedmont Plateau give rise to the York silt loam, a soil which in color characteristics closely resembles the Alamance silt loam, but which carries more mica and has a decidedly greasy feel in the subsoil, besides being less productive.

The native vegetation consists principally of the shortleaf and old-field pine, with scattering white pine, the latter occurring usually on the cold northern slopes. Among the hardwoods are red, white, scarlet, and black-jack oaks, a few poplar along the streams, hickory, and dogwood. Some cedar is also seen. A considerable proportion of this type is forested.

On account of the stiff, compact nature of the Alamance silt loam it is inclined to bake and harden in dry weather in such a way as to cause excessive loss of moisture through surface evaporation. This baking can be reduced to a large extent by keeping the soil well supplied with organic matter, such as barnyard manure and cowpeas or rye plowed under.

This soil is well suited to the production of wheat, rye, oats, corn, small grains, and grasses. Cotton yields average rather low on account of the somewhat cold nature of the soil. A considerable number of bolls fail to reach maturity, especially in years of early frost. The average yield is about one-fourth bale per acre. Much better yields, however, are secured when the season is just right.

¹ This belt of slates extends into South Carolina.

² See Bulletin 21, North Carolina Geological and Economic Survey.

Corn does well in most localities, giving an average yield of about 18 bushels per acre and as much as 40 or 50 bushels under good management. The usual yield of wheat runs from about 8 to 15 bushels per acre, but much better crops are made when the soil is carefully prepared and kept in good condition with respect to organic matter content. The quality of the grain is very good, the berry being fine and well suited for milling. Oats range in yield from 12 to 30 bushels per acre, with an average of about 15 bushels. Sweet potatoes give fair yields, ordinarily from 40 to 50 bushels, and in most favorable years from 75 to 100 bushels. Sorghum is grown in small patches and turns out well, giving from 50 to 75 gallons of sirup to the acre on the more thoroughly drained areas and as high as 100 gallons in moist lower situations. It is believed that Irish potatoes could be successfully grown.

The ordinary commercial fertilizers are used for all crops grown by a large number of farmers living on this soil. Within the last two years, however, the use of phosphoric acid alone has been practiced by a few farmers with as good results as from the mixed fertilizers.

The principal need of this soil appears to be phosphoric acid, with liberal additions of vegetable matter, barnyard manure, and lime. The legumes, such as cowpeas, clover, and soy beans, should be used in rotation with the general farm crops. These crops not only help by storing nitrogen but supply a considerable amount of organic matter even when cut for hay, bringing about decided improvement of the soil structure, making it more open and easier to handle, and giving it better aeration.

The price of this land ranges from \$8 to \$25, the average price being about \$15 an acre.

Alamance silt loam, shallow phase.—The surface soil of the Alamance silt loam, shallow phase, is similar in texture and color and general appearance to that of the typical development of the type, differing essentially in the much shallower depth to underlying bed-rock. The soil of this phase consists of a gray to nearly white floury silt loam to a depth of about 6 inches. In the forested areas the surface soil is usually of a dark-gray color, on account of the relatively high content of organic matter. There are more quartz veins through this phase, and more quartz fragments scattered over the surface than in case of the typical soil. The subsoil consists of a brittle yellow silty clay to a depth of 10 to 24 inches, where the underlying slate rock is encountered. On eroded areas outcrops of the partially weathered rock are frequent.

This shallow phase occupies as a rule the more rolling areas of the slate belt, and along some of the stream courses the surface becomes broken.

The soil is derived from exactly the same rocks as the typical phase, the only difference being in the depth of the soil material.

The native vegetation consists chiefly of red, white, scarlet, and black-jack oaks, pine, some hickory, cedar, and dogwood. A greater part of this type is now covered with second-growth forest.

During periods of heavy rainfall this soil packs, and on exposure to sunshine bakes badly, making its cultivation difficult. This condition of the soil can be remedied by practicing rotations including such crops as rye and cowpeas, to be plowed under. The crops grown are wheat, oats, corn, cotton, sweet potatoes, garden vegetables, and cane. The soil is droughty, and except in wet years very poor yields are obtained. Wheat gives an average of about 5 bushels and oats 10 to 15 bushels per acre. Corn yields from 8 to 15 bushels. Sweet potatoes give fair returns—from 15 to 35 bushels. Sugar cane does well on the low-lying areas.

In a few instances lime has been used on this soil and found to be of great benefit, not only in modifying the structure but in increasing the yields in the years succeeding the application. After the use of lime the yields in some instances were better than those obtained with the low-grade commercial fertilizers the first year.

On account of the susceptibility of this soil to drought its value for agriculture is comparatively low. It can be had for very much less than the deep phase of the type. Its value lies principally in the forest growth, and cut-over areas can be purchased for \$8 to \$15 an acre.

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

Mechanical analyses of Alamance 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.	<i>Per cent.</i>
24343, 24345.....	Soil.....	1.9	2.9	1.4	4.1	13.0	63.1	13.7
24344, 24346.....	Subsoil.....	.6	.9	.4	.9	13.9	33.6	49.1

ALAMANCE SLATE LOAM.

The interstitial material of the surface soil of the Alamance slate loam consists of a gray to nearly white silt loam. The depth averages about 8 inches. In some areas the soil appears to be rather loamy, but close examination shows this to be due to small fragments of the partially disintegrated slate rock. Where this soil is underlain by material other than slate fragments it was found to be a yellow silty clay, rarely over 12 to 15 inches in depth. Below 15 inches it was impossible to make borings on account of the presence

of the rock. It is estimated that from 35 to 50 per cent of bluish-gray to gray slate fragments, usually angular and oblong and varying in length from one-half inch to several inches, are disseminated throughout the soil. Numerous outcrops of the slate rock were encountered throughout the area and were often of so frequent occurrence as seriously to obstruct cultivation. In practically all instances the fragments are sufficiently numerous to interfere more or less with cultivation, making plowing quite laborious.

The largest areas of the Alamance slate loam are found in strips and irregular areas along the Stanly County line, with smaller areas to the south of Drys Mill, to the east of Georgeville, south of Bethel Church, and along Little Meadow and Anderson Creeks.

The topography varies from gently rolling to rolling and broken along the streams.

This soil has been formed from the decomposition of the underlying slate rocks. It represents those areas where erosion has nearly kept pace with rock weathering, or where the rock has been more resistant to weathering. In a few instances on the slopes of the more rolling areas soil and slate fragments from higher positions have accumulated in the shape of moderately deep colluvial soil.

Owing to its rolling surface features, loose structure, and the nearness of the rock to the surface, the type is excessively drained.

The largest area of Alamance slate loam is forested, principally with pine. Small areas, however, support a growth of red, white, and post oak, hickory, and dogwood. Some of the timber is of considerable commercial value.

The Alamance slate loam soil where not too slaty produces fair yields of corn, cotton, wheat, and oats, and fair returns from orchards, especially apples, pears, and peaches.

As a large part of this type is still in forest growth and only a small area under cultivation, the value, as in the shallow phase of the Alamance silt loam, depends largely on the timber growth. On an average this soil where cut over sells for \$8 to \$15 an acre.

The following table gives the results of a mechanical analysis of a sample of the soil of the Alamance slate loam:

Mechanical analysis of Alamance slate loam.

Number.	Description.	Fine gravel.	Coarse sand.	Medium sand.	Fine sand.	Very fine sand.	Silt.	Clay.
24351.....	Soil.....	<i>Per cent.</i> 8.9	<i>Per cent.</i> 6.0	<i>Per cent.</i> 2.5	<i>Per cent.</i> 4.8	<i>Per cent.</i> 7.9	<i>Per cent.</i> 53.8	<i>Per cent.</i> 16.2

GEORGEVILLE SILT LOAM.

The surface soil of the Georgeville silt loam, to a depth of about 4 to 8 inches, consists of a brown to reddish-brown rather heavy silt

loam to silty clay loam. Under virgin timber the color is grayish and the structure noticeably compact. Where this soil is adjacent to the other slate soils the line of separation is rather difficult to establish in places on account of the gradual gradation of this into the Alamance soils. An occasional small area was encountered on the more prominent ridges where the surface soil had been entirely removed, leaving exposed the bare red subsoil. Small slate and quartz fragments were found scattered over restricted areas, but not to such an extent as to interfere with cultivation.

The subsoil of the typical areas of this type consists of a dull red heavy silty clay to a depth of 36 inches, passing usually below this depth into the soft disintegrated rock, which in turn passes into the firm bedrock at about 40 to 50 inches. Local variations in the subsoil are often encountered, where there is a gradual change from the typical red to a rather pinkish red to pink. There is also a gradation toward the yellow of the Alamance silt loam. An occasional outcrop of the parent slate rock is seen. In road cuts and other exposures the color of the partially disintegrated rock displays a range from pink to decided red.

Areas of the Georgeville silt loam occur in strips from one-fourth to three-fourths of a mile in width along many of the streams and in irregularly outlined areas throughout the slate belt. The largest areas occur along Little Buffalo, Little Bear, Anderson, and Clear Creeks and Rocky River, with smaller areas in the vicinity of Georgeville, Phoenix Mine, Barriers Mill, and Mount Pleasant.

The surface features of this type represent broadly the varied topography of the slate belt, ranging from level or gently undulating to rolling, with usually a few broken areas along the streams. Some of that having a less uneven surface configuration occurs in the vicinity of Barriers Mill and in smaller areas along Little Bear Creek. The more rolling phase, representing the greater proportion of the type, is well represented in the areas in the vicinity of Phoenix Mine and Georgeville and those along Anderson and Little Buffalo Creeks. The broken areas occur in the extreme southern portion of the county along Rocky River and Clear Creek.

With the exception of a few areas occupying a somewhat depressed situation or smooth country, this soil has excellent surface drainage. The drainage is rather excessive on the more rolling ridges adjacent to stream courses.

The Georgeville silt loam has been formed through the same agencies as the other soils of the slate belt. The parent slates, however, have weathered to greater average depths than those from which the other slate soils are derived. The slates from which this soil is derived are very closely related to those giving rise to the Alamance soils, but it is believed that they run higher in ferruginous minerals. The partially decomposed rock in this instance is of a pronounced

reddish color, while in case of the Alamance soils the weathered rock is gray.

The predominating growth comprises white, post, red, and black-jack oak, hickory, and dogwood. Pine is the dominant tree on the higher, poorer, ridges. Some cedar is seen in places. A large percentage of the merchantable timber has been cut by the numerous sawmills operating in the southern part of the county.

The Georgeville silt loam is recognized by practically all the farmers in the eastern part of the county as being the strongest soil of the slate belt for general farming purposes. It is well adapted to corn, oats, rye, wheat, clover, and grasses, and more attention should be given to their cultivation. Clover and grasses should be seeded on the more rolling lands and slopes, to prevent washing and also to furnish pasture for stock and cattle.

Corn in best years yields from 35 to 40 bushels, averaging about 18 bushels; wheat from 10 to 20 bushels; and oats from 15 to 35 bushels per acre. Cotton is grown to some extent, but the yields average low on account of frosts, which occur from 10 days to 2 weeks earlier in the slate belt, shortening the growing season and catching unripe bolls. Rye and cowpeas give good returns.

The soil is susceptible of a higher state of improvement than the associated slate soils. By practicing rotations, including green manuring crops, such as cowpeas, and by gradually deepening the plowed portion of the subsoil, a mellower soil is worked up which holds moisture better and allows better soil aeration, and provides a desirable deeper zone for unretarded root development. The following rotation would probably result in increased yields: First year, corn; second year, wheat, followed by cowpeas or rye to be plowed under; third year, oats. An application of 1 ton of burnt lime per acre scattered broadcast over the surface just after the turning under of crops like cowpeas or rye would materially benefit the land. Applications of acid phosphate would likely hasten crop maturity, and consequently could be used to advantage for cotton, and probably for other crops.

Land of this type of soil is considered somewhat better for farming than the associated soils, and is held at prices varying from \$20 to \$40 an acre.

The following table gives the average results of mechanical analyses of the soil and subsoil of the Georgeville silt loam:

Mechanical analyses of Georgeville 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.	<i>Per cent.</i>
24347, 24349.....	Soil.....	3.8	3.4	1.9	5.9	13.2	50.3	21.2
24348, 24350.....	Subsoil.....	.9	1.9	1.2	3.6	7.0	39.2	45.8

CONGAREE SILTY CLAY LOAM.

The surface soil of the Congaree silty clay loam is a brown to reddish-brown silty clay loam with a depth of from 15 to 20 inches. The subsoil, to a depth of 36 inches and more, is a brown to reddish-brown silty loam to silty clay loam averaging a little lighter than the surface soil.

Some small areas of a rather light loam to fine sandy loam were included, owing to the impracticability of mapping them on the scale used. These sandier areas occur mainly near streams. In one very limited area at the confluence of Coddle Creek and Rocky River occurs a pure white to gray sand. With the exception of a few areas the soil is mellow and easily tilled.

Along Cold Water Creek the surface soil is a sand to sandy loam with a depth of 6 or 8 inches. The subsoil frequently includes strata of sand or sandy loam. In these areas the subsoil is usually of a heavier and more compact structure in the lower depths than in the more typical areas.

This soil type occurs as strips, varying in width from a few yards to a half mile, along many of the larger streams of the county. It is well developed along Dutch Buffalo, Cold Water, and Irish Buffalo Creeks, and in small areas along Coddle Creek.

The Congaree silty clay loam occupies the low-lying flat lands only a few feet above the normal water level of the streams. On account of its flat topography and low position overflows are numerous during periods of heavy rainfall. Crops are frequently damaged and sometimes destroyed by overflow water.

During the last 10 or 12 years these lands have not been extensively cultivated on account of the frequency of overflows. The reclamation of this valuable alluvial soil is of great importance, not only from an agricultural standpoint, but from the standpoint of health. Unless, however, cooperative effort among landowners is aroused it is not likely that any great headway will be made toward their drainage and reclamation. By straightening and dredging the stream channels and by constructing dikes in places practically all of the type can be reclaimed from overflow conditions. By terracing of upland slopes and utilization of areas subject to erosion for grass and forestry or orchard purposes, the washing in of soil from the drainage basins can be reduced to a minimum and the injurious results from overwash material considerably lessened.

This soil is of alluvial origin, having been brought down and deposited by the waters of the stream in periods of overflow.

The Congaree silty clay loam is especially suited to the production of corn, grass, and forage crops. Yields of 100 bushels of corn per acre can easily be made where there is no danger from overflow. At present only small areas are being cultivated, and the average yield

is usually from 40 to 60 bushels an acre. Wheat and oats will also give good yields. Wild grasses flourish and the hay obtained is of good quality. At present practically all of this soil is in a growth of wild grasses common to the section.

Areas of this type 20 years ago sold as high as \$100 an acre, and although at present practically worthless except for pasturing, it commands a fair price on account of the possibility of reclamation at some future time.

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

Mechanical analyses of Congaree silty clay loam.

Number.	Description.	Fine gravel.	Coarse sand.	Medium sand.	Fine sand.	Very fine sand.	Silt.	Clay.
		Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	<i>Per cent.</i>
24370.....	Soil.....	0.0	0.3	0.3	1.9	13.2	56.4	27.9
24371.....	Subsoil.....	.0	.0	.9	8.1	28.6	35.4	26.8

MEADOW.

The term "Meadow" is applied to the low-lying or bottom lands along the smaller creeks, branches, and some of the larger creeks of the county. The soil has no regularity of texture or color, varying in texture from a sand to a silt loam, and in color frequently with the color of the predominant upland soils. As a rule the silt loam areas have the characteristics of the Congaree soils. Much of the poorer drained portion has mottled subsoils of dark-brown, gray, and even bluish colors.

During periods of heavy rains a large amount of material is washed down from the hills. Also along the larger streams much material has been deposited from the overflow waters bearing in suspension soil material transported from considerable distances. It not infrequently happens that the character of the surface soil is changed by the deposits of a single overflow, good silt loams sometimes being covered by a layer of sand.

The soils comprised under the head Meadow as a rule are rich in organic matter. With the exception of the sand areas, this land would give good yields of corn, if protected from floods.

Hay of an excellent quality is produced upon a large proportion of the type. Except in years of exceedingly heavy rainfall this hay crop is rarely damaged to such an extent that it can not be used, at least for winter roughage. The type, in the main, when given good drainage, is well suited to corn, oats, and grasses like meadow fescue, tall oat-grass, and redtop. Much of it could be reclaimed from the present poorly drained and frequently overflowed condition.

SUMMARY.

Cabarrus County comprises an area of 368 square miles in the west-central part of North Carolina, wholly within the Piedmont province.

The topography varies from flat and undulating to rolling. With the exception of the stream-bottom lands and considerable areas in the western part of the county, the region is well drained.

Concord, the county seat, Kannapolis, and Mount Pleasant are the largest towns of the county. These places are manufacturing centers and markets for all of the cotton and a large part of the truck grown in the county.

The summers are long and warm, the mean summer temperature being 77° F. The winter mean is 43° F. Only a light snowfall occurs. The mean annual precipitation is 49.6 inches.

The main line of the Southern Railway furnishes transportation facilities for a greater part of the county.

The general farm crops are cotton, corn, wheat, oats, some rye, clover, cowpeas, soy beans, and sorghum. Of minor importance are the truck crops and fruits.

The soils are mainly residual. Seventeen distinct types are recognized. Seven important series are represented—the Cecil, Iredell, Durham, Mecklenburg, Alamance, Georgeville, and Congaree soils, the last including the alluvial types.

The Cecil sandy loam occupies about 10 per cent of the area of the county. It is adapted to a wide range of crops, and is especially valuable for corn, cotton, oats, wheat, clover, cowpeas, sweet potatoes, truck crops, and fruits.

The Cecil coarse sandy loam is of less extent. It is adapted to truck and garden crops, but has a tendency to droughtiness.

The Cecil fine sandy loam covers 11 square miles. It produces fair yields of corn, cotton, wheat, and oats, but is best suited to garden vegetables.

The Cecil clay loam is the most extensive soil in the county, covering about 23 per cent of its area. The heavier areas of this type are suited to the production of wheat, oats, clover, and cowpeas. The lighter areas are adapted to corn and cotton. Eroded areas should be seeded to grass for pasture.

The Cecil clay has about one-fourth the extent of the clay loam. Wheat, oats, corn, cowpeas, and grasses give the best results on this soil. It is one of the strongest soils of the county and capable of high improvement.

The Cecil loam is of small extent. It will produce good crops of wheat, clover, oats, corn, and hay.

The Iredell loam and the Iredell fine sandy loam, locally known as "black-jack land," are adapted to wheat, oats, rye, cowpeas, and grasses. They are used mainly for cotton and corn.

The Durham sandy loam is a soil of relatively small extent. Although not used for tobacco in Cabarrus County, it is naturally well suited to its culture, producing in other parts of the State a fine quality of the bright yellow type. It is also a good soil for the other staples.

The Durham coarse sandy loam is also considered one of the best soils in the State for the production of bright tobacco. It is also well suited to potatoes, truck crops, and fruits.

The Mecklenburg clay loam, known locally as "red black-jack land," with proper treatment is well suited to the production of cotton. It is better adapted to wheat, oats, clover, and corn.

The Mecklenburg sandy loam is better suited to cotton than the clay loam, but is best adapted to corn, oats, wheat, and grasses.

The Alamance silt loam occurs in two phases, based upon depth to underlying bedrock. The deep phase is a good corn, oats, wheat, rye, cane, sweet and Irish potato, and fruit soil. The shallow phase is more droughty than the deep phase, but may be used profitably for the same crops. A good quality of sirup can be obtained from the sorghum cane grown on this soil.

The Georgeville silt loam is well adapted to the general farm crops of the region. The steeper slopes should be used for pasture. Cotton does fairly well, but early frosts usually reduce the yield.

The Congaree silty clay loam occurs in strips along the river and other large tributary streams. It is especially valuable for corn and grasses.

Meadow includes wet areas along the smaller streams. Corn and grass would give best returns on this land when drained.

Land values are relatively high. Red lands (Cecil soils) within a radius of 5 miles of Concord are valued at about \$60 an acre. At a greater distance from Concord, southwest, west, and northwest, they are worth from \$30 to \$50 an acre. The greater part of the "gray lands" ranges in price from \$12 to \$15 an acre.

Cabarrus County possesses natural resources comparing favorably with any other county in the State. Wide areas of uncultivated lands offer good opportunities for those desiring to engage in general or specialized farming.

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