SOIL SURVEY OF CARROLL COUNTY, GEORGIA.

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DESCRIPTION OF THE AREA.

Carroll County lies in the western part of Georgia, bordering the Alabama State line on the west, and midway between the Tennessee line on the north and the Florida line on the south. It is about 45 miles southwest of Atlanta and about 150 miles south of Chattanooga, Tenn. Its greatest north and south dimension is about 32 miles; the east and west dimension varies from about 8 miles in the northern part of the county to about 25 miles in the south-central part. The county comprises an area of 497 square miles, or 318,080 acres.

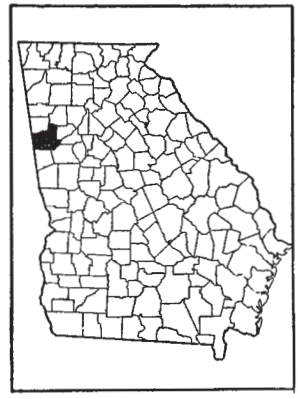

FIG. 7.—Sketch map showing location of the Carroll County area, Georgia.

Carroll County lies within the Piedmont Plateau region of the State. This region, or physiographic division, lies in the eastern part of the United States, extending from New Jersey on the north in a southwesterly direction, and terminating in Alabama. The county is located near the central part of the region from north to south, but nearer the Appalachian Mountains on the northwest than the Coastal Plains on the southeast.

The physiography of the county consists of a plain dissected by stream valleys. The degree or thoroughness as well as the depth of dissection varies with the distance from the larger rivers traversing the county. The Chattahoochee River, the major stream of this part of the Piedmont, forms a part of the southeastern boundary of the county. The Little Tallapoosa River which traverses the county from northeast to southwest, flowing approximately parallel to the course of the Chattahoochee, divides the county into two parts of about equal extent. The basin of Big Indian Creek, which flows into the Little Tallapoosa near the western line of the county, occupies a part of the northern part of the county.

The whole area of the county is thoroughly dissected. The watershed ridges between the drainage basins of the streams just mentioned are narrow and crooked and uneven.

The deepest and most thoroughly dissected part of the county is the southeastern, occupying a belt a few miles wide lying parallel to the Chattahoochee River. The next most thoroughly and deeply dissected belt lies along both sides of the Little Tallapoosa River, and a third along both sides of Big Indian Creek. The depth of dissection along these belts varies directly with the size of the streams, that along Big Indian Creek being the shallowest. The depth of valleys, or dissection, decreases from near the streams to within the watershed where the small streams head.

Oak and Black Jack Mountains are remnant hills standing above the general upland level.

The northern and central parts of the county are characterized by a more gently sloping to rolling topography. In general, the topography of the greater part of the county, 60 to 70 per cent, permits of the use of improved farm machinery. The surface of the bottom and terrace lands along the Chattahoochee and Little Tallapoosa Rivers and other large streams is particularly favorable for intensive farming.

The elevation of the county ranges from 600 feet along the Chattahoochee River to 1,550 feet above sea level on Black Jack Mountain. Other elevations are as follows: Villa Rica, 1,200 feet; Temple, 1,180 feet; Carrollton, 1,095 feet; Bowdon, 1,085 feet; and Roopville, 1,253 feet. The general elevation of the uplands ranges from 1,100 to 1,200 feet above sea level, and of the bottom lands of the Chattahoochee River from 600 to 700 feet.

The drainage of the county is well established and complete. The drainage waters are carried principally by the Chattahoochee and Little Tallapoosa Rivers. The divide separating the basins of the two main streams passes through the county near Roopville, Oak Mountain, and Villa Rica.

Carroll County was laid out in 1826 and comprised all the land lying between the Chattahoochee River on the east, the Alabama State line on the west, and the Cherokee line on the north. The area was obtained from the Creek Indians by the treaty of 1825. The lands were surveyed and opened to entry by lottery soon afterwards. The early settlers were of English descent and came from the central and eastern parts of Georgia and from some of the Eastern States. There has been a gradual increase in population, the census for 1890 reporting 22,301; for 1900, 26,576; for 1910, 30,855; and for 1920, 34,752. The population is almost entirely native born.

Carrollton, the county seat and principal town of the county, had a population of 4,363 in 1920. It is located on the Chattanooga-Griffin branch of the Central of Georgia Railway, about 139 miles south of Chattanooga, 310 miles northwest of Savannah, and about 60 miles southwest of Atlanta. Carrollton has good streets, electric lights, a good water system, and other modern improvements. The fourth district agricultural and mechanical school is situated here.

Bowdon, located in the western part of the county, Villa Rica and Temple in the northern part, and Whitesburg and Clem in the southeastern part are important railroad towns. Roopville, Hulett, Burwell, Lowell, Sand Hill, and Tyus are smaller settlements. Numerous small stores and trading points are also scattered throughout the county.

Transportation facilities are excellent, except in the extreme northwestern and southern parts of the county. The Birmingham-Atlanta line of the Southern Railway passes through the northern part of the county, serving Villa Rica and Temple. The Chattanooga-Griffin branch of the Central of Georgia Railway passes through the county from northwest to southeast, through Bowdon Junction, Carrollton, Clem, and Whitesburg. The Bowdon Railway, a branch of the Central of Georgia, passes through Burwell to Bowdon, connecting with the Central of Georgia at Bowdon Junction.

Carroll County has an extensive public-road system. At present (1921) the main roads centering in Carrollton, extending to Roopville, Bowdon, Jones Bridge on the Chattahoochee River, Mount Zion, and Villa Rica, and from Villa Rica to Temple, are being graded and surfaced with sand-clay. Many of the public roads are in poor condition.

The county is well supplied with schools and churches. Gristmills and cotton gins are numerous in the county, many of them being operated by water power obtained by damming the larger streams. The telephone and rural free delivery of mail extend to nearly all parts of the county.

Carrollton, Bowdon, Whitesburg, Villa Rica, and Temple are the local markets for the various products of the farms.

CLIMATE.

The climate of Carroll County is very healthful. It is characterized by long, hot summers and short winters. The winter months are comparatively mild, with only occasional cold spells lasting a day or two. The coldest weather on record at Tallapoosa, in Haralson County, to the northwest of Carroll County, is —12° F., occurring in February. The mean temperature for the winter period is 42.4° F. Cold rains are common during the winter months.

The summer months are usually hot, the temperature rising as high as 103° F., but the heat is somewhat moderated by frequent showers. The spring and fall months are usually pleasant and favorable, respectively, for planting and harvesting crops.

The average annual rainfall of 49 inches is well distributed throughout the growing season. July, August, February, and March are the months of heaviest rainfall, the mean rainfall for these months being 5.96, 4.64, 5.19, and 5.35 inches, respectively. The fall months are usually the driest part of the year, the mean for these three months being 8.77 inches. The heaviest annual rainfall recorded is 61.49 inches, in 1917; and the lightest 28.54 inches, in 1904.

The average growing season extends from April 5 to October 30, about 209 days, and is ample for the maturing of a large variety of crops. The date of the latest recorded killing frost in spring is April 24, and of the earliest in fall, October 1.

The following table, giving the normal monthly, seasonal, and annual temperature and precipitation, as compiled from the records of the Weather Bureau station at Tallapoosa, Ga., about 20 miles northwest of Carrollton, is fairly representative of climatic conditions prevailing in Carroll County.

Normal monthly, seasonal, and annual temperature and precipitation at Tallapoosa, Haralson County.

(Elevation, 1,150 feet.)

Month.	Temperature.			Precipitation.		
	Mean.	Absolute maximum.	Absolute minimum.	Mean.	Total amount for the driest year (1904).	Total amount for the wettest year (1917).
	°F.	°F.	°F.	Inches.	Inches.	Inches.
December	42.5	79	6	4.60	2.93	1.77
January	42.2	78	−6	3.57	5.29	6.96
February	42.5	82	−12	5.19	2.93	5.87
Winter	42.4	82	−12	13.36	11.15	14.60
March	52.4	90	4	5.35	2.42	11.43
April	60.1	91	28	3.91	1.35	3.96
May	69.4	100	35	3.10	.87	2.23
Spring	60.6	100	4	12.36	4.64	17.62
June	75.9	103	44	3.91	3.34	4.31
July	78.0	103	54	5.96	1.69	3.12
August	77.5	102	50	4.64	6.81	8.24
Summer	77.1	103	44	14.51	11.84	15.67
September	72.4	98	36	3.11	.07	10.79
October	61.6	95	23	3.04	.16	.99
November	50.5	88	12	2.62	.68	1.82
Fall	61.5	98	12	8.77	.91	13.60
Year	60.4	103	−12	49.00	28.54	61.49

AGRICULTURE.

The second treaty with the Creek Indians in 1825 marked the beginning of agriculture in the county. However, there were a few whites in this section prior to that date. The early farming was of the self-sustaining type. The small fields which had been cleared by the Indians were farmed to corn, wheat, and barley. Cattle, sheep, and hogs were raised to supply the home with food and clothing, the clothing being produced from wool spun and woven into cloth at home.

The original tree growth consisted of white, blackjack, red, and water oaks, and longleaf, loblolly, and shortleaf pines on the uplands, with oak, elm, hickory, sycamore, willow, poplar, and gum on the bottom lands. Considerable areas of bottom land are in forest at present, owing to the fact that they are subject to frequent overflow, and therefore not immediately desirable for farming. Approximately 65 to 70 per cent of the county has been cleared and put under cultivation. The percentage of cleared land is much higher through the central part of the county, as the topography here is more favorable for cultivation than in the more broken part extending parallel to the Chattahoochee River. In the early days new lands were cleared and put under cultivation and the older fields, as the farmed lands declined in yields, were "turned out" and left to wash and erode, little or no attention being given to terracing the slopes, as is done to-day, to prevent erosion.

The development of agriculture has been gradual. In 1880, 81 per cent of the county was included in farms, and 36.2 per cent of the land in farms was classed as improved. In 1920, according to the census, 87.3 per cent of the county was in farms, and 59.4 per cent of the farm land was improved.

According to the census 9,300 bales of cotton were produced on 22,593 acres in 1879; in 1909 the production rose to 26,591 bales on 65,646 acres, and in 1919 to 34,246 bales, on 74,247 acres. The average yield per acre in this year was 0.46 bale. In 1879, 22,593 acres were devoted to cotton, and 28,964 acres to corn; while in 1919 the area devoted to cotton was 74,247 acres, representing 39 per cent of the improved land of the county, and that in corn was 52,769 acres.

Cotton mills are located at Carrollton and Banning, though part of the locally produced cotton is shipped out of the county.

The agriculture of to-day is largely centered about the production of cotton, but there is a decided tendency toward a diversified type of farming in which corn, oats, peas, beans, sweet potatoes, and other food products will be grown more extensively and cotton will become a surplus cash crop. At present, however, cotton is the principal cash crop of the county, and credits, loans, and land prices depend largely upon the price of cotton.

The principal varieties of cotton grown are Cleveland, Texas Bur, Bank Account, Half-and-Half, and Webber, a long-staple upland cotton. Many other varieties are grown, but none of these have the prominence of those named.

Cotton is planted on all the upland soils and the terrace soils along the streams. Little or none is planted on the first-bottom lands, owing to the fact that these soils are subject to frequent overflow and are usually too wet to be planted early in the spring. The yields on the upland vary with the soil types, the Davidson and Cecil soils being considered the most productive, with the Madison and Appling soils following. The land is plowed during the winter and early spring. The better farmers plow the land with a 2-horse plow in the early winter and harrow it thoroughly in the spring, which gives a good seed bed. The rows are laid off from 3½ to 4 feet apart, fertilizer is distributed in them, and the seed planted. In many cases the ground is prepared by a middle buster, which turns the previous year's cotton row each way into the furrow; this method, however, is not considered as good as flat plowing. The crop is usually planted on a ridge or slight elevation. Planting usually takes place from April 10 to May 15. Early cultivation, starting soon after the plants appear above the ground, consists of turning the soil away from the plant or "barring off." This is followed by "chopping out" the cotton with hoes, leaving the desired stand. After this the soil is turned back to the plant, and weeds are kept down by later and frequent cultivations with sweeps and scrapes, which stir the soil only to shallow depths. The crop is cultivated from four to six times, and is usually laid by in August. Picking begins in September.

Commercial fertilizers are in common use. The mixtures ordinarily applied for cotton contain 8 to 10 per cent of phosphoric acid, 2 to 3 per cent of nitrogen, and 2 to 3 per cent of potash. In some cases a mixture of acid phosphate and cottonseed meal is used. Com-

mercial fertilizers are used on cotton at the rate of about 150 to 500 pounds per acre, the larger quantities being added in two applications, one at the time of planting and the second about the time of blossoming. Barnyard manure, which is available only in small quantities, is used in the production of cotton and corn.

Corn is the second crop in importance in the county. The acreage devoted to this crop has steadily increased from 28,964 acres in 1879 to 52,769 acres in 1919. The average yield as compared with that of the Corn Belt States is low, being in 1919 but 14.6 bushels. Corn is grown on all soil types, both upland and bottom land. The bottom soils, where not subject to too frequent overflow, are well adapted to corn. All the crop is used to feed work stock or to supply meal for home use, and the production does not meet the demand. The prolific varieties, such as Hastings, Watleys, and Marlboro, predominate. Although the average yield is below 15 bushels, some of the better soils produce from 18 to 25 bushels per acre. In the last few years the farmers have been giving more attention to the preparation of the land for corn and to better cultivation.

Corn land receives practically the same preparation as cotton land. The rows are placed from 3 to 5 feet apart. In many instances soy beans or cowpeas are planted between the rows at the laying by of the corn. This is a good practice, as it helps build up the soil by adding humus. The crop is cultivated from three to five times with one-horse turning plows, scrapes, and sweeps. As a rule the soil is plowed very shallow, and cultivation is likewise shallow. The stalks are often cut and burned on the ground, instead of being plowed under to incorporate vegetable matter in the soil. Practically the same fertilizer is used for corn as for cotton, but the rates of application on corn are somewhat less than on cotton.

The census reports show a decided decline in wheat growing. The area devoted to wheat in 1879 was 10,414 acres; in 1899, 8,858 acres; and in 1919, 2,330 acres. The average yield per acre is low, 7 or 8 bushels, though on some of the better soils, such as the Davidson and Cecil types, yields of 10 and 12 bushels have been obtained. Wheat is sown broadcast in October or November, and harvested in the early part of June.

The area devoted to oats also has decreased, falling from 7,729 acres in 1879 to 1,819 acres in 1919. Barley and rye are grown to a very small extent, and only a few small patches for forage were noticed during the survey.

Alfalfa was seen in only a few patches. These were on the Cecil and Davidson soils, and the stand was good. The crop yields 2 to 3½ tons per acre per season. With an application of lime on the Davidson and Cecil soils good yields should be obtained. Cowpeas are grown with good results, yields ranging from 1½ to 2 tons of hay per acre. This crop is usually sown in the corn fields at the time of laying by. Some velvet beans also are grown.

The production of potatoes in the county is not sufficient to meet the demand. According to the census, sweet potatoes occupied 1,076 acres in 1919. They do well on the sandier soils, and, with the advent of curing houses, this crop should increase in commercial importance.

Sorghum and ribbon cane are grown to supply local demands. Melons and vegetables are produced on most farms for home use.

Peanuts are grown but only in a very small way. The sandier soils are well adapted to peanuts, and the acreage could well be increased.

The forage crops consist of velvet beans, fodder pulled from the corn stalks, and coarse grasses. Only a few acres are devoted to the production of cultivated grasses. Much of the hay used to feed the work stock and other animals is shipped in from the Northwest. The acreage devoted to pastures is comparatively small. The first-bottom lands are best suited for this use.[1] Bermuda grass and lespedeza (Japan clover) are among the best pasture plants for this region.

While there are no commercial orchards in the county, the climate and soil conditions are favorable for the production of certain tree fruits, and nearly every farm has a small orchard. The 1920 census reports 44,992 peach and nectarine trees, 40,371 apple trees, 3,205 pear trees, 2,109 plum and prune trees, and 13,105 grape vines. Of the small fruits, strawberries do exceptionally well, though the acreage devoted to this crop is small.

The adaptation of crops to soil conditions is practiced in a general way by the better farmers. The bottom lands are used for pasturage, oats, and corn, and the uplands for cotton. The Davidson and Cecil soils are recognized as good land for small grains. The sandier soils produce the best crops in dry seasons and the clay loams and sandy clay loams in wet seasons.

In the early agriculture of this county, land was planted to the same crop year after year, and continuous cotton production is still the practice on many farms. There is, however, an increasing tendency to pay more attention to rotation and diversification of crops. No definite crop-rotation system is in general use, though in many cases cotton is followed by corn, in which cowpeas are sown when the corn is laid by. Where cotton is grown year after year, erosion is likely to be active during the winter months and the fields should be protected by a cover crop. A proper rotation of crops would tend to build up the soil and make it more productive.

The farm machinery and implements, except on a few of the better equipped farms, are usually light. One-horse plows are commonly used. The farm buildings are not very large or substantial, as the weather conditions do not necessitate housing the stock during the winter months, and the principal crop, cotton, is not ordinarily stored on the farm.

The raising of livestock has received very little attention, but in recent years there has been an attempt to increase the number of animals, especially hogs, for meat. Dairying has become more important within the last few years. Considerable milk is shipped from Villa Rica to Atlanta, and near Carrollton some dairying is done to supply the local demand. The dairy animals consist principally of Jersey and Jersey grades. Each farmer has one or two cows to supply the home with milk and butter. Very few horses and mules are raised. The work stock consists principally of mules, shipped in from Tennessee and Missouri.

The 1920 census reports an expenditure of $294,459 for labor on 1,400 farms reporting, or an average of $210.33 per farm. Most of the farm laborers are negroes. At times it is hard to get laborers, as

[1] See Georgia State Col. of Agr. Bul. No. 197, Permanent Pastures for Georgia.

public works and manufacturing industries offer wages higher than the farmer is able to pay. Day laborers are paid from 75 cents to $1.25 a day. Cotton is picked by the 100 pounds, the price ranging from 50 cents to $1.

The census of 1920 reports 5,436 farms [2] in Carroll County, with an average size of 50.6 acres, of which 30.1 acres is improved land. There are few large holdings of land, the county being known as "the county of small farms."

In 1920, 41.1 per cent of the farms were operated by owners, 58.8 per cent by tenants, and 0.1 by managers. A majority of the tenant farmers operate on a share basis, the landlord furnishing the stock, implements, and half of the fertilizer and receiving half of the crops. Land rented on a cash basis brings from $2 to $5 an acre. In some instances the land is rented for 50 or 60 pounds of lint cotton per acre, or one-third the cotton and one-fourth the corn produced.

According to the 1920 census, the value of all agricultural products in 1919, exclusive of animals sold and slaughtered,[3] was $10,540,974. The cotton crop was valued at more than $7,000,000, and the cereal crops combined, at $1,420,173.

The selling price of land ranges from $10 to $125 an acre, depending upon the kind of soil, the improvements, and nearness to markets. The average price is about $50 an acre.

SOILS.[4]

Carroll County lies within the Piedmont Plateau Province, and the soils, from the standpoint of origin, fall into two broad groups, namely, the residual and alluvial groups. The residual soils occupy the greater part of the county. These soils are the result of weathering of the underlying geological formations, which consist of some of the oldest rocks of the country. These rocks are quite variable, and include coarse-grained granite, gneiss, mica schist, garnetiferous schist, graphitic schist, and other similar formations. The schists (mica, graphitic, and garnetiferous) predominate. Darker colored hornblende schist, diorite, and diabase rocks occur principally in the central part of the county, in the region of Carrollton. Coarse-grained granite and biotite granite occur mainly in a belt paralleling the Chattahoochee River and in the northern part of the county.

The weathering of these various rocks has given rise to the soils of the Madison, Cecil, and Appling series. The difference in texture of these types is often due to erosion; the sandier members usually occur on the smoother and more gentle slopes, where erosion has not been active, and the sandy clays occur where erosion has removed much of the surface soil down to the heavier subsoil. The clay loam of the Davidson series is the result of the weathering of the harder, fine-grained, dark-colored rocks.

The alluvial soils represent material which has been carried by surface waters to the drainage courses, and deposited by flood waters

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[2] The census lists each tenancy as a farm.

[3] Not reported in 1920.

[4] Carroll County adjoins Cleburne County, Ala., on the west. Where the soil boundaries do not agree, the difference is due to changes in the correlation of the soils. The Madison series of Carroll County, which adjoins the Louisa series in Cleburne County, represents practically the same soil, but a fuller understanding of the soils has resulted in the Madison series being established since Cleburne County was mapped in 1913.

along the streams. This material usually consists of the finer sediments, such as very fine sandy loam and silt loam. The sandier or coarser types represent material that has been deposited by swiftly moving waters in times of overflow. The alluvial deposits are divided into the higher and older terraces or second bottoms, which are seldom overflowed, and the lower lying first bottoms or flood plains subject to frequent overflow.

Broadly speaking, the soils of this county are light colored, varying from light brown or grayish brown to red or reddish brown, except where the surface soil has been changed by erosion, leaving the underlying reddish subsoils exposed. The soils as a whole, especially on the uplands, are low in organic matter.

Originally all the land was forested and there were no areas of prairie land favorable for the accumulation of organic matter. The soils of the county as a whole are noncalcareous, though the darker colored soils, for example, those of the Davidson series, contain considerable lime, and the lime required to correct acidity in these soils is comparatively small.[5] The Cecil soils do not show as high a lime content as the Davidson, but the amount of potash in the Cecil is much higher than in the Davidson soils. The Appling series is characterized by a relatively high content of potash and low nitrogen and phosphoric acid content. The Congaree first-bottom soils are high in potash, and their lime requirement is low.

The climatic conditions, particularly the abundance of rainfall, are not favorable for the accumulation of free carbonates, although the original rocks contained lime. The water-holding capacity of the soils is variable. The heavier members, such as the clays and clay loams, are not as rententive of moisture as the sandier members with sandy clay subsoils.

The lighter colored sandy soils are usually loose and porous. Applications of manure and the plowing under of green cover crops would improve the physical condition. Commercial fertilizers will prove more beneficial when the soil is well filled with humus.

The upland soils of the county may be divided into two main groups with respect to color; (1) those having a light-colored surface soil, with a yellow or slightly mottled red and yellow friable subsoil; and (2) those having a light-brown to slightly reddish surface soil and a red subsoil. The second group may be subdivided into those having a compact, rather stiff, red clay subsoil, as the Cecil and Davidson series, and those having a friable, micaceous lower subsoil, as the Madison series. The Cecil and Davidson soils have only two pronounced layers, while the Madison has three to four.

For the purpose of soil mapping, the soils of the county are classified into series and types. The series consists of soils that are similar in origin, structure, color, and topography. The soil series is divided into soil types on the basis of difference in texture or fineness or coarseness of the material. Seven soil series are represented here by 16 types and 3 phases. In addition there is one miscellaneous

[5] Analyses of Soils of Jasper County, Georgia. Georgia State College of Agriculture, Athens, Ga. Other bulletins of the college applicable to the soils of Carroll County are: Analyses of Soils of Madison County, Analyses of Soils of DeKalb County, Analyses of Soils of Meriwether County. Chemical analyses of the principal soil types of the State can be obtained from the same source.

soil classed as Meadow (Congaree material), in which no attempt has been made to show textural differences.

The types of the Madison series are characterized by light-brown, grayish-brown, or gray to slightly reddish brown surface soils. The upper subsoil is uniformly a stiff, but brittle and compact red clay, which extends to a depth of 15 to 24 inches. The lower subsoil is a red, uniformly friable and loose, micaceous clay. The underlying rocks are relatively close to the surface, being generally reached at depths of less than 3 feet to 6 feet. The soils are derived from the underlying mica, garnetiferous, quartz-mica, and graphitic schists. Four soil types with two phases, covering a large part of the county, are mapped—the sandy clay loam, gravelly sandy loam, gravelly fine sandy loam, and gravelly sandy clay loam, each of the last two with a steep phase.

The Cecil series consists of types with light-brown or reddish-brown to red surface soils. The subsoil is uniformly a compact to stiff, red or brick-red to bright-red clay, which becomes slightly plastic and sticky when wet. The soils are derived from the weathering of gneiss, granites, and quartz-mica schists, with some hornblende schists. The soils of the Cecil series are developed mainly in two belts, one paralleling the Chattahoochee River, and the other extending in a northeast-southwest direction through Carrollton. The Cecil sandy loam, gravelly sandy loam, clay loam, gravelly sandy clay loam, and sandy clay loam, with a steep phase, are developed in the county.

The Davidson series is characterized by dark-red to reddish-brown surface soils and a dark-red to purplish-red subsoil. The red color of the Davidson series is much darker than that of the Cecil series. The subsoil is compact but smooth and friable. The soil is derived from dark-colored diorite, hornblende schist, and diabase rocks. The soils of this series are not as extensive as the Cecil, but they comprise some of the strongest and most productive land of the county. One type, the clay loam, is mapped in the county.

The Appling series includes types with light-brown or grayish-brown to gray surface soils, and a reddish-yellow to mottled red and yellow, comparatively friable subsoil. The color of the subsoil is intermediate between the yellow subsoil of the Durham series and the red subsoil of the Cecil series. The soil is derived from the weathering of gneiss, mica schist, light-colored coarse-grained granite, and quartzite. Two types of this series are mapped, the sandy loam and the gravelly sandy loam.

The alluvial soils are divided into two groups, those on the lower lying lands or first bottoms, which are subject to frequent overflow, and those occupying higher elevations or terraces along the streams, which are rarely overflowed. The terrace soils are mapped as of the Wickham and Altavista series, and the first-bottom soils are included in the Congaree series.

The Wickham series includes soils of brown to slightly reddish brown surface material, with a friable reddish-brown to brown subsoil. This series occurs in association with the Altavista series. The Wickham fine sandy loam is mapped.

The Altavista series comprises soil types having gray surface soils and a yellow subsoil. The series is developed on the second bottoms or terraces along the Little Tallapoosa and Chattahoochee Rivers. One type, the fine sandy loam, is mapped.

The first-bottom lands were included in the Congaree soil series. The surface soil is brown to grayish brown and the subsoil slightly lighter colored. This series is developed both along the smaller stream courses and the Little Tallapoosa and Chattahoochee Rivers. A variation representing the Wehadkee series, in which the subsoil is gray, yellow, and brown mottled, is included with this series on account of its small extent. The Congaree fine sandy loam and silt loam types are mapped.

First-bottom material of diversified texture and structure, which is poorly drained and remains in a wet condition much of the time, is mapped as Meadow (Congaree material).

In the following pages of this report the various soils of Carroll County are described in detail. The table below gives the name and the actual and relative extent of each type mapped:

Areas of different soils.

Soil.	Acres.	Per cent.	Soil.	Acres.	Per cent.
Madison gravelly sandy clay loam.	80,128	30.3	Madison gravelly fine sandy loam.	2,944	2.5
Steep phase	16,256		Steep phase	4,992	
Cecil sandy clay loam	31,744	12.1	Davidson clay loam	7,552	2.4
Steep phase	6,592		Congaree fine sandy loam	4,864	1.5
Madison sandy clay loam	33,920	10.7	Cecil sandy loam	4,736	1.5
Appling sandy loam	27,456	8.6	Cecil gravelly sandy loam	3,968	1.2
Meadow (Congaree material)	24,128	7.6	Congaree silt loam	3,776	1.2
Appling gravelly sandy loam	23,040	7.2	Altavista fine sandy loam	640	.2
Cecil gravelly sandy clay loam	18,432	5.8	Wickham fine sandy loam	320	.1
Madison gravelly sandy loam	13,504	4.2			
Cecil clay loam	9,088	2.9	Total	318,080	

MADISON GRAVELLY SANDY LOAM.

The surface soil of the Madison gravelly sandy loam, which has a depth of 6 to 8 inches, consists of a light-brown, grayish-brown, or yellowish-brown to gray, loose and open sandy loam, containing varying quantities of angular quartz gravel. The upper subsoil, to a depth of 18 to 24 inches, is a yellowish-brown or brownish-red to red sandy clay to clay, which is slightly compact in place but friable when bored out. The lower subsoil is a red to bright-red, friable, highly micaceous clay loam, with a pronounced greasy feel. Fine mica particles are present throughout the 3-foot soil section, but become more abundant in the lower subsoil.

Included with this type are spots of Madison sandy loam. This soil is practically free from gravel, but otherwise has the characteristics of the Madison gravelly sandy loam. These spots occur at Oak Ridge School, near Fairview, around and north of Pine Grove School, and north of Flat Rock School.

The gravelly sandy loam occupies comparatively small areas throughout the county in association with the Madison gravelly sandy clay loam. It occurs on the crests of ridges, on the smoother divides between drainage courses, and on the smoother lower slopes along drainage ways. The total area is comparatively small. The

topography is favorable for cultivation. The type is well drained as a whole. It is not as subject to erosion as the gravelly sandy clay loam type, as the surface is smoother and the run-off is not so rapid; nevertheless most of the type is terraced to prevent erosion.

The greater part of this type is in cultivation. Cotton, corn, oats, cowpeas, and some sweet potatoes are grown, and good yields are obtained. The soil is deficient in organic matter. Treatment similar to that suggested for the gravelly sandy clay loam is recommended for this type.

MADISON GRAVELLY FINE SANDY LOAM.

The Madison gravelly fine sandy loam is a gray, yellowish-gray, or light-brown gravelly fine sandy loam to a depth of 4 to 6 inches, where it passes into a reddish-brown to red clay loam to fine sandy clay loam. When cultivated the sandy loam layer is mixed with the clay loam layer, giving a fine sandy clay loam texture. Scattered over the surface and throughout the surface soil are fragments of graphitic schist, varying from one-half inch to 2 inches in diameter. Numerous quartz and quartzite fragments also appear on the surface. In virgin forest areas the surface soil is a gray fine sandy loam underlain by a yellowish-gray fine sandy loam, and then in turn by the red subsoil. Cultivated fields present a decided gray color when dry.

The subsoil to a depth of 3 feet or more is a yellowish-red or brownish-red to red clay loam to clay, carrying a high content of graphitic schist fragments, which cause a characteristic greasy feel. In places the underlying rocks come within 18 to 24 inches of the surface. The lower subsoil is uniformly friable and loose, owing to the partly weathered condition of the underlying schist. Fine mica particles are common throughout the soil section. On the more nearly level areas, where conditions have been favorable for weathering, the subsoil is a reddish clay of a slightly lighter red color than on the more rolling areas.

The topography is uneven, varying from rolling to hilly and broken. The smoother slopes and the narrow ridge crests or divides are the only areas that are really suited to cultivation. The drainage is good to excessive. Terracing is practiced on all the land under cultivation.

The type occurs principally in the southwestern and extreme northwestern parts of the county. It is residual from the underlying graphitic schists, principally, with some quartz-mica schist. In gullies and roadside cuts the dark, lead-colored, shiny, slick graphitic schist is exposed.

Originally all the type was in forests of pine, red oak, and blackjack oak. The land has only been cleared within the last 10 to 20 years. Areas recently cleared are said to be productive, but the land deteriorates very rapidly under cultivation, owing to the ease with which it erodes. Less than half of the type is under cultivation. Cotton, corn, and oats are grown, with yields about the same or perhaps a little less than on the associated Madison soils.

The type is deficient in humus, and is subject to washing. Proper terracing and the plowing under of cover crops are suggested for the improvement of this type.

Madison gravelly fine sandy loam, steep phase.—The surface soil and subsoil of the steep phase are similar in texture, color, and structure to those of the typical gravelly fine sandy loam described above. The main difference is in topography, the steep phase representing the steeper slopes, and hilly, broken, or rough areas of the Madison gravelly fine sandy loam.

The steep phase occurs in the extreme northwestern part of the county and on Black Jack Mountain in the southwestern corner. It is residual in origin from dark-colored graphitic schist, fragments of which are common on the surface.

The phase has a low agricultural value, because of its steep topography, and little of it is used for farming. Practically all the areas in cultivation lie along the narrow crests of ridges between drainage courses. This land is best suited for forestry and grazing.

MADISON GRAVELLY SANDY CLAY LOAM.

The surface soil of the Madison gravelly sandy clay loam consists of 6 to 8 inches of light-brown or reddish-brown to grayish-brown sandy clay loam, containing a high percentage of angular quartz gravel and fine fragments of the bedrock. The surface soil is moderately loose. The surface soil in virgin areas has a veneer of light-brown sandy loam, with a reddish-brown sandy clay layer immediately below. When cultivated the clay and sandy material is mixed, making the soil a sandy clay loam in texture. Small areas of gray sandy loam and reddish-brown sandy clay loam to clay loam included with the type give the cultivated fields a spotted appearance.

The upper subsoil is a brownish-red or red to bright-red, stiff but friable clay, which becomes plastic and sticky when wet. It is somewhat compact in places, but is friable when bored out with the soil auger. The lower subsoil, from a depth of 18 to 24 inches to a depth of 3 feet or more, is a reddish-brown to red, very friable and crumbly clay loam to clay, with a high content of fine mica particles derived from the partly decomposed rocks that underlie the type. Mica particles are common throughout the 3-foot soil section but are more abundant in the lower depths. The parent rock is generally soft or "rotten" and easily broken up, in contrast with the harder rock fragments associated with the Davidson and Cecil soils.

A few small areas of a gray, highly micaceous sandy loam, underlain by a friable reddish-brown clay loam with a high content of mica and a greasy feel, are included with this type. Such areas represent types of the Louisa series, but owing to their small extent they are mapped with the Madison soils. A small area of this soil occurs about one-half mile northwest of Efsey Church, and a few occur elsewhere.

The Madison gravelly sandy clay loam represents a soil condition intermediate between the Cecil sandy clay loam and the Louisa sandy clay loam types, the upper subsoil resembling that of the Cecil and the lower subsoil that of the Louisa series.

This is the most extensive type mapped in the county. The largest area occurs as a broad belt extending from northeast to southwest through Hulett, Clem, Roopville, and Tyus. Another large area is

mapped near Jake and Kansas in the northwestern part. Smaller isolated areas are mapped throughout the county.

The type is residual from the weathering of the underlying quartz-mica schist and garnetiferous schist, which have a high content of mica. The underlying rocks are generally near the surface. Weathering is rather active, and the rocks are easily broken up in the hand or by a hammer.

The greater part of this type has a gently rolling and rolling to hilly topography. The type is most extensive where the topography is comparatively steep and the run-off is rapid, removing much of the surface soil. It predominates in the southeastern part of the county, where the slope from the crest of the ridges to the drainage ways is rather steep. As a whole the type is well to excessively drained. On the steeper slopes all the cultivated land is terraced to prevent serious washing and gullying.

Scattered tracts on the steeper slopes are forested with various oaks, hickory, and shortleaf pine. The greater part of the type has been cleared and put under cultivation. The general farm crops of the region—cotton, corn, oats, and some cowpeas—are grown. Cotton yields from one-third to three-fifths bale per acre; corn, from 12 to 15 bushels. Higher yields of corn are obtained where the soil is heavily fertilized or manured. Oats and cowpeas are grown as forage crops, with fair results.

Commercial fertilizers are in common use for field crops. The soil as a whole is low in organic matter. The application of manures and the turning under of green-manure crops will improve the physical condition of the soil as well as add needed humus. Since the soil is subject to washing, terracing should be practiced on most fields. Land of this type sells for $25 to $75 or more an acre.

Madison gravelly sandy clay loam, steep phase.—The soil material of the steep phase is similar to that of the typical Madison gravelly sandy clay loam, the phase representing the steeper, more broken, and hilly areas. Only a small proportion of the phase is suited to cultivation. This phase occupies the steep, broken slopes along the stream courses, principally in the southeastern part of the county along Yellow Dirt, Whooping, Snake, and Wolf Creeks. Other small areas are scattered over the county on the steeper slopes of the typical soil.

The greater part of this phase supports a forest of oak, hickory, and pine. Erosion is active, but since the land is largely forested, the damage from erosion is not as great as it would be if the land were cleared. The steep phase has a very low farming value and is best suited for grazing and forestry.

MADISON SANDY CLAY LOAM.

The Madison sandy clay loam consists of an upper layer 3 or 4 inches deep, of grayish-brown to reddish-brown loose sandy loam to sandy clay loam, and a lower layer 6 to 8 inches deep of reddish-brown to red sandy clay loam to sandy clay. The immediate surface layer in virgin areas is a thin veneer of sandy material, the red sandy clay loam to sandy clay appearing below. When the soil is cultivated, the two layers are mixed, giving the soil a sandy clay

loam texture. Scattered over the surface and throughout the surface soil is a large quantity of small garnets that were originally imbedded in the schist from which the soil is derived. Spots of gray and red sandy loam and clay loam give the fields of this type a spotted appearance. Only a little quartz gravel is present on the surface.

The upper subsoil, which extends to a depth of 18 to 24 inches, is a brownish-red to red, rather compact, but friable sandy clay loam. This is underlain to a depth of 3 feet or more by a red, friable, micaceous clay loam or clay. Fragments of the underlying mica schist and garnetiferous schist are encountered locally within the 3-foot soil section, and in places the depth to bedrock is rather shallow. Mica is abundant throughout the soil and subsoil in most places.

This type includes small areas of Madison sandy loam, gravelly sandy loam, and gravelly sandy clay loam, but as a whole it is fairly uniform in texture, color, and structure.

The Madison sandy clay loam is extensive in the county. The largest areas lie in the western and northwestern parts, with scattered areas throughout other parts of the county.

The type occupies divides and gently sloping to hilly areas. As a whole the topography is favorable for cultivation, and the greater part of the soil is farmed. Drainage is well established. In many places the run-off is rapid, making it necessary to terrace the land to prevent erosion.

Originally all the land of this type was covered with a growth of timber. The larger part of it has been cleared, although there are some areas of forest, consisting mainly of pine, oak, and hickory. Cotton, corn, oats, and general farm crops are grown with fair to good results. The soil is deficient in organic matter. The treatment suggested for the other types of this soil series would prove beneficial. Land of this type is held for $25 to $75 an acre.

The following table gives the results of mechanical analyses of samples of the soil, subsurface, and subsoil of the Madison sandy clay loam type:

Mechanical analyses of Madison sandy clay loam.

Number.	Description.	Fine gravel.	Coarse sand.	Medium. sand.	Fine sand.	Very fine sand.	Silt.	Clay.
		Per cent.	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*
256616..	Soil, 0 to 5 inches.....	4.4	7.6	5.1	27.1	7.6	17.3	30.9
256617..	Subsurface, 5 to 18 inches.	1.8	6.9	5.0	21.6	4.9	12.3	47.5
256618..	Subsoil, 18 to 36 inches.	1.2	5.1	3.7	19.0	5.6	23.5	41.8

CECIL GRAVELLY SANDY LOAM.

The surface soil of the Cecil gravelly sandy loam is a yellowish-brown, yellowish-gray, or gray gravelly sandy loam. Fine angular quartz gravel is scattered over the surface and through the soil material. The upper subsoil is a yellow to reddish-yellow fine sandy loam, which passes at 15 to 18 inches into a reddish-brown, brownish-red, or red clay, rather heavy, compact, and stiff. The subsoil is

sticky when wet. Fine mica particles are scattered throughout the 3-foot section. This type differs from the sandy loam type mainly in that it contains quartz gravel.

This type occurs as comparatively small isolated tracts, principally in the north-central part of the county. The topography ranges from smooth or gently rolling to undulating and hilly.

The greater part of the type is under cultivation, the crops and yields being similar to those on the sandy loam type. The suggestions for the improvement of the sandy loam type apply equally to this soil.

CECIL GRAVELLY SANDY CLAY LOAM.

In virgin areas the surface soil of the Cecil gravelly sandy clay loam consists of two layers, an upper one, a few inches thick, of light-brown or brownish-gray to gray sandy loam, and a lower one of yellowish-gray sandy loam extending to a depth of 6 to 8 inches. In the cultivated fields the surface soil is a reddish-brown to gray sandy loam, underlain at 3 to 5 inches by a reddish-brown to red sandy clay loam. The gravel content is the distinguishing feature between this type and the sandy clay loam of the series. The gravel consists of angular quartz fragments and particles of parent rock. This type has a "spotted" gray and red appearance when cultivated, the gray color being due to the small areas of sandy loam material, and the red color to the clay loam areas, which are largely the result of erosion of the surface soil and exposure of the red clay loam layer. The typical subsoil is a brownish-red, red, or bright-red, rather compact, stiff, and rather brittle clay. Mica particles are present throughout the soil section. Small areas of the sandy clay loam and gravelly sandy loam types are included with the type as mapped in the present survey.

The Cecil gravelly sandy clay loam occurs principally in the central and northern parts of the county in comparatively small areas, and in a few scattering areas in the western part. The topography is generally undulating to gently rolling, similar to that of the sandy clay loam type, but in places it approaches hilly.

The type is considered a good general farming soil. Crops and yields are similar to those on the Cecil sandy clay loam. The gravel content does not interfere with cultivation. The suggestions offered for the improvement of the sandy clay loam are applicable to this type.

CECIL SANDY LOAM.

The Cecil sandy loam consists of 6 to 7 inches of light-brown or yellowish-brown to gray light sandy loam, of loose, mellow structure, resting on a subsoil of rather compact, stiff, but brittle brownish-red to bright-red clay containing some quartz grains and finely divided mica flakes. In a few places the upper subsoil has a yellowish to reddish-yellow color. This is likely to be the condition in the forested areas where the soil is in a virgin state. Here the red lower subsoil is encountered at depths of 15 to 18 inches. Some small quartz gravel is found, but it is not abundant as on the gravelly types of the series. This type occurs in close association with the sandy clay loam, and includes small areas of that type.

The Cecil sandy loam is not extensive and is mapped in small isolated tracts in the east-central and northern parts of the county. The topography is gently rolling on the broad divides to rolling in other places, and is generally favorable for cultivation. Terracing is practiced to prevent serious washing of the soil.

Owing to the ease of cultivation and the favorable topography, the greater part of the type is under cultivation. Cotton, corn, oats, wheat, sorghum, cowpeas, and sweet potatoes give good yields. Cotton returns from one-half to three-fourths bale per acre, and corn from 15 to 30 bushels. Commercial fertilizers are used on both these crops.

Because of its sandy character, the soil dries out rather quickly and warms up early in the spring. It can be worked under a wider range of moisture conditions than the clay and clay loam types of this series. Deeper plowing, the growing of cover crops, and the incorporation of vegetable matter in the soil should be practiced. Peanuts, bright tobacco, and sweet potatoes are grown successfully on this type in other localities. This soil is very easy to till and responds readily to fertilizers and manures. It is one of the earliest soils in the county, and trucking can be carried on profitably.

The type is held for $25 to $100 an acre, depending upon improvements, nearness to markets, and the general condition of the land.

CECIL SANDY CLAY LOAM.

In virgin areas the immediate surface soil of the Cecil sandy clay loam in places is a grayish-brown sandy loam, underlain by a brownish-red sandy clay. The mixing of these layers in cultivation results in a sandy clay loam texture, and the surface soil, 5 to 8 inches deep, is of reddish-brown to brownish-red sandy loam to sandy clay loam. The typical subsoil is a compact, stiff but brittle, red to bright-red clay, which is sticky when wet. Angular quartz fragments and small mica particles are present in places, but the soil is typically free from stones and gravel that would in any way interfere with cultivation. The underlying rock is near the surface in some places and is exposed in gullies and road cuts.

The Cecil sandy clay loam is locally called "spotted red land," as the fields present a patchy gray and red appearance, the gray representing areas of sandy loam and the red of clay loam to clay texture, occurring where the former mantle of sandy loam has been removed by erosion.

In a few small areas the subsoil is mottled with gray. Such areas represent a gradation from the typical Cecil toward the Appling series.

The Cecil sandy clay loam is an extensive soil in Carroll County. The largest area forms a belt extending from the northern part of the county in a southwesterly direction on both sides of the Little Tallapoosa River to near Lovvorns Mill. Another belt borders the Chattahoochee River. A small area lies south of Bowdon, and a few others occur elsewhere in the county.

The type is residual from the weathering of granitic gneiss, quartz-mica schist, and hornblende schist. The rocks are more massive and harder than those underlying the Madison soils.

The type has a gently rolling to undulating topography, with comparatively hilly areas in a few places. The slopes as a rule are long and gentle, with broad interstream divides. Surface drainage is good. Most of the type is terraced to prevent erosion and gullying.

The favorable texture, topography, and drainage of this type makes it one of the valuable agricultural soils of the county. About 70 per cent of the type has been cleared and is under cultivation. A scattered growth of oak, hickory, gum, and pine is still present in small areas.

The principal crops are cotton, corn, and oats; but wheat, cowpeas, sorghum, and forage crops also are grown. Good yields are obtained from all the crops. Garden vegetables and fruits also do well. Cotton yields from one-third to three-fourths bale per acre; corn, 12 to 25 bushels; and forage crops, from three-fourths to one ton or more of hay per acre.

Commercial fertilizers, prevailingly 8-2-2 or 9-3-3 mixtures, are used on cotton and corn land. The applications vary from 150 to 400 pounds per acre for cotton; considerably less is applied for corn. The soil is in need of humus, and would be benefited by applications of manures and the plowing under of cover crops. Deeper plowing, during the winter and fall months where possible, would also be beneficial.

Cecil sandy clay loam, steep phase.—The steep phase of the Cecil sandy clay loam is similar in texture, color, and structure to the typical soil but differs in topography, the phase occupying steep and broken to hilly areas. In most cases the land is too broken and steep for cultivation, although a few small tracts are used in growing cotton and corn. The phase is subject to active erosion, deep gullies appearing in the fields in a very short time where terracing is not carefully attended to.

This steep phase is mapped in association with the typical sandy clay loam as a belt bordering the Chattahoochee River, along the headwaters of Snake Creek, and in a few isolated areas in the central part of the county.

The greater part of the phase supports a growth of pine, oak, and hickory. In forested areas a thin layer of sandy loam material overlies the red clay material. This land is best suited for forestry and pasture. Lespedeza (Japan clover) would do well.

CECIL CLAY LOAM.

The Cecil clay loam, locally known as "red-clay land," as typically developed is a reddish-brown or brownish-red to red, friable, heavy clay loam, 5 to 6 inches deep, underlain by a red to bright-red, heavy, stiff clay which is sticky and plastic when wet. Included with the type are small areas that are more sandy, resembling the Cecil sandy clay loam. The type is practically free from gravel or stones. In a few small areas the clay loam surface soil is underlain by stiff red clay at a depth of only 2 to 4 inches. These areas resemble the Cecil clay, but owing to their small size they are not shown separately on the map. Fine mica particles are present in places, but ordinarily not in sufficient quantity to give the type a slick or greasy feel. A few

small areas occur where the surface soil and subsoil are darker than typical; such areas resemble the Davidson soils.

The Cecil clay loam occupies sloping to slightly rolling or hilly areas. There are a few steep slopes where erosion has been sufficiently active to remove the surface soil and leave the clay loam and clay of the subsoil exposed. The topography as a whole is slightly more rolling than that of other types of the series, and erosion is more active. Terracing is necessary to prevent serious washing of the land. The type occurs in comparatively small areas through the central and northern parts of the county, with a few scattering areas in the southeastern and western parts.

This soil is adapted to the production of cotton, corn, and forage crops. On account of its heavy texture it is more difficult to handle and not so easily tilled as the sandy and sandy clay loam types. It should not be plowed or cultivated when wet, and, like the Davidson clay loam, it clods and bakes when dry. Deep plowing and the incorporation of green-manure crops will do much to improve its physical condition. Heavier plows and farming implements are needed here than on the sandier members of the series. Land of the Cecil clay loam sells for $40 to $75 an acre.

DAVIDSON CLAY LOAM.

The surface soil of the Davidson clay loam consists of 8 to 10 inches of dark-red to brownish-red, friable, mellow clay loam. The subsoil to a depth of 3 feet or more is a dark-red to purplish-red silty clay to clay of smooth structure. The upper subsoil is compact though friable; the lower part of the 3-foot section is heavier and slightly sticky. Fine particles of mica are usually present in quantities sufficient to give a slightly greasy feel in the material. In a few places subangular quartz gravel is scattered on the surface and through the soil. The dark-colored basic rocks, from which the soil is derived, outcrop in places, and fragments of these rocks appear on the surface. However, as a whole, the type is comparatively free from stone and gravel, and in no place is the coarse material sufficiently abundant to interfere with cultivation.

The Davidson clay loam is locally called "black land," on account of its dark color, and also "push land," or "gummy land," owing to its peculiarity of sticking to the plowshare, especially if it is plowed when wet. The type as a whole is rather uniform in color and texture as mapped in this county. Areas where gravel and stone in any considerable amount occur are shown by stone symbols. In places tracts, a few acres in extent, of Cecil material have been included with the type. This Davidson soil is the most easily distinguished among the upland soils, because of its brownish-red to dark-red color.

The type occurs principally in the central part of the county, in a belt extending in a northeast-southwest direction through Carrollton. Other areas lie along the Little Tallapoosa River, south of Bowdon, north of Villa Rica, and southwest of Whitesburg, along the Chattahoochee River. Many small isolated areas are mapped. The larger areas lie southwest of Villa Rica and near Carrollton.

The soil is residual in origin from dark-colored, basic, diorite, diabase, and hornblende schist rocks. The topography ranges from

comparatively gently sloping and smooth to gently undulating and in places to hilly. The surface as a whole is very favorable for intensive farming. The hilly part of the type occurs principally southwest of Villa Rica. The drainage is good, and on the steeper slopes the run-off is excessive and erosion active. The steeper slopes, where farmed, are terraced to prevent gullying.

The Davidson clay loam was originally in forest of hardwoods, longleaf pine, and shortleaf pine. Most of it has been cleared, and from 75 to 85 per cent of the type is now under cultivation. It is recognized as a productive soil and the greater part of it is being farmed to general crops. Cotton, corn, and oats are the leading crops. Wheat, cowpeas, and a little alfalfa are grown. Cotton yields one-half to three-fourths bale per acre; corn, 20 to 25 bushels; and oats and wheat give better yields on this type than on the associated Madison and Cecil soils. Commercial fertilizers are used on all crops, but not nearly so much is applied per acre as on the adjacent soils. Chemical analyses of this soil in Jasper County, Ga., show a high lime content.

This type requires greater care in plowing than some of the associated Cecil and Madison soils, as it tends to clod and bake because of its heavier texture. While the soil is fairly well supplied with organic matter, the incorporation of manures and green crops would improve the tilth. Deeper plowing and proper crop rotations also are recommended. This land is suited to the production of alfalfa, and is also a good wheat, oats, and clover soil.

The Davidson clay loam is recognized as among the best upland soils of the county and commands the highest prices. It sells for $50 to $150 an acre.

APPLING GRAVELLY SANDY LOAM.

The surface soil of the Appling gravelly sandy loam consists of 6 to 10 inches of yellowish-gray to gray, locally light-brown, gravelly sandy loam to fine sandy loam. The abundance of angular quartz and porphyritic granite gravel distinguishes this type from the sandy loam. The subsoil is similar in texture and structure to that of the sandy loam. There is very little variation in the type, except in the proportion of gravel. A few small areas of soils of the Worsham series are included.

This type is not as extensive as the sandy loam. The largest area lies in the vicinity of Bowdon Junction. Smaller areas occur throughout the county.

From the standpoint of crop production this type compares favorably with the sandy loam, and the gravel does not interfere with the cultivation. The methods recommended for improving the Appling sandy loam apply equally well to the gravelly sandy loam. The range in price of the two types is about the same.

APPLING SANDY LOAM.

On account of its light color the Appling sandy loam is locally called "gray land." The surface soil consists of 6 to 8 inches of loose, porous yellowish-gray to gray sandy loam or loamy sand, low in organic matter and containing some fine gravel in places. The

upper subsoil is a yellow to pale-yellow friable sandy loam, rather heavy in places. This passes at 18 to 24 inches into a streaked gray, yellow, and red, and occasionally brown, more compact sandy clay loam to sandy clay or clay. The lower subsoil in places has a decidedly greasy feel owing to the presence of fine mica particles. Along contacts with the Cecil and Madison soils the surface soil may have a light-brown color.

The type is closely associated with the Cecil and Madison soils, and small areas of these soils are included with the type, such areas being too small to be mapped separately.

A few small areas of Worsham soils are also included with the type. These occur around the heads of small drainage ways, and at the foot of slopes, and are poorly drained. In such places the surface soil has a gray to whitish color and is underlain by a yellow and gray, mottled with red, heavy, plastic clay. A few small areas of this variation are situated 4 or 5 miles southwest of Carrollton and others northeast of that town.

The Appling sandy loam is rather extensive, comprising some comparatively large areas and many smaller ones scattered over the county. The largest areas lie near Villa Rica, north of Hominy Creek, in the vicinity of Burwell, southwest of Carrollton, near New Hope Church and County Line Church, and along the Chattahoochee River.

The type is residual in origin from light-colored rocks, including granitic gneiss, porphyritic granite, and associated schists. The mottled or streaked appearance of the subsoil is probably due to leaching. Bedrock is reached in places within the 3-foot section.

The topography is for the most part undulating to gently rolling, becoming somewhat hilly in only a few places. The greater part of the type occupies smooth, gentle slopes. As a whole it is well drained, though there are a few small areas that could be improved by artificial drainage. Such areas are usually water-logged, owing to constant seepage of ground water. Terracing is practiced to protect the land from washing.

Originally all the Appling sandy loam was forested with pine, oak, and hickory, but a large proportion has been cleared and is now under cultivation. The soil is loose and porous and easily cultivated, but at the same time resistant to drought. Cotton, corn, oats, cowpeas, and sweet potatoes are the principal crops. Cotton produces from one-third to one-half bale per acre and corn from 12 to 18 bushels. Cowpeas yield one-half to three-fourths ton of cured hay per acre. This soil is adapted to a wide range of crops, including all the general farm crops, but is especially suited to the growing of sweet potatoes and melons. Farther north in the Piedmont region it is used for the growing of bright tobacco with good results. Peanuts also can be produced successfully.

According to chemical analyses made by the Georgia experiment station, using samples of this type collected in Jasper and Dekalb Counties, the soil and subsoil are high in potash, but as the potash appears to be locked up in a very insoluble form, applications of potash are needed to produce good crops. The samples studied also were low in nitrogen and phosphoric acid, and field observations in Carroll County would seem to confirm the results so far as nitrogen

is concerned. Applications of manure and the plowing under of green-manure crops should be used to supply this deficiency. The selling price of this type ranges from $25 to $75 an acre.

WICKHAM FINE SANDY LOAM.

The surface soil of the Wickham fine sandy loam consists of 8 to 10 inches of brown to reddish-brown fine sandy loam with a mellow and friable structure. The subsoil to a depth of 3 feet or more is a more compact yet friable reddish-brown to dull-red sandy clay loam or clay loam to silty clay, the lower part being heavier and more compact than the upper part. Locally the fine sandy loam to loamy fine sand extends to a depth of 3 feet, but such areas are small. Small rounded river gravel is present in a few places.

The Wickham fine sandy loam occurs as isolated areas, from 5 to 50 acres in extent, principally along the Chattahoochee River, Big Indian Creek, and Little Tallapoosa River. The type occupies smooth, gently sloping to nearly level terraces. Practically all of it is well drained and is seldom if ever overflowed.

Originally the type was covered with forest, but practically all of it has been cleared and put under cultivation. It is recognized as a valuable soil for cotton, corn, and oats. Cotton yields one-half to three-fourths bale per acre; and corn, 20 to 25 bushels. Land of this type is valued at $50 to $100 an acre.

ALTAVISTA FINE SANDY LOAM.

The surface soil of the Altavista fine sandy loam is a light-brown or grayish-brown to gray fine sandy loam, 10 to 12 inches deep. The subsoil is yellow, slightly mottled with gray and locally streaked with red in the lower part. The surface soil is loose and porous; the subsoil is more compact and heavier, ranging in texture from clay loam to sandy clay.

The Altavista fine sandy loam occupies second bottoms or terraces along the larger streams in association with the Wickham series. The type is derived from old alluvial material deposited when the streams flowed at higher levels than at present. The type is not extensive. It occurs in small areas along the Chattahoochee and Little Tallapoosa Rivers and Big Indian Creek. The topography is nearly level to slightly undulating. The areas are well drained, and are overflowed only during brief periods in the highest floods.

The type is farmed to corn, cotton, and oats. The yields are fair to good, but not quite as good as on the Wickham soils. The soil is low in organic matter, and applications of manure and the plowing under of green crops, particularly cowpeas, would prove beneficial. Land of this type is held at $50 to $75 an acre.

CONGAREE FINE SANDY LOAM.

The surface of the Congaree fine sandy loam is a light-brown to brown or slightly grayish brown fine sandy loam 8 to 10 inches deep. The subsoil to a depth of 3 feet or more is a yellowish-brown to yellowish-red heavy though moderately friable sandy loam to fine sandy clay loam. Both soil and subsoil contain large quantities of finely

divided mica particles. While the soil is typically a fine sandy loam, areas of sandy loam, silt loam, and silty clay loam texture are included, these being too small to be separated on a map of the scale used. Adjacent to the stream courses a narrow belt of sand or coarse sand occurs in places as a slight ridge or natural levee. This represents the coarser soil particles deposited in times of high water.

The Congaree fine sandy loam occurs along the Little Tallapoosa and Chattahoochee Rivers and their larger tributaries. It occupies smooth, nearly level to slightly undulating first bottoms and is subject to overflow several times each year.

The soil is loose and porous, dries out rather quickly after overflows, and a large part of it is under cultivation. Crops do well on the better drained parts of the type. Corn and oats are the important crops. The uncleared land supports a growth of shortleaf pine and wild grasses and is used for pasture.

Drainage and protection from overflow are the steps most needed in the improvement of this soil. The supply of organic matter also should be increased.

CONGAREE SILT LOAM.

The surface soil of the Congaree silt loam in virgin areas is a light reddish brown to light-brown friable silt loam, 6 to 12 inches deep. The soil has a smooth, velvety, and slightly greasy feel, which is due to the abundance of fine mica particles. The subsoil is generally similar to the surface soil in color and texture, though in a few places slight mottlings of gray and yellow are common in the lower part of the 3-foot section. The subsoil is more compact than the soil. Layers of fine sand are encountered locally in the subsoil. Many small areas with the texture of fine sandy loam are included with the type as mapped in the present survey.

The surface soil in cultivated fields has a light-brown to light reddish brown color, and often, especially when dry, a grayish cast.

Included with this type are a few small areas having light-brown to slightly grayish surface soils and a mottled gray, yellow, and brown subsoil. Such areas represent types of the Wehadkee series, but owing to their small extent they have been included with the Congaree silt loam. Areas of this kind occur below the junction of Buck Creek and the Little Tallapoosa River, in a small area along Snake Creek about 2 miles above Banning Mill, and in a few places elsewhere along the Little Tallapoosa River.

In places considerable fine sand has been mixed with the silt material by recent overflows. In a few level spots the lower subsoil is composed of stratified sands. Areas of Meadow (Congaree material) too small to be shown separately on a map of the scale used, also are included.

The Congaree silt loam occupies first-bottom positions in the wider bottoms along the Little Tallapoosa River, Snake Creek, Big Indian Creek, and the Chattahoochee River. It is low, has a nearly flat or, at most, only slightly undulating surface, and is subject to overflow.

The Congaree silt loam is one of the most fertile soils in the county for corn and forage crops, but owing to the danger of overflow only a small part of it is under cultivation. The heavy rains in the

spring months cause it to remain wet, and corn and other crops can not be planted until late in the season.

The greater part of the type is in forests of water oak, red oak, white oak, sycamore, ash, poplar, elm, green maple, shortleaf pine, hickory, willow, and other hardwood species. A few small areas are cleared and used for pasture, for which the land is well adapted.[6] Corn, the principal tilled crop, yields from 20 to 50 bushels in the more favorable, that is, the drier seasons. Oats are grown as a forage crop, and cowpeas and velvet beans also are grown with good results. No fertilizers are used on this type.

Land values range from $25 to $50 an acre, varying with the value of the adjacent upland soils. With proper drainage this type would become one of the most productive and highly prized soils of the county.

MEADOW (CONGAREE MATERIAL).

Meadow (Congaree material) comprises first-bottom alluvial material of variable texture and structure, which has been washed from the adjacent uplands and deposited along the stream courses. The land classified as Meadow represents material of the Congaree series, but the texture, which ranges from sand to silty clay, varies so greatly within short distances that type distinctions are not practicable. The color of the soil ranges from brown and grayish brown to reddish brown. The subsoil is yellowish brown, reddish brown, or mottled gray, yellow, and red. Fine mica particles are abundant throughout the 3-foot soil section.

Meadow (Congaree material) is mapped principally along the smaller streams of the county and along the Little Tallapoosa River and Big Indian Creek. The bottoms, as a rule, are narrow, the surface is flat to nearly level, and the drainage is poor. Little or none of the type is cleared and under cultivation. It supports a growth of oaks, gum, maple, birch, willow, and water-loving grasses. The greater part of the bottom land is used for summer pasture. The land is badly in need of drainage and protection from overflow. In its present condition it has little or no value for the production of cultivated crops.

SUMMARY.

Carroll County lies in the western part of Georgia, in the Piedmont Plateau region, and bordering the Alabama State line. It embraces an area of 497 square miles, or 318,080 acres.

The topography ranges from smooth and gently sloping, through undulating or rolling to rough, steep, and broken. The greater part is undulating to rolling. The elevation of the county ranges from 600 to 700 feet above sea level along the Chattahoochee River to 1,550 feet on Black Jack Mountain in the southwestern part of the county.

The drainage of the county is carried by the Chattahoochee and the Little Tallapoosa Rivers.

[6] The principal grasses for successful pastures in this State are discussed in "Permanent Pastures for Georgia," Bulletin No. 197, Georgia State College of Agriculture.

Settlement of the county began about 1825, when the lands were thrown open to settlement by a treaty with the Indians. The population of the county in 1920 was 34,752. Carrollton, the county seat and the largest town, has a population of 4,363.

Transportation is afforded by the Southern Railway in the northern part of the county. The Central of Georgia Railway crosses the county from northwest to southeast, and the Bowdon Railway (Central of Georgia) serves the western part of the county.

Only a few of the wagon roads are improved. These are surfaced with a sand-clay mixture, and are kept in good repair. The other roads of the area are in only fair condition.

The climate of the county is characterized by long hot summers and short open winters. The average growing season, or the period free from killing frost, is over 200 days. The mean annual temperature is 60.4° F. and the mean annual precipitation is 49 inches, which is well distributed throughout the growing season.

Agriculture is the chief industry of the county. The principal crops are cotton, corn, and oats; and the minor crops wheat, forage crops, sorghum, sweet potatoes, and vegetables. Peaches, pears, and plums are grown for local use. Dairying is carried on to a small extent. The livestock raised is not sufficient to meet the demands for work stock or for meat. Commercial fertilizers are used on cotton and corn land. The yield of cotton in 1919 averaged 0.46 bale per acre; and of corn, 14.6 bushels.

The native forest growth consists of shortleaf, loblolly, and longleaf pines, oaks, hickory, gum, and poplar. Between 65 and 75 per cent of the county has been cleared.

The upland soils of the county are residual, i. e., derived, through weathering, from the underlying rocks. The alluvial soils consist of materials that have been washed from the uplands and deposited by streams along their courses. The soils range in texture from gravelly sandy loams to clay loams.

As a whole the soils are deficient in organic matter and lime. Deeper plowing, the application of manure, and the plowing under of cover crops are recommended for their improvement.

There are seven soil series in the county, represented by 16 types and three phases. In addition to these there is one mixed soil classed as Meadow (Congaree material).

The Madison series includes the most extensive soils in the county. Four types and two phases of this series are mapped, ranging in texture from a gravelly sandy loam to sandy clay loam. Cotton, corn, and oats are the principal crops. These are excellent cotton soils under boll-weevil conditions.

The Cecil series comprises some of the best farming land of the county. The soils are productive for cotton, corn, and grains. Five soil types and one phase of this series are mapped, ranging in texture from a gravelly sandy loam to clay loam.

The Davidson clay loam is well developed in the central part of the county. It is considered the strongest and most productive upland soil for grains, corn, and cotton. A little alfalfa is grown with fair results. The Davidson soils are considered the best of the Piedmont soils for this crop.

The Appling soils are characterized by gray to yellowish-gray surface soils and a yellow, gray, and red mottled subsoil. These soils are considered good for general farm crops, though not quite as productive as the Cecil soils. Two types, the gravelly sandy loam and sandy loam, are mapped.

The alluvial soils are represented by the Altavista and Wickham series on the terraces and by soils of the Congaree series and Meadow (Congaree material) in the first bottoms. The terrace soils are valuable farming soils. The Congaree soils are considered good corn and oats soils where not too much subject to overflow. Meadow (Congaree material) is poorly drained. It is largely in forest, and is best suited for forestry and pasture.

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