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Soil Survey

Candler County Georgia

By

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United States Department of Agriculture

UNITED STATES DEPARTMENT OF AGRICULTURE

Agricultural Research Administration

Bureau of Plant Industry, Soils, and Agricultural Engineering

In cooperation with the

UNIVERSITY OF GEORGIA, COLLEGE OF AGRICULTRURE

HOW TO USE THE SOIL SURVEY REPORT

SOIL SURVEYS provide a foundation for all land use programs. This report and the accompanying map present information both general and specific about the soils, the crops, and the agriculture of the area surveyed. The individual reader may be interested in the whole report or only in some particular part. Ordinarily he will be able to obtain the information he needs without reading the whole. Prepared for both general and detailed use, the report is designed to meet the needs of a wide variety of readers of three general groups: (1) Those interested in the area as a whole; (2) those interested in specific parts of it; and (3) students and teachers of soil science and related agricultural subjects. Attempt has been made to meet the needs of all three groups by making the report comprehensive for purposes of reference.

Readers interested in the area as a whole include those concerned with general land use planning—the placement and development of highways, power lines, urban sites, industries, community cooperatives, resettlement projects, and areas for forest and wildlife management and for recreation. The following sections are intended for such users: (1) General Nature of the Area, in which location and extent, physiography, relief, and drainage, climate, water supply, vegetation, organization and population, industries, transportation and markets, and cultural development and improvement are discussed; (2) Agriculture, in which a brief history of the present status of the agriculture is described; (3) Estimated Yields and Productivity Ratings, in which are presented the productivity of the soils, which are grouped according to their relative physical suitability for agricultural use; and (4) Land Use and Soil Management, in which the present uses of the soils are described, their management requirements discussed, and suggestions made for improvement.

Readers interested chiefly in specific areas—as some particular locality, farm, or field—include farmers, agricultural technicians interested in planning operations in communities or on individual farms, and real estate agents, land appraisers, prospective purchasers and tenants, and farm loan agencies. These readers should (1) locate on the map the tract with which concerned; (2) identify the soils on the tract by locating in the legend on the margin of the map the symbols and colors that represent them; and (3) locate in the table of contents in the section on Soils the page where each type is described in detail and information given as to its suitability for use and its relations to crops and agriculture. They will also find useful specific information relating to the soils in the sections on Estimated Yields and Productivity Ratings and on Land Uses and Soil Recommendations.

Students and teachers of soil science and allied subjects—including crop production, forestry, animal husbandry, economics, rural sociology, geography, and geology—will find their special interest in the section on Morphology and Genesis of Soils. They will also find useful information in the section on Soils, in which are presented the general scheme of classification of the soils of the area and a detailed discussion of each type. For those not already familiar with the classification and mapping of soils, these subjects are discussed under Soil Survey Methods and Definitions. Teachers of other subjects will find the sections on General Nature of the Area, Agriculture, Estimated Yields and Productivity Ratings, and the first part of the section on Soils of particular value in determining the relations between their special subjects and the soils of the area.

This publication on the soil survey of Candler County, Ga., is a cooperative contribution from the—

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SOIL SURVEY OF CANDLER COUNTY, GA.

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United States Department of Agriculture in cooperation with the University of Georgia, College of Agriculture

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WHEN settlement began in Candler County, Ga., in the early part of the nineteenth century the pioneers made small clearings in the well-drained parts of the pine woods and grew corn, wheat, and vegetables for home use. At first, cattle, sheep, and hogs were the chief sources of income, but cultivated crops gradually took the lead as the population increased, markets became more accessible, and additional land was cleared. Cotton soon became the chief crop but was supplanted by tobacco in 1939. The climate and many soils favor the growth of a variety of crops, however—chiefly corn, sweetpotatoes, oats, peanuts, soybeans, velvetbeans, cowpeas, and legumes—and the production of hogs and other livestock. To provide a basis for the best agricultural uses of the land a cooperative soil survey was begun in 1939 by the United States Department of Agriculture and the College of Agriculture of the University of Georgia. The report is here presented and may be briefly summarized as follows.

SUMMARY

Candler County, on the middle to higher Coastal Plain of southeastern Georgia, has an area of 248 square miles. Metter (population 1,823), the county seat, is 60 miles northwest of Savannah, 95 miles southeast of Macon, and 75 miles south of Augusta. Pulaski (population 241) is the only other important town. Most of the

land ranges in relief from broad almost level undulating to gently sloping areas and is favorable for agriculture. The greater part of the upland soils is well drained, but here and there are small poorly drained areas of flat land. The elevation ranges from about 116 feet to nearly 300 feet above sea level. The summers are long and hot, and the winters mild. Both climate and soils favor the production of a wide variety of crops.

Most of the uplands were originally covered with a forest of longleaf pine, but practically all merchantable timber has been cut. The county is young agriculturally—about half the land in farms has been cleared and cultivated since 1900. The principal crops—corn and cotton—occupy 61 and 23 percent, respectively, of the cultivated land.

In 1939 tobacco became the chief source of revenue, with cotton the second cash crop of importance. Among other crops are sweetpotatoes, oats, velvetbeans, cowpeas, peanuts, and leguminous crops, including soybeans, Austrian Winter peas, hairy vetch, lespedeza, crotalaria, and kudzu. A large variety of garden vegetables and some sugarcane, fruits, and pecans are grown. Bermuda grass, Dallis grass, and carpet grass are the principal tame grasses grown for hay and pasture. More diversified farming is being practiced, and there is a greater acreage than formerly in leguminous crops. A large number of hogs and some cattle are raised for home consumption and for market. Some revenue is derived from the sale of turpentine products, and some lumbering is carried on.

The soils are representative of a large area in the so-called wiregrass region of Georgia. All have a surface layer of sandy loam, fine sandy loam, or sand, and the subsoil in most of them is friable sandy clay, fine sandy clay, or sand. They are classed in three broad groups—(1) cropland, (2) pasture land, and (3) forest.

The cropland soils may be subdivided as good, fair to good, and poor. Good cropland soils include Tifton sandy loam and fine sandy loam, Norfolk sandy loam and fine sandy loam, and Kalmia fine sandy loam. These are characterized by a brownish-gray sandy surface soil and a light yellowish-brown friable sandy clay subsoil, have favorable surface relief, are well drained, warm early in spring, are easily tilled, and respond readily to the application of fertilizers or the turning under of green legume crops. The improved farms and the most stabilized agriculture are on these soils. They produce the greater part of the cash crops and most of the corn, as well as a large part of the hay and forage.

Fair to good cropland soils include Tifton sandy loam, eroded sloping phase; Norfolk sandy loam, eroded sloping and deep phases; Norfolk fine sandy loam, deep phase; and Kalmia fine sandy loam, deep phase. These soils occur on gradients of 5 to 10 percent. In places some sheet erosion is evident and locally a few shallow gullies have formed. The deep phases are underlain by a friable sandy clay subsoil at a depth of 20 to 30 inches. These soils are used for growing crops similar to those of the good cropland, but with similar treatment the yields are slightly lower, and it is more difficult to maintain them in a good state of productivity.

The poor cropland soils—Gilead sandy loam, Norfolk and Kalmia fine sands and Norfolk sand—have almost level to gently sloping relief and are well to excessively drained. Gilead sandy loam is character-

ized by a hard partly cemented sandy clay subsoil, as contrasted with the friable sandy clays of the fair to good soils and lacks their water-holding capacity. The fine sands and sand are inherently low in organic matter and in mineral plant-food elements and are difficult to build up and maintain in a moderate state of productivity. Only a small proportion is cultivated.

Pasture land soils—Plummer sandy loam and loamy sand, Portsmouth fine sandy loam, Myatt fine sandy loam and loamy fine sand, and Kalmia-Myatt fine sandy loams—occur on level or very gently sloping relief. All are naturally poorly drained and require artificial drainage even for pasture. These are the best soils for pasture grasses.

The forest-land soils include Gilead sandy loam, eroded sloping phase; Norfolk sand, scrub phase; Alluvial soils, undifferentiated; and Swamp. The Gilead soil occurs chiefly on slopes of 5 to 10 percent and has been damaged considerably by sheet erosion and some by gullying. Norfolk sand, scrub phase, consists of deep, loose, porous, almost white sand of very low fertility. Alluvial soils, undifferentiated, and Swamp occur on the flood plains in the first bottoms and are wet most of the year. They support a forest growth of cypress, black tupelo (blackgum), sweetgum, red maple, magnolia, ironwood, and some pond pine.

The county offers good opportunities for further development, especially as regards the production of peanuts, sweetpotatoes, and hogs. A considerable acreage of potentially good farming land has not yet been cleared and brought under cultivation. More and better pastures can be obtained easily by partly clearing some of the poorly drained soils and establishing a few shallow ditches.

GENERAL NATURE OF THE AREA

LOCATION AND EXTENT

Candler County, occupying a land area of 248 square miles, or 158,720 acres, is in the southeastern part of Georgia (fig. 1). Metter, the county seat and largest town, is 60 miles northwest of Savannah, 95 miles southeast of Macon, and 75 miles south of Augusta. The county is irregular in shape.

PHYSIOGRAPHY, RELIEF, AND DRAINAGE

The county is on the Hazlehurst terrace,[1] one of the highest and most remote from the ocean of the marine coastal terraces comprising the Sea Island section of the Coastal Plain province. These terraces consist of an intimate mixture of unconsolidated or only slightly consolidated water-laid sands, silts, and clays that were deposited in the Atlantic Ocean along the eastern and southeastern edges of North America before the shore line of the continental mainland reached its present position.

The county is part of a comparatively smooth plain sloping gradually southeastward and modified by shallow valleys and slight depressions. It includes three distinct topographic divisions—uplands, river terraces, and flood plains—all of which have been formed by erosion of the originally smooth Coastal Plain formation. The relief consists of a succession of almost flat or gently undulated, moderately

[1] LAFORGE, L., COOKE, W., KEITH, A., and CAMPBELL, M. R. PHYSICAL GEOGRAPHY OF GEORGIA. Ga. Geol. Survey Bul. 42, 189 pp., illus. 1925.

wide interstream divides separated by relatively broad valleys with gently sloping sides and nearly level bottoms. In general the slopes are less than 5 percent, but along many of the sides of valleys they range from 5 to about 15 percent.

The elevation over most of the well-drained uplands ranges from 215 to 260 feet above sea level. The lowest land, 116 feet, is in the swamps along the Canoochee River in the southeastern part, and the highest is in the northwest.

Drainage is generally southeastward, chiefly through the Canoochee River and its tributaries. A small area in the southwestern part is drained by the Ohoopee River. Fifteenmile Creek, the principal tributary of Canoochee River within the county, drains most of the northern and central parts.

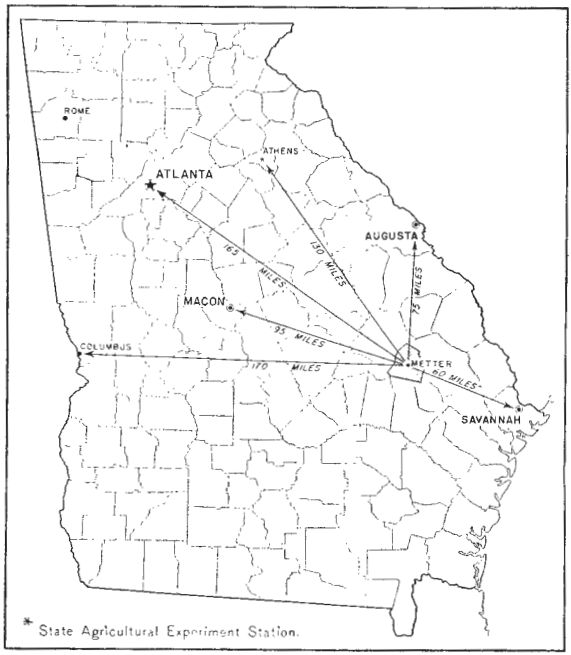

FIGURE 1.—Location of Candler County in Georgia.

Although gentle slopes and very slight differences in elevation characterize the relief, the soils for the most part are well drained. Only those that have either hard and indurated or loose and incoherent substrata are excessively drained. In most places runoff is not rapid, and erosion is not severe. In cultivated fields, on the more sloping relief, a few shallow gullies are developing and a few small areas are severely eroded. Swampy situations are confined chiefly to small sinks or depressions on both the uplands and river terraces and to the flood plains along the major streams and rivers. Other less poorly drained areas include foot slopes where seepage occurs and the nearly level flatwoods. The flatwoods, which are at the heads of and along the upland drainageways, are locally known as upland flatwoods; those on

river terraces and flood plains are called the lowland flatwoods. Several of the flatwood areas suitable for grazing have been drained artificially.

CLIMATE

Long hot summers and short mild winters characterize the climate, which is favorable for a great variety of crops and for raising livestock. Fall-sown small grains and winter cover crops, as Austrian Winter peas and vetches, grow throughout the winter and afford good pasture. Beets, cabbage, carrots, lettuce, mustard, onions, English peas, rutabagas, broccoli, eggplant, sweetpotatoes, and other fresh vegetables can be grown during the early spring months, especially on well-drained soils and on southward-facing slopes. Collards and turnips can be grown throughout the winter.

Temperatures are mild throughout the year, and wide variations do not occur. The mean annual temperature at Brooklet, Ga., is 66.5° F. Frosts have been recorded there as late as April 26 and as early as October 21, but the average length of the frost-free season is 244 days, from March 16 to November 15, inclusive. Freezing periods of long duration seldom occur. Climatic data representative of Candler County are given in table 1, compiled from the records of the United States Weather Bureau station at Brooklet, Bulloch County, Ga.

In general, the rainfall is well distributed throughout the year. At Brooklet the average annual rainfall is 48.31 inches. The precipitation is somewhat heavier in summer, when the moisture demands of growing plants are greatest, and is lightest in fall, thus favoring the ripening and harvesting of crops. Snow is rare.

TABLE 1.—*Normal monthly, seasonal, and annual temperature and precipitation at Brooklet, Bulloch County, Ga.*

[Elevation, 150 feet]

Month	Temperature			Precipitation			
	Mean	Absolute maximum	Absolute minimum	Mean	Total for the driest year	Total for the wettest year	Average snowfall
	°F.	°F.	°F.	*Inches*	*Inches*	*Inches*	*Inches*
December	50.8	85	8	3.20	3.11	4.72	(1)
January	50.1	82	12	2.98	3.23	5.48	0.1
February	52.0	86	2	3.62	2.13	5.25	.4
Winter	51.0	86	2	9.80	8.47	15.45	.5
March	59.5	97	21	3.78	1.62	4.60	0
April	65.9	98	29	3.09	2.51	5.58	0
May	74.1	102	41	3.74	1.54	3.30	0
Spring	66.5	102	21	10.61	5.67	13.48	0
June	80.1	105	48	6.18	2.03	6.13	0
July	82.0	106	59	6.06	5.45	4.04	0
August	81.3	107	56	6.14	6.60	2.80	0
Summer	81.1	107	48	18.38	14.08	12.97	0
September	77.3	107	42	4.67	.52	24.34	0
October	67.4	97	30	2.40	.45	1.99	0
November	57.3	91	20	2.45	(1)	3.15	(1)
Fall	67.3	107	20	9.52	.97	29.48	(1)
Year	66.5	[2] 107	[3] 2	48.31	[4] 29.19	[5] 71.38	.5

[1] Trace. [2] In August and September 1925. [3] In February 1899. [4] In 1931. [5] In 1929.

WATER SUPPLY

An abundance of drinking water and water for livestock can be obtained throughout most of the county at depths of 20 to 50 feet. Wells are drilled or bored easily into the underlying clays and sands. A few schoolyards and some of the improved farms have drilled wells. In some places these are within or near barnyards, feed lots, and other sources of contamination and are either poorly cased or open. Several small lakes and ponds, most of which are artificial, afford local recreation and provide some water for livestock. Springs consist mainly of seeps, and the water is usually of inferior quality. Streams are numerous throughout the county and seldom run dry.

Although the supply of underground water is abundant, irrigation is not practiced. During years of normal or nearly normal precipitation the yield of many crops commonly grown would not be increased enough to warrant irrigation.

VEGETATION

Prior to settlement by the white man, Candler County was a forested area. Longleaf pines prevailed over the well-drained soils of the uplands, and a variety of trees were in the poorly drained areas. Most of the original growth on the uplands has been cut, and about the only merchantable timber left is that in the large swamps. About 35 percent of the land has been cleared for cultivation, and the rest supports a growth as follows: Scattered longleaf pines with some small oaks, dogwood, persimmon, and hickory on the well-drained sandy loams of the uplands; second-growth loblolly and slash pines, some sweetgum, black tupelo, and small scattered oaks with an undergrowth of myrtle and inkberry (gallberry) on the poorly drained uplands; cypress, black tupelo, tupelo gum, red maple, water oak, pond pine, water elm, ironwood, and magnolia on the swamp areas; and a scattering of longleaf pine together with a thick growth of small turkey and scrub oaks on the deeper sands. In the wooded areas the native grasses include mainly bunch wire grass, some bullgrass, ticklegrass, sweetgrass, and crabgrass. Most of the trees are suitable only for small timber, posts, cross ties, pulpwood, and turpentine gum.

ORGANIZATION AND POPULATION

Settlement of the area began in the early part of the nineteenth century. In 1914 the county was organized from parts of Bulloch, Emanuel, and Tattnall Counties. Most of the early settlers came from the Carolinas, Virginia, and the older settled parts of Georgia. The present population is largely native-born and consists of about 65 percent whites and 35 percent Negroes. According to the Federal census, the population was 9,103 in 1940, all classed as rural, and averaged 36.3 persons to the square mile. Except within the vicinity of towns the population is rather evenly distributed. The most sparsely settled parts include the swamps and areas where the soil is sandy to considerable depth. Metter and Pulaski, the only towns of importance, have a population of 1,823 and 241, respectively. Aline, Shamrock, Excelsior, and Canoe are small villages.

INDUSTRIES

The only industries in the county, aside from growing cultivated crops and raising livestock, include lumbering and the production of turpentine gum. Lumbering is of secondary importance and is limited to posts, poles, pulpwood, and a few railroad ties. Practically all the large merchantable timber has been removed. Pulpwood probably will become more important, as most of the soils are well suited to growing pine and other softwoods commonly used for this purpose. Considerable turpentine gum is produced, largely from slash pine. In recent years many farmers have realized that the sale of the gum is an important source of revenue and have been giving much more attention to the development of their turpentine timber. Formerly most of them leased their turpentine timber for a certain number of years to operators who paid the owner a specified amount for the privilege of working the trees. Recently, however, this practice has been losing favor, as many farmers have learned that it is much more profitable to operate the trees themselves. This not only provides greater current returns to the owner, but it gives him more control over his timber and over the future supply of gum.

TRANSPORTATION AND MARKETS

Transportation and markets are sufficient to meet the demands. A branch of the Central of Georgia Railway Company passes through Pulaski to Metter. Two paved State highways cross the county from north to south and from east to west. These facilities furnish good connections with outside markets. A network of good sandy clay roads serves all parts of the county and these are kept in good repair. The streams are spanned with good free bridges, either of concrete or wooden construction.

Metter is centrally located and is the chief trading and shipping center. Pulaski serves as a trading and shipping point for the eastern part. General stores are located throughout the rural districts and serve as transportation and exchange centers for home supplies and farm produce.

CULTURAL DEVELOPMENT AND IMPROVEMENT

The public school system is well developed. Consolidated high schools are at Pulaski and Metter, and grammar schools and schools for Negro children are scattered throughout the county. Churches are conveniently located. Rural mail routes reach nearly all farm homes; telephones are common; and electric power lines cross all parts of the county and serve many farms.

Farm improvements and equipment are adequate and are kept in good repair. Owing to the mild climate, expensive farm buildings are not needed. The houses are mainly small one-story wooden structures, but many occupied by landowners are much larger. A few are equipped with modern conveniences and some with electricity. Most barns and other outbuildings are large enough to house the livestock, the more expensive machinery, and the crops commonly stored on the farm. Usually only the feed lots and cultivated fields are fenced, either with barbed or woven wire or rails. State laws do not require that pastures be fenced, even along roads, and livestock is allowed free use of the open range.

AGRICULTURE

The pioneers made small clearings in the well-drained parts of the pine woods and grew corn, wheat, and vegetables for home use. Owing to the huge task of removing the forests and the remoteness of the area from market centers, cattle, sheep, and hogs were at first the chief sources of revenue. The animals had free range and subsisted largely on shrubs, grasses, fruits, and nuts from the open woods. When ready for market, they were driven to the nearest shipping point.

As the population grew and markets became more accessible, additional land was cleared and the production of cultivated crops gradually surpassed the raising of livestock. Cotton soon became the chief crop and continued to be the principal cash crop until 1939. Although the appearance of the boll weevil about 1920 and the introduction of tobacco and sweetpotatoes as substitute cash crops caused considerable reduction in its acreage, cotton has more or less determined the economic welfare of all the inhabitants since an early date.

Farming was retarded considerably during the eighties, when capital and labor turned to the turpentine and lumbering industries, but after practically all the virgin timber was exhausted, most of the inhabitants resumed farming again, and agriculture has since been their principal occupation.

Although cotton was the principal cash crop from the early settlement of the county until 1939, many farmers now realize the importance of crop diversification, and the climate and many of the soils favor the growth of a variety of crops. Raising hogs and livestock is becoming more important. The present agriculture, therefore, is rapidly becoming more diversified, and on most farms it consists mainly of the production of cotton, tobacco, and sweetpotatoes as cash crops and in addition enough subsistence crops to raise and fatten a comparatively large number of cattle and hogs for market.

The values of the principal farm products by classes in 1919, 1929, and 1939 are shown in table 2.

TABLE 2.—*Value of agricultural products, by classes, in Candler County, Ga., in stated years*

Crops	1919	1929	1939	Livestock products	1919	1929	1939
All cereals	$554,684	$179,447	$193,193	Cattle, hogs, and sheep sold alive or slaughtered	(1)	(1)	$166,252
Corn for grain	(1)	178,104	192,594				
Other cereals	(1)	1,343	599				
Other grains and seeds	2,797	9,706	1,314	Poultry [3] raised	$51,148	$43,229	44,113
Hay and forage	14,367	3,541	43,473	Chicken eggs produced		35,991	45,784
Cotton	(1)	737,145	284,023	Whole milk, cream, [4] and butter sold	2,563	6,194	8,242
Tobacco	(1)	342,199	298,359				
Vegetables	94,280	88,441	95,998	Wool shorn	22	96	47
For sale [2]	(1)	11,951	10,048	Honey produced	1,510	1,383	305
For farm household use [2]	(1)	35,166	62,701	Total	55,243	86,893	264,743
Potatoes and sweetpotatoes	(1)	41,324	23,249				
Fruits and nuts	12,979	9,420	19,603				
Horticultural specialties sold	(1)	3,000	(1)				
All other crops	1,699,766	26,444	23,823				
Forest products sold	(1)	15,975	24,171				
Total	2,378,873	1,415,318	986,957				

[1] Data not available.
[2] Excluding potatoes and sweetpotatoes.
[3] Chickens only, in 1919.
[4] Both sweet cream and sour cream (butterfat).
[5] Includes value of wax.


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PLATE 1
South

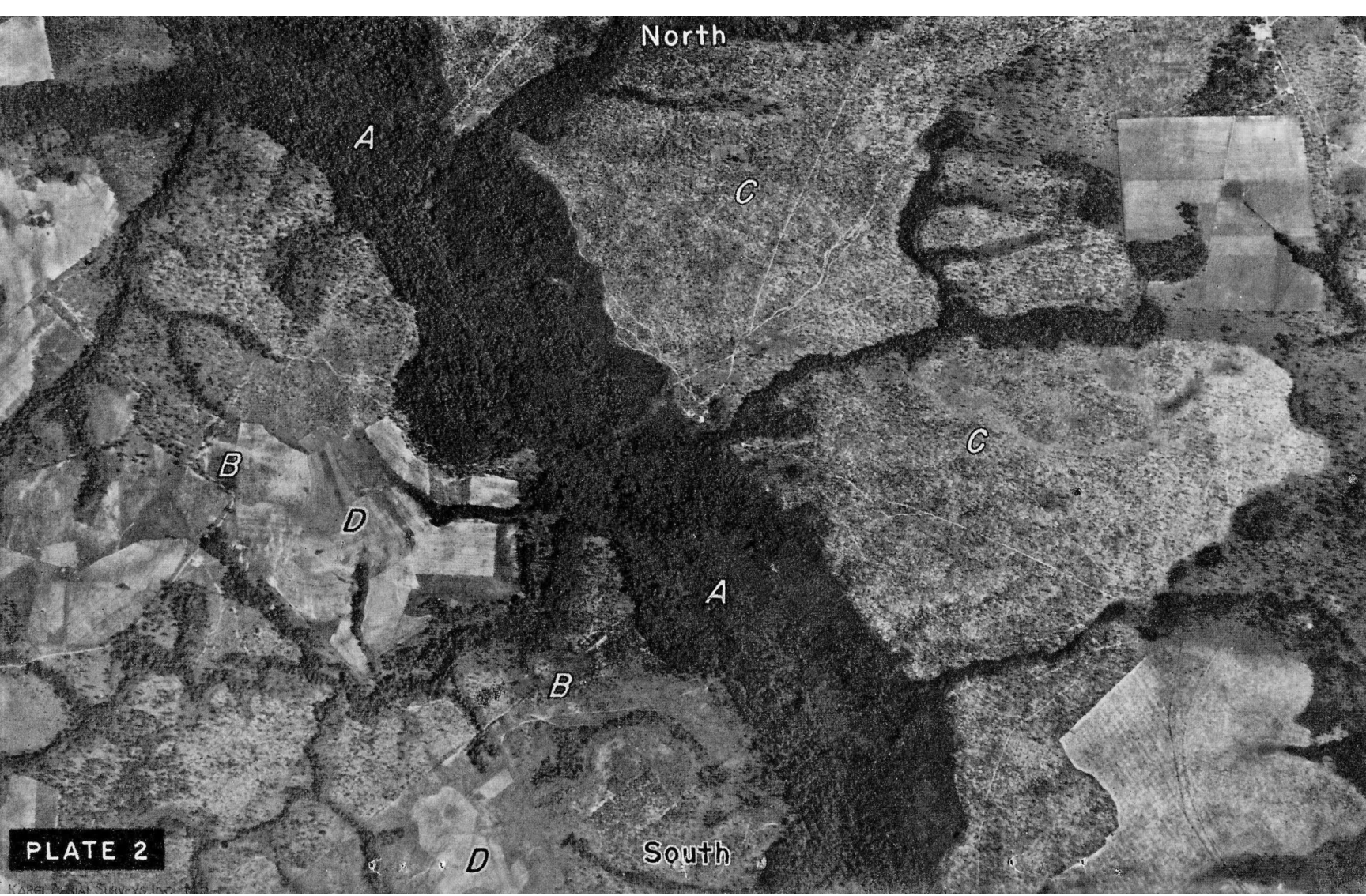

PLATE 2

PLATE 3

South

The value of cotton, tobacco, and corn is much greater than that of all livestock and other farm products. The total value of all crops harvested and forest products sold in 1929 was $1,415,318, whereas in 1939 it was $986,957, but the value of livestock products greatly increased in 1939, owing to a shift from cotton and to some extent tobacco as cash crops and to the raising of more livestock and the production of more subsistence crops.

The acreage of the principal crops for the years 1919, 1929, and 1939 is shown in table 3.

TABLE 3.—*Acreage of the principal crops in Candler County, Ga., in stated years*

Crop	1919	1929	1939	Crop	1919	1929	1939
Corn:	*Acres*	*Acres*	*Acres*	Vegetables harvested for	*Acres*	*Acres*	*Acres*
For grain	24,901	19,565	30,963	sale	-------	330	424
For other purposes	430	1,485	1,484	Sugarcane	245	193	316
Oats:				Cotton	24,877	19,454	11,991
Threshed	1,083	83	65	Tobacco	124	2,945	2,836
Cut and fed unthreshed	-------	2,089	1,131	Hay	415	204	1,762
Beans	-------	[1] 369	[1] 937	Legumes for hay	287	101	1,715
Peas	31	[1] 180	[1] 949		*Number*	*Number*	*Number*
Peanuts	42	[1] 308	[1] 756	Peach trees	4,748	3,151	3,769
Potatoes	16	11	32	Pear do	547	337	719
Sweetpotatoes	341	345	442	Pecan do	-------	5,264	5,922

[1] Partly duplicated in legumes for hay.

At present the principal crops are corn, cotton, and tobacco. Others produced are sweetpotatoes, potatoes, oats, peanuts, soybeans, velvetbeans, cowpeas, Austrian Winter peas, hairy vetch, lespedeza, and crotalaria. Pecans are grown to a considerable extent, as also are sugarcane, garden vegetables, and fruits for home use. Cotton, tobacco, and sweetpotatoes are the principal cash crops, and there is also considerable revenue from the sale of cattle, hogs, and poultry products and some from turpentine and resin.

Cotton and corn have occupied the greatest proportion of the cultivated land since an early date, and prior to 1930 they were grown on about an equal acreage basis. From 1929 to 1939, however, the acreage of corn increased about 35 percent and that of cotton decreased about 38 percent. This change in acreage is due largely to the restrictions on cotton and to soil conservation practices, and also to the need for more corn for fattening hogs and for feeding cattle. Corn occupies about 61 percent of the cultivated land. It is used mainly for feeding work animals, cattle, and hogs and for home consumption. Next to tobacco, cotton is the principal cash crop and occupies 23 percent of the cultivated land. The climate and most of the soils are well suited to it. Although the acreage has been considerably reduced in the past few years, this crop will likely continue to rank as an important cash crop until further adjustment in the agricultural system or until some other cash crop proves more profitable. When harvested this crop is nonperishable and can be stored and sold at a convenient time. The seed is used in the manufacture of cottonseed meal and oil and is an important source of income.

In 1939 tobacco ranked first as a cash crop and third in acreage. The returns per acre are greater than from any other crop commonly grown.

Only a part of the soils is well suited to the production of flue-cured tobacco.

A small acreage is used for sweetpotatoes, some of which are sold for cash, and the rest are used in the homes and for hog and cattle feed. The yield could be easily increased, as many of the soils are well suited to this crop. Peanuts have been grown to a small extent, but recently their production has gradually increased. Some are sold for cash, but many farmers plant them alone or with corn for use in fattening hogs.

Since 1925 farmers have been growing a large variety of legumes both for hay, seed, or feed and for soil-improvement purposes. Velvetbeans, cowpeas, and soybeans are the principal leguminous cover crops; they are grown for both hay and seed and afford excellent forage for cattle and hogs. Austrian Winter peas and vetch are the principal winter cover crops. Lespedeza is the leading leguminous pasture crop, and the yields of hay are fairly good. Clover and alfalfa are grown to a limited extent. Kudzu, now grown on a small acreage, is becoming more important for pasture purposes and hay and as a soil-improvement crop. Some crotalaria does well on the sandy soils as a soil-improvement crop. Oats are produced as feed for work animals and breeding stock and to some extent as a nurse crop for legumes and grasses.

Many homes have peach, apple, pear, and plum trees, fig bushes, and a large variety of garden vegetables. The vegetables are grown mainly for home use, but a few are marketed. Pecans do well on the well-drained sandy loam uplands. The production of both pecans and peaches could be extended. At present there are several 50- to 100-acre orchards of these.

The number of animals on all farms has increased gradually with the increase in population and in the acreage of hay and corn. The income from livestock sold or traded increased from $24,917 in 1929 to $94,966 in 1939 and from livestock products sold or traded from $42,072 in 1929 to $46,218 in 1939. The number of livestock on farms in 1920, 1930, and 1940 is shown in table 4.

TABLE 4.—*Number of livestock on farms in Candler County, Ga., in stated years*

Livestock	1920	1930	1940	Livestock	1920	1930	1940
	Number	*Number*	*Number*		*Number*	*Number*	*Number*
Horses	356	280	[1] 67	Goats	1,586	1,657	[2] 1,117
Mules	1,869	1,578	[1] 1,863	Chickens	37,660	23,946	[2] 38,327
Cattle	7,435	2,820	[1] 6,066	Other poultry	3,392	(4)	[2] 432
Swine	19,318	9,326	[2] 10,312	Bees (hives)	487	490	249
Sheep	85	87	[3] 66				

[1] Over 3 months old, Apr. 1.
[2] Over 4 months old, Apr. 1.
[3] Over 6 months old, Apr. 1.
[4] Not available.

The principal work animals are mules, which, according to the 1940 census, numbered 1,863, as compared with 67 horses, but in recent years the number of horses has increased. The work animals average about one head for every 15 or 20 acres of cultivated land, but where mechanized farm machinery is used to some extent to do the heavier work, as breaking of land and disking, there is about one head to every 25 or 30

acres. Because of the increasing use of mechanized machinery there are now slightly fewer mules and horses in the county than in former years.

As the number of cattle and hogs increased between 1930 and 1940, it became necessary to produce more feed crops, which usually resulted in crop rotation and better farm management. Hog raising has been the most important livestock interest the greater part of the time since farming began in the county. Hogs are rather evenly distributed over the county, the largest herds being on farms where the most corn, sweetpotatoes, and peanuts are produced. Some farmers raise 20 to 30 head for market each year, and a few have herds of 100 or more. The purebred stock is principally Duroc-Jersey and Poland China. A great many hogs are of mixed or grade breeds. In recent years the quality has been improved by a more careful selection of breeding stock.

The marked increase in the number of cattle on all farms in recent years has been among the dairy breeds. Such breeds are raised for both dairy and beef purposes and consist mainly of mixed Jersey and Guernsey. Some farmers raise Shorthorn, Aberdeen Angus, or Hereford cattle for market purposes. A few goats are raised on some farms, partly to supply milk for home use, but mainly to keep pastures free from weeds and shrubs. Sheep raising is of minor importance.

The most desirable permanent pastures are confined mainly to uncleared areas of imperfectly drained soils. The native grasses include wire grass, broomsedge, ticklegrass, bullgrass, smutgrass, and crabgrass. Most of these are low in food value and usually become exhausted under continuous grazing during the hot dry summer or early fall. Bermuda grass has replaced to a large extent the native grasses in most of the well-established pastures and now is the leading grass. Other important introduced grasses that thrive on imperfectly to poorly drained soils are carpet grass and Dallis grass. Carpet grass is not so nutritious as Dallis grass or Bermuda grass but grows well and quickly forms a thick carpetlike sod. It will stand severe tramping and makes a good base for the lespedeza and white clover that prevail in some of the best managed pastures. Lespedeza affords good grazing late in summer when some of the other grasses suffer from lack of moisture. It produces an abundance of seed and if allowed to mature reseeds itself. White clover is a long-lived, shallow-rooted perennial that lies dormant in winter but affords good grazing early in spring.

Most farmers keep 20 to 30 hens and a few have flocks of 100 or more. Rhode Island Red and White Leghorn are the principal breeds. Most of the poultry products are bartered or traded at local stores for home supplies; some are shipped to distant markets.

According to the census, 13.6 percent of the farmers reported an average expenditure of $411.21 for feed in 1919, whereas 27.1 percent spent an average of only $63.26 in 1929, and 356 farmers, or 31.2 percent, spent an average of $73.18 in 1939. This indicates that more farmers are buying feed but that the individual farmer is growing more on the farm for his cattle and hogs.

Information regarding the acreage and use of land on farms of the county is given in table 5.

TABLE 5.—*Acreage and percentage of various types of farm land in Candler County, Ga., in stated years*

Item	1920 (1,303 farms)		1930 (1,180 farms)		1940 (1,141 farms)	
	Acres	Percent [1]	Acres	Percent [1]	Acres	Percent [1]
Average size of farms	98.4		90.6		98.4	
Total farm land	128,203	87.9	106,961	66.5	112,326	69.9
Improved land in farms [2]	65,796	51.3	62,144	58.1	56,445	50.3
Cropland harvested	(3)	(3)	47,785	44.7	52,681	46.9
Crop failure	(3)	(3)	674	.6	174	.2
Cropland idle or fallow	(3)	(3)	5,551	5.2	1,885	1.7
Plowable pasture	(3)	(3)	8,134	7.6	1,705	1.5
Woodland	60,810	47.4	37,036	34.6	52,149	46.4
Other land in farms	1,597	1.2	7,781	7.3	3,732	3.3

[1] For total farm land, percentage of county acreage (158,720); for all other items, percentage of total farm land acreage.
[2] As of year preceding census year.
[3] Data not available.

Farms range in size from 10 acres or less to large plantations having several hundred or more acres, but most of them are from about 20 to 40 acres, although the average size in 1940 was 98.4 acres. Most farmers are growing more feed crops and are increasing their acreage of legumes and grasses on land that was formerly used for corn, cotton, and other soil-depleting crops.

In many parts of the county there is in the aggregate a considerable acreage of good land not yet cleared. Along the streams are extensive areas of swamp, and on the uplands are many areas of imperfectly drained land too wet for general agricultural use. There are also areas of deep sand inherently too poor for agricultural use except possibly for forestry. Much of the imperfectly drained upland and terrace soils is being used for both forestry and pasture land, for which they are best adapted.

According to the 1940 census, 33.7 percent of the farms in the county were operated by owners, 66.2 percent by tenants, and 0.1 percent by managers. From 1920 to 1940 the number of farms operated by tenants increased, with a corresponding decrease in those operated by owners. Most of the tenant farmers are sharecroppers. Only 166 of the 755 tenant farms were operated on a strictly cash basis. Under the sharecropper system most commonly practiced, the landlord furnishes the work animals, tools and machinery, and feed for the livestock, pays half of the cost of the seed and fertilizer, and receives half the crops. Cash rent ranges from $1 to $4 an acre for the cultivated land, the price depending largely on the character of the soil. In a few instances the tenant furnishes his work animals, tools, seed, and fertilizer, and the landlord receives one-third or one-fourth of the crops.

During normal times farm labor is plentiful and the price for it reasonable. Most of the labor consists of native-born whites and Negroes. A considerable part of the farm work is done by the immediate family. Laborers hired by the month are furnished a house and a small garden plot in addition to their wages. Much of the farm labor is on a day basis for ordinary farm work, but the picking of cotton is usually at a stated price per 100 pounds of seed cotton.

According to the census, 672 farmers, or 58.9 percent of the total number, spent an average of $147.85 for labor in 1939.

Most of the buildings on owned or operated farms are in fair to good condition, but many of the tenant houses are in need of repair. As State laws do not require the fencing of pastures, fences are not needed except around cultivated fields and feed lots. Some of the best improved farms are fenced almost entirely with woven wire, especially around cultivated fields and some of the pastures.

Farm machinery consists mainly of one- and two-horse plows, cultivators, planters, and other light machinery. Only a few farmers who cultivate large acreages use tractors and other types of heavy machinery.

In 1939, 5,086 tons of commercial fertilizer were purchased by 1,091 farmers at a cost of $135,077, or an average of $123.81 per farm reporting. In addition to this, 36 tons of lime, marl, or gypsum were purchased and used on 10 farms, at a cost of $251.

The selling price of land varies considerably, depending on economic conditions, character of the soil, relief, drainage, farm improvement, and location. The highest priced land includes the best drained and most productive sandy loam and fine sandy loam soils on the uplands, and locally on or near highways and near cultural developments. The lowest priced land includes those areas generally unsuited to agricultural purposes other than forestry, as the most sandy and excessively drained soils or areas of swamp where there is no valuable timber. According to the 1940 census the average value of farm property was $2,990, including land and buildings, implements and machinery, and domestic animals, poultry, and bees.

SOIL SURVEY METHODS AND DEFINITIONS

Soil surveying consists of the examination, classification, and mapping of soils in the field and the recording of their characteristics, particularly in regard to the growth of various crops, grasses, and trees.

The soils and the underlying formations are examined systematically in many locations. Test pits are dug, borings made, and highway or railroad cuts and other exposures studied. Each exposes a series of distinct soil layers, or horizons, termed collectively the soil profile. Each horizon, as well as the underlying parent material, is studied in detail, and the color, structure, porosity, consistence, texture, and content of organic matter, roots, gravel, and stone are noted. The chemical reaction of the soil and its content of lime and salts are determined by simple tests.[2] Other features taken into consideration are the drainage, both internal and external, the relief, or lay of the land, and the interrelations of soil and vegetation.

The soils are classified according to their characteristics, both internal and external, with special emphasis upon the features that influence the adaptation of the land to the production of crop plants, grasses, and trees. On the basis of these characteristics the soils are grouped into classification units, the principal three of which are (1)

[2] The reaction of the soil is its degree of acidity or alkalinity expressed mathematically as the pH value. A pH value of 7 indicates precise neutrality; higher values, alkalinity; and lower values, acidity. Indicator solutions are used to determine the chemical reaction. The presence of lime is detected by the use of a dilute solution of hydrochloric acid.

series, (2) type, and (3) phase. In some places two or more of these principal units may be in such intimate or mixed pattern that they cannot be clearly shown separately on a small-scale map but must be mapped as (4) a complex. Some areas that have no true soil, as Alluvial soils, undifferentiated, and Swamp, are termed (5) miscellaneous land types.

The series is a group of soils having the same genetic horizons, similar in their important characteristics and arrangement in the profile and having similar parent material. Thus, the series comprises soils having essentially the same color, structure, natural drainage, and other important internal characteristics and the same range in relief. The texture of the upper part of the soil, including that commonly plowed, may vary within a series. The series are given geographic names taken from localities near which they were first identified. Norfolk, Tifton, Kalmia, and Portsmouth are names of important soil series in Candler County.

Within a soil series are one or more types, defined according to the texture of the upper part of the soil. Thus, the class name of this texture—sand, loamy sand, sandy loam, silt loam, clay loam, silty clay loam, or clay—is added to the series designation to give a complete name to the soil type. Except for the texture of the surface soil, these types have approximately the same internal and external characteristics. The soil type is the principal unit of mapping, and because of its specific character it is usually the unit to which agronomic data are definitely related. In comparisons of the type and phases of that type, to avoid the repetition of their complete names, the type is sometimes referred to by abbreviation, either as the type, the normal soil, the normal type, or the typical soil. Tifton sandy loam and Tifton fine sandy loam are soil types within the Tifton series.

A soil phase is a variation within the type, different from it in some minor feature, generally external, that may be of special practical significance. For example, within the normal range of relief of a soil type some areas may be adapted to the use of machinery and the growth of cultivated crops and others may not. Differences in relief, stoniness, and degree of accelerated erosion may be shown as phases. Even though no important differences may be apparent in the soil itself or in its capability for the growth of native vegetation throughout the range in relief, there may be important differences in respect to the growth of cultivated crops. In such instances the more sloping parts of the soil type may be segregated on the map as a sloping or a hilly phase. Similarly, some soils having differences in stoniness may be mapped as phases, even though these differences are not reflected in the character of the soil or in the growth of native plants. Kalmia fine sandy loam, deep phase, is an example of a phase in the Kalmia series.

An example of a soil complex is found in Kalmia-Myatt fine sandy loams, in which the soils are so intimately associated that they cannot be separated on a map of the scale used. Alluvial soils, undifferentiated, and Swamp are two examples of miscellaneous land types.

A, Cowpea hay in stacks on Norfolk sandy loam, deep phase, about 3 miles southeast of Metter; Norfolk sandy loam in background; and *B*, sugarcane and peanut field on Tifton sandy loam (0- to 2-percent slope) about 1½ miles southwest of Metter.

A, Peanuts on Tifton sandy loam (0- to 2-percent slope) about 4½ miles west of Metter; and *B*, Bermuda grass pasture on Tifton sandy loam (0- to 2-percent slope) with pecan orchard and farm buildings in background.

TABLE 6.—*Characteristics of the soil series of Candler County, Ga.*

Series	Topographic position	Relief	Drainage		Color		Texture		Subsoil consistence	Parent material
			External	Internal	Surface soil	Subsoil	Surface soil	Subsoil		
Tifton	Uplands	Nearly level to gently sloping.	Good	Good	Brownish gray to light brownish gray.	Light yellowish brown to moderate yellowish brown.	Sandy loam	Sandy clay	Friable to firm	Beds of unconsolidated sandy clay and sand
Norfolk	do	do	do	do	Light brownish gray to yellowish gray.	Weak yellow to light yellowish brown	do	Sandy clay loam.	Friable	Do
Gilead	do	Gently sloping to steeply sloping	Good to excessive.	Slow to imperfect	Light gray or yellowish gray.	Light brown to strong brown mottled in lower part.	do	Sandy clay	Hard, compact	Do.
Plummer	do	Nearly level	Poor	Poor	Medium gray to dark gray.	Mottled light gray and yellowish brown	do	do	Friable to moderately compact.	Do.
Portsmouth	do	do	do	do	Dark gray to black	Mottled yellow and gray.	Fine sandy loam	Fine sandy clay	Friable, slightly plastic.	Do.
Kalmia	Terraces	Nearly level to gently undulating.	Good to fair	Good to fair	Weak yellow to yellowish gray.	Light yellow to light yellowish brown	do	do	Friable	Old alluvium.
Myatt	do	Nearly level	Poor	Poor	Medium gray to dark gray.	Mottled light gray and yellowish brown	do	do	Firm to slightly plastic.	Do.
Alluvial soils, undifferentiated.	First bottoms	Flat	do	Very poor	Variable	Variable	Variable	Variable	Variable	Recent alluvium.
Swamp	do	do	do	do	do	do	do	do	do	Do.

The soil surveyor makes a map of the county or area, showing the location of each of the soil types, phases, complexes, and miscellaneous land types in relation to roads, houses, streams, lakes, section and township lines, and other cultural and natural features of the landscape.

SOILS

The soils of Candler County are representative of those of a large area in the middle or higher part of the Coastal Plain, particularly in Georgia. The elevation ranges from about 150 to nearly 300 feet, and the relief from broad nearly level to very gently sloping and steeply sloping areas with some slight depressions. The slopes range from 0 to 5 percent in gradient over about 70 percent of the county, and only a few slopes exceed 10 percent. Most of the soils are naturally well drained. Poorly drained areas are confined chiefly to the swamps, slight depressions, and first bottoms along the smaller streams.

The organic-matter content in the well-drained soils is low. The original vegetation, consisting mainly of longleaf pine, did not favor the accumulation of organic matter in the soils. The moderately heavy precipitation, together with the mild temperature has caused burning out or leaching of the fine organic materials, particularly on the loose sandy soils. Some of the poorly drained areas have remained in a swamp or semiswampy condition for a long time, and a large quantity of organic matter has accumulated. The ground seldom freezes except for short intervals and then only to a shallow depth, and the leaching processes continue throughout the greater part of the year.

Sheet erosion or surface wash is noticeable in some places on the soils occupying the more sloping areas that have been under cultivation to row crops for a long time. Locally on slopes a few shallow gullies have formed as a result of sheet erosion, thus rendering small areas undesirable for cultivation. Most of the so-called gullies are merely rills that can be easily crossed and obliterated by tillage. Sheet erosion, however, is becoming more noticeable each year, and some areas of the Tifton, Norfolk, and Gilead soils on steeper slopes are beginning to show its effect.

All the upland soils, or approximately 85 percent of the soils in the county, have developed from beds of unconsolidated sandy clay, sand, and sandy material. These soils are naturally low in mineral plant nutrients. The soils on the terraces and in the first bottoms have developed from material brought down by the streams from Coastal Plain soils and deposited at times of overflow. The texture of most of the surface soil is sandy loam or loamy sand, and a large part of it is underlain by a friable sandy clay subsoil within 10 to 18 inches of the surface. The well-drained sandy loam and fine sandy loam have good physical properties, that is, they absorb water readily, warm early in spring, are easy to till, and respond readily to the application of commercial fertilizer or the turning under of green-manure crops. All the soils are medium to very strongly acid.

In table 6 the series are listed as to position, and for each are shown the relief, drainage, color, texture, consistence, and parent material.

The soils of the well-drained uplands and terraces belong to the Tifton, Norfolk, and Kalmia series. The surface relief, or lay of the land, is favorable for the use of all kinds of farm machinery. The Tifton and Norfolk occupy a large part of the uplands, whereas the Kalmia is the most important soil on the terraces. These are the principal agricultural soils of the county (pls. 1 and 2), and on them most of the cotton, tobacco, corn, soybeans, sweetpotatoes, peanuts, and oats are produced. Approximately a third of the potentially good agricultural soil has not been cleared and cultivated. This could be done easily and cheaply. Most of the merchantable timber has been removed, leaving scattering longleaf pine and numerous small oak and other deciduous trees together with an undergrowth of myrtle, briers, shrubs, and wire grass.

The Tifton soils, locally called pebbly land, are perhaps the most important agriculturally in the county. These soils are distinguished by the presence of a large quantity (25 to 40 percent) of small, rounded or smooth angular brown, reddish-brown, or almost black concretions ranging from one-eighth to one-half inch or more in diameter. These are scattered over the surface, mixed throughout the soil, and to a less extent in the subsoil. The surface soil is predominantly a brownish-gray or light brownish-gray sandy loam or fine sandy loam underlain by light yellowish-brown to moderate yellowish-brown firm but friable sandy clay or fine sandy clay. Below 30 to 40 inches is a mottled or splotched purplish-red clay and yellow sandy clay material.

The Norfolk soils are the most widely distributed soils in the county and rank second in agricultural importance. They occur in close association with the Tifton and Gilead soils, but are easily distinguished from them (pl. 3). They have a light brownish-gray or yellowish-gray surface soil with weak-yellow or light-yellow subsurface layer and yellow or light yellowish-brown friable sandy clay loam subsoil. Underlying the subsoil, at a depth of 30 to 40 inches, is a mottled light-gray, yellow, and reddish-brown friable sandy clay material that does not have as much purple or red as the Tifton soils. The Norfolk soils are lighter in color and slightly lighter in texture than the Tifton. In addition to the sandy loam, fine sandy loam, and their deep phases, there are areas of excessively drained sand of variable texture and depth. These sands are low in plant nutrients and have a low agricultural value. Most of them have a vegetative cover of scrub oak, occasional longleaf pine, with some myrtle and wire grass as an undergrowth.

EXPLANATION OF PLATE 1

Vertical aerial view of typical area of farming land in the north-central part of Candler County, showing a general distribution of (*A*) Tifton sandy loam on 0- to 2-percent slopes and on 2- to 5-percent slopes; (*B*) Tifton sandy loam, eroded sloping phase, on 9- to 14-percent slopes where terraces have been built and contour cultivation practiced; (*C*) Norfolk sandy loam; and (*D*) Norfolk sandy loam, deep phase, on 2- to 5-percent slopes. These are the best soils in the county for the production of cotton, tobacco, peanuts, and corn. The dark-shaped strips (*E*) are low-lying, poorly drained areas along the drainageways and are Plummer loamy sand. The forest growth (*F*) consists of slash and loblolly pines and sweetgum.

The Kalmia soils occur on well-drained positions on the terraces or second bottoms along the larger streams and rivers and are associated with the more poorly drained Myatt soils. In color, texture, and consistence they resemble somewhat the Norfolk soils of the uplands. Their agricultural use is not essentially different from that of the Norfolk soils. In many places the Kalmia and Myatt soils are so intricately associated that they could not be separated accurately on a soil map of the scale used.

The Gilead soils are characterized by a subsoil of yellowish-brown compact to slightly cemented layer of sandy clay. The surface soil is light in color, leached, and variable in depth. The material underlying the compact subsoil is also variable in texture, color, and consistence. Surface drainage is good, but internal drainage is slow, owing to the compact layer. These soils usually occur on gently sloping to steeply sloping relief, are slightly to severely eroded, and are droughty. They are less productive and slightly more difficult to maintain improvements on than the Norfolk or Tifton soils.

The poorly drained soils of the uplands and terraces belong to the Plummer, Portsmouth, and Myatt series. The Plummer and Portsmouth occupy nearly level areas on the uplands, whereas the Myatt occupies a similar position on the terraces. Most of the soils of this group are naturally too wet for cultivation. They support numerous trees, mainly loblolly and slash pines, and are used chiefly for pasture purposes and forestry. The Plummer and Myatt have a medium-gray to dark-gray surface soil with a mottled medium-gray or light-gray, yellow, or brown sandy clay subsoil. The subsoil in these varies in texture from a sandy loam to a slightly compact sandy clay. The Portsmouth soil differs from the Plummer in having a very dark-gray or black surface soil containing a large quantity of organic matter. It requires artificial drainage to reclaim it for agriculture and some drainage over the broader areas for pasture.

The Georgia Coastal Plain Experiment Station at Tifton has demonstrated that the Plummer soils, even the loamy sands, will produce good pasture if enough tame grasses, as carpet grass, Dallis grass, lespedeza, and white clover, are sown where the soil has been cleared sufficiently to allow sunshine to reach the ground, where it has been drained adequately, and where it has been given enough lime and phosphate. The station recommends this practice on all areas of Plummer soils, except possibly the most poorly drained areas where artificial drainage would be most difficult and expensive. The wettest areas should remain in forest.

EXPLANATION OF PLATE 2

Vertical aerial view of a sparsely developed area near the western side of Candler County. Dark shades (*A*) indicate areas of alluvial soils, undifferentiated, along the streams; the natural vegetation is sweetgum, water oak, water tupelo, and pond pine. In the central and northern parts are extensive areas of (*B*) Norfolk sand and (*C*) Norfolk sand, scrub phase—soils of low agricultural value and best used for trees. On this sand are turkey and myrtle oaks and scattering longleaf pines. The prevailing slope is 2 to 8 percent, and the area is excessively drained. The cleared and cultivated fields (*D*) are areas of Norfolk sandy loam on 2- to 5-percent slopes.

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The income derived from the sale of turpentine gum, pulpwood, timber, and other forest products from all areas of Plummer soils can be increased considerably by clearing out the undesirable trees and undergrowth so that those that remain can develop more uniformly.

The very poorly to poorly drained Alluvial soils, undifferentiated, and Swamp occur in the first bottoms along the streams and rivers. The materials comprising these land types have been washed from the upland soils and deposited by streams. They are so variable in color and texture that they cannot be definitely classified. The Alluvial soils, undifferentiated, differ mainly from the Swamp in that they occupy slightly higher elevations and are not so poorly drained and can, in some places, be fairly easily drained for pasture purposes. The Swamp is wet or covered by water the greater part of the year and would be difficult and expensive to reclaim. Under present conditions, forest is the best use for these land types.

In the following pages the soil types, phases, and land types are described in detail and their agricultural relations discussed. Their location and distribution are shown on the accompanying soil map, and their acreage and proportionate extent are given in table 7.

TABLE 7.—*Acreage and proportionate extent of the soils mapped in Candler County, Ga.*

Soils	Acres	Percent	Soils	Acres	Percent
Alluvial soils, undifferentiated	7,104	4.5	Scrub phase	7,872	4.9
Gilead sandy loam	1,792	1.1	Norfolk sandy loam	14,720	9.3
Eroded sloping phase	7,040	4.4	Deep phase	17,600	11.1
Kalmia fine sand	832	.5	Eroded sloping phase	3,328	2.1
Kalmia fine sandy loam	256	.2	Plummer loamy sand	28,288	17.8
Deep phase	640	.4	Plummer sandy loam	15,424	9.7
Kalmia-Myatt fine sandy loams	1,344	.8	Portsmouth fine sandy loam	896	.6
Myatt fine sandy loam	4,096	2.6	Swamp	7,104	4.5
Myatt loamy fine sand	2,496	1.6	Tifton fine sandy loam	4,480	2.8
Norfolk fine sand	4,416	2.8	Tifton sandy loam	11,392	7.2
Norfolk fine sandy loam	3,648	2.3	Eroded sloping phase	2,752	1.7
Deep phase	4,736	3.0			
Norfolk sand	6,464	4.1	Total	158,720	100.0

DESCRIPTIONS OF SOIL UNITS

Alluvial soils, undifferentiated.—A miscellaneous land type occurring principally along Fifteenmile Creek and the Canoochee River and their larger tributaries. It lies almost level with the water level of the stream and is subject to frequent overflow. This land type consists of layers of stream sediments that have been washed partly from

EXPLANATION OF PLATE 3

Vertical aerial view of an area about 7 miles east of Metter in the eastern part of Candler County in a good agricultural section, where cotton, tobacco, and peanuts are the principal cash crops. There is a general distribution of (*A*) Tifton sandy loam, (*B*) Tifton fine sandy loam, (*C*) Norfolk sandy loam, and (*D*) Norfolk sandy loam, deep phase, all of which are on 2- to 5-percent slopes. There also are areas (*E*) of Gilead sandy loam, eroded sloping phase, on 5- to 14-percent slopes. On the more sloping areas under cultivation (*F*) are terraces constructed for preventing severe washing or gullying. The dark-colored areas (*G*) are Plummer sandy loam and (*H*) Plummer loamy sand, which have a growth of slash or loblolly pine, sweetgum, and tupelo gum. When properly handled, these soils make good pasture grasses.

areas farther upstream but chiefly from the adjacent uplands and deposited on the flood plains along the present streams and rivers. The type is the result of soil material accumulation rather than soil development and varies so greatly in color, texture, and consistence and is so intimately mixed that any attempt to show definite soil separations within the areas would be impracticable.

The texture of the materials varies from heavy plastic silty clay to sand, with most of the sandy layers nearest the surface and the heavier fine-textured materials in alternating layers at lower depths. Owing to a great variability in organic-matter content, the materials are gray to almost black to a considerable depth.

Although inherently more fertile than some of the other soils or soil material in the county, these soils cannot be cultivated, owing to their extremely wet condition most of the time. The demand for farming land of this type is not sufficient to warrant the expense of perfecting drainage and making other improvements necessary before cultivation could be practiced. Under present economic conditions, it is recommended that areas of this land type and soil material be left in forest, except where it is economically feasible to develop them into good grazing lands. Some excellent pastures could be made on these soils in many places.

Gilead sandy loam.—Occupying 1,792 acres scattered throughout the Tifton and Norfolk soil areas, this soil occurs on the tops of narrow well-rounded upland ridge points and on gentle slopes adjacent to the steeper slopes of the larger valleys. The relief ranges from undulating to gently sloping, with a gradient of 3 to 5 percent. Surface drainage is good to excessive, whereas internal drainage is slow and restricted because of a hard-cemented subsoil.

This soil differs from the Norfolk and Tifton soils in having a lighter colored and more leached surface layer and a hard compact sandy clay subsoil. The surface soil to a depth of 4 to 6 inches is grayish yellow to light gray. It contains practically no organic matter, has a noticeable quantity of small, rounded, white or brown pieces of quartz gravel, and varies in texture from coarse sand to fine sandy loam but is predominantly a medium sandy loam.

The yellowish-gray or weak-gray loamy sand subsurface layer extends to a depth of 14 to 20 inches, underlain by a light-brown to strong-brown compact or slightly indurated subsoil, composed of sand, silt, and clay materials cemented by iron oxide and colloidal clay. This layer ranges in thickness from a few inches to 10 or more and grades into a mottled or streaked gray, yellowish-brown, or purplish-red heavy sandy clay or clay. Where this soil is closely associated with the Tifton soils there may be numerous rounded brown iron concretions scattered over the surface, and where it grades toward the Norfolk soils a deeper covering of sandy material overlies the hard subsoil. Locally some erosion has taken place, and as a result the subsoil is nearer the surface or may be exposed in shallow gullies. Owing to the character of the subsoil, runoff is more rapid than on similar types of the Tifton and Norfolk soils.

Much of the soil has been cleared and farmed, but in many places it is not desirable as a farming soil and has been abandoned. In wooded areas the growth is dominantly longleaf pine and some small oak and

an undergrowth mainly of wire grass. On some of the smoother areas where there is a deep uniform sandy loam or loamy sand layer over the subsoil, yields of cotton, peanuts, sweetpotatoes, and vegetables are fair to good, especially if the soil has been fertilized or manured. The yields, however, are lower than on either the Norfolk or the Tifton sandy loams under similar treatment, because the soil is more leached and does not contain so much organic matter as the others and the hard compact subsoil does not allow good moisture conditions throughout the year. The soil can be much improved by the addition of barnyard manure and other forms of organic matter. Not many farms are located wholly on this type, but on many small acreages are associated with the Tifton and Norfolk soils. The better areas can be used for crop production, whereas the more sloping and shallower parts should be in forest or planted to kudzu.

Gilead sandy loam, eroded sloping phase.—This phase has a less uniform sandy loam surface soil and subsoil than the type and occurs on slopes with a gradient of 5 to 15 percent. It has undergone in many places considerable sheet erosion, which accounts for the uneven depth of the sandy surface soil. In addition to the sheet erosion, numerous small gullies and a few deep ones have developed on many areas that have been clean-cultivated for a number of years with little or no regard for erosion control. Both sheet erosion and gullying are caused in a large measure by the prevailing slope, together with a compact subsoil or parent material that does not absorb rainfall readily.

The surface soil varies in depth from only a few inches to as much as 30, and the yellow, weak-brown to strong-brown compact but brittle sandy clay subsoil also varies in thickness. The underlying material consists of a mottled light-gray, light-red, purple, or yellow heavy sandy clay or clay. In places, this mottled material underlies the sandy surface soil, and outcrops of it are seen on the more eroded areas. Locally at the base of slopes, sandy material from the higher lying areas has sloughed or washed down and accumulated to a depth of 2 or 3 feet.

Only a small percentage of this phase is cultivated. In places, particularly on the steeper slopes or short breaks, erosion is noticeable in wooded areas that have never been cleared. Most of the soil supports a growth of longleaf and slash pines, small oak, and bunch wire grass. The cultivated areas are used for the same crops and are fertilized in about the same manner as the type, but they are more difficult to farm because of the greater relief, greater susceptibility to erosion, and less favorable moisture conditions. It is more difficult to maintain the productivity and keep the soil built up to produce good yields than on the typical soil. The constructon of broad terraces and the growing of strip crops are recommended on the more gently sloping relief. On the more severely eroded and steeper slopes grasses and trees are the best uses.

Included with the phase are small areas of Norfolk soils and, in a few places, areas of eroded Tifton soils.

Kalmia fine sandy loam.—Occupying 256 acres on the nearly level stream terraces along the larger streams and rivers, this soil is slowly drained but adequately enough for growing most crops common to

the area. Except for slight inundations at short intervals, caused by intermittent streams emerging from the adjacent uplands, the land is not subject to overflow. Runoff is rather slow, and water erosion is negligible. Occasionally, artificial drainage is necessary for the best agricultural uses. Except for its topographic position and origin, this soil is similar to Norfolk fine sandy loam. It is formed chiefly from material washed from the adjacent uplands and is somewhat finer textured throughout than most Norfolk soils.

In virgin areas the surface soil to a depth of about 8 inches consists of a 2-inch layer of dark brownish-gray fine sandy loam, moderately rich in organic matter and underlain by a 6-inch layer of weak-yellow to yellowish-gray fine sandy loam, containing a smaller quantity of organic matter. Where cultivated, the surface soil is a light brownish- or yellowish-gray fine sandy loam that becomes lighter colored with depth. Between 12 and 20 inches below the surface it gradually merges into a light-yellow to light yellowish-brown friable fine sandy clay subsoil, which becomes mottled below 30 inches with shades of gray, brown, and red. The substratum is about 4 feet below the surface and consists of a firm fine sandy clay material with numerous streaks, stains, and splotches of red, gray, and yellow. Mottlings in both the lower subsoil and the substratum are more pronounced and more indicative of poor subsurface drainage than those found in most areas of Tifton and Norfolk soils.

A considerable part of the soil is cultivated. The rest supports longleaf and slash pines of good quality and considerable grass suitable for grazing. The soil is well suited to a wide range of crops. Corn, tobacco, sweetpotatoes, peanuts, and oats are the chief crops, together with legumes grown both for feed and soil improvement. Yields are generally slightly lower than on most Norfolk and Tifton soils, because of the slightly poorer drainage conditions, but in dry seasons they often are higher owing to the greater supply of moisture on the terraces.

The soil can best be improved by increasing and maintaining its supply of organic matter through the growth of winter legumes as cover crops and interplanting legumes in summer. In places where drainage is not adequate, the installation of a few open ditches would prove beneficial. Fertilizer treatments are about the same as those used on Norfolk sandy loam. Many uncultivated areas are used advantageously for permanent pasture. Bermuda grass and lespedeza grow well and become easily established.

Kalmia fine sandy loam, deep phase.—In close association with other Kalmia soils, this deep phase occupies 640 acres on nearly level river terraces. It has a deeper fine sandy loam surface soil than the type, is slightly better drained, and owing to its deeper more porous subsurface layer, is a little better suited to most crops common to the area. The rest of the profile is almost identical with that of the type, except that the deeper surface soil has lost slightly more plant nutrients, chiefly organic matter, through leaching. Most of the soil is used for growing a large variety of crops common to the area. It responds well to good management and is excellent for tobacco, truck crops, and vegetables. Recommendations for maintaining and increasing the fertility of this soil are practically the same as those given for the deep phase of Norfolk fine sandy loam.

Kalmia fine sand.—On nearly level second bottoms or river and stream terraces adjacent to the larger streams or swamp areas, this soil occupies 832 acres. It is closely associated with Kalmia fine sandy loam, deep phase, but differs from that soil mainly in having a loose and incoherent fine sand extending to a depth of 3 feet or more. The surface soil to a depth of 4 to 6 inches is light brownish-gray or yellowish-gray fine sand, containing a small quantity of organic matter. It is underlain to a depth of about 30 inches by a pale-yellow or weak-yellow loose fine sand that overlies a mottled yellow, weak-red, and gray fine sand or loamy fine sand, which grades into a mottled gray and yellow fine sandy clay at a depth of about 48 inches.

Owing to its sandy texture, porous condition, and low organic-matter content, very little of this soil is farmed. Corn, truck crops, and other vegetables are grown on small areas. The yields of crops, the capability of the soil, and the recommendations for improvement are practically the same as for Norfolk fine sand. Under present economic conditions forestry is perhaps the best use for this soil.

Kalmia-Myatt fine sandy loams.—A complex consisting of a very intimate mixture of areas and narrow strips of Kalmia and of Myatt fine sandy loams, so closely associated that the areas of the individual types cannot be clearly shown on the soil map. They occupy 1,344 acres on the broad flat terraces or second bottoms along the larger streams and rivers in close association with the areas of Kalmia fine sandy loam and Myatt soils. The relief and drainage are variable, that is, the Kalmia soils occupy slightly higher positions and are imperfectly to fairly well drained, whereas the Myatt soils are slightly lower in position and poorly drained. Some of the areas of Myatt fine sandy loam occur as slight depressions or in basinlike positions, and during rainy seasons water stands on or near the surface for a considerable length of time.

Land of this complex is not generally cultivated but supports a scattered growth of pine and small oak, together with an undergrowth of wire grass and other grasses and weeds. Locally, where Kalmia fine sandy loam predominates, cultivated crops are grown successfully, but most areas are used mainly as open range or pasture for cattle, hogs, and goats. Much more profitable pasture could be obtained by cutting the underbrush, thinning the trees so that the sunshine could reach the ground, and sowing a mixture of carpet grass and Dallis grass. An application of lime and phosphate would greatly improve the growth of these grasses. In addition, all soils in the complex are adapted to growing slash pine for turpentine and longleaf pine for lumber. If the land is needed for agricultural purposes, other than forestry or pasture, the management practices given for Kalmia fine sandy loam would apply equally well to comparable areas of the complex, but because of difficulty of drainage the included Myatt fine sandy loam areas probably would have to be kept for pasture purposes or for the production of trees.

Myatt fine sandy loam.—This soil occupies 4,096 acres on poorly drained parts of the nearly level second bottoms and terraces in the larger stream valleys. The flat or slightly sloughlike relief has poor surface and internal drainage. It is associated with the Kalmia soils but has a darker surface soil and a mottled subsoil.

To a depth of 5 to 8 inches the surface soil is a medium-gray fine sandy loam or loamy fine sand containing a considerable quantity of organic matter. The 10- to 12-inch subsurface layer is yellowish gray fine sandy loam. At a depth of about 18 inches the upper subsoil layer is mottled yellowish-brown and light-gray fine sandy loam or fine sandy clay, gradually becoming heavier and more mottled with depth, and at 28 to 32 inches it is heavy slightly plastic fine sandy clay loam or fine sandy clay, mottled and streaked with shades of light gray, yellow, and brown. Below 48 inches the material gradually becomes lighter in color and coarser in texture and in many places grades toward the Kalmia soil; in others the two are so mixed that the Kalmia-Myatt fine sandy loams are mapped as a complex. Both the surface soil and subsoil are strongly acid.

The soil is used mainly as open range pasture for cattle. A small part of it has been cleared or cultivated. If cleared, drained, fertilized, limed, and seeded, good pasture grasses can be grown. The same management practices as suggested for Plummer loamy sand are recommended.

Myatt loamy fine sand.—In close association with the Myatt and the Kalmia fine sandy loams, this soil occupies 2,496 acres on the nearly level terraces or second bottoms. Some of it occurs in slight depressions on the most nearly flat areas. All is naturally poorly drained.

The surface soil to a depth of 6 to 8 inches is medium-gray or almost black loamy fine sand and contains an abundance of organic matter. This layer is underlain by light-gray or medium-gray loamy fine sand to a depth of 30 to 40 inches, where it grades into mottled gray, light-gray, yellow, or brown fine sandy gray material.

The soil is not so good as Myatt fine sandy loam. None of it is cultivated, but if adequately drained and partly cleared it would provide desirable pasture land. The same management practices as suggested for Plummer loamy sand are recommended.

Norfolk sandy loam.—Locally called gray sandy land, this soil comprises 14,720 acres and is one of the most extensive soil types in the county. It occurs on broad nearly level or undulating to very gently sloping upland divides and to a less extent on the lowest parts of gentle slopes in association with the Tifton and other Norfolk soils. In most places the gradient ranges from 1 to 4 percent. All areas have good surface and internal drainage and have not been damaged greatly by water erosion. The soil is lighter colored than Tifton sandy loam, contains less organic matter, is slightly more sandy, and does not contain so many concretions.

To a depth of 4 to 6 inches in cultivated fields the surface soil is light brownish-gray or yellowish-gray loose sandy loam, containing only a small quantity of organic matter and a few small rounded quartz pebbles. To a depth of 14 to 18 inches the subsurface layer is a weak-yellow to grayish-yellow sandy loam or loamy sand that grades into a weak-yellow to light yellowish-brown heavy sandy loam to sandy clay, which is a transitional layer between the subsurface soil and subsoil. The subsoil is a light yellowish-brown to dusky-yellow friable sandy clay loam to a depth of 32 to 36 inches. This is underlain by mottled or streaked gray, yellow, and reddish-brown

sandy clay material. In wooded areas there is a shallow covering of pine needles or leaves, and the first 1 to 3 inches of the soil is brownish-gray or medium-gray sandy loam. Both surface soil and subsoil are medium to strongly acid.

This type is one of the important agricultural soils in the county. It is well suited to growing the principal crops and is especially well adapted to the production of flue-cured tobacco, peanuts, and sweetpotatoes. A large part is cultivated, and the rest supports a growth of longleaf and slash pines, scattered oaks, and some wire grass.

The main crops are corn, cotton, tobacco, sweetpotatoes, and a few oats and peanuts, as well as some leguminous crops, garden vegetables, and pecans. Corn yields 10 to 25 bushels an acre when the land is given a light application of fertilizer or a top dressing of 75 to 100 pounds of nitrate of soda. Cotton yields one-third to two-thirds of a bale when fertilized with 200 to 400 pounds of a 3–9–5 or 3–8–5 mixture.[3] The Georgia Coastal Plain Experiment Station recommends heavier applications of fertilizer for cotton. Some farmers obtain higher yields of corn and cotton where leguminous crops have been turned under, barnyard manure applied, or heavier applications of commercial fertilizer used. Tobacco yields 500 to 750 pounds an acre when an application of 600 to 1,000 pounds of a 3–8–5 mixture is made, sweetpotatoes 60 to 200 bushels when the land is fertilized with 400 to 800 pounds of a 4–8–6 or 5–7–5 mixture, and oats 15 to 30 bushels when the land is given a top dressing of 75 to 100 pounds of nitrate of soda. Peanuts yield well when 200 to 400 pounds of a 3–9–3 mixture is applied, and their production could be extended. Fair yields of sugarcane can be obtained if an application of 200 to 500 pounds of a 4–8–4 mixture is given.

As the color indicates, this soil is deficient in organic matter. It possesses good physical properties, is mellow and friable, warms early in spring, and is easily tilled. The surface soil and the subsoil allow the absorption of rainfall, have good moisture-holding capacity, and are easily penetrated by plant roots. Austrian Winter peas and vetch are grown on some farms, although summer legumes are more generally grown. These crops are recommended for the improvement of this soil because they supply the needed organic matter and nitrogen, improve the moisture-holding capacity, and reduce surface wash on the sloping areas.

Included with this type are a few areas that contain a noticeable quantity of concretions on the surface and mixed with the soil and also areas where the texture is a fine sandy loam.

Norfolk sandy loam, deep phase.—A sandy loam or loamy sand soil deeper and lighter textured over the friable sandy clay loam than in the typical soil characterizes this phase. It occupies 17,600 acres in scattered areas in association with other Norfolk soils. Most of it is on undulating to gently sloping areas (2 to 10 percent). Both surface and internal drainage are good.

The surface soil to a depth of 4 to 6 inches is light brownish-gray or yellowish-gray light-textured sandy loam or loamy sand, underlain by weak-yellow to grayish-yellow loamy sand extending to a depth of

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

20 to 32 inches. The subsoil is strong-yellow to light yellowish-brown friable sandy clay loam or firm sandy loam grading into a mottled or splotched grayish-yellow and yellowish-brown sandy clay material at a depth of 36 to 40 inches. A few small rounded iron concretions are present on the surface and mixed with the soil.

Small areas of the sandy loam, the fine sandy loam, and the fine sand are included with this phase. These areas are of minor extent.

The soil has good physical properties. It is easily penetrated by air, water, and plant roots, and is moderately retentive of moisture. Organic matter oxidizes and leaches from the deep sandy surface material more readily than from the upper part of the typical soil. In very dry seasons roots of shallow-rooted plants do not reach the moisture stored in the subsoil.

Most of the soil has been cleared and cultivated (pl. 4, *A*). The rest supports a scattered growth of longleaf pine, a variety of small oak and other hardwoods, and considerable undergrowth including wire grass. Some of the once cultivated areas have reforested to old field or loblolly pine or scrub oak. Corn, oats, cotton, tobacco, peanuts, and sweetpotatoes are grown, but the yields are slightly lower under similar practices and fertilization than on the type. The soil is well suited to growing flue-cured tobacco and peanuts, and the production of these crops can be increased. The soil is medium to strongly acid and responds readily to liming and fertilization. One of its most essential needs is a larger quantity of organic matter, and this can best be supplied by turning under leguminous cover crops and barnyard manure.

Norfolk sandy loam, eroded sloping phase.—This phase differs from the type primarily in having a thinner surface soil and steeper gradient. The surface soil also varies more in texture and contains a little less organic matter. In most places the texture ranges from sandy loam to sandy clay loam and the surface layer is light brownish gray to a depth of 4 to 8 inches or less. Locally, enough of the subsoil has been mixed with the original surface layer to make the present surface layer yellowish brown. Reddish-brown iron concretions are more numerous at the surface. Over most areas gradients are 5 to 10 percent.

External drainage is rapid but not excessive, and internal drainage is good. Water erosion has not been severe, but it has been sufficient to cause uniform thinning of the surface soil in many places, and in other places occasional shallow gullies have formed. The gullies can be crossed in most places by all types of farm machinery. Locally, in the vicinity of some of the deeper gullies, the subsoil is exposed.

Most of the 3,328 acres mapped is cultivated, chiefly to corn, oats, cotton, and sweetpotatoes. Although slightly deficient in organic matter, this phase is fairly productive of these crops. Yields are a little lower than those obtained on the typical soil under similar treatment and are comparable with those produced on the eroded sloping phase of Tifton sandy loam. Fertilizer recommendations and methods of soil improvement recommended for Norfolk sandy loam will apply equally well to this phase. In addition, some terracing and contour cultivation help to control runoff and thus reduce erosion and conserve soil moisture.

Small areas of Norfolk sandy loam, Tifton sandy loam, and Tifton fine sandy loam, which occur on more sloping relief than normal for those soils, are included on the soil map with this phase.

Norfolk fine sandy loam.—On its 3,648 acres of the nearly level uplands this soil occurs on slopes with a gradient of less than 4 or 5 percent, chiefly in the southern part of the county. It differs from the sandy loam primarily in having more fine sand in the surface layer. Drainage is good throughout, and erosion is negligible.

In virgin areas, the surface soil to a depth of 6 to 8 inches consists of a 2-inch surface layer of brownish-gray fine sandy loam underlain by a subsurface layer of yellowish-gray fine sandy loam. Where cultivated, the entire surface soil is light brownish-gray fine sandy loam, containing a small quantity of organic matter and some coarse sand. The rest of the profile is almost identical with that of the sandy loam, except in texture and a slightly more mottled subsoil, owing primarily to the slower and somewhat restricted subsurface drainage characteristic of nearly level areas.

The soil is easily managed and well suited to most crops common to the area. Most of it is cultivated chiefly to corn, oats, cotton, and tobacco. Yields of all crops usually are comparable with those obtained on Norfolk sandy loam but generally are slightly lower than those produced on Tifton fine sandy loam, owing to lower organic content. Fertilization and soil improvement practices are similar to those for the sandy loam.

The soil may vary slightly in texture and depth of the surface layer but such variations are of minor importance and do not noticeably affect the agricultural use or value of the land.

Norfolk fine sandy loam, deep phase.—This phase differs from the type chiefly in having a deeper and sandier subsurface layer and from the deep phase of the sandy loam mainly in the texture of the surface soil. It occupies 4,736 acres chiefly on gentle slopes (3 to 10 percent) in the southern part of the county. Most areas are well drained and have not been eroded. Occasionally, a few shallow gullies occur on some of the more sloping areas, but sheet erosion is slight.

Where cultivated the 6- to 8-inch surface layer is light brownish-gray fine sandy loam, containing a few iron concretions, and underlain to a depth of 24 to 36 inches by grayish-yellow loamy fine sand or fine sandy loam. The rest of the profile is similar to that of other Norfolk soils. In virgin areas the 2-inch surface layer is dark brownish-gray fine sandy loam, containing more organic matter than the soils in most cultivated areas.

The soil is well suited to a wide range of crops common to the area, is easily managed, and can be cultivated in most places. It is well suited to tobacco and sweetpotatoes but is used more extensively for corn, oats, and other feed crops. Fertilizer treatments and recommendations for soil improvement are about the same as those for Norfolk sandy loam, but the yields are slightly lower, owing to the poorer moisture-holding capacity and lower organic content of the deep surface layer.

As mapped, the soil includes small areas of Norfolk fine sandy loam; Norfolk sandy loam, deep phase; and Norfolk loamy fine sand.

Norfolk fine sand.—This soil occupies 4,416 acres on nearly level upland divides, chiefly in the southern part of the county. It is closely associated with Norfolk sand and the deep phase of Norfolk fine sandy loam, but differs from the fine sandy loam chiefly in its coarser texture and more sandy subsoil and from the sand in its finer texture. Over most areas, gradients are less than 4 or 5 percent, drainage is good, and erosion is negligible.

The 6-inch surface layer is light brownish-gray fine sand or loamy fine sand, containing a small quantity of organic matter. To a depth of about 18 inches it is underlain by a pale-yellow or weak-yellow loamy sand that gradually becomes more yellow and coarser with increasing depth. Below a depth of 30 to 40 inches the material is a friable yellow sandy loam that gradually becomes more compact and mottled with increasing depth. At about 48 inches below the surface the solum rests on a sandy clay loam substratum, which is slightly compact but pervious and contains numerous red, gray, and yellow mottlings. The reaction is strongly acid.

This soil varies in texture and, as mapped, includes numerous small areas of Norfolk sand and a deep phase of Norfolk fine sandy loam.

Only a small percentage of the soil has been cleared for cultivation, and part of that has been abandoned. Owing to the more sandy and porous subsoil than that of Norfolk sandy loam or Norfolk fine sandy loam it suffers more rapid penetration of water downward beyond the reach of ordinary plant roots and, therefore, is less productive of all crops. The soil responds favorably to fertilization and to good management, however, and where the supply of organic matter is added frequently, it retains enough moisture to meet the demands of early-maturing crops during most years and is well suited to growing truck crops and garden vegetables. Uncultivated areas support longleaf pine, small oaks, and wire grass and are used chiefly as pasture land or forest.

Norfolk sand.—Occupying 6,464 acres, generally contiguous to poorly drained creek bottoms and swamps in all parts of the county, this soil ranges in relief from nearly level to gently sloping—from 2 to 5 percent on ridge tops and from 5 to 10 percent on valley sides. Drainage is good to excessive, and erosion is negligible, owing to the open porous character of the surface soil and subsoil.

The 4-inch surface layer is light brownish-gray or grayish-yellow sand, containing a very small quantity of organic matter and many coarse quartz grains, a few small pieces of rounded quartz gravel, iron concretions, and pebbles. The subsurface layer is grayish-yellow sand similar to the layer above except for its lighter color. At a depth of about 12 inches grayish-yellow sand grades into a pale-yellow loose incoherent sand that continues to a depth of more than 40 inches. The lower substratum may or may not be slightly indurated and usually consists of pale-yellow sandy clay loam or sandy clay.

The soil is extremely porous and undergoes much loss of organic matter and other essential plant nutrients through oxidation and leaching. Owing to its extreme porosity it also suffers excessive loss of moisture and is better suited to forest than to cultivated crops or grasses. Probably less than 10 percent of its total area has been

cleared for cultivation, and much of that formerly cultivated is now abandoned. Abandoned land may still be free of trees. The small quantity of organic matter the soil originally contained is soon exhausted, and usually any attempt to increase and maintain the supply does not prove practical.

Crotalaria does well on this soil and adds a considerable quantity of organic matter. A corn crop following the turning under of crotalaria gives fair yields. Some cotton, tobacco, sweetpotatoes, and velvetbeans are grown. All crops, except a few that mature early, usually suffer from lack of moisture and produce low yields. Owing to the droughty character of the soils desirable permanent pastures are established with much difficulty. Uncultivated areas support longleaf pine, small scrubby oaks, and bunch wire grass and are used chiefly and most advantageously for forestry purposes.

The soil includes many small areas of Norfolk fine sand and Norfolk fine sandy loam, deep phase, but owing to their small extent and minor agricultural importance they are not mapped separately.

Norfolk sand, scrub phase.—Chiefly along Ohoopee and Canoochee Rivers and Fifteenmile Creek, this scrub phase occurs on gently sloping hummocky or dunelike relief contiguous to the large swamps. This excessively drained phase, occupying 7,872 acres, differs from the type in being lighter colored in the surface part, deeper to clay, and less coherent. The surface soil to a depth of 4 to 6 inches is yellowish-white or light-gray sand or coarse sand, containing many small rounded quartz pebbles. The subsoil resembles the type in color in some places, but usually it is lighter colored. Below 4 or 5 feet is a weak-yellow or grayish-yellow loose sand.

The soil contains very little organic matter or mineral nutrients and is unretentive of moisture. Practically none of it is farmed, and it is of little or no agricultural value except for forestry. The tree growth consists mainly of small scrub oak and some blackjack oak of little or no commercial value. A few longleaf pines and an occasional oak and maple with an undergrowth of bunch wire grass occur on the lower slopes adjacent to the swamps, where moisture conditions are favorable for such vegetative growth, but these areas constitute only a small percentage of the total area. If protected from fires, hogs, and goats, longleaf pine probably would grow more abundantly.

Plummer sandy loam.—The 15,424 acres of this soil are distributed throughout the county on broad open flat uplands and gentle low-lying slopes at the base of Tifton and Norfolk soils and locally around stream heads. All areas are poorly drained. Seepage water from the higher lying soils keeps the land wet during much of the year.

The surface soil to a depth of 4 to 6 inches is a medium- to dark-gray sandy loam or loamy sand containing a considerable quantity of organic matter and is underlain by a light brownish-gray sandy loam. This shows some mottlings or specks of gray and brown that indicate that the soil has been in a waterlogged condition for a long time. The subsoil, beginning at about 15 to 18 inches, is a mottled light-gray and yellowish-brown friable to heavy sandy clay that continues to a depth of 30 inches or more and grades into a mottled gray, yellow, and reddish-brown slightly plastic heavy sandy clay. The soil is strongly acid.

Very little of this soil is cultivated, and slash pine with some sweetgum and black tupelo constitute the principal forest growth with an undergrowth of inkberry (gallberry) and grass. Under present conditions the soil is best suited to forestry and pasture purposes. During dry years some of the higher lying areas adjacent to the well-drained uplands produce fair yields of sugarcane, corn, and certain garden vegetables, but generally the soil is not recommended for growing cultivated crops on an extensive scale. Good pastures can be readily established by removing the undesirable trees and undergrowth, by constructing shallow open ditches to take off the excess water, by making moderately heavy applications of lime and phosphate, and by sowing a mixture of tame grasses and clover.

Plummer loamy sand.—All areas of this soil, which occupies 28,288 acres, are poorly drained. It occurs in narrow strips on nearly level or flat areas near the heads of streams and intermittent drainageways and along these to the point where it grades into Alluvial soils, undifferentiated. Part of the soil material is unconsolidated beds of sand and clay and some of the material forming the surface soil has been washed in from the adjacent sandy upland soils.

The surface soil to a depth of 6 to 8 inches is medium- to dark-gray loamy sand, underlain by a light- or yellowish-gray, or in places, by a light brownish-gray loamy sand that continues to a depth of 30 inches or more. Extending far below this depth is a sandy clay material.

The soil supports a growth of slash pine, black tupelo, sweetgum, and usually an undergrowth of inkberry (gallberry) or myrtle and some wire grass. It is used partly for pasture but almost exclusively for forestry. If cleared or partly cleared and drained, fairly good pasture can be obtained. The use capability and recommendations for the improvement of Plummer sandy loam will apply equally well to this soil.

In the mapping there have been included small areas of loamy fine sand, sand, and sandy loam that were too small to be shown separately.

Portsmouth fine sandy loam.—This soil occupies only 896 acres on nearly level situations, in shallow basinlike areas, or in slight depressions scattered throughout the upland in close association principally with Plummer soils and to a less extent on the second bottoms and terraces associated with Myatt soils. It is very poorly drained and has a much darker surface soil than the Myatt or Plummer, owing to a greater accumulation of organic material.

The surface soil to a depth of 10 to 12 inches is very dark-gray or almost black fine sandy loam or loamy fine sand, with a high content of fairly well decomposed organic matter. The 6- to 10-inch subsurface layer is light brownish-gray fine sandy loam or loamy fine sand. The upper subsoil layer is mottled or splotched yellowish-brown and grayish-yellow slightly plastic heavy fine sandy loam or clay loam, which at a depth of 26 to 30 inches grades into lighter colored and somewhat coarser textured material. At about 50 inches below the surface is a grayish-white or yellowish-gray sandy loam or loamy sand. Both the soil and subsoil are strongly acid.

There is some variation in the texture and depth of the black surface soil. Locally it is a dark-gray or almost black very fine sandy loam, loam, or sandy clay loam. Such areas are small and have about the same agricultural value as Portsmouth fine sandy loam. There is also some variation in the consistence of the subsoil, which ranges from sticky friable heavy silt loam to a slightly plastic sandy clay.

Only small areas have been cleared for farming. Most of the soil supports a timber growth of slash pine, black pine, black tupelo, maple, and some oak, together with a dense undergrowth of inkberry (gallberry), myrtle, and wire grass. At present it is used mainly for the production of pasture grasses and timber. None of it can be cultivated successfully without artificial drainage, and good pastures cannot be obtained without partial drainage. When the soil is drained and reclaimed and liberal quantities of lime, phosphate, and potash are supplied, fairly good yields of corn, sugarcane, and some truck crops can be obtained. Good pasture grasses can be produced in much the same manner as recommended for Plummer sandy loam, but such practices are not considered economical at present over large areas, because of the difficulty and expense involved in perfecting drainage conditions. In most places, the best use of the soil is for forestry.

Where pasture grasses are needed for milk cows on individual farms, the land can be reclaimed at a reasonable cost by clearing out the underbrush, cutting the undesirable trees, establishing artificial drainage, applying lime and phosphate, and by seeding a mixture of carpet grass, Dallis grass, lespedeza, and white clover.

Swamp.—Occurrence of this land type is in first bottoms or flood plains mainly along the Canoochee and Ohoopee Rivers and their larger tributaries. It consists of a mixture of soil materials rather than a definite soil type. The materials have been washed from the adjacent uplands or brought in from distant areas outside the county and vary in texture from sand and sandy loam to clay but consist predominantly of mucky fine sand. They contain a large quantity of organic matter and are inherently good soils, but very poor drainage and economic conditions prohibit the use of swampland for anything but forestry.

The swamp areas are covered with water or are saturated during the greater part of the year. During extremely dry seasons in fall some of this land may become dry enough to afford limited pasture for cattle. Practically all of it is forested and supports some merchantable timber, mainly gums and cypress, and a thick undergrowth of bay bushes, willows, and briers. Improved forest-management practices, as recommended for other poorly drained areas, would prove nearly as beneficial for most areas of swampland.

Tifton sandy loam.—Locally called pebbly land, this soil occupies 11,392 acres well distributed throughout the county in fairly large areas, principally on smooth, nearly level, gently undulating or gently sloping areas on the interstream divides. Most of it has a gradient of 1 to 5 percent and lies favorably for agricultural operations. Erosion is practically negligible, except for some slight sheet erosion on the more sloping areas. Most of the soil is cultivated, and the rest supports a good growth of longleaf and loblolly pines together with some oak and hickory trees and considerable grass and other undergrowth.

The surface soil to a depth of 4 to 6 inches in light brownish-gray mellow sandy loam containing a small quantity of organic matter. Distributed over the surface and mixed with the soil and subsoil are numerous brown or black rounded or smoothly angular concretions an eighth to half an inch in diameter or larger. In many places,

approximately 25 to 40 percent of the soil consists of these concretions. The light yellowish-brown sandy loam subsurface layer extends to a depth of 10 to 14 inches. The light yellowish-brown to strong yellowish-brown friable sandy clay upper subsoil grades at a depth of about 22 to 26 inches into a friable fine sandy clay that is slightly lighter colored and slightly more mottled with red and yellow. At about 32 to 38 inches is a mottled, streaked, or splotched yellow, gray, reddish-brown, and purplish-red hard brittle sandy clay. In the lower subsoil are a few concretionary splotches of purplish red or reddish brown.

Variations are included in this soil. In places the color of the surface soil is lighter than common and the texture is a loamy fine sand, or the content of concretions may be higher, the color more dominantly brown and the appearance pebbly or gravelly. In the wooded areas the presence of a fairly large quantity of organic matter in the form of a thin covering of leafmold makes the surface 1 to 3 inches very dark gray.

This is one of the best if not the best of the agricultural soils in the county, and most of it is under cultivation (pl. 4, *B*). It has good surface and internal drainage, warms early in spring, and is easily cultivated. It responds readily to fertilization and other good management practices and therefore can be improved to a fairly high state of productivity by the incorporation of green-manure crops and barnyard manure. The soil is sufficiently retentive of moisture to insure at least partial crops during the more severe droughts.

Corn and cotton are the principal crops, but some oats, sweetpotatoes, peanuts, tobacco, sugarcane, garden vegetables, winter and summer legumes, and pecans are grown (pl. 5). Usually corn yields 15 to 25 bushels an acre and cotton ⅓ to 1 bale when the land is fertilized with 200 to 400 pounds of a 3–9–5 or 3–8–5 fertilizer. Where corn follows cotton, as it usually does, it receives very little or no fertilizer at planting time but the soil may be given a top dressing of 75 to 100 pounds of nitrate of soda later. Larger yields of corn are obtained after a leguminous crop has been turned under. Tobacco yields 500 to 800 pounds an acre, when the land is fertilized with 600 to 1,000 pounds of 3–8–5 mixture, and sweetpotatoes 60 to 150 bushels, when 400 to 800 pounds of a 5–7–5 or 4–8–6 mixture is used. A common practice is to interplant velvetbeans and soybeans or follow cowpeas with the corn. Some Austrian Winter peas and hairy vetch are grown during the winter and turned under in spring. These leguminous crops supply the soil with organic matter and make it more retentive of moisture during dry periods. Lespedeza usually yields ¾ to 1½ tons of hay an acre.

The Georgia Coastal Plain Experiment Station recommends for cotton 600 to 800 pounds an acre of 3–9–5 or 3–8–6 fertilizer for the best yields, and for corn 300 to 400 pounds of a 2–10–4 mixture when green-manure crops are grown the preceding winter and turned under. If there is no green-manure crop, it recommends an application of 75 to 100 pounds of nitrate of soda in addition to the fertilizer recommended. A 3-year rotation suggested for the soil consists of corn the first year followed by a winter legume, as Austrian Winter peas or vetch with oats; cotton the second year followed by a winter legume; and velvetbeans, cowpeas, or soybeans the third year. Corn requires large quantities of organic matter, nitrogen, and moisture. It does well follow-

ing leguminous crops grown every third year, because these supply the soil with organic matter and nitrogen. On a few of the more sloping areas, trees would retard runoff and conserve soil moisture. In a few places bordering the eroded sloping phase, contour farming and terracing are recommended.

Tifton sandy loam, eroded sloping phase.—This phase differs from the type chiefly in having a thinner sandy surface soil and a more sloping relief as the result of water erosion. It occurs mainly on slopes of 5 to 10 percent. A few shallow gullies have formed, but most of them can be crossed by farm machinery and many can be effaced by tillage. Much of the organic matter and other fine soil materials has been lost by leaching and water erosion. All areas of the 2,752 acres mapped are well to excessively drained in the upper part and have good drainage in the subsoil.

Locally the surface soil is light-colored and variable in texture and depth. Where the soil is shallow some of the subsoil has been turned up by the plow and mixed with the surface layer, which makes the surface texture heavier and browner than normal. Where practically all the sandy material has been removed concretions completely cover the surface, giving it a pebbly or gravelly reddish-brown appearance.

Owing to the sloping condition, this phase is not so easily handled as the typical soil on the smoother relief. It requires more careful management, some terracing, and the growing of cover crops to guard against severe erosion. In some places at the base of eroded slopes sandy surface soil material has accumulated to a depth of 15 to 20 inches.

Practically all this eroded sloping phase is cultivated, chiefly to cotton and corn, although cover crops are becoming more common. Yields are slightly less under the farming practices and fertilization than those obtained on the sandy loam, probably owing to the fact that the moisture conditions are less favorable and the supply of organic matter is lower. Growing winter cover crops, as Austrian Winter peas and vetch, and also some summer legumes is most essential for this soil if it is to be farmed successfully. These crops would increase the organic content, improve the moisture-holding capacity, and, in some measure, check the surface washing. On some of the more sloping gullied areas kudzu would check erosion, improve the soil, and furnish grazing for cattle.

Tifton fine sandy loam.—This soil occupies 4,480 acres on nearly level or gently undulating interstream upland areas, mainly in the southern part of the county. Most slopes range from 1 to 5 percent. Drainage is adequate and erosion is negligible. The soil differs from the sandy loam in having finer sandy material in the surface soil and in the subsoil. The 6- to 8-inch surface layer is brownish-gray fine sandy loam, containing a moderate quantity of organic matter and many small iron concretions. The rest is similar to that of the sandy loam. Locally this soil resembles Norfolk fine sandy loam in color and consistence of the subsoil, but in most places both surface soil and subsoil are typical of the Tifton series.

This type is managed and fertilized in practically the same manner as the sandy loam, but the yields of some crops are a little higher, owing to a slightly greater organic-matter content and moisture-holding capacity. The soil is of lesser importance than the sandy loam,

TABLE 8.—*Estimated average acre yields of the principal crops of each soil in Candler County, Georgia, for three generalized levels of management*

[Figures in columns A are the estimated yields per acre under a minimum of management, figures in columns B are the estimated yields under prevailing farming practices; figures in columns C represent yields that may be expected under more intensive management practices. Leaders indicate that the crop is not commonly grown on the soil or under the specified management]

Soil	Corn			Oats			Cotton			Tobacco			Cowpea hay			Velvetbean hay			Soybean hay			Peanuts			Clover			Alfalfa			Lespedeza			Potatoes			Sweetpotatoes			Principal crops or prevailing use
	A	B	C	A	B	C	A	B	C	A	B	C	A	B	C	A	B	C	A	B	C	A	B	C	A	B	C	A	B	C	A	B	C	A	B	C	A	B	C	
	Bu.	*Bu.*	*Bu*	*Bu.*	*Bu*	*Bu.*	*Lb.*	*Lb.*	*Lb.*	*Lb.*	*Lb.*	*Lb*	*Tons*	*Tons*	*Tons*	*Tons*	*Tons*	*Tons*	*Tons*	*Tons*	*Tons*	*Lb.*	*Lb.*	*Lb*	*Tons*	*Tons*	*Tons*	*Tons*	*Tons*	*Tons*	*Tons*	*Tons*	*Tons*	*Bu*	*Bu*	*Bu*	*Bu.*	*Bu.*	*Bu*	
Alluvial soils, undifferentiated																																							Forest
Gilead sandy loam	5	10	15	10	20	25	75	150	300		350	600	0 50	0 50	1 00	0 50	0 50	1 00	0 50	0 50	1 00	420	840	1,260	0 50	0 50	1 00		0 50	1 00	0 75	0.75	1 50	30	60	125	35	75	125	Corn, oats, tobacco, and peanuts
Eroded sloping phase																																							Forest and some idle land
Kalmia fine sand	5	10	15	5	10	20	50	125	250		300	500	.25	25	75	25	.25	.75	.25	25	75	280	560	1,120	.25	25	50		.25	50	.50	50	1 00	35	75	150	35	75	140	Largely in forest, corn, oats, peanuts, and sweetpotatoes.
Kalmia fine sandy loam	10	15	25	10	20	30	85	225	400		450	700	.75	.75	1 50	.75	.75	1 50	75	75	1 50	420	840	1,400	.50	.50	1 00		.50	1 00	1 00	1 00	1 25	40	80	150	40	80	140	Corn, cotton, oats, tobacco, and peanuts
Deep phase	5	10	20	10	20	25	75	150	300		400	700	75	75	1 25	.75	75	1 25	75	75	1 25	420	840	1,400	.50	.50	1 00		.50	1 00	.50	50	1 00	40	80	150	50	90	150	Corn, oats, tobacco and peanuts
Kalmia-Myatt fine sandy loams	10	20	25	10	20	30	50	100	150		200	400	1 00	1 00	2 00	1 00	1 00	2 00	1 00	1 00	2 00				75	75	1 50		.25	50	1 00	1 00	2 00							Largely in pasture, corn, oats, and hay.
Myatt fine sandy loam [1]	10	20	25	10	10	20							75	75	1 50	75	75	1 50	75	75	1 50				75	.75	1 50				1 00	1 00	2 00							Largely in forest, potential use, pasture.
Myatt loamy fine sand [1]			25			20									1 00						1 00						1 50					2 00							Do
Norfolk fine sand	5	10	15	5	10	20	50	125	250		300	500	25	25	75	25	25	75	25	25	75	280	560	1,120	.25	25	50		.25	50	50	50	1 00	35	75	150	35	75	140	Largely in forest, cotton, oats, peanuts, and sweetpotatoes.
Norfolk fine sandy loam	10	20	30	10	20	30	100	275	500		500	800	1 00	1 00	2 00	1 00	1 00	2 00	1 00	1 00	2 00	420	840	1,400	50	50	1 00		50	1 25	1 00	1 00	1 50	50	90	175	50	90	150	Corn, cotton, oats, tobacco, and peanuts
Deep phase	5	10	20	10	20	25	75	150	300		400	700	75	75	1 25	75	75	1 25	75	75	1 25	420	840	1,400	50	50	1 00		50	1 00	50	.50	1 00	40	80	150	50	90	150	Corn, oats, tobacco, and peanuts
Norfolk sand	5	10	15	5	10	15	40	100	150		250	450	.25	25	50	25	25	50	25	25	.50	280	560	840	25	.25	50		25	.50	.50	.50	1 00	25	50	150	30	90	130	Largely in forest
Scrub phase																																							Forest
Norfolk sandy loam	10	20	30	10	20	30	100	275	500		500	800	1 00	1 00	2 00	1 00	1 00	2 00	1 00	1 00	2 00	420	840	1,400	50	50	1 00		50	1 25	1 00	1 00	1 50	50	90	175	50	90	150	Corn, cotton, tobacco, oats, peanuts, and sweetpotatoes.
Deep phase	5	10	20	10	20	25	75	150	300		400	700	75	75	1 25	75	75	1 50	75	75	1 25	420	840	1,400	50	50	1 00		50	1 00	50	.50	1 00	40	80	150	50	90	150	Corn, oats, cotton, tobacco, and peanuts
Eroded sloping phase	5	10	25	5	10	25	90	250	450		350	600	50	50	1 50	50	50	1 50	50	50	1 50	280	700	1,260	50	50	1 00		50	1 25	75	75	1 50	30	60	125	35	75	125	Corn, cotton, oats, and sweetpotatoes
Plummer loamy sand [1]	10	20	25	10	10	20							50	50	1 00	50	50	1 00	50	50	1 00				75	75	1 50				1 00	1 00	2 00							Forest
Plummer sandy loam [1]	10	20	25	10	10	20							75	75	1 50	75	75	1 50	75	75	1 50				75	75	1 50				1 00	1.00	2 00							Forest, potential use, pasture
Portsmouth fine sandy loam [1]	10	20	25	10	10	20							75	75	1 50	75	75	1 50	75	75	1.50				75	75	1 50				1 00	1.00	2 00							Forest; potential use, pasture and hay.
Swamp																																							Forest
Tifton fine sandy loam	10	25	35	10	25	35	150	350	600		500	800	1 00	1 00	2 00	1 00	1 00	2 00	1 00	1 00	2 00	420	840	1,400	50	50	1 00		50	1 25	1 00	1 00	1 50	50	90	175	50	90	150	Corn, cotton, oats, and peanuts
Tifton sandy loam	10	20	30	10	20	30	150	300	550		500	800	1 00	1 00	2 00	1 00	1 00	2 00	1 00	1 00	2 00	420	840	1,400	50	50	1 00		50	1 25	1 00	1 00	1 50	50	90	175	50	90	150	Corn, cotton, oats, peanuts, and sweetpotatoes.
Eroded sloping phase	5	10	25	5	10	25	90	250	450		350	600	.50	.50	1.50	.50	.50	1 50	.50	.50	1 50	280	700	1,260	.50	.50	1.00		.50	1 25	.75	.75	1 50	30	60	125	35	75	125	Corn, cotton, oats.

[1] Requires artificial drainage in order to produce the estimated yields.

TABLE 9.—*Productivity ratings of the soils of Candler County, Georgia*

[Indexes in columns A refer to estimated yields under a minimum of management; those in columns B to estimated yields under prevailing management; and those in columns C to estimated yields under recommended more intensive management practices]

Soil [1]	Crop productivity index [2] for—																																							Land classification
	Corn (100=50 bu)			Oats (100=50 bu.)			Cotton (100=400 lb)			Tobacco (100=1,000 lb)			Cowpea hay (100=1 ton)			Velvetbean hay (100=1 ton)			Soybean hay (100=2 5 tons)			Peanuts (100=1,200 lb)			Clover hay (100=2 tons)			Alfalfa hay (100=4 tons)			Lespedeza hay (100=1.5 tons)			Potatoes (100=200 bu)			Sweetpotatoes (100=150 lb)			Vegetables [3]	Peaches [3]	Pecans [3]	Pasture [3]	Forest [3]	
	A	B	C	A	B	C	A	B	C	A	B	C	A	B	C	A	B	C	A	B	C	A	B	C	A	B	C	A	B	C	A	B	C	A	B	C	A	B	C						
Tifton fine sandy loam	20	50	70	20	50	70	38	88	150	.....	50	80	100	100	200	100	100	200	40	40	80	35	70	117	25	25	50	.....	13	31	67	67	100	25	45	88	33	60	100	a	a	a	b	a	The soils have favorable relief, are well drained, warm early in spring, are easily tilled, and respond readily to the application of fertilizers and the turning under of green legume crops. They produce the greater part of the cash crops and constitute the better farming areas
Tifton sandy loam	20	40	60	20	40	60	38	75	138	.....	50	80	100	100	200	100	100	200	40	40	80	35	70	117	25	25	50	.....	13	31	67	67	100	25	45	88	33	60	150	a	a	a	b	a	
Norfolk sandy loam	20	40	60	20	40	60	25	69	125	.....	50	80	100	100	200	100	100	200	40	40	80	35	70	117	25	25	50	.....	13	31	67	67	100	25	45	88	33	60	100	a	a	a	b	a	
Norfolk fine sandy loam	20	40	60	20	40	60	25	69	125	.....	50	80	100	100	200	100	100	200	40	40	80	35	70	117	25	25	50	.....	13	31	67	67	100	25	45	88	33	60	100	a	a	a	b	a	
Kalmia fine sandy loam	20	30	50	20	40	60	21	56	100	.....	45	70	75	75	150	75	75	150	30	30	60	35	70	117	25	25	50	.....	13	25	67	67	83	20	40	75	27	53	93	a	a	a	b	a	
MODERATELY HIGH GENERAL PRODUCTIVITY—FAIR TO GOOD CROPLAND																																													
Tifton sandy loam, eroded sloping phase	10	20	50	10	20	50	23	63	112	.....	35	60	50	50	150	50	50	150	20	20	60	23	58	105	25	25	50	.....	13	31	50	50	100	15	30	63	23	50	83	c	a	a	b	a	The soils are generally less well suited to growing the common farm crops, because of either more sloping areas, greater droughtiness, lower fertility, or greater difficulty in maintaining productivity than good cropland.
Norfolk sandy loam, eroded sloping phase	10	20	50	5	10	50	23	63	112	.....	35	60	50	50	150	50	50	150	20	20	60	23	58	105	25	25	50	.....	13	31	50	50	100	15	30	63	23	50	83	c	a	a	b	a	
Norfolk sandy loam, deep phase	10	20	40	20	40	50	19	38	75	.....	40	70	75	75	125	75	75	150	30	30	50	35	70	117	25	25	50	.....	13	25	33	33	67	20	40	75	33	60	100	a	b	b	c	c	
Norfolk fine sandy loam, deep phase	10	20	40	20	40	50	19	38	75	.....	40	70	75	75	125	75	75	125	30	30	50	35	70	117	25	25	50	.....	13	25	33	33	67	20	40	75	33	60	100	a	b	b	c	c	
Kalmia fine sandy loam, deep phase	10	20	40	20	40	50	19	38	75	.....	40	70	75	75	125	75	75	125	30	30	50	35	70	117	25	25	50	.....	13	25	33	33	67	20	40	75	33	60	100	a	b	b	c	c	
MEDIUM GENERAL PRODUCTIVITY—POOR CROPLAND																																													
Gilead sandy loam	10	20	30	20	40	50	19	38	75	.....	35	60	50	50	100	50	50	100	20	20	40	35	70	105	25	25	50	.....	13	25	50	50	100	15	30	63	23	50	83	c	a	a	c	d	The soils are difficult to build up and maintain in a moderate state of fertility, as they are low in organic matter and plant nutrients and have poor moisture relations
Norfolk fine sand	10	20	30	10	20	40	12	31	63	.....	30	50	25	25	75	25	25	75	10	10	30	23	47	93	13	13	25	.....	6	13	33	33	67	18	38	75	23	50	93	b	b	b	d	c	
Kalmia fine sand	10	20	30	10	20	40	12	31	63	.....	30	50	25	25	75	25	25	75	10	10	30	23	47	93	13	13	25	.....	6	13	33	33	67	18	78	75	23	50	93	b	b	b	d	c	
Norfolk sand	10	20	30	10	20	30	10	25	38	.....	25	45	25	25	50	25	25	50	10	10	20	23	47	70	13	13	25	.....	6	13	33	33	67	12	25	75	20	47	87	b	b	b	d	d	
LOW AND MODERATELY LOW GENERAL PRODUCTIVITY—PASTURE LAND																																													
Kalmia-Myatt fine sandy loams [4]	20	40	50	20	40	60	12	25	38	.....	20	40	100	100	200	100	100	200	40	40	80	.....	.....	.....	37	37	75	.....	6	13	67	67	133	.....	.....	.....	.....	.....	.....	b	.....	.....	a	b	The soils, except for the Kalmia member of the Kalmia-Myatt complex, are naturally poorly drained and require artificial drainage for use either as pasture land or cropland They may be used to some extent for crops, but are classified as pasture land, because they are the best soils in the county for growing natural pasture grasses
Plummer sandy loam [5]	20	40	50	20	20	40	.....	.....	.....	.....	.....	.....	75	75	150	75	75	150	30	30	60	.....	.....	.....	37	37	75	.....	.....	.....	67	67	133	.....	.....	.....	.....	.....	.....	.....	.....	.....	a	b	
Myatt fine sandy loam [5]	20	40	50	20	20	40	.....	.....	.....	.....	.....	.....	75	75	150	75	75	150	30	30	60	.....	.....	.....	37	37	75	.....	.....	.....	67	67	133	.....	.....	.....	.....	.....	.....	.....	.....	.....	a	b	
Portsmouth fine sandy loam [5]	20	40	50	20	20	40	.....	.....	.....	.....	.....	.....	75	75	150	75	75	150	30	30	60	.....	.....	.....	37	37	75	.....	.....	.....	67	67	133	.....	.....	.....	.....	.....	.....	.....	.....	.....	a	b	
Myatt loamy fine sand [6]	20	40	50	20	20	40	.....	.....	.....	.....	.....	.....	50	50	100	50	50	100	20	20	40	.....	.....	.....	37	37	75	.....	.....	.....	67	67	133	.....	.....	.....	.....	.....	.....	.....	.....	.....	a	b	
Plummer loamy sand [6]	20	40	50	20	20	40	.....	.....	.....	.....	.....	.....	50	50	100	50	50	100	20	20	40	.....	.....	.....	37	37	75	.....	.....	.....	67	67	133	.....	.....	.....	.....	.....	.....	.....	.....	.....	a	b	
VERY LOW GENERAL PRODUCTIVITY—FOREST LAND																																													
Alluvial soils, undifferentiated	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	d	b	The soils and land types differ widely in characteristics, but they are designated as forest land as they are not well suited either to crop or pasture production Alluvial soils, undifferentiated, and Swamp are wet most of the year, whereas Gilead sandy loam, eroded sloping phase, is well to excessively drained and is shallow over a hard partly cemented subsoil. The group is dominantly droughty, unsuited to pasture grasses, and best adapted to forestry
Swamp	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	d	b	
Gilead sandy loam, eroded sloping phase	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	e	d	
Norfolk sand, scrub phase	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	c	e	

[1] Arrangement is in descending order of general productivity for the common crops under improved management practices

[2] The indexes given indicate the estimated average production of each crop on each soil as a percentage of the standard; the standard has an index of 100 and represents the approximate average yield obtained without the use of amendments on the more extensive and better soil types of the regions of the United States in which the crop is most widely grown.

[3] No yield estimates are given for vegetables, peaches, pecans, pasture, or forest, because of a lack of specific information. The letters a, b, c, d, and e indicate, respectively, the comparative general suitability and productivity of the soils for the particular crop or group of crops

[4] The yields refer largely to those produced on the Kalmia fine sandy loam member of the complex.

[5] Artificial drainage required to produce the estimated yields.

owing to its more limited distribution. It is potentially well adapted to all crops common to the area, but is used chiefly for corn and cotton. Cotton yields are about the same as on Tifton sandy loam, but corn usually produces 2 to 5 bushels more an acre.

The soil is not conducive to erosion. Its productivity can be maintained and increased by growing legumes and other soil-improvement crops.

ESTIMATED YIELDS AND PRODUCTIVITY RATINGS

In table 8 the soils of Candler County are listed alphabetically and estimated average acre yields of the principal crops are given for each soil under three generalized levels of management.

The estimates in columns A indicate yields obtained under a minimum of management, including simple or very moderate tillage, no definite system of crop rotation, no fertilization, liming, or other amendments, and no mechanical practices for runoff control, as contour farming, terracing, or strip cropping.

The estimates in columns B indicate yields obtained under the prevailing farming practices, including a rather ill-defined plan of crop rotation, moderate fertilization of cotton, tobacco, and vegetables, but little or no fertilization of corn, small grains, legumes, or pasture grasses. Tillage is more carefully done and some of it is on the contour. Strip cropping is also occasionally practiced.

The estimates in columns C indicate yields that may be expected from more intensive management practices, in which larger and more frequent applications of fertilizer and lime are made, careful selection and rotation of crops are followed, legumes and cover crops are used to maintain and increase the organic-matter and nitrogen content of the soils, artificial drainage is undertaken where feasible, and careful tillage, contour farming, terracing, and strip cropping are followed where essential to the maintenance and increase of soil productivity. Actual recommendations of fertilizer applications vary with the individual soils and crops, but in general, applications for tobacco consist of 800 to 1,000 pounds an acre of a 3–8–5 or 3–8–8 mixture; for cotton 200 to 400 pounds of a 3–8–5 mixture; and for sweetpotatoes 400 to 600 pounds of a 4–8–6 mixture.

The estimates in table 8 are based primarily on interviews with farmers, the county agricultural agent, members of the staffs of Georgia Agricultural Experiment Station, College of Agriculture, and others who have had experience in the agriculture of this county. They are presented only as estimates of the average production over a period of years, according to three broadly defined general levels of management. These estimates may not apply directly to specific tracts for any particular year. On the other hand, they appear to be as accurate as can be obtained without further detailed and lengthy investigations, and they serve to bring out the relative productivity of the soils shown on the map.

In order to compare directly the yields obtained in Candler County with those obtained in other parts of the country, the yield figures are converted in table 9 into indexes based on standard yields. The soils are listed in the approximate order of their general productivity under improved practices (columns C), the most productive first.

655708—48——3

The rating compares the productivity of each of the soils for each crop to a standard of 100. This standard index represents the approximate average acre yield obtained without the use of amendments on the more extensive and better soil types of the regions of the United States in which the crop is most widely grown. An index of 50 indicates that the soil is about half as productive for the specified crop as the soil with the standard index. The standard yield for each crop is given at the head of each respective column. Soils given amendments, as lime and commercial fertilizers, or special practices, as irrigation, and unusually productive soils of small extent may have productivity indexes of more than 100 for some or all crops.

Five classes of general productivity are given in table 9. The order of placement of the soils in these classes is based largely on personal judgment of the relative suitability of the soils combined with a percentage weighting of its crop indexes in column C according to the relative acreage and value of the individual crops.[4]

Since it is difficult to measure mathematically either the exact productivity of a crop in the agriculture of an area or the importance or suitability of certain soils for particular crops, too much significance should not be attached to the precise order in which the soils are listed. The arrangement, however, does give information as to their general productivity. The last column of table 9 gives the more important characteristics or conditions that determine the relative suitability of each group.

The principal factors affecting the productivity of land are climate, soil (this includes the many physical, chemical, and biological characteristics), slope, drainage, and management, including the use of amendments. No one of these factors operates separately from the others, although some one may dominate. The factors listed may be grouped simply as the soil factor and the management factor. Slope, drainage, and most of the aspects of climate may be considered characteristics of a given soil type, since the soil type, as such, occupies specific geographic areas characterized by a given range of slope and climatic conditions. Crop yields over a long period of years furnish the best available summation of the associated factors and therefore are used where available.

Productivity tables do not present the relative roles that soil types, because of their extent and the pattern of their distribution, play in the agriculture of the county. The tables show the relative productivity of individual soils according to designated generalized levels of management. They cannot picture in a given county the total quantitative production of crops by soil areas without the additional knowledge of the acreage of the individual soil types used for each of the specified crops.

Economic considerations play no part in determining the crop productivity indexes. They cannot be interpreted into land values therefore except in a very general way. Distance to market, transportation facilities, cost of production, relative prices of farm products, and other factors influence the value of land. It is important to realize

[4] The relative percentage weightings assigned to crop indexes are as follows: Cotton, 30; corn, 30; tobacco, 30; peanuts, 5; and oats, 5. No weighting was assigned to forage crops or sweetpotatoes, because of the relatively small acreage of each. The suitability of a soil for peanuts indicates in a general way its suitability for sweetpotatoes.

that productivity as measured by yields is not the only consideration that determines the relative worth of a soil for growing crops. The ease or difficulty of tillage and the ease or difficulty with which productivity is maintained are examples of considerations other than productivity that influence the general suitability of a soil for agricultural use. In turn, steepness of slope, presence or absence of stones, resistance to tillage offered by soil consistence or structure, and the size and shape of areas are characteristics of soils that affect the relative ease with which they can be tilled. Likewise, inherent fertility and susceptibility to erosion are characteristics that influence the ease of maintaining soil productivity at a given level. Productivity, as measured by yields, is influenced to some degree by all these and other factors, as moisture-holding capacity of the soil and its permeability to roots and water; and so they are not factors to be considered entirely separately from productivity; but, on the other hand, they must be recognized in schemes of classification to designate the relative suitability of land for agricultural use.

LAND USES AND RECOMMENDATIONS

The terms "land use" and "soil management" are very closely related and refer mainly to what use is made of the land for cultivated crops, pasture, or forest. Proper land use and good soil management are basic problems in determining the success of agriculture and the economic welfare of the inhabitants in an agricultural community as Candler County. The character of the surface soil and subsoil, the lay of the land, drainage conditions, and climate are important factors in determining the productivity of the soil and are the main factors that influence land use. Since social and economic conditions vary from time to time and from place to place, they are of secondary importance in determining land use over a long period of time. Nevertheless, they influence land use and soil management at the present time.

Based on their suitability and to a large extent their present agricultural use, the soils of Candler County can readily be classed, as shown in the central heads of table 9, as (1) cropland, (2) pasture land, and (3) forest land; the cropland soils may be subdivided into three classes—(1) good cropland, (2) fair to good cropland, and (3) poor cropland.

This method of grouping is not meant to imply that the current agricultural purposes are the same on all the soils of any particular group or that all the soils in that group are equally suited to the same crops. It is recognized that it is practically impossible to place some of these soils definitely in one class or another because of certain characteristics of the soil and the way in which they have been or may be handled. The soils in group 2 may be as well or even better adapted to certain crops than some of those in group 1. Most of the soils, however, in each group present somewhat similar management problems for conserving and maintaining their productivity. Not many of the soils are confined exclusively to any particular part of the county, and on nearly every farm may be found soils of two or more groups. A good idea of the distribution of the soils may be obtained by referring to the soil map.

The group of good cropland soils has friable sandy surface soil and friable sandy clay loam or sandy clay subsoil. These soils are the most important in the agriculture of the county and they determine largely the economic welfare of its inhabitants. They are widely distributed, occupy nearly level to gently sloping relief, are naturally well drained, and have good water absorption and moisture-holding capacity. With these good physical characteristics, they respond favorably to good management practices, particularly as regards the application of manure or fertilizer or the turning under of green-manure crops. They are easily tilled, have good workability, and warm early in spring, and there is practically no problem of conservation as regards water control and erosion. The best improved farms and the most stabilized agriculture are on these soils.

The sloping phases of fair to good cropland soils have a gradient of 5 to 8 percent or more and in many places show sheet erosion or surface wash. Locally the eroded sloping phases have shallower sandy surface soils over the friable sandy clay loams and sandy clays than the soil types, whereas the deep phases have a deeper sandy covering or 20 to 30 inches of loamy sands over sandy clays and usually occur on gently sloping or almost level areas. The productivity of these soils is not easily maintained as on the soils in group 1. On the eroded sloping areas, terracing, contour tillage, and strip cropping are practiced to some extent to retard further sheet erosion. The greatest needs of the eroded sloping phases are the control of runoff and an adequate supply of organic matter. The deep phases are considered as good or better for growing tobacco, peanuts, and various truck crops as the sandy loams in group 1.

Only a small percentage of the group of poor cropland soils is cultivated. The sands are loose and porous to a depth of 3 feet or more and for the most part are of low productivity. The impervious character of the subsoil of Gilead sandy loam hinders the movement of soil water and as a result causes considerable sheet erosion on the more sloping areas during very heavy rains. All these soils require careful management and are difficult to build up and maintain in a fair state of productivity. They need a large quantity of organic matter annually, as it burns or leaches out rapidly. Fairly good yields of corn are obtained by turning under a crop of crotalaria.

Pasture-land soils or those used primarily for pasture or forestry purposes are naturally poorly drained and require artificial drainage to reclaim them for good pasturage. They can be used advantageously for this purpose in connection with the good well-drained agriculture lands. Some of these soils if drained, limed, and fertilized, would produce good yields of sugar and corn. In many places shallow open ditches are required to take off the excess surface water and to lower the ground water level to a depth of 10 to 15 inches. These soils produce ordinary wild grasses in their present conditions, but to maintain good pasture they should be properly seeded and both lime and phosphate applied. The favorable moisture conditions coupled with the presence of a fair to large quantity of organic matter render them more suitable for pasture grasses than any other soils in the county.

The group of forest-land soils are unsuited to cultivation or even to pasture purposes in their present condition because of their extremely wet condition or their low productivity and droughtiness.

They are placed in this group not because they are considered the best soils for growing trees but because forestry and wildlife are perhaps the best use that can be made of them under existing conditions. Norfolk sand, scrub phase, is too droughty, owing to the loose deep sand, and too low in fertility to grow good timber quickly.

Some of the Alluvial soils, undifferentiated, can be cleared and drained sufficiently to produce good pasture grasses, but the Swamp areas are too wet for this use. These soils now support a large variety of good trees. Many farmers have been giving considerable attention to the development of their turpentine timber during recent years. This can be carried on profitably in connection with the pasture land, as it is recommended that many of the slash pine trees be left in the pasture.

There are in the aggregate many acres of good soil that have not been cleared or brought under cultivation. Some farmers are using the soils to the best advantage under present economic conditions, but on the other hand some have grown crops that provide the greatest money return without proper regard to the conservation of the soil. As a result, the productivity of some of the arable soils has been reduced considerably. Perhaps the most frequent and obvious example of wrong use of the land is the growing of clean-cultivated crops year after year, particularly on the more sloping areas, thus allowing the depletion of organic matter, sheet erosion or surface wash, and in some cases the formation of shallow gullies.

Burning off is a common practice in many parts of the county. Burning corn stalks, cotton stalks, and other plant residue before planting each succeeding crop, as well as burning off the areas used for pasture purposes, destroys considerable organic matter that should be incorporated in the soil. This burning is done with the idea of killing or controlling insects, diseases, and weeds. It does not prevent diseases nor does it destroy all the insects or prevent weeds from growing. It would be much better for the land if the organic matter could be plowed under. Fallowing is practiced to some extent by some farmers, but many of them have found that a vegetative cover is considered the most effective means of maintaining and improving the productivity of the soils. A vegetative cover on the land throughout the year also prevents surface wash and leaching. Burning over of timber land causes considerable damage or may kill the young trees in many places and may render the soil subject to erosion on the more sloping areas.

All the soils in the county range from medium to strongly acid. Very little lime has been applied to the well-drained upland soils. Some farmers have applied lime to the soils for pasture grasses and a few have applied it to the well-drained soils where leguminous crops are grown. Most cultivated crops can be grown successfully on acid soils, but clovers and legumes do much better if the soils are limed.

Most farmers understand the growing of the major crops and the tillage requirements of their soils. They know that different soils require different management practices. Practically all of them use commercial fertilizer and grow leguminous crops. The most progressive farmers are practicing a diversified agriculture as regards their cash crops and particularly the subsistence crops. More feed is grown and more livestock is raised than formerly. In this diversification,

some farmers have a rather definite crop-rotation system. They realize that all well-drained upland soils are deficient in organic matter and are endeavoring to maintain or increase the supply by growing and turning under leguminous crops, as Austrian Winter peas and hairy vetch for winter, and growing velvetbeans, cowpeas, soybeans, crotalaria, lespedeza, and kudzu during the summer. The climate and soils favor a diversified agriculture, which includes growing a large variety of garden vegetables as well as pecans, peaches, pears, plums, figs, watermelons, and some berries.

A definite system of crop rotation is a most important factor in building up and maintaining the fertility of the cultivable soils. A 3-year rotation recommended by the Georgia College of Agriculture as being best suited for the sandy loam soils consists of cotton the first year, followed by Austrian Winter peas or hairy vetch sown in fall with a small grain, as oats, for hay or winter grazing. The next year a summer forage crop, as velvetbeans, cowpeas, or soybeans, is planted in spring and followed in fall by Austrian Winter peas or hairy vetch for a winter cover crop. The third spring the legume is turned under as a soil builder, and about 15 days later corn is planted with velvetbeans, cowpeas, or soybeans. It is considered a better practice to follow a legume winter cover crop with corn instead of cotton, as the legume is allowed about 15 days more growth before being plowed under and also because corn utilizes the decaying organic material derived from the cover crop to better advantage than cotton. Peanuts may be interplanted in the corn instead of velvetbeans, cowpeas, or soybeans. They will produce an abundance of feed but are not considered so beneficial to the soil.

On some of the more sloping areas, and usually these are also the more eroded, some farmers have constructed low broad-based terraces and adequate spillways. Cultivation can be carried on fairly easily on such terraces. Some farmers who cultivate on a large scale do not favor this practice, because locally there may be short rows and irregular-shaped fields. They realize, however, that this is a good way to handle these sloping areas to control erosion and prevent the loss of soil moisture. On some of the sloping areas contour strip cropping is practiced; this consists of planting close-growing crops and row crops in alternate strips on the contour. Such a method may obviate the necessity of constructing terraces. The steeper and more eroded areas should be kept in grass or seeded to crotalaria or planted to kudzu or trees. Farmers appreciate the value of kudzu in reclaiming such land and preventing further erosion. In order to get a good growth of this crop it is necessary that the soil be manured or fertilized and properly handled until the crop begins to spread. The control of runoff prevents both sheet and gully erosion and conserves the water in the soil for the growing plants.

Farmers realize that practically all the well-drained upland soils are deficient in and need organic matter. To maintain or increase the productivity of these soils an adequate supply should be provided, either in the form of barnyard manure or green-cover crops. Growing leguminous crops is becoming more and more important, and many farmers include them in their regular rotation . Austrian Winter peas and hairy vetch are the principal legume cover crops grown during winter and early spring. These are sown in fall, and to obtain good results 300 to 500 pounds per acre of superphosphate are applied.

Summer legumes consist of velvetbeans, cowpeas, soybeans, crotalaria, and lespedeza. Of the velvetbeans, the 120- and 90-day runner varieties are the most popular, as they improve the soil and furnish forage for cattle and hogs. The Bradhorn variety of cowpeas improves the soil and provides excellent hay for cattle. Soybeans are coming into greater favor; the Hayseed and Otootan are the principal varieties. These crops can be grown alone or interplanted with corn.

Crotalaria makes a good growth on the deep phases of the sandy loams and sands. It is an important summer legume and, when turned under, supplies the soil with a large quantity of organic matter. It is not used for grazing or for hay. Seed may be planted any time from March to May at the rate of 25 to 35 pounds an acre. When sown on young oats in spring, the oats can be harvested in the usual manner and in summer the crotalaria will produce a cover crop that can be turned under in fall prior to the seeding of winter cover crops. The early strain of *Crotalaria spectabilis* is best suited to the soils in this locality.

Lespedeza makes an excellent pasture for cattle, is a soil-improvement crop, and can be used for hay, and locally some seed is gathered. The common lespedeza, Tennessee 76, and Kobe are the principal varieties. Small areas are planted to kudzu, and this is used mainly for grazing and soil improvement purposes. The soil used for lespedeza should be given an application of ½ to 1 ton an acre of ground limestone and 300 to 600 pounds of superphosphate. It has been demonstrated that alfalfa can be grown in this county. It requires a heavy application of manure, fertilizer, and lime.

All the above-mentioned crops in addition to supplying needed humus, tend to increase the moisture-holding capacity of the soil and reduce runoff. The legumes collect nitrogen from the air through bacteria living in nodules on their roots and store it in the soil in a form available for plants. The inoculation of seed with the proper bacteria is of great importance in obtaining best results with legumes, particularly if they are of a type not previously grown on the area to be seeded.

Corn is the most widely grown crop in the county. It is grown to a greater or less extent on all the soils under cultivation. The best yields are obtained from the small-eared varieties, as Whatley Prolific, Hastings Prolific, Henderson Red Cob Prolific, and Good Golden Prolific. The greater part of the seed is produced locally, as it is better adapted to the soils and climatic conditions. The essential requirements for good yields of corn are an abundant supply of organic matter, proper moisture conditions throughout the growing season, and sufficient mineral nutrients. The recommended application of fertilizer for corn is 400 to 600 pounds of 2–10–4, but where leguminous crops are grown and turned under previous to planting corn, part or all of the nitrogen may be omitted. The usual fertilization for corn consists of 200 to 400 pounds an acre of a 2–8–4 or 3–8–5 mixture. If the corn does not follow a leguminous crop that has been turned under, an application of 75 to 100 pounds of nitrate of soda is applied as a side dressing when the corn plant is about 14 to 18 inches high. Some farmers do not use a complete fertilizer but apply only nitrate of soda. The principal diseases of corn are smut and root rot, and the greatest insect damage is caused by the corn weevil. It has been observed that varieties having fine husks extending well over the tips

of the ears are more resistant to weevil injury than those having coarse husks that fail to cover the tip of the ear.

Cotton is the principal cash crop and the second largest in acreage. Pure seed of good quality is of utmost importance in successful cotton production. The most progressive farmers plant breeder seed that has been grown locally in their one-variety community. In such communities, the gin handles only that variety. This practice enables each farmer to maintain the quality of the seed cotton. Wilt-resistant varieties, as Rhynes Cook, Pettys Toole, and Perrys Toole are grown most extensively and produce good yields. Wilt, root knot, and root rot are the principal diseases of cotton in this county. The boll weevil is the worst insect pest, and considerable spraying is required to control it. There is also some damage from armyworms, red spiders, fly hoppers, cutworms, and the cotton louse.

The usual fertilization for cotton consists of 200 to 400 pounds an acre of 3–8–3 or 3–9–3, and this is supplemented by a side dressing of 75 to 100 pounds of nitrate of soda after the cotton is chopped or thinned out. Most cotton is grown on Norfolk and Tifton sandy loams and phases of these soils. The Georgia Coastal Plain Experiment Station recommends an application of 600 to 800 pounds of 3–9–5, together with a side application of 100 pounds of nitrate of soda on the sandy loams. If winter legumes have been turned under or barnyard manure is applied to the soil, the side dressing of nitrate of soda may be omitted.

In recent years flue-cured tobacco has become an important cash crop in the county. The principal varieties are the Jamaica, Cash, Bonanza, and Yellow Prior. These are the light type varieties best suited to Norfolk and Tifton sandy loams and also to Kalmia fine sandy loam. The soils should be plowed late in fall and early in winter in order that all the coarse vegetable matter may decay before planting time. Most farmers apply 600 to 1,000 pounds an acre of 3–8–3 or 3–8–5. The station recommends a rate application of 1,000 to 1,200 pounds of 3–9–5 or 3–8–8 for the above-mentioned soils. On the better types or on soils where leguminous crops have preceded tobacco, 800 pounds is sufficient. Tobacco is sensitive to fertilizer treatment, and usually the quality of the leaf is determined by the kind and quantity of fertilizer used. The grower should exercise the utmost care in selecting and applying the proper kind of fertilizer. Bluemold and root knot are the most serious diseases of tobacco, whereas the worst insect pests are cutworms, crickets, and wireworms.

Peanuts are grown on the sandy loams and phases of the Tifton and Norfolk soils and to a less extent on Kalmia fine sandy loam. Until recently most of the peanuts were produced mainly for hog feed, but now a considerable part is sold for cash. The principal varieties are the Spanish, Improved Spanish, Alabama Runner, Georgia Runner, and North Carolina Runner. The Spanish varieties are grown principally for cash, although some are grown for early hog grazing. They mature about 1 month earlier than the other varieties and provide forage for hogs at the time when most needed. They are the bunch type and are easy to cultivate and harvest. The North Carolina, a high yielding variety, has a spreading habit with pods at both the base of the plant and along the vines or stems. These are not so easy to harvest but are more desirable for late hogging off. Peanuts

do not respond so well to heavy fertilization as cotton and tobacco, but at the same time they remove large quantities of mineral plant nutrients from the soil. If they follow a heavily fertilized crop, very little or no fertilizer is applied; otherwise, the usual application of 200 to 400 pounds an acre of a 3–9–3 mixture is made. Some farmers use a light application of lime or gypsum. About 400 pounds of a 2–10–4 mixture is recommended for commercial peanuts. The treatment of peanut seed with Arasan gives a marked increase in stand.

Sweetpotatoes are an important cash crop as well as furnishing food for home use and feed for hogs. They give their best returns on the sandy loam soils where other conditions are favorable. Porto Rico is the most desirable variety for home use and local commercial purposes, while the Big-Stem Jersey is best suited for early shipment to northern markets, and the Southern Queen is the most desirable for grazing and hogging off. Most farmers apply 400 to 600 pounds an acre of a 4–8–6 or 5–7–5 mixture. The station recommends 600 to 800 pounds of 4–8–8 or 4–8–10. Like other farm crops, sweetpotatoes are subject to disease, and in places stem rot, black rot, soft rot, and dry rot are giving farmers some trouble.

A small acreage is used for growing oats, rye, and wheat, and these crops are apparently becoming more important each year. Oats are sown either broadcast or drilled in fall. The varieties are Bancroft, Appler, and Red Rustproof. Rye is grown for grazing purposes as well as for a green-manure crop. Both rye and oats are desirable as nurse crops for legumes and grasses. Oats are important in the feeding ration of work stock. The experiment station suggests that wheat for local use may be produced on some of the better soils but that it probably will never be a money crop in this section. These crops are usually fertilized at the time the seed is sown with a light application of 3–8–3 and in spring the soils are given a side dressing of 75 to 100 pounds an acre of nitrate of soda.

The production of livestock could be extended in the county if suitable pastures are developed and more feed crops are grown to carry the cattle through the short winter season or by greatly increasing the crops that can be pastured during winter. In recent years farmers have given considerable attention to the improvement of their pasture lands. Cattle and hogs are allowed to graze freely over all the uncultivated land in most communities. Beef cattle consist of grade Hereford, Shorthorn, and Aberdeen Angus. The breeding stock has been considerably improved during recent years. Native grasses consist of wire grass, broomsedge, ticklegrass, bullgrass, smutgrass, and crabgrass. The most progressive farmers realize that better cattle production depends largely on more and better pastures.

Many farmers have recently been following the recommendations of the Georgia Coastal Plain Experiment Station for pasture improvement. This station has demonstrated the value of Plummer sandy loam for pasture. It is reasonable to expect that other soils, as Plummer loamy sand, Myatt fine sandy loam, Kalmia-Myatt fine sandy loams, and Portsmouth fine sandy loam, included in the group of pasture land soils, could be used in a similar way. Following these recommendations underbushes and undesirable trees for timber were removed to allow the sunshine to reach the ground. Shallow open ditches were dug leading to the natural drainageways to remove the excess surface water and provide adequate drainage of the surface soil.

In many places straightening or deepening of the natural drainageways or constructing a main ditch was necessary. The land was disked thoroughly to eradicate weeds, sedges, briers, and sprouts and to prepare a good seedbed. A mixture of 10 pounds of crabgrass, 8 pounds of Dallis grass, 10 pounds of common lespedeza, and 5 pounds of white clover was sown in February or early in March. The sod was kept free of obnoxious weeds and shrubs by properly regulated grazing. Any undergrowth that could not be kept down by grazing without damaging the grass, roots, and sod cover from excessive tramping, was removed by mowing. Light applications of phosphoric acid and a liberal quantity of lime was applied. Lespedeza furnished the bulk of the pasturage the first year, and the grasses together with the lespedeza and white clover provided abundant pasture of good quantity thereafter. Care was taken to regulate grazing so that lespedeza and clover were allowed to reseed each fall.

In connection with pastures, the following three-in-one system recommended by the Georgia College of Agriculture would provide satisfactory grazing: A field of winter legumes with small grain; a second field of summer pasture grasses, as Bermuda, carpet, and Dallis grasses with lespedeza; and a third field for full pasture crops, as cowpeas, soybeans, velvetbeans, runner peanuts, kudzu, or alfalfa. The last-mentioned crop is a reserved pasture that could be cut for hay if the summer pasture provided sufficient grazing.

Another rotation recommended in connection with the production of livestock is as follows: The first year, corn followed by wheat or oats with vetch for hay; the second year, wheat or oats for grain with vetch, succeeded by lespedeza, cowpeas, or soybeans; the third year, small grain followed by lespedeza, cowpeas, or soybeans and these by a winter legume to be plowed under in spring for corn.

The most satisfactory upland permanent pasture on the farm of the Georgia Coastal Plain Experiment Station was obtained by seeding Tifton sandy loam with a mixture of lespedeza and Bermuda grass. Another good temporary pasture was obtained by seeding lespedeza broadcast in oats early in March, and a third excellent pasture on Tifton sandy loam consisted of a combination of Austrian Winter peas, hairy vetch, and oats, which were turned under about the first of June, after which the land was seeded broadcast to Sudan grass.

Raising hogs in the county is of considerable importance. Enough are kept by practically every farmer to supply the home needs for meat and many are raised for market. They are turned into the peanut, soybean, or velvetbean fields and later are fed corn a few weeks prior to killing. The principal breeds of hogs are Duroc-Jersey and Poland China. Small dairies near Metter supply the local demand for milk. Most milk cows are grade Jerseys. On many farms goats are kept, and the kids are marketed when about 3 months old.

The average farmer could very profitably give more attention to his subsistence garden. Records show that if properly handled the area used in planting a home garden will give greater returns than any other area of equal size on the farm. The Georgia Coastal Plain Experiment Station recommends an application of 30 to 60 pounds of well-rotted manure and 5 to 10 pounds of a higher grade commercial fertilizer to each 100-foot row at least 2 weeks before planting. In

order to prevent nematode injury or hold it in check and to avoid trouble from other diseases and insects, a 3-year rotation is suggested. Corn, oats, velvetbeans, and North Carolina runner peanuts are recommended for this rotation. Both the soils and the climate favor the growing of a large variety of garden vegetables, and many hardy vegetables can be grown throughout the winter.

It is suggested that the farmers or landowners make use of the information contained in the bulletins of the Georgia Coastal Plain Experiment Station, at Tifton, the Georgia Agricultural Experiment Station, at Griffin, and the College of Agriculture, at Athens, and also the recent bulletins of the United States Department of Agriculture, and keep in touch with the county agricultural agent. Much valuable information can be had from these sources on the kind and quantity of fertilizer, lime, varieties, rotations, treatment of seed, control of diseases, and handling of insect pests.

MORPHOLOGY AND GENESIS OF SOILS

Soil is the product of the forces of weathering and soil development acting on the parent material deposited or accumulated by geologic agencies. The characteristics of the soil at any given point depend on (1) the physical and mineralogical composition of the parent material; (2) the climate under which the soil material has accumulated and has existed since accumulation; (3) the plant and animal life in and on the soil; (4) the relief, or lay of the land; and (5) the length of time the forces of development have acted on the material. The climate, and its influence on soil and plants, depends not only on temperature, rainfall, and humidity but also on the physical characteristics of the soil or soil material and on the relief, which in turn strongly influences drainage, aeration, runoff, erosion, and exposure to sun and wind.

Candler County is situated in the Coastal Plain province and is in the Red and Yellow soil region of the United States. The soils are Podzolic and Lateritic, although no true Laterites or Podzols are developed. The Tifton soils are Lateritic, whereas the Norfolk and associated soils show slight podzolization.

The county lies on the Hazlehurst terrace,[5] one of the highest of the marine coastal terraces comprising the Coastal Plain. Its altitude ranges from 215 to 260 feet. This, at one time, was a broad, smooth plain, but geologic erosion has changed to some extent the surface configuration, thus producing a relief ranging from nearly level to gently and steeply sloping areas bordering the natural drainageways or swamps. Some well-defined stream valleys have been formed. The materials forming this marine terrace have been classed in the Lafayette formation,[6] which consists of irregularly bedded sands, clays, sandy clays, and gravel locally indurated, and possibly of the Pliocene epoch. The upland soils have developed in place through the soil-forming processes from the weathered products of these beds of unconsolidated materials comprising the Coastal Plain. The terrace land soils include areas of old alluvium on the second bottoms or terraces

[5] See footnote 1, p. 3.

[6] VEATCH, J. O., and STEPHENSON, L. W. PRELIMINARY REPORT ON THE GEOLOGY OF THE COASTAL PLAIN OF GEORGIA. Ga. Geol. Survey Bul. 26, 466 pp., illus. 1911.

in the river valleys. There are also recent deposits of alluvial material. The materials on both the terraces and first bottoms have been washed largely from soils on the Coastal Plain.

The native vegetation on the well-drained soils was dominantly longleaf pine, with a small stand of hardwoods. The forest growth, together with the long summer season, warm temperature for the greater part of the year, and high rainfall, has not been conducive to the accumulation of organic matter in the soils. In the forest areas a thin veneer of leafmold is generally on the surface and a small quantity of organic matter in the topmost 1- to 3-inch layer of the soil. The soil is seldom frozen except for a few days during the coldest weather, and leaching and erosion continue throughout the year.

The pH values of certain soils in Candler County, Ga., are given in table 10.

TABLE 10.—*pH determinations of samples of three soil profiles from Candler County, Ga.*

Soil type and sample No.	Depth	pH	Soil type and sample No.	Depth	pH
	Inches			*Inches*	
Plummer sandy loam:			Norfolk sandy loam:		
2510027	0–4	4.4	2510042	0–6	5.0
2510028	4–10	4.9	2510043	6–16	5.9
2510029	10–16	4.9	2510044	16–30	5.9
2510030	16–24	4.9	2510045	30–45	4.8
Myatt fine sandy loam:			2510046	45–60	4.8
2510032	0–2	4.9			
2510033–36 [1]					
2510037	36–48	4.7			

[1] Samples not received.

All the soils are prevailingly sandy and light-colored throughout. Most of them show high eluviations in the A horizons and have definitely illuviated B horizons. The C horizons are more variable in color and texture than either the A or B horizons but are dominantly lighter colored and finer textured than the B. Soils of the poorly drained areas have dark-gray or black surface soil, owing to organic accumulations, and a light-colored mottled subsoil and substratum.

In the county are three great groups of soils—zonal, intrazonal, and azonal.[7] The zonal soils are an important group having well-developed soil characteristics that reflect the influence of the active factors of soil genesis, climate, and living organisms, chiefly vegetation. The group includes soils of the Tifton, Norfolk, and Kalmia series.

The intrazonal soils include those with more or less well-developed soil characteristics that reflect the dominating influence of some local factors of relief, parent material, or age over the normal effect of climate and vegetation. These may be associated with two or more of the zonal groups. Relief and drainage are largely responsible for the characteristics of the Portsmouth, Myatt, and Plummer soils, whereas the parent material and relief influence the character of the Gilead soils, which together comprise the intrazonal group.

The azonal soils represent any group of soils without well-developed profile characteristics, owing to youth, or strong relief. This group

[7] BALDWIN, M., KELLOGG, C. E., and THORP, J. SOIL CLASSIFICATION. U. S. Dept. Agr. Yearbook (Soils and Men) 1938 : 979–1001. 1938.

includes the Alluvial soils, undifferentiated, and Swamp. These soils do not have well-developed profiles because they consist of very recent alluvial material that is continually being modified by the deposition of fresh material from higher levels.

The classification of the soil series on the basis of their characteristics and their genetic relations is shown in table 11.

TABLE 11.—*Classification of the soil series of Candler County, Ga., on the basis of their characteristics and their genetic relationship*

Soil series	Parent material	Relief	Drainage	Consistence of B horizon
ZONAL SOILS				
Tifton	Beds of unconsolidated sandy clay and clay, Coastal Plain material.	Undulating to sloping.	Very good	Friable.
Norfolk	Beds of unconsolidated sandy clay and sand.	Nearly flat to sloping.	Good to excessive	Do.
Kalmia	Old alluvium from Coastal Plain soils.	Flat to undulating	Fair to good	Do.
INTRAZONAL SOILS				
Gilead	Beds of unconsolidated sandy clay and clay.	Undulating to steeply sloping.	Good to excessive	Hard, slightly cemented.
Portsmouth	do	Flat	Poor	Friable.
Plummer	do	Flat to gently sloping.	do	Do.
Myatt	Old alluvium from Coastal Plain soils.	Flat	do	Moderately friable.
AZONAL SOILS				
Alluvial soils, undifferentiated.	Recent alluvium from Coastal Plain soils.	Flat	Poor	Variable.
Swamp	do	do	Very poor	Do.

Tifton, Norfolk, and Kalmia sandy loams and fine sandy loams are zonal soils. The Tifton and Norfolk occur on the uplands, whereas the Kalmia occurs on the second bottoms or terraces. These soils are well drained and have the most mature or normally developed profiles and express the influence of climate and vegetation on the parent material.

Following is a description of the profile of Tifton sandy loam as observed in a well-drained, gently wooded area 4½ miles northwest of Metter and ½ mile east of State Highway No. 23. The vegetation on this area consists of longleaf pine, with a scattered growth of small oak and hickory and a thick undergrowth of wire grass. This is a representative zonal soil in the wire grass region of southeast Georgia.

A_1. 0 to 3 inches, brownish-gray sandy loam containing a noticeable quantity of organic matter. Scattered over the surface and distributed throughout the layer are 25 to 40 percent of small rounded or smoothly angular hard ferruginous concretions of a brown or black color, ranging from ⅛ to ½ inch in diameter, some much larger. The concretions consist of sand, silt, and clay cemented by iron oxide.

A_2. 3 to 12 inches, dusky-yellow or light yellowish-brown friable sandy loam containing concretions as in the A layer.

A_3. 12 to 14 inches, transitional layer grading in texture from sandy loam to sandy clay and of an intermediate color between A_2 and B_1.

B_1. 14 to 26 inches, moderate yellowish-brown friable but slightly sticky sandy clay, containing a noticeable quantity of concretions of the same character as in the A horizon.

B_2. 26 to 34 inches, moderate to strong yellowish-brown sandy clay showing some streaking or mottling of yellow and reddish brown. In this layer there are soft or incipient ferruginous concretions.

C. 34 inches +, mottled, splotched or streaked yellow, reddish-brown, light-gray, and purplish-red slightly compact sandy clay material. Coatings of gray clay or silt are conspicuous along bedding and joint planes.

Throughout A and B horizons are some small channels produced by animal burrows or root channels. The iron oxide in the material has been reduced on the walls of the channels and a very thin gray coating has formed. In some of the channels in the B_2 layer the walls are coated with iron oxide.

The mechanical analyses of samples of Norfolk and Tifton fine sandy loams are given in table 12.

TABLE 12.—*Mechanical analyses of two soil types in Candler County, Ga.*

Soil type and sample No.	Depth	Fine gravel	Coarse sand	Medium sand	Fine sand	Very fine sand	Silt	Clay
Norfolk fine sandy loam:	*Inches*	*Percent*	*Percent*	*Percent*	*Percent*	*Percent*	*Percent*	*Percent*
2510011	0–6	4.3	14.6	16.8	35.6	15.4	9.9	3.4
2510012	6–16	4.8	14.0	16.2	36.2	15.8	9.7	3.3
2510013	16–30	6.0	11.7	12.4	27.8	12.6	8.9	20.6
2510014	30–44	3.7	11.2	13.1	27.4	12.4	8.2	24.0
2510015	44–60	4.0	10.6	12.1	28.0	12.4	9.4	23.5
2510016	60+	3.8	16.1	16.2	29.8	10.3	9.3	14.5
Tifton fine sandy loam:								
2510022	0–10	4.9	17.5	18.9	32.1	12.4	11.0	3.2
2510023	10–22	4.2	15.9	18.4	35.0	13.0	10.2	3.3
2510024	22–40	6.4	13.8	13.5	25.8	10.0	10.4	20.1
2510025	40–55	6.1	15.3	16.0	24.1	8.6	8.3	21.6
2510026	55–65	5.6	16.3	15.0	22.3	8.3	13.7	18.8

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