

U. S. DEPARTMENT OF AGRICULTURE,

BUREAU OF SOILS—MILTON WHITNEY, Chief.

IN COOPERATION WITH THE GEORGIA STATE COLLEGE OF AGRICULTURE,
ANDREW M. SOULE, PRESIDENT; DAVID D. LONG,
IN CHARGE SOIL SURVEY.

SOIL SURVEY OF CRISP COUNTY,
GEORGIA.

BY

E. T. MAXON, OF THE U. S. DEPARTMENT OF AGRICULTURE
IN CHARGE, AND DAVID D. LONG, OF THE GEORGIA
STATE COLLEGE OF AGRICULTURE.

W. EDWARD HEARN, INSPECTOR, SOUTHERN DIVISION.

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



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LETTER OF TRANSMITTAL

U. S. DEPARTMENT OF AGRICULTURE,
BUREAU OF SOILS,
Washington, D. C., March 13, 1917.

SIR: The field operations of the Bureau of Soils for 1916 included a soil survey of Crisp County, Georgia, undertaken in cooperation with the Georgia State College of Agriculture. The selection of Crisp County was made after conference with State officials.

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

Respectfully,

MILTON WHITNEY,
Chief of Bureau.

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

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MAP.

Soil map, Crisp County sheet, Georgia.

SOIL SURVEY OF CRISP COUNTY, GEORGIA.

By E. T. MAXON, of the U. S. Department of Agriculture, and DAVID D. LONG, of the Georgia State College of Agriculture.—Area Inspected by W. EDWARD HEARN.

DESCRIPTION OF THE AREA.

Crisp County lies in the southwestern part of Georgia. Cordele, the county seat, situated near the center of the county, is 153 miles south of Atlanta, 167 miles west of Savannah, and 90 miles north of the Florida boundary line. Crisp County is bounded on the north by Dooly County, on the east by Wilcox and Turner Counties, on the south by Turner and Worth Counties, and on the west by Worth, Lee, and Sumter Counties. It is separated from Worth County by Swift Creek and from Lee and Sumter Counties by the Flint River. The greatest dimensions of the county are 18 miles from east to west and 14 miles from north to south. It has a total area of 271 square miles, or 173,440 acres.

Crisp County includes three physiographic divisions—the Altamaha Uplands, the Dougherty Plain, and the “flatwoods.” The Altamaha Uplands is a term applied throughout this region to the rolling uplands underlain by unconsolidated sands and clays. It constitutes the greater part of Crisp County, including all that part lying east of a line drawn roughly from Swift Creek north along the old Thigpen Trail to the vicinity of Wenona, thence east a short distance, thence west and northwest across the National Highway, keeping within a radius of 2 miles of Cordele, to the “break” along Gum Creek, thence following this stream westward to the vicinity of Coney, and from there northward to the county line.

The eastern half of the county consists of gently rolling uplands, with numerous prominent ridges and well-defined though gradual slopes. The valleys here are narrow, but as the elevation decreases they widen, the country becomes more gently rolling, and the streams flow sluggishly, with changeable courses.



FIG. 1.—Map showing location of the Crisp County area, Georgia.

The gently undulating areas comprising the Dougherty Plain are typically developed in a strip 2 to 4 miles wide immediately east of Flint River.

The so-called flatwoods country, only locally developed in this county, resembles to some extent the flatwoods of southeast Georgia. It is represented by the low-lying, gently undulating, poorly drained areas occurring in the southwestern part of the county between the Altamaha Uplands and the Dougherty Plain. It is characterized by numerous ponds and sinks, ranging from a few square rods to many acres in extent.

The elevations at Cordele, in the northern part of the county, and Arabi, in the southern part, are given as 336 and 460 feet above sea level, respectively. Arabi is located on a ridge extending in a north-east direction through the settlements of Penia and Tremont School. The land south of this ridge slopes to the southeast, while that north of it slopes to the west.

A large part of the county is drained by the Flint River through its tributaries, Limestone, Gum, Cedar, and Swift Creeks. The Flint River has a well-defined channel lying 25 to 60 feet below the level of the uplands and varying in width from a few rods to three-quarters of a mile. It is in many places walled by bluffs and cliffs 10 to 50 feet in height.

Limestone Creek, with its branches, affords inadequate drainage for the northwest corner of the county. This stream has a well-defined channel and is flanked by a valley wall rising rather abruptly to a height of 10 to 30 feet. Much of the water in this creek is derived from underground sources.

Gum Creek, the largest stream having its entire course within the county, rises in the uplands in the northeastern part of the county and flows westward to the Flint River. The tributaries of this stream in the northwest corner of the county extend in all directions, forming a network of streamlets that afford excellent surface drainage for that region. A few of the branches in the vicinity of the Albany-Vienna Road have a smaller gradient and do not sufficiently drain their watersheds. The tributaries along the upper part of Gum Creek have cut V-shaped valleys 10 to 40 feet deep, but in the more gently rolling country farther down the flood plain widens out and lies but little lower than the surrounding country. From Cordele to the river Gum Creek flows through swamplike areas which lie 20 to 50 feet below the rolling uplands. The slopes from the uplands to the streams may be either gradual or abrupt.

Cedar and Swift Creeks have their sources in the uplands, Cedar Creek rising southeast of Cordele and northeast of Wenona, and Swift Creek rising west and northwest of Arabi. These streams

afford practically complete surface drainage for the territory along their upper courses, but in the flatwoods region to the west they flow sluggishly through wide, shallow, semiswampy valleys. For a short distance between the Albany-Vienna Road and Flint River, Cedar Creek has cut a U-shaped valley ranging from 8 to 15 feet deep.

Lime, Reedy, and Deep Creeks and their tributaries, in the eastern and southeastern part of the county, completely drain that section, touching nearly every farm. They flow in a southeasterly direction into Turner County. Many of the small branches have amphitheaterlike depressions at their sources, which give way to narrow valleys leading to the main streams. The main streams flow through wider valleys, which are flanked by rising uplands:

Crisp County was organized in 1905 from part of Dooly County, the latter having been formed in 1821 of territory acquired from the Creek Indians. The first settlers in Crisp County came from North Carolina and other settlements to the north. Cordele was settled about 1889. Several colonies of Germans from the north settled in the vicinity of Penia and Listonia at an early date. The present inhabitants include some of these early settlers, as well as farmers from middle and north Georgia. The population of the county in 1910 was 16,423, of which 10,540, or 64.2 per cent, were rural. The density of the rural population was 38.1 persons to the square mile. The population is quite evenly distributed, the least settled part of the county being along the Flint River.

Cordele is the county seat and the largest town in the county, with a population in 1910 of 5,883. It is a railroad center and a city with modern improvements and industrial interests. Arabi ranks next in size, with a population in 1910 of 433.

Crisp County has good transportation facilities. It is crossed from east to west by the Seaboard Air Line Railway and from north to south by the Atlanta, Birmingham & Atlantic Railway and the Georgia Southern & Florida Railway, while the Georgia Southwestern & Gulf Railroad extends from Cordele to the southwest corner of the county. Cordele is the junction point of all these lines.

A good system of public roads has been developed throughout the county, there being approximately 600 miles of sand-clay road at the present time. Rural mail-delivery routes serve most of the county.

Cordele is the main distributing point and the principal local market for the agricultural products of the county. Jacksonville, Savannah, and Macon are important outside markets.

CLIMATE.

The climate of Crisp County is characterized by short, mild winters and long summers. For the months of December, January, and

February the mean temperature is 49.3° F., and for the months of June, July, and August 81.4°. The highest temperature ever recorded is 104° F., in July, and the lowest -6° F., in February. Snow seldom falls and ice forms only a few times in the winter.

The mean annual rainfall amounts to 48.64 inches. The precipitation is well distributed throughout the year, being greatest during the growing season. Oats and corn occasionally suffer from periods of hot, dry weather in the spring and summer, and cotton sometimes suffers from excessive rainfall.

The average dates of the last killing frost in the spring and the first in the fall are, respectively, March 8 and November 13, giving an average growing season of slightly over 8 months. The date of the latest recorded killing frost in the spring is April 1, and that of the earliest in the fall October 27.

The following data, compiled from the records of the Weather Bureau station at Americus, a town 20 miles west of Crisp County, are representative of the climatic conditions in the county:

Normal monthly, seasonal, and annual temperature and precipitation at Americus, Sumter County.

Month.	Temperature.			Precipitation.		
	Mean.	Absolute maximum.	Absolute minimum.	Mean.	Total amount for the driest year.	Total amount for the wettest year.
	° F.	° F.	° F.	Inches.	Inches.	Inches.
December.....	49.8	78	8	3.81	2.40	3.78
January.....	47.9	79	11	4.23	4.35	4.70
February.....	50.2	82	- 6	5.08	4.31	5.41
Winter.....	49.3	82	- 6	13.12	11.06	13.89
March.....	59.2	90	18	5.50	3.92	7.31
April.....	65.5	96	31	3.49	2.07	2.57
May.....	74.8	100	42	3.29	3.06	4.14
Spring.....	66.5	100	18	12.28	9.05	14.02
June.....	80.7	102	52	4.42	3.44	5.06
July.....	82.5	104	61	5.21	2.90	5.08
August.....	81.1	102	60	5.33	7.09	7.86
Summer.....	81.4	104	52	14.96	13.43	18.00
September.....	76.6	101	43	3.31	3.70	13.28
October.....	66.1	92	30	2.25	2.14	0.86
November.....	56.6	84	22	2.72	1.28	1.10
Fall.....	66.4	101	22	8.28	7.12	15.24
Year.....	65.9	104	- 6	48.64	40.66	61.15

AGRICULTURE.

Agriculturally this is a new country, for only 30 years ago the entire region was heavily forested with longleaf pine. The first sawmill was established about 1890 and the lumbering and turpentine industries became the chief sources of revenue. The country was quickly cut over and put under cultivation, and at the present time only a few small sawmills and turpentine stills are operated. Nearly all the merchantable timber has been cut. Small patches of second-growth pine are found on the uplands, while longleaf and spruce pine, magnolia, cypress, oak, sweet gum, black gum, and water beech grow along the minor drainage ways and in the river bottoms.

Cotton and corn have been the principal crops since farming was begun. Oats and peanuts rank next in importance. A small patch of sweet potatoes is grown on nearly every farm for table use and for feeding hogs. Sugar cane and vegetables are grown to a smaller extent. A small acreage also is devoted to crimson clover and alfalfa, which seem to do well. Cowpeas are grown for hay and forage. Some farmers grow rye and barley for hog pasturage.

Cotton is the most important crop in this region, and practically the only income crop. The 1910 census reports 34,668 acres in cotton, from which 18,092 bales were produced; 21,993 acres in corn, producing 278,461 bushels; 3,367 acres in oats, producing 65,538 bushels; 3,349 acres in peanuts, producing 55,147 bushels; 1,016 acres in hay and forage crops, producing 627 tons; and 583 acres in sweet potatoes, producing 52,581 bushels. The greater part of the corn and oat crops is fed on the farms.

Stock raising is gaining in importance. Nearly every farmer keeps a drove of hogs to supply meat products for home use, and some farmers raise hogs for sale. In 1910 there were a total of 15,602 hogs and 5,449 head of cattle in the county. Of the latter, 1,912 were milch cows. A small number of sheep and goats are kept. Duroc-Jersey and Berkshire are the predominating breeds of hogs. The cattle in general are small and of mixed breeding, but a few farmers are improving their breeds by the introduction of pure-bred bulls.

On the average farm the implements include a turning plow, light cultivators, and a cotton planter and stalk cutter. The more progressive farmers use 10-inch plows, cutaway disk harrows, grain drills, reapers, mowing machines, and other modern machinery. Most of the draft work is done by mules, which are large and of good stock, imported from Tennessee and Kentucky. In 1910 there were 2,053 mules and 485 horses in the county.

Various methods are followed in growing cotton, but usually the stalks of the preceding crop are cut with a stalk cutter in the winter

and the field plowed to a depth of 6 inches, using a two-horse to four-horse plow. In the spring the land is thrown up in ridges from 4 to 6 feet apart. A furrow is then opened along the middle of these ridges and the fertilizer is applied and lightly covered with soil, after which the seed is drilled in the furrow, with the cotton planter. As soon as the plants appear shallow cultivation is begun, usually with one-horse implements, and continued at intervals until the bolls are well formed. The flat or nearly flat seed bed has proved very successful both for cotton and corn in this county. By this method the plants are placed deep in the furrow, so that the soil may be gradually worked toward them at each cultivation. When the crop is laid by the surface is practically level instead of being ridged. Short-staple cotton is the more commonly grown type, popular varieties being Half-and-Half, Pullnott, and Toole Prolific.

Corn land is prepared in about the same manner as cotton land, the seed being planted in furrows. The rows are made 4 to 6 feet apart and the plants spaced 15 to 20 inches apart in the row. The crop ordinarily receives four cultivations. The leaves are pulled, tied in bundles, and cured for fodder, and when the grain matures the ears are pulled and stored in the husk. Varieties of White Dent are most commonly grown.

Many farmers plant peanuts between the corn rows, alternating a row of peanuts with one or two of corn, and, after the corn has been harvested, turn hogs into the field. Velvet beans are gaining in favor as a crop to plant with corn, not only on account of their feeding value but also for their beneficial effect on the soil.

Oats and rye are increasing in acreage. These two crops are seeded in November and December and mature in May or June. In most cases the oats are either drilled in or sowed broadcast and plowed under, but a part of the crop is sowed in rows about 3 feet apart and cultivated during the growing season.

Some attention is given to crop rotation. Cotton is grown for one or two years and followed by corn for one year. Oats are sown in the late fall, harvested in May or June, and followed by cowpeas, which are cut for hay, after which the land is returned to cotton.

According to the census, \$155,782 was expended for fertilizer in 1909, an average of \$119 for each of the 1,305 farms reporting an outlay. For cotton a 10-2 or 9-2 mixture at the rate of 200 to 450 pounds per acre is used. Many farmers use a home mixture consisting of 2 parts of acid phosphate to 1 part of cottonseed meal, applied at the rate of 250 to 400 pounds per acre. Others use green cotton seed and compost. A few farmers grow cotton without the use of fertilizer. For corn the same mixtures are used as for cotton, but in smaller quantities, the applications ranging from 150 to 350

pounds per acre. As a rule, commercial fertilizer is also used in growing oats.

Negroes are largely depended upon for labor over most of the county. When employed by the month they receive from \$10 to \$15, with board. Day laborers are ordinarily paid 45 to 60 cents a day. Cotton pickers receive 40 to 75 cents per 100 pounds.

The 1910 census reports 1,451 farms in the county, of an average size of 91.4 acres, each tenancy being considered as a farm. Large tracts of land are still held by persons living in towns, only 30.5 per cent of the farms being operated by owners, as compared with 68.2 per cent operated by tenants. Farms are rented either on a cash or share basis. Cash rents range from \$4 to \$6 an acre. On a share basis the owner, who usually furnishes one-half the fertilizer, receives one-half the crops produced.

According to the census, the average value of all property per farm in 1910 was \$2,551, apportioned as follows: Land, 64.3 per cent; buildings, 17.7 per cent; implements and machinery, 3.9 per cent; and domestic animals, poultry, and bees, 14.1 per cent. The farm buildings usually consist of a dwelling house and a building for housing the stock and at least a part of the fodder. Occasionally room is provided to store part or all of the farm machinery. Many of the farms have substantial woven-wire fences.

The price of land varies considerably, ranging from \$50 to \$100 an acre within a radius of 5 miles from Cordele and from \$15 to \$50 in more remote sections. Very little good land can be bought for less than \$40 an acre.

SOILS.

The soils of Crisp County are derived from the unconsolidated and partially consolidated deposits of Tertiary age underlying the Coastal Plain of the eastern part of the United States. The material underlying the eastern half of the county consists of beds of sands, clays, and gravels, locally more or less indurated. The western part is underlain by three belts of material, two of them discontinuous and narrow, lying mainly in the south-central part of the county; the third one extending as a north-south belt entirely across the western side of the county, spreading out into a broad area in the northwestern quarter. These three belts are made up of sands, clays, and limestones, the proportion of the latter increasing westward. Owing to the deep weathering that has been effected by the heavy rainfall and high temperature prevailing in the region, the lime has been leached to great depths, leaving a soil made up of a small amount of noncalcareous or very slightly calcareous residue from the limestone and a much larger proportion of wholly detrital

material derived from the sands and clays interbedded with the limestones. So far as the existing soils are concerned, therefore, there is not a wide difference between those derived from the noncalcareous fragmental material of the eastern half of the county and those from the practically noncalcareous fragmental material of the western part of the county, the latter resulting in part from direct sedimentation of the material giving the soils in the eastern half of the county and in part from the decomposition of limestones.

The fact that these formations have not exercised a predominant influence in the development of the soils of the county is shown by the soil map. The soils of the eastern and western halves of the county are in their broad features essentially alike, the types of the Norfolk and Tifton series predominating on both sides. There are two differences subordinate in their nature that probably express differences in parent rock, one of them probably being due to the presence of limestone in the parent rock, the other certainly not due to such rock. The belt of Norfolk sand stretching north and south across the western part of the county can hardly be the product of a limestone constituent in the parent rock, while the presence of small areas of Orangeburg and Greenville soils in the extreme western part of the county is probably due to such influence. The topography is that of a rolling upland with well-rounded slopes.

Along the margin of the Altamont formation in the western part of the county are numerous sinks and depressions where the underlying limestone of the Vicksburg and Alum Bluff formations has been dissolved. Here the topography is gently rolling to undulating.

The soils of Crisp County are all sandy in texture, and since deposition have been modified by erosion, oxidation, leaching, and the accumulation of organic matter. Eleven series, embracing 14 distinct soil types, in addition to Swamp, are mapped. The upland soils are classed in the Norfolk, Tifton, Susquehanna, Greenville, Orangeburg, Ruston, Plummer, and Grady series.

The Norfolk series includes types with gray to dark-gray surface soils and yellow, friable sandy clay subsoils. This is the most extensive series in the county. The Norfolk sand, with a sandhill phase, and the Norfolk sandy loam, with a deep phase, are mapped.

The types grouped in the Tifton series have gray to grayish-brown soils and yellow, friable sandy clay subsoils. This series is distinguished from the Norfolk by an abundance of small, iron concretions or accretions on the surface and throughout the surface soil and subsoil. Two types, the sand and sandy loam, are mapped.

The surface soils of the types included in the Susquehanna series are gray, and the subsoil mottled gray and red or gray, red, and yellow plastic, heavy clay. This series occurs in the Altamaha

Uplands in close association with the Norfolk series. It is represented in Crisp County by one type, the sandy loam.

The types included in the Greenville series have red to reddish-brown surface soils and red sandy clay subsoils. Only one type, the Greenville sandy loam, is mapped in this county.

The types in the Orangeburg series are characterized by gray to reddish-brown surface soils and bright-red, sandy clay subsoils. These soils have a more rolling topography than the Greenville. The Orangeburg sandy loam is the only type of this series mapped in Crisp County.

The surface soils of the types grouped in the Ruston series are grayish brown to brown and rest upon a reddish-yellow, moderately friable sandy clay subsoil. This series is not extensive in Crisp County. Two types are encountered—the loamy sand and sandy loam.

The Plummer series includes types with dark-gray surface soils and light-gray to gray, friable, sandy subsoils, mottled with yellow and brown. The sandy loam is the only type representing the Plummer series in this survey.

In the Grady series are included types characterized by gray to dark-gray, sandy surface soils and mottled gray, bluish-gray, and red, heavy sandy clay or clay subsoils. Soils of this type occupy lime sinks or depressions. Conditions of poor drainage and accumulation of organic matter are the principal influences differentiating this series from the surrounding upland soils. The Grady series is represented in the county by one type, the sandy loam.

The alluvial soils, occurring on second bottoms or terraces along streams, deposited mainly at a time when overflows reached higher levels than at present, are represented by the Kalmia and Myatt series. The Kalmia series has gray to grayish-yellow surface soils and yellow subsoils. The Myatt series is characterized by gray to dark-gray surface soils and gray subsoils, mottled yellow and brown. Each of these two series is represented in Crisp County by one type, the fine sandy loam.

The first-bottom land along the Flint River consists of a mixture of Piedmont and Coastal Plain material. The surface soil is brown to chocolate brown in color, while the subsoil varies from light brown to yellow and gray in the more poorly drained areas. This material is classified as the Congaree silt loam, the only type of the Congaree series encountered in the survey.

Swamp represents wet bottom lands along drainage ways. The surface soil is dark brown and the subsoil is gray to bluish. The material is variable in texture.

The following table gives the actual and relative extent of the various soil types mapped in the county. The distribution of the

several types is shown on the accompanying map by means of colors. In subsequent pages of this report the soils are described in detail and their agricultural value pointed out.

Areas of different soils.

Soil.	Acres.	Per cent.	Soil.	Acres.	Per cent.
Norfolk sandy loam.....	40,448	31.7	Orangeburg sandy loam.....	2,816	1.6
Deep phase.....	14,400		Congaree silt loam.....	2,240	1.3
Tifton sandy loam.....	40,064	23.1	Ruston loamy sand.....	1,792	1.0
Plummer sandy loam.....	25,664	14.8	Kalmia fine sandy loam.....	1,792	1.0
Norfolk sand.....	15,936	9.5	Myatt fine sandy loam.....	1,792	1.0
Sandhill phase.....	576		Tifton sand.....	1,472	.9
Susquehanna sandy loam....	9,600	5.5	Greenville sandy loam.....	1,216	.7
Swamp.....	6,400	3.7			
Grady sandy loam.....	4,288	2.5	Total.....	173,440
Ruston sandy loam.....	2,944	1.7			

NORFOLK SAND.

The Norfolk sand consists of a light-gray to gray, loose, incoherent sand, from 6 to 8 inches deep, underlain by a pale-yellow, loose sand which extends to a depth of more than 3 feet.

This type occurs in widely scattered areas throughout the county. The largest areas lie west of and adjacent to the Albany-Vienna Road. A small area about $2\frac{1}{2}$ miles northeast of Penia, shown as Norfolk sand, is really Norfolk coarse sand, both the surface soil and subsoil consisting of loose sand, coarse in texture.

The topography of the Norfolk sand varies from undulating to rolling. Drainage is usually excessive. The characteristic vegetation consists of scrub oak and blackjack oak, with scattered long-leaf pine.

Only a small proportion of the Norfolk sand is under cultivation. Yields are relatively small unless large quantities of fertilizer are used. Farm land of this type is held at \$15 to \$35 an acre.

Norfolk sand, sandhill phase.—The Norfolk sand, sandhill phase, consists of a loose, incoherent gray sand showing little or no change throughout the 3-foot section. The texture from place to place ranges from medium to coarse.

Only a few areas of this phase are mapped. These occur in the western part of the county as ridges or small hillocks. They usually support a thin growth of blackjack oak, scrubby oak of other species, and sand bur. This phase has little or no agricultural value.

NORFOLK SANDY LOAM.

The Norfolk sandy loam consists of a gray sand, about 4 inches deep, grading into a grayish-yellow loamy sand which becomes

heavier with depth. This is underlain at a depth of 15 to 18 inches by a yellow to bright-yellow sandy loam or friable sandy clay of considerable depth.

In a few places the surface soil to a depth of 12 inches consists of a gray to slightly brownish gray, mellow sandy loam, underlain by a bright-yellow, heavy sandy loam or sandy clay. Such areas usually occur along ridges and in the better drained positions. In places ferruginous pebbles occur in the surface soil, such areas closely resembling the Tifton sandy loam. Two small areas of Norfolk fine sandy loam lying about 1 mile west of the county convict camp on the National Highway are included with the Norfolk sandy loam as mapped.

The Norfolk sandy loam is encountered throughout the county, both on the hilly uplands and, to a less extent, in the flatwoods. The topography ranges from gently undulating in the western and southwestern parts of the county to rolling in the northern and eastern parts. Except in the more nearly level sections, the drainage is adequate. Where the type is associated with its deep phase the topography is rolling, and where the Tifton soils are developed the Norfolk usually occupies the lower slopes.

When well drained this is one of the more productive soils in the county. Cotton and corn are the important crops. This type usually is preferred to the Tifton soils for the production of corn.

Cotton yields two-thirds to three-fourths bale per acre, corn 15 to 35 bushels, and oats 20 to 40 bushels. In some cases, with large applications of fertilizer and with careful cultivation, larger yields are obtained.

For cotton an acreage application of 200 to 400 pounds of a 10-2 mixture of commercial fertilizer or a mixture of cottonseed meal and acid phosphate is generally used. Velvet beans, peanuts, and cow-peas are grown to some extent as soil improvers.

Land of this type sells for \$25 to \$100 an acre, depending upon location with respect to towns, public roads, and railroads. Farm land within a radius of 5 miles of Cordele brings \$50 to \$100 an acre, while land outside this belt brings an average of \$35 an acre.

This type can be improved by the incorporation of large quantities of organic matter in the form of stable manure or of leguminous crops, such as cowpeas, soy beans, and velvet beans, and by liming. Rye, vetch, and crimson clover may be used as winter cover crops and plowed under the following spring in time to plant cotton or corn. Deep fall plowing to conserve the winter rainfall and frequent cultivations during the growing season are essential.

Norfolk sandy loam, deep phase.—The surface soil of the Norfolk sandy loam, deep phase, consists of a loose gray sand, underlain at 6 to 8 inches by a pale-yellow or yellowish-gray sand or slightly

loamy sand. This passes at about 20 inches into a lighter sandy loam, which grades into sandy clay at a depth of about 3 feet. This phase represents a gradational type between the Norfolk sandy loam and the Norfolk sand. Nearly every area of the Norfolk sandy loam, deep phase, includes areas, only a few acres in extent, of either heavier or lighter material, usually lighter, which on account of their small size are not separated on the map.

This phase is most typically developed in the flatwoods region, around the many small, semiswampy sinks and sinuous areas of the Grady and Plummer soils. It is also encountered throughout the northern part of the county. The topography is undulating to gently rolling. In rainy seasons crops are likely to suffer from inadequate drainage.

Approximately 75 per cent of this phase is under cultivation. Cotton and corn are the main crops. Cotton yields are ordinarily slightly lower than on the typical Norfolk sandy loam. Corn yields 18 to 35 bushels per acre. Oats, rye, cowpeas, and peanuts are grown to some extent. Fair yields of these crops are obtained. Land of this type sells for \$25 to \$50 an acre.

The Norfolk sandy loam, deep phase, can be improved by the same methods as the typical soil.

TIFTON SAND.

The surface soil of the Tifton sand is a gray to grayish-brown, loose sand or slightly loamy sand, 6 to 12 inches deep, containing a large percentage of iron concretions. The subsoil is a light-yellow to grayish-yellow sand in the upper part, changing at a depth of about 30 inches to a loamy sand. In many places a stratum of iron concretions occurs in the subsoil at a depth of about 18 inches.

This type occurs largely in the eastern and northeastern parts of the county, at the heads of the tributaries of Lime, Reedy, and Deep Creeks. A few smaller areas are encountered in the northern part of the county. It usually occupies positions along the ridges or breaks between streams.

In productiveness there is little difference between this type and the heavier types of the Tifton series, and it is formed in about the same manner.

TIFTON SANDY LOAM.

The surface soil of the Tifton sandy loam consists of a grayish-brown to yellowish-brown loamy sand or light sandy loam, about 6 inches deep, grading into a yellow sandy loam, which extends to a depth of 10 or 12 inches. In many places, owing mainly to the abundance of iron concretions, the upper part of the surface soil is reddish brown. The subsoil is a bright-yellow to deep-yellow, fri-

able sandy clay, becoming heavier with depth and frequently showing slight mottlings of red and rusty brown.

A characteristic feature of the Tifton sandy loam is the presence of a large percentage of small, rounded iron concretions in both surface soil and subsoil. These particles are usually from one-eighth to 1 inch in diameter and are brown to dark brown or reddish brown in color. Though they seldom occur in sufficient quantities to interfere with cultivation, there is a wide variation in the content, the proportion ranging from 15 to 50 per cent. Over most of the type the concretions form probably 30 per cent of the soil mass. In some places the concretions are rather uniformly distributed through the soil and subsoil, while in others they occur most abundantly, as strata 2 or 3 inches thick, in the subsoil.

Besides this variation in content of concretionary material, the type varies in color and topography. In a few areas along slopes the soil is dull reddish brown in color, and such areas would be mapped as Ruston sandy loam if of sufficient extent.

In the northwestern part of the county, or the section drained by Limestone and Gum Creeks, the Tifton sandy loam carries more fine-textured material or silt than usual, and in many places the material below a depth of 30 inches consists of clay.

The Tifton sandy loam is most extensively developed in the eastern part of the county. The largest continuous area is located northeast of Arabi, along the Arabi and Williford Road. Another extensive area occurs along the Bowen-Adkins Road northwest of Cordele. Smaller areas are scattered throughout nearly all parts of the county. The larger proportion of this type occurs in the rolling uplands, especially along the ridges. Small developments, however, are found covering gently undulating areas. Both the surface drainage and underdrainage are excellent.

The Tifton sandy loam is known as "pebbly" or "pimply" land and is recognized as a very productive and desirable soil. It ordinarily gives larger yields of cotton and oats than any other type in the county and apparently requires less fertilizer. Cotton yields from two-thirds to three-fifths bale per acre, and many farmers, with proper fertilization and cultivation, obtain 1 bale to the acre. The short-staple varieties are most commonly grown. Corn ordinarily yields 25 bushels and oats from 20 to 30 bushels per acre. Velvet beans, cowpeas, and peanuts are grown with marked success on this soil.

Farm land of this type is held at \$25 to \$100 an acre, the average price being about \$40 an acre. It seldom changes hands.

This soil is easily improved and capable of high development. Its principal need is more organic matter, which can be supplied by

growing and plowing under such legumes as cowpeas, velvet beans, and crimson clover. Vetch and crimson clover can be grown as winter cover crops and plowed under in the spring in time for the planting of cotton.

SUSQUEHANNA SANDY LOAM.

The surface soil of the Susquehanna sandy loam consists of a loose, gray sand or loamy sand, passing at about 6 inches into a pale-yellow sandy loam. The subsoil is a heavy, plastic, dull-red clay, mottled with gray and sometimes with yellow, and containing a noticeable quantity of finely divided mica. The depth of the surface material varies considerably, even within short distances. In local "gall spots," usually less than 1 acre in extent, the heavy clay subsoil lies within 3 or 4 inches of the surface. Frequently it lies at a depth of 30 inches or more. Small outcrops of the underlying Alum Bluff formation, consisting of hardened and weathered sands and clays, occur one-half mile west of Arabi and 1 mile west of Tremont School, on the crests of slopes.

The Susquehanna sandy loam is most typically and extensively developed in the northeastern and southern parts of the county. Smaller areas occur throughout the uplands in the eastern part. The type usually occupies slopes, especially around stream heads and along drainage ways, throughout the rougher sections, and its topography is rolling. Surface drainage is good, but the heavy subsoil prevents free movement of underground water, creating a saturated condition on the lower slopes during wet weather.

Most of the merchantable timber has been removed from this type, leaving a few scattered trees and many stumps. Only a few small areas are under cultivation, the remainder either being used for pastures or lying idle. Probably the type can best be utilized as pasture or forest land.

GREENVILLE SANDY LOAM.

The surface soil of the Greenville sandy loam consists of a reddish-brown to red, light sandy loam, 8 to 10 inches deep. The subsoil is a red to dark-red sandy clay. In the area of this type lying north of the Spring Hill School the surface soil in a few places is a dark reddish brown, medium sand, 5 or 6 inches deep, underlain by a red loamy sand which extends to a depth of 3 feet or more.

The Greenville sandy loam occurs in the extreme western part of the county along the uplands bordering the Flint River. The topography is undulating to slightly rolling, with no steep slopes. Both surface drainage and underdrainage are good.

This type is of high agricultural value and probably 90 per cent of it is under cultivation. Most of the cultivated land has been

cleared of stumps, rendering the use of machinery practicable. Cotton, corn, and oats are the principal crops. Cotton yields ordinarily one-half to three-fifths bale per acre, corn 20 to 25 bushels, and oats 25 to 30 bushels.

Improved methods of cultivation are practiced on this type. Plows are drawn by two and four mules and set deep. Disk harrows and modern harvesting implements are in common use. Commercial fertilizer is used for cotton, corn, and oats.

ORANGEBURG SANDY LOAM.

The surface soil of the Orangeburg sandy loam is a grayish-brown to reddish-brown medium sandy loam. The subsoil is a red to bright-red sandy loam, abruptly grading into a moderately heavy sandy clay. The large area lying south of Daphne includes many spots of loamy sand too small to be properly indicated on a map of the scale used, otherwise they would have been shown separately.

The Orangeburg sandy loam is inextensive and is confined to the western part of the county. The topography is undulating to rolling. Drainage conditions are good, and in a few places severe erosion is caused by heavy rains.

Cotton and corn are the principal crops. Oats and cowpeas are also extensively grown. Cotton yields one-fourth to one-third bale to the acre, corn 15 to 18 bushels, and cowpeas one-half to three-fourths of a ton of hay. A few pecan trees set out on this soil appear to be in a thriving condition.

RUSTON LOAMY SAND.

The Ruston loamy sand consists of a gray to grayish-brown loamy sand, underlain at about 8 inches by a dull reddish brown loamy sand, which extends to a depth of 3 feet or more.

This type occurs in small patches throughout the western part of the county. The topography is gently rolling and drainage is good to excessive. Only a small percentage of the land is under cultivation. Cotton and corn are grown, but the yields are only fair. The suggestions made for the improvement of the Norfolk sand are applicable to this type.

RUSTON SANDY LOAM.

The surface soil of the Ruston sandy loam to a depth of 4 inches consists of a gray to slightly brownish gray sand, changing to a dull-yellow loamy sand or light sandy loam which extends to a depth of about 9 inches. The subsoil is a heavy sandy loam which abruptly grades into a dull-red to reddish-yellow, somewhat friable sandy clay. In a few places, on the crests of slopes, the type contains 5 to 25 per cent of iron concretions.

The Ruston sandy loam is developed mainly in the extreme western part of the county, though small isolated areas occur throughout

all sections. It occupies the slopes and tops of ridges and in a few places forms gently rolling uplands. The natural drainage is good, the run-off being so rapid in places that steeper slopes are subject to erosion and terracing is necessary.

This type is usually farmed in connection with other soils. Cotton, corn, oats, and rye are the principal crops.

PLUMMER SANDY LOAM.

The Plummer sandy loam consists of a gray to dark-gray sand or loamy sand, carrying varying quantities of organic matter, and from 8 to 15 inches deep, underlain by a light-gray to bluish-gray, compact sandy loam or friable sandy clay. Mottlings of gray, yellow, and red are often encountered in the lower part of the 3-foot section.

This type is developed in narrow strips throughout the uplands. It also occurs in low-lying areas in the flatwoods. Drainage is naturally poor, and the type is covered with water the greater part of the year. The vegetation is distinctive, consisting of sedge grass, gallberry, gum, and pine. The timber growth is being rapidly removed and the land ditched. Very little of the type is under cultivation at present.

GRADY SANDY LOAM.

The Grady sandy loam consists of a gray to dark-gray loamy sand to light sandy loam, from 6 to 24 inches deep, underlain by a gray to drab, sticky sandy clay, which abruptly passes into a mottled red, brown, and yellow plastic clay.

In some of the larger bodies of this type there are included areas of clay or clay loam which, owing to their small extent, swampy condition, and dense vegetation, it is impracticable to map.

The Grady sandy loam is developed throughout the western part of the county in small, scattered areas. It occupies small, irregular, shallow depressions, locally termed sinks or lakes. The topography is flat, and water stands on the surface during the winter months and often during the entire year. Artificial drainage is being attempted in some places by means of open ditches.

Only a small percentage of this type is under cultivation at present. Most of it is covered with a forest growth consisting of gum, scrub oak, water oak, beech, and cypress, with an undergrowth of broom sedge and cane. Where the soil is well drained good yields of corn are obtained.

KALMIA FINE SANDY LOAM.

The surface soil of the Kalmia fine sandy loam consists of a light-gray, loose, mellow fine sand to loamy fine sand, 6 to 8 inches deep. This is underlain by a light-yellow, mellow, loamy fine sand which

gradually becomes heavier in texture to a depth of about 24 inches, where a pale-yellow, friable fine sandy clay, which extends to a depth of more than 36 inches, is encountered.

This type occurs in close association with the Myatt fine sandy loam, and in many places the two types merge so gradually that it is necessary to establish arbitrary lines of separation. Included with the Kalmia fine sandy loam as mapped there are several areas of Kalmia sandy loam that are not separated because of small extent. The largest of these areas, comprising several hundred acres, lies near the Hatley Road in the eastern part of the county. The others occur in the southwestern part of the county, along Swift Creek.

The Kalmia fine sandy loam is not extensive. Its largest development occurs along Deep Creek, beginning at the point where this creek crosses the Hatley Road and extending in interrupted areas to the southeastern corner of the county. It is also encountered in areas of good size along Lime and Gum Creeks. The type occupies second-bottom positions about 6 to 10 feet above the level of the streams, and is subject to overflows in times of heavy precipitation. The topography is level and, owing to a low-lying position and a high water table, the land is only fairly well drained.

The original forest has been removed, only a few scattered long-leaf pines remaining. The type supports a thrifty growth of wire grass and broom sedge and is chiefly used as pasture land. Only a few acres are cultivated.

No definite price can be quoted for land of this type, as it is generally sold in conjunction with the upland soils.

Drainage is the first need in the improvement of this soil. When properly drained it can be successfully used for the production of the general farm crops, especially corn and sugar cane.

MYATT FINE SANDY LOAM.

The soil of the Myatt fine sandy loam is a bluish-gray or drab fine sand to loamy fine sand, 8 to 15 inches deep. The subsoil is a bluish-gray or light-drab, light fine sandy loam, gradually becoming heavier and passing at about 24 inches into a fine sandy clay of similar color but conspicuously mottled with white, gray, brown, and shades of yellow. These mottlings are frequently encountered close to the surface.

In a few spots along Gum Creek and Flint River the soil consists of a gray fine sandy loam underlain by a heavy, plastic clay of light-gray or mottled gray, red, or yellow color. Such material is true Leaf fine sandy loam, but it occurs in areas too small to show on the soil map. Areas of the Kalmia fine sandy loam too small to separate are also included with the Myatt.

The Myatt fine sandy loam occurs in the southeastern part of the county, where it occupies second-bottom or terrace positions along Lime and Deep Creeks and other streams. The terraces are not more than 4 to 8 feet above the normal flow of the streams. The surface is level and drainage is poor. This type includes the more poorly drained parts of the stream terraces, and the Kalmia fine sandy loam the better drained parts. Owing to seepage, to a high water table, and to frequent overflow, drainage is difficult to establish.

The original forest has been removed and the type is utilized entirely as pasture land.

Where this type of soil predominates land values are low.

CONGAREE SILT LOAM.

The Congaree silt loam consists of a dark-brown to chocolate-brown silt loam, about 8 inches deep, underlain by a brown to yellow, heavy silt loam or silty clay loam, mottled in places with red and yellow. There is considerable variation in the color of the subsoil. Most of the type differs somewhat from the Congaree silt loam as mapped in other sections of Georgia. In poorly drained areas the subsoil has the characteristics of Chastain material. There are a few small areas in the form of narrow ridges and mounds where the texture is that of a fine sandy loam.

The Congaree silt loam is confined to first-bottom positions along the Flint River, and is subject to overflow. The topography is level, except where small streams or bayous cut through the type.

The forest growth on the better drained areas consists of long-leaf pine, spruce pine, and oak, while the low-lying, more poorly drained areas, support a growth of water oak, gum, cypress, and magnolia.

None of this type is under cultivation. It is utilized for pasturing hogs. It is naturally a strong soil and if properly drained would produce large yields of corn and other crops.

SWAMP.

Swamp includes low-lying wet land along the streams. The soil material in such areas varies considerably in texture and structure, but it usually is dark colored and either a sand or sandy loam in texture. In places the material resembles that forming the Plummer sandy loam.

Swamp is encountered along the larger streams throughout the county. The largest and most continuous areas lie along Gum, Cedar, and Swift Creeks, in the western half of the county.

The type supports a forest of black gum, sweet gum, magnolia, and other water-loving trees, with an undergrowth of shrubs, small plants, and vines.

Practically none of the Swamp has been reclaimed and put under cultivation. It sometimes is utilized to pasture cattle and hogs during dry seasons.

SUMMARY.

Crisp County is located in the southwestern part of Georgia. It has an area of 271 square miles, or 173,440 acres.

A large part of the county is drained by Flint River. Lime, Reedy, and Deep Creeks completely drain the eastern and southeastern parts. The topography varies from gently undulating to rolling and the drainage is in general well established. There are a few low, flat, poorly drained areas and lime sinks.

The climate is characterized by short, mild winters and long summers. The mean temperature for the winter season is 49.3° F. and for the summer 81.4°. The mean annual rainfall amounts to 48.64 inches.

The population of the county, census 1910, is 16,423, of which 64.2 per cent is rural. Cordele, the county seat and largest town, had a population in 1910 of 5,883. Transportation facilities are good.

Thirty years ago the entire county was heavily forested with long-leaf pine; now nearly 75 per cent of its area is in farms. Cotton and corn are the most important crops.

The soils of Crisp County are of Coastal Plain origin and are prevailingly sandy in texture, with sandy clay subsoils. Types of the Norfolk and Tifton series predominate.

The Norfolk sandy loam is one of the most extensive types in the county. It is considered one of the best soils for corn and almost as valuable as the Tifton sandy loam for cotton. The Norfolk sandy loam, deep phase, is slightly less productive than the typical sandy loam. The Norfolk sand is the least desirable of this series, and only a small proportion of it is cultivated. The sandhill phase of this type is very inextensive and of little or no agricultural value.

The Tifton soils are important in the county. The Tifton sandy loam, the predominating type throughout the rolling uplands, is well adapted to general farm crops. The Tifton sand is less extensive than the sandy loam, but differs little from that type in productiveness.

The Susquehanna sandy loam occurs in the rougher sections of the county, where erosion has been active, and is not generally utilized for agriculture.

The Greenville sandy loam is locally known as "red land." It is adapted to the general farm crops and is of high agricultural value. Cotton, corn, and oats are the principal crops.

The Orangeburg sandy loam is of small extent. It produces fair yields of cotton and corn, the principal crops.

The Ruston sandy loam and loamy sand are inextensive and unimportant, being farmed in connection with other types. These soils produce fair yields of cotton and corn.

The Plummer and Grady sandy loams, owing to their poorly drained condition, are of little present importance in the agriculture of the county.

The Kalmia and Myatt fine sandy loams and the Congaree silt loam are alluvial soils in need of drainage.

Swamp represents wet, poorly drained, first-bottom lands occurring along the larger streams throughout the county.



[PUBLIC RESOLUTION—No. 9.]

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

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

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

Approved, March 14, 1904.

[On July 1, 1901, the Division of Soils was reorganized as the Bureau of Soils.]



Areas surveyed in Georgia.

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