UNITED STATES DEPARTMENT OF AGRICULTURE

Soil Survey
of
Clarke County, Georgia

By

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Georgia State College of Agriculture

Bureau of Chemistry and Soils
In Cooperation with the
Georgia State College of Agriculture

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CONTENTS

SOIL SURVEY OF CLARKE COUNTY, GEORGIA

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COUNTY SURVEYED

Clarke County is situated somewhat east of the north-central part of Georgia. Athens, the county seat, is 73 miles east of Atlanta and 96 miles north of Macon. Branches of Oconee River form the boundary along the southwest side, after crossing the western part of the county. In order that the map may join with soil maps already published, a small part of Jackson County, not previously mapped, has been included along the northern county line.

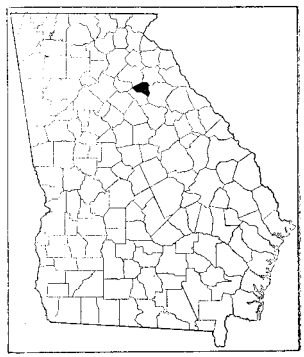

FIGURE 1.—Sketch map showing location of Clarke County, Ga.

Clarke County, which embraces part of an eroded and dissected remnant of an old plateau, lies in the central part of the Piedmont Plateau. Few areas lie at the old plateau level and none project above it. Most of the county lies at lower levels, determined by the extent of dissection by streams. High, undulating remnants of the old plateau are in the western, northern, and eastern parts. The remainder of the county has been eroded to a variable extent. Erosion has been greatest in areas bordering Oconee River and its forks, Middle Oconee and North Oconee Rivers. These streams have carved valleys with very narrow alluvial belts, and in most places the slopes bordering the streams rise steeply for 100 to 200 or more feet, then gradually round away toward the crest to the smoother areas above. Areas between the tributaries become markedly more rolling or hilly, with sharper relief toward the rivers. Especially in the southeast part of the county, surface erosion has commonly advanced across the ridges between the creeks.

The remnants of the old plateau, which are the highest areas in the county, range in elevation from about 775 feet to a little more than 850 feet above sea level. The elevation on the Danielsville road near the county line is slightly more than 850 feet, along the Seaboard Air Line Railway 1½ miles from the northeast county line is 850 feet, and northwest of Winterville is 785 feet. The plateau area in the western part near the county line ranges from about 775 feet above sea level to a little more than 850 feet. Surface erosion has not been great in these areas but is marked in most places below an elevation of 775 feet. In the southeast corner of the county the crest of the ridge between Shoal and Big Creeks ranges from 730 to 760 feet in elevation.

Drainage is everywhere well established, and over 75 per cent of the county it is so excessive that checking surface run-off to prevent excessive erosion is a problem of great importance. The northeast corner of the county occupies a divide between two of the major drainage systems of the State. Drainage north and northwest of Winterville is into Broad River and from the rest of the county is into Oconee

113968—30——1

River. In the part of the county between these two drainage systems relief is least marked and only shallow drainage channels have developed. In this region and to less extent in the western part of the county, soils in small areas near the shallow drainage channels have developed under conditions of poor internal drainage, although surface drainage is generally good. The fall of the larger streams is from 100 to 150 feet each 10 miles.

In 1783 the territory of which Clarke County is now a part was obtained from the Creek Indians by treaty. The following year it was opened for settlement by land grants to soldiers of the American Revolution. In 1784 the State legislature created the educational institution now known as the University of Georgia. It was located in 1801 at a site in Jackson County, which was given the name of Athens. When school opened in 1802 most of the county was wilderness. The same year Clarke County was established from Jackson County. Subsequent settlement and development of the county have been closely allied with and influenced by the growth of the university. The establishment of the Georgia State College of Agriculture in 1872 and its enlargment in 1906 have materially benefited the later development of agriculture in the county. The county boundaries were changed from time to time after its establishment. In 1807 territory was added from Greene County, and in 1811, 1813, 1829, and 1875 land from Clarke County was annexed, respectively, to Madison County, Oglethorpe County, Madison County, and Oconee County. Part of Oglethorpe County was added to Clarke County in 1906.

Many of the first settlers in the county were connected with the university and came from the Northern States as well as from other Southern States and other parts of Georgia. The present population shows a marked admixture of the descendants of the members of the early faculty who aided in building up the institution. According to the census the population of Clarke County was 26,111 in 1920. Of these, 16,748 were inhabitants of Athens and 9,363 were classed as rural. The average density of the rural population is given as 82.1 persons to the square mile. The rural population is well distributed throughout all parts of the county, except on the rougher lands bordering the rivers and larger creeks. Of the entire population, 52.6 per cent are native white, 46.7 per cent are negro, and 0.7 per cent are foreign-born white. Of the 9,363 rural population, 1,381 are classed as farmers, of which 33.8 per cent are white and 66.2 per per cent are negro.

Athens is the largest city not only in Clarke County but also in this part of Georgia. There is considerable manufacturing both in Athens and in the near-by towns of Princeton and White Hall. Consequently, Athens constitutes the principal market for farm produce for the entire county. A small amount is trucked to Atlanta, and small shipments are sometimes made to Florida and to New York, Philadelphia, and other cities in the Northeast. As only a small part of the county is more than about 8 miles distant from Athens, long hauls are not necessary in marketing farm produce. Excellent roads, among the best in the State, radiate in all directions from Athens. The principal roads are paved or surfaced with sand-clay or gravel, and secondary roads have been graded and are in good condition except during rainy periods.

The county is served by lines of five railways—the Seaboard Air Line, Southern, Gainesville Midland, Georgia, and Central of Georgia.

CLIMATE

The climate of Clarke County is continental and is characterized by long, moderately hot summers and short, moderately cold winters. During the summer short hot spells are common, but the nights are usually pleasant. The average date of the latest killing frost is April 2, although killing frost has been recorded as late as April 21. The average date of the earliest frost is November 3 and the earliest recorded was on October 11. This gives an average frost-free season of 214 days. During the winter the ground is frozen for brief periods.

Clarke County has a high annual precipitation, well distributed for crop production. Rainfall is comparatively heavy during winter, is light during the spring planting months of April and May, increases during the summer growing season, and is lightest during the harvest months of September, October, and November. The heavy summer rainfall may interfere somewhat with curing summer hay crops such as alfalfa and sometimes delays the harvesting of grain crops. In 1925, the driest year recorded, an almost complete crop failure resulted from insufficient moisture during the growing season.

Table 1 gives the normal monthly, seasonal, and annual temperature and precipitation, with recorded extremes in each, as compiled by the Weather Bureau from observations made at Athens.

TABLE 1.—*Normal monthly, seasonal, and annual temperature and precipitation at Athens*

[Elevation, 694 feet]

Month	Temperature			Precipitation			
	Mean	Absolute maximum	Absolute minimum	Mean	Total amount for the driest year (1925)	Total amount for the wettest year (1908)	Snow, average depth
	° F.	*° F.*	*° F.*	*Inches*	*Inches*	*Inches*	*Inches*
December	43.6	74	6	4.36	3.37	4.34	0.4
January	42.5	77	1	4.86	9.85	3.93	.6
February	44.4	77	−3	5.13	1.77	7.26	1.2
Winter	43.5	77	−3	14.35	14.99	15.53	2.2
March	52.3	86	12	5.15	2.80	4.58	.1
April	60.8	92	28	3.50	1.60	6.57	(1)
May	70.0	100	36	3.52	2.06	1.97	----------
Spring	61.0	100	12	12.17	6.46	13.12	.1
June	76.7	105	43	4.37	1.15	3.82	----------
July	79.0	108	55	5.08	1.17	3.81	----------
August	78.0	103	54	4.98	.35	18.43	----------
Summer	77.9	108	43	14.43	2.67	26.06	----------
September	72.7	99	40	3.39	.30	1.88	----------
October	62.0	96	25	2.91	4.46	4.01	(1)
November	51.5	83	16	2.84	3.32	2.34	.2
Fall	62.1	99	16	9.14	8.08	8.23	.2
Year	61.1	108	−3	50.09	32.20	62.94	2.5

[1] Trace.

SOIL SERIES AND TYPES

The soils of Clarke County have been classified in soil series, each designated by a proper name. The soils in each series have the same profile characteristics and have been formed in the same manner under similar conditions and from the same kind of material. The series are further divided into soil types on the basis of the texture of the surface soil; that is, the proportion of sand, silt, and clay present. Wherever possible in this report the soils have been described in wooded areas or in areas which have never been cultivated, as in such places the soil is in its natural condition. In addition to the soil types, several phases of types, representing minor variations from the typical soil, are shown on the map. In Clarke County 7 soil series, including 9 soil types and 4 phases of types, are represented. In addition, 1 miscellaneous class of mixed material, meadow, is mapped.

In the following pages of this report the soils are described in full and their agricultural possibilities are discussed; their distribution is shown on the accompanying soil map; and their acreage and proportionate extent are given in Table 2.

TABLE 2.—*Acreage and proportionate extent of the soils mapped in Clarke County, Ga.*

Type of soil	Acres	Per cent	Type of soil	Acres	Per cent
Cecil clay loam	23,040	35.6	Durham sandy loam	384	0.5
Steep phase	3,136		Worsham sandy loam	1,216	1.7
Cecil sandy loam	11,712	40.2	Wickham sandy loam	192	.3
Mixed phase	17,920		Congaree fine sandy loam	1,920	2.6
Cecil sandy clay loam	2,432	3.3	Congaree silty clay loam	640	.9
Madison sandy loam, mixed phase	2,496	3.4	Meadow	3,328	4.5
Madison gravelly sandy loam, mixed phase	4,288	5.8	Total	73,600	
Appling sandy loam	896	1.2			

CECIL CLAY LOAM

In forested areas the surface soil of Cecil clay loam, locally known as red clay land, consists of a surface layer from 1 to 4 inches thick of brown loam containing considerable organic matter and vegetable mold, overlying light reddish-brown clay loam continuous to a depth ranging from 4 to 10 inches. This clay loam is friable when dry and moderately sticky when wet. In cultivated fields the surface soil ranges from reddish-brown to red clay loam. The subsoil, which ranges in thickness from 24 inches to 6 or more feet, usually being thinner on steep slopes, is clay, light red when dry and dark red when wet. A freshly cut surface is yellowish red, and around decayed roots the material is very dark red or brownish red. This material is brittle and compact, breaking into large irregular lumps with no regular cleavage lines. The color along the breakage lines and through the soil mass is uniform. The lumps readily break into granules the size of field peas; the granules when air-dry are crushed with considerable difficulty with the fingers. Coarse angular quartz grains are scattered through this layer, a conspicuous feature of which is the resistant, hard, bricklike surface exposed in cuts. This layer grades through a transitional layer, from 8 to 20 inches thick, of red fairly friable clay carrying a noticeable proportion of mica flakes, into an underlying layer, from

10 to 50 inches in thickness, of light-red very friable clay streaked with yellow on the cut surface and containing considerable mica and locally some soft disintegrated rock. The next lower material is mottled soft disintegrated granite or gneiss.

Throughout most of the county, the upper part of the subsoil of Cecil clay loam is markedly more friable than typical, being firm rather than stiff, owing to the comparatively high mica content. In many places the parent material is very micaceous disintegrated gneiss. Locally the surface soil has been completely removed by erosion and in a few places the subsoil has also been eroded, leaving only very friable material consisting of coarse particles of feldspar and quartz with considerable mica to a depth ranging from 10 to 30 inches. Below this is hard granite or gneiss. Another variation from typical occurs where the surface soil is very dark brown or even purplish brown to a depth ranging from 5 to 15 inches. Such areas resemble Davidson clay loam in the surface soil but not in the structure of the subsoil. The largest areas showing this condition occur north of Cleveland School, and very small spots are throughout the southeastern part of the county. Fragments of augite gneiss or rocks of high manganese content commonly cover the surface of such areas. The greatest variation in the soil, however, is where it resembles and contains an admixture of the parent material of the Madison soils. Throughout the county, except in the northeast part, some areas are underlain by gneiss intermixed with strata of quartz mica schist, or by granite or gneiss containing mica in large quantities, often in flakes from 2 to 4 inches in diameter. The subsoil usually is more friable in these micaceous areas, and the soil resembles the Madison soils. In a variation at the base of some slopes the soil material is colluvial to a depth ranging from a few inches to 2 or more feet and the subsoil is much more friable than typical.

Cecil clay loam is the most extensive soil in Clarke County. The largest development is in the southeast part, although large areas occur in all except the northeast part. Areas are sloping and rolling, ranging from gently sloping to as steep as can be farmed and protected from erosion. Internal drainage is good and surface drainage good or excessive, depending on the degree of slope. This soil requires protection from surface erosion on most areas and from gullying on the steeper areas. Practically all the soil is now or can be protected from surface erosion and gullying by adequate terracing and growing winter cover crops.

About 75 per cent of this land is now or has been cultivated. Although some land has been abandoned because of damage by erosion, economic conditions are responsible for the idleness of some areas not under cultivation at present. This is one of the most productive soils in the county, and over part of it an excellent system of soil improvement and conservation has been and is being practiced. Where such care has been given the surface soil is from 6 to 10 inches thick, whereas in areas which have not been adequately tilled and protected it is 3 inches or less thick, and in many places is absent, leaving the subsoil exposed.

Areas of this soil which have become eroded are commonly abandoned or if used produce very poor crops. Such areas suffer excessively both from heavy rains and from dry weather. An illustration of what can be accomplished in the reclamation of badly eroded

slopes can be seen on the farm of the Georgia State College of Agriculture where slopes, once badly washed, now have a deep surface soil in an excellent condition of tilth. Methods for reclaiming such eroded slopes are discussed in the chapter entitled "Agriculture."

This soil is used for all general crops and is considered better suited to alfalfa than any other soil in the county. (Pl. 1, A.) It is extensively used for cotton, corn, hay, and all grain crops. Rye is commonly planted on some eroded areas.

Cecil clay loam, steep phase.—Cecil clay loam, steep phase, occupies steep slopes, narrow ridges, and rough areas, mainly unsuited to cultivation. Owing to the character of the relief, there is considerable variation in the soil profile. Along Middle Oconee and North Oconee Rivers areas of Madison soils too steep to be farmed and patches of Cecil sandy loam or Cecil sandy loam, mixed phase, are included. In some areas rock comes within 5 or 10 inches of the surface, and some spots are rocky on the surface. In such places, indicated on the soil map by rock symbols, the surface soil consists of disintegrated granite.

This soil is inextensive. The largest areas are near the junction of Middle Oconee and North Oconee Rivers and near Tallassee Shoals on Middle Oconee River. Many small areas occur along both rivers and along Big Creek, Cedar Creek, and smaller creeks.

Practically none of this phase of Cecil clay loam is cultivated. It supports a growth of loblolly and shortleaf pines, with some oaks and other hardwoods. It should remain in forest, be planted to trees, or be used for pasture.

CECIL SANDY LOAM

In forested areas the 1 or 2 inch surface layer of Cecil sandy loam consists of dark-gray or dark grayish-brown sandy loam. The organic material present is partly decomposed and usually becomes separated from the mineral soil particles on being disturbed when air-dry, leaving yellowish-gray or brownish-gray sandy loam. This layer grades into pale-yellow or grayish-yellow sandy loam extending to a depth ranging from 4 to 12 inches, where it grades into a transitional zone beginning as light reddish-yellow heavy sandy loam and becoming light red with depth. This layer is very friable, and the air-dry lumps are readily pulverized. It extends to a depth ranging from 8 to 15 inches, being thickest in nearly level or gently undulating areas. In most areas of sharper relief it is absent, leaving a sharp line of transition from the grayish-yellow surface soil to the red subsoil. In such places the surface soil is rarely more than 6 inches deep. In cultivated fields the surface soil is yellowish-gray sandy loam, spotted in places with reddish yellow and red. In the larger smooth areas it contains a noticeably larger amount of fine material than in areas of sharper relief, where the proportion of coarser material becomes greater.

The subsoil of stiff but brittle clay, appearing light red when dry and dark red when wet, breaks into large angular irregular lumps which readily break into angular particles the size of field peas. When air-dry these particles can be crushed by the fingers only with considerable difficulty. The clay is moderately sticky when wet, and coarse grains of quartz are scattered throughout it. This layer extends to a depth ranging from 24 inches to 8 or more feet and grades into light-red friable crumbly clay containing numerous fine mica flakes, scattered quartz grains, and partly weathered minerals of the parent rock.

A, Alfalfa on a field of Cecil clay loam which was once badly eroded; B, rock walls built across a drainage way to prevent the formation of gullies

This layer ranges in thickness from 8 to 20 inches and grades into very friable and crumbly mottled light-red, yellow, brown, and gray partly disintegrated granite or gneiss containing scattered mica, quartz, and feldspar crystals.

Many small gravelly spots, which, where of sufficient size, are indicated on the map by gravel symbols, are scattered throughout the areas of this soil. The gravel, mainly angular quartz from one-half to 3 inches in diameter, is intermixed with coarse sand. Such spots are of distinctly lower agricultural value than typical areas of this soil. A few areas, mainly in the northern part of the county, contain a noticeable quantity of brown gravel from one-eighth to one-half inch in diameter. The coloration is owing to iron stains. The gravel consists of smooth subangular fragments of quartz, quartzite, and granite, with a coating of iron. In small spots this gravel covers the surface and gives it a brown color. Throughout the southeastern part of the county the surface soil rarely exceeds 6 or 8 inches in thickness, whereas in the northeastern and western parts it averages 12 or more inches.

Cecil sandy loam comprises a considerable proportion of the soils between Athens and Winterville and northwest of Winterville to the Danielsville road. Comparatively large areas occur in the vicinity of Oconee Heights and in the western part of the county along the Atlanta highway. The land is smooth and undulating or gently sloping. Drainage is excellent, but erosion is not severe. About 90 per cent of the soil is cultivated to cotton, corn, oats, wheat, peanuts, hay crops, potatoes, market-garden crops, and fruits.

Cecil sandy loam, mixed phase.—Cecil sandy loam, mixed phase, has a very spotted appearance in the field. This classification includes semieroded Cecil sandy loam, where the surface soil has been washed off, exposing the red clay subsoil in spots, with many intermixed spots of well-developed gray sandy loam and red or reddish-brown sandy clay loam and clay loam. In the northeast part of the county it includes small spots of Madison soils. Nearly all the areas in the northeastern part of the county have a high mica content, giving rise to a subsoil more friable than typical. In included areas in and northeast of Athens all the soil material down to the friable parent material has been removed by erosion in spots. This exposed material is commonly gravelly and coarse textured, with crystals of feldspar, quartz, and mica, and in many places is shallow over hard rock.

The largest areas of this soil occur north of McNutt Creek in the western part of the county, although extensive areas are east from Athens to Shoal Creek, along the Lexington highway to Big Creek, northeast of Athens along the Danielsville road, northwest along the Commerce road, northwest of White Hall, near Belmont School, and throughout the northwestern part of the county. Areas are gently rolling or mildly sloping and undulating, surface drainage ranges from good to excessive, and erosion is prevalent. About 75 per cent of the soil is cultivated to the crops grown on Cecil sandy loam. Where this soil is plowed deeply, is well tilled, and is protected from erosion it approaches Cecil sandy clay loam in agricultural value. The utilization of that part of the soil most subject to erosion is dependent on the ability to check the advance and remedy the damages of erosion. A few badly gullied areas should immediately be

reforested. Methods for reclaiming eroded areas are discussed in the chapter entitled "Agriculture."

CECIL SANDY CLAY LOAM

Cecil sandy clay loam has a surface soil of reddish-brown sandy clay loam ranging in thickness from 6 to 9 inches but averaging about 7 inches. This grades into friable red clay loam from 2 to 5 inches thick in some areas, although in most it is very thin or absent. The subsoil is firm brittle red clay similar to that underlying Cecil sandy loam and Cecil clay loam.

In some areas the subsoil is darkened by manganese minerals occurring in undecomposed fragments. The boundaries between this soil and Cecil sandy loam and Cecil sandy loam, mixed phase, are in many places arbitrary and small patches of those soils, as well as of Cecil clay loam, were included in mapping. However, Cecil sandy clay loam is shallower than Cecil sandy loam and is not so subject to erosion or so variable in the surface soil as Cecil sandy loam, mixed phase. The surface soil is in places heavy sandy loam 3 inches or less in thickness. Where such areas are plowed 6 inches deep or deeper, a uniform sandy clay loam texture is obtained. In a few small included areas occupying slight depressions the surface soil is brown loam containing considerable organic matter. Such an area occurs one-half mile west of the county line on the Lexington road.

In Clarke County this soil occurs only in small areas. The largest are between Athens and Winterville along the railroad, 1 mile west of New Grove Church, 1½ miles northeast and 1 mile north of Morton Chapel, and north of Athens west of the Southern Railway. The soil occupies high, slightly undulating positions where drainage is excellent. Where well tilled, Cecil sandy clay loam has a higher agricultural value than any other Cecil soil. The surface soil is exceptionally favorable in texture, structure, and tilth. Practically all the soil is cultivated to about the same crops as are grown on Cecil sandy loam, except that the sandy clay loam is used more extensively for alfalfa.

MADISON SANDY LOAM, MIXED PHASE

In cultivated fields the surface soil of Madison sandy loam, mixed phase, consists of intermixed spots of grayish-brown or gray sandy loam, reddish-brown sandy clay loam, and red clay loam. Scattered small fragments of angular quartz gravel and quartz mica schist are on the surface in most places. In wooded areas a thin surface covering of leaf mold is underlain by grayish-brown sandy loam or loam about 3 inches thick. This grades into light reddish-brown mellow sandy loam containing a noticeable amount of small mica flakes and in uneroded areas extending to a depth ranging from 6 to 12 inches. The subsoil consists of two distinct layers. The upper layer, which ranges in thickness from 4 to 20 inches but averages between 10 and 15 inches, is firm brittle red clay breaking into irregular lumps which are pulverized with moderate ease when dry. When wet the material is moderately sticky, and when moist the material tends to roll and crumble rather than to polish as does the subsoil of the Cecil soils when rubbed between the fingers. A few small mica flakes are scattered through this layer, which typically has a smooth

feel and contains less quartz sand than the subsoil of the Cecil soils, with which this Madison soil is closely associated. The lower subsoil layer consists of friable and very micaceous light-red clay having a greasy feel. It ranges in thickness from 10 to 25 inches and grades into purplish-red soft friable partly disintegrated quartz mica schist, many veins of which penetrate the subsoil layers. The soil is comparable to Cecil sandy loam, mixed phase, in the variability of the surface soil. On steeper areas clay loam spots predominate and on the more gently sloping areas there is a greater proportion of sandy loam.

The largest areas of Madison sandy loam, mixed phase, are east and southwest of Princeton, south of White Hall, and near the county line northeast of the Tallassee Shoals. Small areas are scattered throughout the county, except in the southeast part. Most of the land is undulating and gently sloping, but about 15 per cent is too steeply sloping for satisfactory cultivation. Internal drainage is excellent, and surface drainage is good or too free. Checking erosion is an important problem in the utilization and conservation of this soil.

About 75 per cent of the Madison sandy loam, mixed phase, is cultivated. It has high agricultural value, ranking with the best soils of the county. It is an excellent cotton soil and produces good yields of corn, wheat, oats, rye, fruits, and market-garden crops.

MADISON GRAVELLY SANDY LOAM, MIXED PHASE

Madison gravelly sandy loam, mixed phase, differs from Madison sandy loam, mixed phase, in the presence of a large amount of gravel on the surface and through the soil, in the variability in the thickness of the soil layers over the parent material, and in the greater surface relief of the areas.

The proportion of gravel ranges from small to so large on the crests of some ridges that cultivation is seriously impeded. The gravel differs from place to place from angular quartz, from one-half inch to 6 inches in diameter, to fragments of quartz mica schist from one-fourth inch to 3 inches in length. Veins of quartz are common, and scattered quartz mica schist bowlders occur in places, especially in the western part of the county. There is great variability in the depth of the soil layers overlying the parent material, but in most places it is not more than 15 or 20 inches.

This soil occurs mainly on sharply hilly areas with narrow ridges and abrupt slopes, but in the northeast part of the county it is commonly found on undulating ridges and gentle slopes. In the areas of milder relief the gravel is mostly smaller and does not seriously interfere with cultivation. The largest development of the soil occurs north of Athens west of the Danielsville road to Sandy Creek. Another important area is in the western part of the county along Bear Creek. Other areas occur 1¼ miles north of Cleveland School, along McNutt Creek, along Middle Oconee and North Oconee Rivers, south and southwest of Athens, and along Shoal Creek 1 mile south of the Lexington road. Many small areas are elsewhere throughout the county.

From 60 to 70 per cent of this soil is too rough to utilize for general crops. The remainder is cropped and fertilized much as is Madison sandy loam, mixed phase. The rougher areas should be used for forestry.

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APPLING SANDY LOAM

In virgin areas the surface soil of Appling sandy loam consists of two distinct layers. The surface layer, which is 2 or 3 inches thick, is dark-gray or light-gray loamy sand with a small content of partly decomposed organic matter. The second layer, which extends to a depth ranging from 7 to 14 inches but rarely less than 10 inches, consists of grayish-yellow mellow friable sandy loam. This layer is in many places underlain by a transitional layer of reddish-yellow heavy sandy loam ranging from 1 to 5 inches in thickness. In cultivated fields the surface soil is gray sandy loam without the yellowish cast noticeable in Cecil sandy loam. The subsoil is firm brittle yellowish-red or light brownish-red clay which breaks into irregular lumps. Air-dry lumps break easily into coarse granules which can be pulverized with moderate pressure. This layer extends to a depth ranging from 18 to 26 inches, where it grades into firm brittle red clay streaked and spotted with yellow and yellowish brown. This clay continues to a depth ranging from 36 to 50 or more inches, where it grades into mottled red, brown, yellow, and grayish-white soft disintegrated granite or gneiss.

Areas of this soil occurring northeast of Winterville, north of McNutt Creek in the western corner of the county, and south of New Grove Church include spots, too small to be shown separately, of Durham sandy loam and Worsham sandy loam. Such included areas occur principally along small drainage ways.

Appling sandy loam occurs mainly within a radius of 2 miles of Winterville, but many small areas are throughout the northeast part of the county and two are in the western part south of Mount Zion Church and between the Atlanta highway and McNutt Creek near the western county line. Areas are gently sloping or slightly undulating and show little relief. A common occurrence of the soil is on gentle slopes between areas of Worsham sandy loam at the base and Cecil sandy loam on the upper slopes. Surface drainage is good, and internal drainage is generally good, although in some locations there is a fluctuating water table which is comparatively high during protracted wet periods.

About 75 per cent of this soil is cultivated to the crops grown on Cecil sandy loam. Small areas are used for pasture and for hay crops.

DURHAM SANDY LOAM

In virgin areas Durham sandy loam has a surface layer, from 3 to 5 inches thick, of yellowish-gray or dark-gray sandy loam containing a small amount of organic matter. This grades into very friable pale-yellow sandy loam continuous to a depth of 10 or 15 inches. In cultivated fields the surface soil is yellowish-gray sandy loam. The subsoil is friable yellow clay. It breaks into irregular lumps which are readily broken into a granular mass. Air-dry granules are easily pulverized. At a depth ranging from 30 to 50 inches, but in most places being 40 or more inches, this layer grades into firm but very brittle mottled red, yellow, brown, and grayish-white sandy clay material which in turn grades into soft disintegrated granite or gneiss at a considerable depth.

One-half mile northwest of Tuck Springs Church the surface soil is coarse sandy loam, and small spots of Worsham sandy loam are in-

cluded in a few areas. Rounded gravel are scattered on the surface of an area on the west side of North Oconee River 1 mile north of Athens. Had this area been of greater extent it would have been mapped as Altavista sandy loam.

This is an inextensive soil in Clarke County, occurring in small areas principally in the vicinity of Winterville and north near the county line; around New Grove Church, north to the county line, and 1 mile northwest; one-half mile northwest of Tuck Springs Church; near the county line on the Danielsville road; 1 mile northeast of Athens on Trail Creek; near the mouth of Bear Creek; and one-half mile northeast of Sykes Mill. The areas are high, smooth, and nearly level. The soil occurs commonly in well-drained positions near the heads of intermittent drainage ways where the slope is not sufficient to induce erosion. Drainage is good.

Most of this soil is cultivated to the crops grown on Cecil sandy loam. It is a productive, easily tilled soil little subject to erosion. It is well suited to the production of bright-leaf tobacco.

WORSHAM SANDY LOAM

Worsham sandy loam has a surface soil consisting of grayish-yellow or light-gray sandy loam from 4 to 12 inches in thickness. Beneath this in places is a transitional layer of friable light-gray sandy clay, generally streaked with yellow and brown. Where present this layer rarely exceeds 10 inches in thickness. It grades into grayish-white or bluish-gray stiff heavy sandy clay or clay faintly streaked and mottled with brown and yellow. When air-dry this material is nearly white. It is seepy and is used locally for whitewash.

This soil as mapped includes many narrow marginal areas of Durham sandy loam and Appling sandy loam. A tract in Winterville has a very silty surface soil, which is partly alluvial in origin.

Worsham sandy loam occurs as small spots throughout the county but mainly in the northeast quarter. It occupies low, nearly flat areas or the base of gentle slopes bordering the heads and upper courses of seepy drainage ways. Surface drainage is in most places adequate, but internal drainage is slow.

About 10 per cent of this soil is cultivated to corn. It is good pasture land, especially where seeded to Bermuda grass. Part of the land is gullied and is suited only to reforestation.

WICKHAM SANDY LOAM

Wickham sandy loam has a surface soil of brown light sandy loam from 4 to 10 inches thick. The subsoil, which ranges in texture from clay to clay loam and is friable and crumbly, is reddish brown on the broken surface, with a yellowish color on the cut surface. It contains scattered quartz grains and small black soft accretions about one-eighth inch in diameter, which appear as black streaks through the soil when it is cut. At a depth ranging from 30 to 60 or more inches this layer grades into light reddish-brown or reddish-yellow friable sandy clay mottled and streaked with shades of yellow and brown.

Included with this soil, 1¼ miles west of Mitchell Bridge, are spots of a soil which has a gray surface layer and a yellow clay subsoil. A small area east of the railroad trestle west of Mitchell Bridge is brown loamy sand, and an area at the junction of McNutt Creek

with Middle Oconee River is light-brown fine sandy loam. A spot east of Epps Bridge has a red stiff clay subsoil.

This soil occurs principally along Middle Oconee River from Mitchell Bridge to Tallassee Shoals. Small areas are at Epps Bridge, at the mouth of McNutt Creek, on North Oconee River southeast of Athens, and one-fourth mile above Barnetts Bridge. Tracts lie on terrace positions above overflow and are nearly level. Drainage is excellent.

About 80 per cent of this soil, including practically all the typical areas, is cultivated, principally to corn, cotton, and melons. This is one of the best agricultural soils in the county, owing to its high productivity, ease of tillage, excellent natural tilth, and favorable position where not subject to erosion.

CONGAREE FINE SANDY LOAM

Congaree fine sandy loam has a surface soil consisting of light-brown loamy fine sand containing a noticeable amount of fine mica scales. At a depth ranging from 8 to 16 inches this grades into brown heavy fine sandy loam containing mica scales in noticeable amounts but in smaller proportion than in the surface layer. This layer may pass into material of varied texture (silt loam, fine sandy loam, or sand) at a depth of 30 or more inches. A narrow natural levee of loose incoherent sand along most of the rivers of the county was included with this soil in mapping.

Congaree fine sandy loam is the most extensive first-bottom soil in the county. It occurs along Middle Oconee River, on North Oconee River at the north side of the county and south from Athens, and along Bear Creek. Areas are nearly level and are subject to periodic overflow. It is reported that overflow damages crops on an average of about once in four or five years.

About 50 per cent of this soil is cultivated. The typical areas are very productive, but the loose incoherent sand areas support little vegetation. Corn is the principal crop, and small acreages are in melons and hay crops.

CONGAREE SILTY CLAY LOAM

Congaree silty clay loam has a surface soil, from 6 to 14 inches thick, of reddish-brown silty clay loam, minutely streaked with gray in most places. In cultivated fields, the surface soil is grayish-brown or reddish-brown silty clay loam. The surface layer grades into gray silty clay finely streaked with brown and dark brown. In places this extends to a depth of 40 or more inches, but elsewhere it grades into gray silty clay at a depth of about 30 inches. In small areas near the upland borders of the soil shallow sandy wash overlies the surface and in a few places thin strata of coarse sand or sand are in the soil.

This soil is of minor extent, occurring exclusively on the first bottoms of North Oconee River and Sandy Creek near Athens. Areas are nearly level, and drainage is slow, both on the surface and internally. Extensive ditching has facilitated the movement of surface water from part of the land, but the surface soil tends to remain wet for a considerable time after rains. The water table is in most places close to the surface.

About 30 per cent of this soil has been cleared; about half the cleared acreage is used for corn and the remainder for hay crops.

Yields of corn are excellent, if the crop is not drowned out; hay crops produce well.

This soil is difficult to till. It should be plowed or worked only when at the right moisture conditions, or lumps will be formed which will bake with bricklike hardness. The surface tends to crack deeply on drying. Injury to crops results, unless the land is cultivated after every rain before it gets too dry.

MEADOW

Meadow comprises alluvial soils occupying first-bottom positions along creeks and smaller streams. The material is so mixed in texture that no one soil type can be shown on the map. Areas of sand, sandy loam, fine sandy loam, silt loam, and silty clay loam (Congaree material), all of which may occur in short distances, are included. On the streams northeast of Athens, meadow includes a large proportion of Congaree silty clay loam, most of which is poorly drained but which could be ditched and reclaimed. On Shoal Creek it consists largely of Congaree silt loam. Small areas occur on all creeks in the county.

Drainage conditions vary with the location, but much of the land is poorly drained. Some important well-drained areas of high agricultural value are along Shoal Creek. Approximately 15 per cent of this class of land is cultivated and about 50 per cent is pastured. Excellent corn and hay crops are obtained on the better areas.

AGRICULTURE

Early agriculture in Clarke County consisted of growing crops for supplying home needs. Cotton, tobacco, and grain crops were grown. At an early date Oconee River was utilized for developing water power for manufacturing. Fifty-five factories were reported by the census of 1850. Cotton production was encouraged by the establishment of cotton mills, and agriculture in general was developed to include the production of food for the mill employees.

Cotton is the most important crop grown in Clarke County. The acreage increased steadily from 1879 to 1919, when this crop occupied more than 60 per cent of all the improved farm land in the county. A sharp reduction in acreage, owing largely to the low price of cotton and to the high cost of production, took place between 1919 and 1924. Drought caused the crop to be nearly a total loss in 1925. Because of these conditions there has recently been a marked tendency toward diversification, and the acreage of feed crops and crops which will improve the soil as well as provide more sources of cash income has increased. Cotton is still the principal cash crop, but alfalfa, hay, oats, and market-garden crops are also the source of cash income. Corn, rye, wheat, and hay are extensively grown subsistence crops. With the increase in the acreage of feed crops has come a marked increase in the production of livestock and poultry. The average yield of cotton is not high, but in a 5-acre cotton-growing contest in 1927 the winner produced 740 pounds of lint to the acre.

Corn has always occupied an acreage second only to cotton. The average yield of this crop is low, although growers in the county corn-growing contest in 1927 obtained 30 or 40 bushels to the acre on the upland soils and from 60 to 100 bushels on the first-bottom soils.

The Hastings and Whatley varieties comprise 85 per cent of the corn grown. The crop is grown exclusively for home use, feeding of work animals, and fattening of hogs. When grown for silage, corn is commonly mixed with sorghum.

The acreage devoted to oats for grain has shown a marked decrease since 1879 and is much smaller than the acreage cut and fed unthreshed. The average yield of grain is low, but a few farmers are reported to have obtained 40 or more bushels to the acre for many years.

The acreage of wheat has decreased materially since 1879. The average yield of this crop in 1924, as reported by the 1925 agricultural census, was 7.6 bushels to the acre, but one farmer grows wheat yearly and obtains an average of 20 bushels to the acre.

Rye has occupied a small acreage since 1879, but the acreage has increased recently. Most of this crop is used for grazing, for green manure, and for winter cover.

Small acreages of barley were reported in 1879 and 1889, but the crop was not reported again until 1924, when 18 acres were grown. Most of this crop is grown for grazing and hay, and the acreage is reported to be increasing. Beardless varieties are most popular. Velvetbeans and peanuts were also grown on small acreages in 1924. Hay crops have assumed increasing importance in recent years. Hay in 1924 included 204 acres of alfalfa, 723 acres of other cultivated grasses, 441 acres of wild grasses, 384 acres of grains cut green, and 2,756 acres of legumes cut for hay. In 1927 alfalfa was grown on between 400 and 500 acres with an average acre yield of 5½ tons.

Fruit, with the exception of peaches and pecans, is grown only to supply home needs. Small fruits are not extensively grown. The first pecan trees were reported in 1899, when there were three trees in the county. By 1924 there were 11,341 trees, and new groves were still being set out in 1927. The number of peach trees nearly doubled from 1919 to 1924, when 25,288 trees were reported. A few young orchards were being planted in 1927. Production of market-garden and other crops for the Athens market has been receiving increased attention in recent years. A few farmers have turned from cotton farming to the production of special crops for this market. In 1924 such crops, with the acreage grown, were as follows: Cabbage, 29 acres; lettuce, 1 acre; dry onions, 10 acres; sweet corn, 11 acres; tomatoes, 35 acres; cantaloupes and muskmelons, 25 acres; and watermelons, 162 acres. Potatoes and sweetpotatoes are grown largely for home use. One of the most successful gardeners keeps a crop on his farm of 8 acres throughout the entire year. Fruits grown on this farm include grapes, peaches, cherries, figs, pears, plums, apricots, and apples. There are also 58 pecan trees. Small fruits include strawberries, dewberries, and raspberries. Vegetables grown for market consist of spinach, turnips, mustard, cabbage, green beans, Lima beans, English peas, cowpeas, carrots, beets, salsify, eggplant, bell peppers, okra, asparagus, onions, squash, cucumbers, tomatoes, cantaloupes, watermelons, sweetpotatoes, and potatoes. Additional land is sometimes rented for these crops. Stable manure for this farm is purchased from Athens and from neighboring farmers, and in addition from 1,200 to 2,000 pounds of commercial fertilizer analyzing 4–12–4[1] or higher is used. Part of the farm is

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

limed every year, and green-manure crops are plowed under in the orchard every year.

Considerable interest is being shown in livestock, especially since crops to replace cotton have been grown. The value of all livestock in the county was reported by the 1925 census to be $247,987. A few herds of beef cattle, mainly Herefords, are kept, but most of the cattle are kept for milk production, for which purpose Jerseys are preferred. Part of the sweet milk is distributed in Athens and a large ice-cream manufacturing plant there is supplied with sweet cream. Cream is also supplied the creamery of the College of Agriculture, and some is shipped to Atlanta.

Hogs are kept mainly for home consumption, although a few are sold locally. A few goats and sheep were reported on scattered farms in 1924.

Interest in poultry is growing in the county. Chickens are mainly White Leghorn, Rhode Island Red, and Barred Plymouth Rock. The value of poultry and eggs produced in 1924 was reported as $82,808. Several farmers specialize in the sale of hatching eggs and day-old chicks. Athens provides a market for much of the poultry products, and the surplus is shipped mainly to New York.

Although the planting of certain crops is not restricted to definite soil types, some soil types are recognized as being better suited than others to certain crops. Corn is known to yield far better on the Congaree and Wickhan than on the upland soils. These soils, except Congaree silty clay loam, are also preferred for watermelons. Cecil clay loam and Cecil sandy clay loam are generally preferred for alfalfa. Sweetpotatoes are usually planted on the more sandy soils, including the Cecil soils, Appling sandy loam, Durham sandy loam, and part of the Madison sandy loam, mixed phase. The Congaree soils, where not devoted to the production of corn or melons, are used for hay crops.

The most productive and best upland agricultural soil in Clarke County is Cecil sandy clay loam. Madison sandy loam, mixed phase, is regarded as one of the best cotton soils in the State, and production records from counties containing a large proportion of this soil tend to bear out this estimate. Cecil clay loam is inherently one of the most productive soils, as it is high in plant food and retains fertilizers and moisture better than most of the other soils. Where well tilled excellent crop yields are obtained, but over much of this soil poor tillage, including shallow plowing, plowing when too wet, and inadequate harrowing, results in poor crops. This soil is often less prized than its productiveness would warrant, owing to the greater difficulty of tillage as compared with the sandy loam soils.

Cecil sandy loam ranks about fourth in inherent productiveness, but owing to the light texture of the surface soil, which renders it easy to till, it is preferred by most farmers to Cecil clay loam. Durham sandy loam is about equal to Cecil sandy loam in desirability for agriculture, but it is of such small extent as to be of little importance. Cecil sandy loam, mixed phase, is usually less desirable than either Cecil sandy loam or Cecil clay loam. Its utilization is dependent on the extent to which erosion has damaged it. It is a difficult soil to till properly, as the methods which give best results on the sandy loam spots are inadequate for the spots of clay loam. Appling sandy

loam is usually less desirable than the Cecil, Madison, and Durham soils. It is more inclined to be leachy in some places, suffering severely from droughty conditions.

Wickham sandy loam, one of the alluvial soils, in typical areas constitutes the best agricultural soil in the county. Congaree fine sandy loam is more desirable than Congaree silty clay loam, owing to its better drainage and lighter texture.

Little fall plowing is done, except for the grain crops which are fall planted. During the winter a little land is plowed for cotton and corn but most is spring plowed. Deep plowing of the heavier soils is becoming more general, especially since the advent of tractors, but much of the land, especially the shallow sandy loam and clay loam soils, is still plowed only 3 or 4 inches deep. Fields which for a long time have been well prepared before planting are conspicuous for the excellent tilth of the surface soil, especially on the heavier soils.

It is reported that crop rotations are followed on practically all the larger farms, but on many of the small farms continuous cropping to one crop is common. The most general rotation is cotton, one year; corn, one year; then small grain. Some farmers have adopted the following rotation as better suited to the soil requirements of the county: Cotton, one year, with a winter legume planted in the cotton middles in the fall and turned under in the spring; corn, followed by a small grain during the winter; then cowpeas.

Fertilizer has constituted a major farm expense for many years. In 1899 the cost was $27,130. By 1919 it had increased more than nine times, to $248,116. In that year fertilizer was used by 97.5 per cent of the farmers. With the decline in the price of cotton and the attendant changes in farming the use of fertilizer fell off. In 1924 only 85.1 per cent of the farmers used fertilizer, and the cost had dropped to $94,590.

Although considerable variation exists in the analyses of fertilizers used on cotton, 4–10–4 is the most common. A few farmers use 4–12–4 on the sandy soils. The demand for low-grade fertilizer is decreasing. Farmers are also using larger quantities to the acre. Few use as little as 300 pounds, and from 400 to 600 pounds is the common application. On corn, 100 pounds of nitrate of soda are commonly used, but on the first-bottom soils in the corn-growing contest in 1927, 800 pounds of superphosphate (acid phosphate) to the acre were applied. For oats a few farmers use superphosphate at planting time and 100 pounds of nitrate of soda or sulphate of ammonia as a top-dressing in the spring. On land being prepared for alfalfa, from 1 to 3 tons of ground limestone is usually applied.

Dwellings are good on most farms. Except on dairy farms, where a few modern well-equipped dairy barns are found, barns are small. The 1-horse plow has practically been displaced by heavier 2-horse plows or tractor outfits, of which there are many in the county, especially on the larger farms. Very few riding cultivators are used. With the increase in the acreage of hay crops, improved machinery for handling hay, including loaders and side-delivery rakes, is being adopted. A few barns are equipped with tracks and forks or slings for rapid unloading. Most work animals are mules. They are good stock and are kept in good condition.

Labor has been the largest item of farm expense since it was first reported in 1899. In 1919, 50.8 per cent of the farmers hired labor which cost $255,102. In 1924, however, the expense had been reduced to $94,805 and laborers were hired by only 37.8 per cent of the farmers. Farm labor is mostly negro and is reported scarce. The tendency is to replace laborers by machinery wherever possible.

The census of 1925 reported 84.7 per cent of the area of the county in farms, which averaged 54.4 acres in size. Only four farms exceeded 500 acres in size. The average of improved land in 1925 was 68.2 per cent of the farm.

The percentage of tenancy was greater in 1920 than in any other census year. In that year 73.9 per cent of the farms were tenant operated and 24.9 per cent were owner operated. In 1925, 68.7 per cent were operated by tenants. In 1920 more than half the tenants were croppers; that is, the owners furnished the land and work animals and one-half the fertilizer and usually received one-half of all the crops produced. A smaller number of tenants were standing renters, furnishing the work animals and paying a stated share of the farm products for the use of the farm.

RECOMMENDATIONS FOR THE MANAGEMENT OF CLARKE COUNTY SOILS

The most widespread need of the soils of Clarke County is protection from erosion, both surface erosion and gullying. In 90 per cent of the county surface erosion is a serious problem, and in parts of the county it has been the cause of the abandonment of considerable land. An excellent method of preventing the formation of gullies is shown in Plate 1, B, where several successive rock walls have been built across the head of a small drainage way. Soil material has washed behind each wall nearly to the level of the top of the wall. Instead of an entire field ruined by gullies, a succession of very fertile well-drained terracelike areas has formed. However, checking the advance of a gully is usually more difficult than preventing its initial formation.

Areas which can not be protected from gullying and surface wash should be reforested. Most of the areas which have been abandoned can be reclaimed. Although terracing is common, the use of winter cover crops has not been so extensive. The use of such legumes as hairy vetch, Monantha vetch, Austrian field peas, bur clover, and crimson clover as winter cover crops is being encouraged. It is reported that vetch constitutes one of the best winter cover crops under all conditions; but if the soil is in good tilth, bur clover makes an excellent cover crop.

A recommended rotation including winter cover and soil-improvement crops is as follows: Cotton, with a winter legume planted between the cotton rows in fall; cotton stalks and legume turned under in spring and land planted to corn; small grain; cowpeas. It is essential for best results that any crop to be turned under for green manure in the spring shall be turned under early, usually in April, while there is plenty of moisture in the soil.

Practically all soils in the county are deficient in organic matter. In spite of this marked deficiency, a few farmers sell manure instead of using it on their soils. Since the supply of manure is not sufficient

to satisfy the need for organic matter, green-manure crops should be more extensively grown.

Although excellent cultural methods are practiced on part of the heavier soils, on the larger part better methods, including deeper plowing, fall plowing, and more adequate harrowing before planting, are needed. Fall plowing is of the greatest importance on the heavier soils in preparing a mellow seed bed. Care must also be exercised not to plow or cultivate the heavier soils when too wet. A few fields observed were so lumpy from working too wet that the seed bed was exceedingly poor.

Considerable areas of the heavier or shallower soils, especially Cecil clay loam, which have been abandoned because of surface erosion, can be made highly productive. A system for reclaiming such land successfully used on the farm of the Georgia State College of Agriculture and on private farms and recommended by the college has the important advantage of making the land self-supporting while it is being built up. Under this system the land is plowed at least 8 inches deep in early fall and is inoculated for vetch unless stable manure can be used. From 300 to 400 pounds to the acre of superphosphate is applied and rye and vetch are sown during the latter part of September or first part of October. The growth is grazed and the remainder turned under between May 1 and May 10. Cowpeas, to be cut for hay, are then planted. The cowpeas are followed by cotton, which usually gives an average yield, or by corn and cowpeas if the field is fall plowed. If it is winter or spring plowed, corn and velvetbeans constitute a better crop. The following rotation can be adopted for a few years: Cotton; vetch and oats or vetch and rye; and corn and cowpeas or corn and velvetbeans. After two or three years it is best to put part of the clay land into alfalfa. The land should be cultivated long enough to get rid of Bermuda, Johnson, and nut grasses. A crop of rye or oats and vetch should be followed by cowpeas cut for hay. After removing the hay crop about 4 tons of ground limestone to the acre should be applied, the land plowed at least 8 inches deep, and cowpeas sown. After the peas are cut for hay the land should be disked thoroughly and inoculated for alfalfa. Inoculation may be by artificial culture or by a wagonload to the acre of soil from a field in which alfalfa is growing or by both methods. About 500 pounds of superphosphate to the acre should be used and 30 pounds of alfalfa seed to the acre sown. The seed should be sown about October 1 and never later than October 10. From 300 to 400 pounds of superphosphate should be applied to alfalfa every year during the last part of February or first part of March. A field of alfalfa is usually profitable from 4 to 6 years, although some fields last much longer. Yields average about 3 tons to the acre each year. Four cuttings are usually made but sometimes only three. Care must be exercised not to cut too early in the spring or too late in the fall. Lime should be applied about once every 10 years.

It is extremely difficult to build up eroded clay land economically and profitably without a dairy. However, if the hay crops are fed to cows and the manure made is applied to the soil, Cecil clay loam and other red clay lands can be made highly productive.

Additional information on crops and soil improvement can be obtained from the Georgia State College of Agriculture.

SOILS

Clarke County is in northeast Georgia, in the central part of the piedmont plateau near the headwaters of Oconee River. Previous to clearing, the upland soils of the county supported a growth of pines intermixed with hardwoods. This growth is not conducive to the accumulation of any considerable amount of organic matter, such as is found in grasslands or prairie soils. The county also lies in a region of high annual precipitation and comparatively high temperatures. These climatic conditions have not favored the accumulation of organic matter in the soil, as the high temperatures have aided the rapid oxidation of the organic material and the high rainfall on the sloping land has tended to leach out the disintegrated and decomposed organic remains. The result is that there is very little organic matter in any of the upland soils and that which is present is in the first inch or two of the virgin soils. The mature soils of the county, therefore, have a light-colored surface soil; that is, one ranging in color from gray to red. The high precipitation has also prevented the accumulation of lime carbonate in any horizon, although the original rocks contained calcium. In a series of soiltex tests made on the upland and terrace soils, acid reactions were obtained in all horizons of each soil.

Owing to the high temperature, oxidation is rapid and where drainage and aeration are favorable has reached a considerable depth. In the normal comparatively mature soils on well-drained slopes the iron compounds have been largely oxidized, producing the deep-red color. This oxidation has extended to a depth ranging from 5 to 10 or more feet.

As the soils are rarely frozen and rainfall is well distributed, active leaching is rapid and continues throughout the year, tending to remove from the A horizon all soluble products as fast as they are formed by weathering processes. Thus a large part of the fine material has been removed from the A horizon; part has been carried away in the surface water by lateral run-off and part deposited in the B horizon. The result of this leaching is that the profile of all normal soils shows a light-textured A horizon from which a large proportion of the fine material and of the soluble constituents has been removed; a B horizon in which fine material and soluble constituents from the A horizon have been deposited, causing it to be the heaviest in texture and richest in soluble plant food of any of the horizons; and a C horizon which is intermediate in texture between horizons A and B and on which soil-forming processes have acted but little, so that the constituents of the parent material are plainly discernible in place.

The soils of the county may be divided into three major groups, according to the maturity of the soil profile. The first group includes those soils which have developed normal soil profiles under conditions of good drainage on smooth or gently sloping areas; the second group those soils which have been influenced by conditions not conducive to normal development, such as soils which have been denuded or developed under conditions of poor drainage; and the third group the alluvial soils.

The first group may be further divided according to the color of the B horizon, which is indicative of the extent of and the conditions attending oxidation of the mature soils. The first subdivision includes

the most mature and most completely oxidized soils, those having a red B horizon very heavy in texture, indicating an advanced stage of illuviation. In this subdivision occur most of the Cecil clay loam, Cecil sandy loam, and Cecil sandy clay loam. Part of the Madison sandy loam, mixed phase, can be included for the purpose of comparison with the Cecil profile, although owing to erosion most of this soil belongs in the second major group. All these soils have been developed under conditions of almost ideal surface and internal drainage in positions where they were subject to very little or very slow erosion.

Detailed profile descriptions of representatives of the first subdivision of the first major group of soils follow. Cecil sandy loam is the dominant mature soil in the county. A virgin wooded area of high gently sloping relief 3¾ miles north of Athens shows a profile as follows: (1) 0 to 1 inch, horizon A_1, dark grayish-brown sandy loam containing considerable partly decomposed organic matter; (2) 1 to 5 inches, horizon A_2, pale-yellow mellow and friable sandy loam; (3) 5 to 9 inches, horizon A_3, gradational zone of yellow grading into light-red heavy sandy loam; (4) 9 to 35 inches, horizon B_1, red clay, appearing light red when dry, dark red when moist, and yellowish red on cut surfaces. It breaks into irregular angular lumps without definite cleavage lines, and breakage lines show a uniform color with the crushed soil. Scattered coarse sand particles are throughout. The material is brittle and compact when dry, stiff at normal field moisture conditions, and sticky when wet. Air-dry lumps can be readily broken into granules from one-eighth to one-fourth inch in diameter. The granules can be crushed only with considerable difficulty. Exposed vertical cuts resist weathering and stand up after exposure with characteristic bricklike hardness, showing very little or no cracking; (5) 35 to 45 inches, horizon B_2, light-red clay carrying considerable fine mica flakes which render it friable and crumbly; and (6) 45 to 58+ inches, horizon C_1, very friable and crumbly mottled light-red, yellow, brown, and gray disintegrated parent material consisting of granite or gneiss. It contains considerable mica, with scattered quartz and feldspar crystals. The feldspar is usually soft.

The A_3 horizon is variable in thickness. It is most pronounced on smooth areas, where it may be from 4 to 8 inches in thickness; on slopes and areas with sharper relief it is usually absent, leaving a sharp line of demarcation between the yellow A_2 horizon and the red B_1 horizon. The B_1 horizon is rather variable in structure in different parts of the county. Wherever this Cecil soil occurs adjacent to areas of Madison soils the B_1 layer is more friable than typical and is commonly firm rather than compact when dry. In such areas it is usually thinner and the B_2 layer is thicker.

Cecil clay loam, as mapped in Clarke County, includes areas with a deep well-developed surface soil, areas where erosion has removed all but a few inches of the surface soil, and scattered areas where the B horizon is exposed. A typical wooded moderately sloping area with a well-developed surface soil is 1¾ miles east of Tuck Springs Church. The A horizon shows the following layers: (1) 0 to 2 inches, horizon A_1, brown loam carrying considerable partly disintegrated organic material; and (2) 2 to 6 inches, horizon A_2, light reddish-brown clay loam. Included with this soil are several very small areas, mainly in

the southeast part of the county and north of Cleveland School, where the surface soil is very dark reddish brown and the subsoil is the compact stiff brittle clay typical of the Cecil soils. Conspicuous quantities of augite gneiss occur on many of these areas, some of which are covered with rock fragments and gravel very high in manganese. Such areas are common bordering areas of Madison soils and commonly appear to be associated with zones bordering quartz mica schist.

Cecil sandy clay loam is a new soil type, as mapped in Clarke County. The name was formerly applied to areas of sandy loam and clay loam so small and closely intermixed as to make separation difficult, a condition now mapped as the mixed phase of Cecil sandy loam. The term "sandy clay loam" now applies only where the texture of the surface soil is sandy clay loam.

Part of the Madison sandy loam, mixed phase, belongs in the first subdivision of the first major group, although erosion has removed so much of the surface soil in spots that a sandy loam soil can not be consistently shown on the map. Although this soil type has a well-developed profile showing advanced oxidation it appears to be a younger soil than the Cecil soils, since the illuviated B horizon is uniformly shallow and there is greater variability in the thickness of the various horizons. A typical wooded area 2½ miles north of Athens has a profile as follows: (1) 0 to 3 inches, horizon A_1, grayish-brown loam containing scattered fragments of angular quartz and covered by a shallow layer of leaves and partly decayed organic material; (2) 3 to 9 inches, horizon A_2, light reddish-brown heavy sandy loam containing a noticeable amount of small mica flakes and scattered fragments of angular quartz; (3) 9 to 24 inches, horizon B, bright-red clay, containing a small amount of small mica flakes, which is stiff under average field moisture conditions, somewhat sticky when wet, and firm and brittle when dry, breaking into irregular lumps which are readily broken and can be pulverized with moderate ease; (4) 24 to 40 inches, horizon C_1, light-red friable micaceous clay with a very slick, greasy feel; and (5) 40 to 50+ inches, horizon C_2, purplish-red soft very micaceous material consisting of disintegrated quartz mica schist.

The second subdivision of the first major group includes soils having yellow subsoils. Only one such soil, Durham sandy loam, occurs in Clarke County. This soil appears to have been developed under conditions which prevented complete oxidation. It occupies high nearly level areas with very little relief and possibly was developed under conditions of a high water table, although advancing drainage ways have lowered the water table in all areas at present. A typical virgin area of Durham sandy loam at New Grove Church has a profile as follows: (1) 0 to 4 inches, horizon A_1, yellowish-gray sandy loam carrying a small amount of organic material on the surface; (2) 4 to 12 inches, horizon A_2, pale-yellow very friable and mellow light sandy loam; (3) 12 to 40 inches, horizon B, friable yellow clay, uniform in color on broken and cut surfaces, showing no definite cleavage lines but breaking into irregular angular lumps which when air-dry are readily broken into a fine granular mass; and (4) 40 to 52+ inches, horizon C, very friable mottled red, yellow, grayish-white, and brown sandy clay parent material which is underlain at a considerable depth by disintegrated granite or gneiss from which the soil is derived.

The third subdivision of the first major soil group includes soils intermediate in color between those of the first two subdivisions. Appling sandy loam is the only soil mapped which belongs in this division. The upper part of the B horizon resembles that of soils representative of the first subdivision in color and structure, but in the lower part oxidation has not been complete, as is evidenced by the mottled colors. A typical area of Appling sandy loam on the northeast side of Winterville shows the following layers: (1) 0 to 2 inches, horizon A_1, light-gray loamy sand carrying a small amount of organic matter; (2) 2 to 10 inches, horizon A_2, mellow friable grayish-yellow sandy loam; (3) 10 to 24 inches, horizon B_1, firm brittle yellowish-red clay, of which air-dry lumps readily break into coarse granules which can be pulverized with moderate pressure; (4) 24 to 42 inches, horizon B_2, firm brittle red clay streaked and blotched with yellow and yellowish-brown; and (5) 42 to 56+ inches, horizon C, mottled red, brown, yellow, and grayish-white parent material consisting of soft disintegrated and partly decomposed granite or gneiss.

The mottling in the B_2 horizon of Appling sandy loam is probably owing to poor aeration contingent on poor internal drainage at some time in the development of the soil. The soil does not occupy the crests of ridges near old drainage ways but occurs as gently sloping areas near the heads of drainage ways, in two distinct but different present conditions. All the areas have good surface drainage and part of the soil is now well drained internally, probably owing to the advance of drainage ways, but on a considerable part of this soil the B horizon is saturated for a much longer time following heavy rains than are the B horizons of the red soils.

The second major group includes soils too young to have developed a normal profile and soils in which normal soil profile development has been hindered by erosion or by poor drainage. Much of the Cecil clay loam, all the Cecil clay loam, steep phase, part of the Cecil sandy loam, mixed phase, part of the Madison sandy loam, mixed phase, and and all the Madison gravelly sandy loam, mixed phase, probably once had normally developed soil profiles. These soils, however, through the destructive agencies of erosion have lost in part or wholly the A_1 and A_2 layers, leaving the B horizon exposed. In extreme cases only a shallow B horizon remains over the C horizon, and even the C horizon is exposed in gullies and on the steeper slopes.

Worsham sandy loam, owing to insufficient drainage, has not developed a normal soil profile. There is no uniform color in the A or B horizon. The streaked and mottled color of the B horizon indicates incomplete oxidation, resulting from poor internal drainage, and the almost white color of the A and B horizons in places shows the effects of alternate wetting and drying. Some of the material which is light gray when wet dries out almost white; such material is used locally for whitewash.

The third major soil group comprises the alluvial soils developed on terraces and first bottoms. These soils consist of materials washed from the uplands and deposited by the streams at times of overflow. Wickham sandy loam is the only terrace or second-bottom soil in the county. The material giving rise to this soil has lain above overflow sufficiently long and has been sufficiently well drained to develop in some places a normal soil profile.

The first-bottom materials, which are young and dominantly poorly drained, are still receiving new material or are changed by overflow waters. They consist of such recently deposited material and are so poorly drained that no indication of a mature soil is seen. In fact, the texture, color, and structure are very variable over most of the first bottoms. Sufficiently large areas showing a definite texture were mapped as Congaree fine sandy loam and Congaree silty clay loam. Areas so intricately mixed in texture, color, and structure that no type designation could be given them were classed as meadow.

In addition to the field tests for acidity, laboratory determinations of pH values were made on Cecil sandy loam, Cecil clay loam, and Appling sandy loam. The electrometric method was employed, the hydrogen electrode being used. Results are given in Table 3.

TABLE 3.—*pH determinations of certain Clarke County soils*

Sample No.	Soil type	Depth in inches	pH
258718	Cecil sandy loam	0 to 1	4.50
258719	do	1 to 5	5.19
258720	do	5 to 9	5.12
258721	do	9 to 35	5.12
258722	do	35 to 45	4.87
258723	do	45 to 58+	4.87
258731	Cecil clay loam	0 to 2	5.39
258732	do	2 to 6	5.13
258733	do	6 to 42	5.13
258734	do	42 to 60	5.05
258735	do	60 to 90	4.96
258736	do	90 to 100+	5.02
258710	Appling sandy loam	0 to 2	5.60
258711	do	2 to 10	5.13
258712	do	10 to 24	5.20
258713	do	24 to 42	5.13
258714	do	42 to 56	5.05

SUMMARY

Clarke County is slightly east of the north-central part of Georgia. It lies in the central part of the piedmont plateau, near the headwaters of Oconee River. Few remnants of the old plateau remain, most of the area having weathered to lower levels. Drainage is well established over all the county and is excessively free over much of it.

The climate of the county is continental, with long, warm summers and short, moderate winters. Rainfall is heavy and well distributed through the year.

Athens, which is the seat of the University of Georgia and the Georgia State College of Agriculture and the location of several manufacturing plants, is the principal market for farm produce and has some influence on the kind of crops raised. Highways are excellent in the county, and railroad transportation is adequately furnished by five railroads.

The red deeply oxidized soils, including members of the Cecil and Madison series on the uplands and Wickham sandy loam on the terraces, occupy most of the county. The Cecil soils alone cover about 79 per cent of the area. The soils having light-colored subsoils, including members of the Durham and Appling series, are very inextensive. The first-bottom soils are mapped in two types of the Congaree series and as meadow, a miscellaneous material.

Cotton is the principal cash crop, and corn is the largest subsistence

crop, although oats, wheat, and hay are also important. The interest in dairying, which is now a minor industry, is increasing. Considerable garden truck is raised for the Athens market.

A large proportion of the arable land has been cultivated, but part of the Cecil clay loam has been abandoned because of damage by erosion. This land can be reclaimed and made highly productive by good management, including adequate tillage and suitable crop rotations. Such areas constitute good settlement possibilities for farmers who wish to operate their own farms. However, in selecting land for farming purposes care should be exercised not to select land for cultivation which can not be easily protected from erosion.

[PUBLIC RESOLUTION—No. 9]

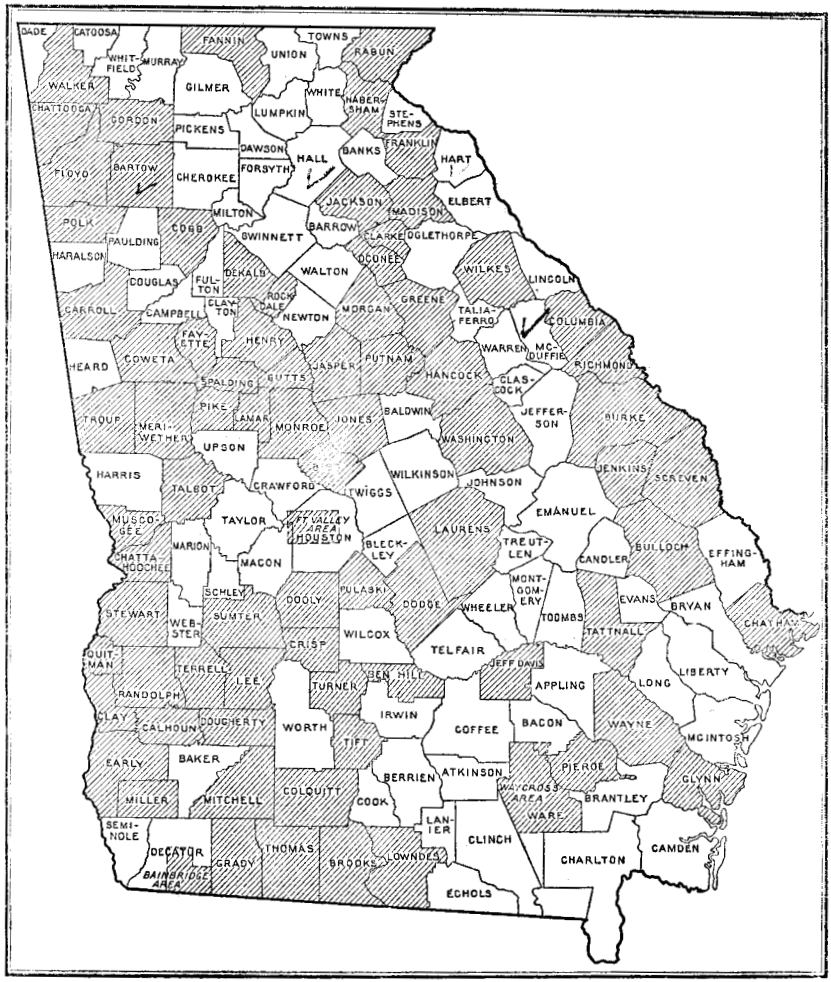
JOINT RESOLUTION Amending public resolution numbered eight, Fifty-sixth Congress, second session, approved February twenty-third, nineteen hundred and one, "providing for the printing annually of the report on field operations of the Division of Soils, Department of Agriculture."

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

That there shall be printed ten thousand five hundred copies of the report on field operations of the Division of Soils, Department of Agriculture, of which one thousand five hundred copies shall be for the use of the Senate, three thousand copies for the use of the House of Representatives, and six thousand copies for the use of the Department of Agriculture: *Provided*, That in addition to the number of copies above provided for there shall be printed as soon as the manuscript can be prepared, with the necessary maps and illustrations to accompany it, a report on each area surveyed, in the form of advance sheets, bound in paper covers, of which five hundred copies shall be for the use of each Senator from the State, two thousand copies for the use of each Representative for the congressional district or districts in which the survey is made, and one thousand copies for the use of the Department of Agriculture.

Approved, March 14, 1904.

On July 1, 1901, the Division of Soils was reorganized as the Bureau of Soils, and on July 1, 1927, the Bureau of Soils became a unit of the Bureau of Chemistry and Soils.]



Areas surveyed in Georgia, shown by shading

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