U. S. DEPARTMENT OF AGRICULTURE.
BUREAU OF SOILS.

# SOIL SURVEY OF DUVAL COUNTY, FLORIDA.

BY

ARTHUR E. TAYLOR, IN CHARGE, AND T. J. DUNNEWALD.

[Advance Sheets—Field Operations of the Bureau of Soils, 1921.]

WASHINGTON:
GOVERNMENT PRINTING OFFICE.
1923.

[PUBLIC RESOLUTION—No. 9.]

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

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

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

Approved March 14, 1904.

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

# CONTENTS.



# ILLUSTRATIONS.

FIGURE.



MAP.

# SOIL SURVEY OF DUVAL COUNTY, FLORIDA.

By ARTHUR E. TAYLOR, In Charge, and T. J. DUNNEWALD.

## DESCRIPTION OF THE AREA.

Duval County is situated in the northeastern corner of the State of Florida, being separated from Georgia by Nassau County. It is bounded on the north by Nassau County, on the west by Nassau and Baker Counties, on the south by Clay and St. Johns Counties, and on the east by St. Johns County and the Atlantic Ocean. The county is irregular in outline; a part of its northern boundary is formed by the Nassau River and Thomas Creek, and Julington Creek forms part of the southern boundary. It has an area of approximately 782 square miles, or 500,480 acres.

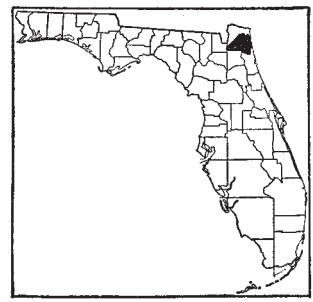


FIG. 2.—Sketch map showing location of the Duval County area, Florida.

The county consists of an almost level to gently undulating "flatwoods," broken by low, isolated ridges, well distributed throughout the county, and by narrow belts of low ridges along the coast and along the St. Johns River and its principal tributaries. Westward from a line extending from the point where the old Jacksonville Road crosses McGirts Creek to Plummer, the land gradually rises from an average elevation of about 30 feet to one of about 100 to 150 feet along the Baker County line, with an average elevation for this region of about 80 feet. The surface is characterized by low and broad, gently undulating ridges, slightly depressed, irregular areas, where drainage has not yet become established, and long, narrow swamps, where streams move so slowly that it is usually difficult to determine the direction of the current. In the part lying east of this region the average height above sea level is about 30 feet. However, there are small local areas, such as the sand dunes east of Mill Cove, along Trout and Cedar Creeks near Jacksonville, in Tiger Ridge, and at Mount Cornelia, where the elevation exceeds 50 feet in many places, and it attains a maximum of 90 feet at St. Johns Bluff and 100 feet in the hills east of Turner Pond. The topography in this section is somewhat variable. The part lying west of Tiger Ridge and Pumpkin Hill Creek has a prevailingly level surface, dissected by the St. Johns and Nassau Rivers, Julington, McGirts, Trout, Cedar, Dunn, and Thomas Creeks, and their many tributaries. Excepting the St. Johns River, only in exceptional cases have the channels of these streams been cut more than 10 feet below the general level of the country bordering them. Many of the smaller creeks and branches are merely long, narrow swamps in which there is a very sluggish current during wet periods. Interstream areas are dotted with numer-

ous undrained depressions of irregular outline. Between Tiger Ridge and the salt-water marsh along Pablo Creek, and north of Powers Bay, the surface is featured by numerous long, narrow swamps separated by long, low, narrow ridges, all of which roughly parallel the coast line. Large swamps, broken by many islands, occur in the southeastern corner of the county. In the northeastern and eastern parts of the county there are extensive salt-water marshes which contain many islands. The largest of these islands are long and comparatively narrow, with their long axes approximately parallel with the coast line. Between the Pablo Creek marsh and the coast are a number of low, parallel ridges, of dunelike character, with intervening troughs, but in places the surface is almost flat and more or less dotted with poorly drained basins.

All the streams of Duval County flow into the St. Johns River, with the exception of those lying in the extreme western and extreme northern parts. North of Maxville and west of Fiftone, Baldwin, and Brandy Bay, the branches flow northward and westward into Nassau County; north of Brandy Bay, Plummer, Cary, and Braddock School, the natural drainage is northward into Thomas Creek; and north of Pecan Park and Dunn Creek School the waters flow northward, emptying into the Nassau River. The St. Johns River enters the south-central part of the county and flows northward to a point near the geographical center of the county, where it turns eastward, emptying into the Atlantic Ocean. Its principal tributaries on the west and north sides flow in a general southeasterly direction; those east and south of the river and west of Tiger Ridge have a westerly course, but those east of this ridge flow in a northerly direction. The well-drained part of the county is comparatively small, and is found largely in the hammocks and blackjack-oak ridges along St. Johns River, Cedar, Trout, McGirts, Pablo, Pumpkin Hill, Julington, and Yellow Water Creeks, on Tiger Ridge, along the coast, and in other small, low, ridgy areas well distributed over the county. The greater part of of the county is poorly drained. The leading swamp and bay areas are Cross, Durbin, and Gum Swamps, and Powers, Tiger, Brandy, and Baldwin Bays. Other large swamps, covering from 1 to 5 square miles, are found between Baldwin and Otis, northwest of Plummer along Thomas Creek, and northwest of Utto Chapel School. Other swamp areas, containing from 1 to 100 acres, are very numerous throughout the flatwoods of the county.

The streams are very sluggish and have not developed valleys. It is very difficult to determine the extent of the overflow land, owing to the gradual merging of the bottoms into the upland. In many cases the water spreads out over wide areas. Only the larger creeks and rivers have well-defined channels. The streams generally head in swamps or bays and are intermittent in their upper reaches. The creeks and branches are fringed with a heavy growth of cypress, bay, water oak, hickory, gum, water maple, ash, and slash pine.

Although Duval County was occupied by the Spanish early in the eighteenth century, the first permanent settlement was made in 1791 by the English near the present site of Jacksonville. Duval County was established in 1822, and Jacksonville was incorporated in 1832. At that time it had a population of 250. The early settlers came principally from Georgia and the Carolinas. The extension of settlement was slow and took place largely along the St. Johns River,

although Fort George and Talbot Islands were settled and farmed very early in the nineteenth century.

The population of the county, according to the 1920 census, is 113,540, of which only 16.9 per cent is classed as rural. The most uniformly settled part of the county, including the greater part of the agricultural population, lies west of Bayard, Tiger Ridge, and Dunn Creek School, and east of McGirts Creek, Plummer, and Braddock School. Small farming communities are also found about Baldwin, Maxville, Mandeville, East Mayport, along the Gainesville Road, and at a few other points. East of Tiger Ridge and in the vicinities of Powers Bay, Brandy Bay, and Sal Taylor Creek there are large uninhabited areas, which are used only for turpentining, lumbering, and grazing.

Jacksonville, the county seat, has a population of 91,558, showing an increase of 58 per cent since 1910. It has very important shipyards and other industries, is the chief Florida port of entry of coastwise traffic, and is the leading railroad center. It is connected by steamboat line with Boston, New York, Baltimore, Savannah, Habana, and other cities along the Atlantic coast, and freighters from all sections of the world make this port. Eight railroads run out of Jacksonville, affording through passenger and freight service to all parts of the United States and many parts of Canada. South Jacksonville has 2,775 inhabitants. Baldwin, a railroad junction of the Seaboard Air Line Railway in the western part of the county, has a population of 470. Other railroad shipping points are Maxville, Fiftone, Tulane, Plummer, Dinsmore, Cary, Otis, Halsema, Whitehouse, Marietta, Pickett, Grand Crossing, Tisonia, Pecan Park, Duval, Broward, Yukon, Hogan, Center Park, San Pablo Station, Pablo Beach, Atlantic Beach, East Mayport, Mayport, Sunbeam, Greenland, Bayard, Ortega, and a number of other small towns and points along the railroads from which produce can be shipped. No place in the county is more than 12 miles from either a railroad station or a steamboat landing.

The county is fairly well provided with hard-surfaced roads. Vitrified brick and shell roads extend out from Jacksonville to Mayport, Pablo Beach, Atlantic Beach, St. Augustine, Mandarin, Green Cove Springs (Clay County), Otis, Dinsmore, Hogan, and Fernandina (Nassau County), thus connecting many rural sections with Jacksonville, the main market and shipping point of the State. Most sections of the county, excepting large swamp or marsh areas, can be reached by settlement and turpentine roads.

Most of the towns are provided with telephones, and almost all of the settlements, except some of the more remote, are reached by the rural and star mail routes.

## CLIMATE.

The climate of Duval County is subtropical. The winters are mild and generally pleasant, with occasional cool spells of a few days when the temperature goes slightly below the freezing point. In a few instances light snows have fallen, but the only measurable snowfall was 2 inches on the night of February 12–13, 1899. The summers are long and warm, but are tempered by practically constant winds, which are especially conducive to pleasant nights. Along the coast, where many citizens of Jacksonville have their cottages, even the

hottest weather is ameliorated by the ocean breezes, rendering both the days and nights pleasant.

The lowest temperature recorded during a 47-year period of observation at Jacksonville is 10° F. and the highest, 104° F. The mean annual temperature is 68.2° F.

The mean yearly precipitation is reported as 53.25 inches. The wet season lasts from June to September, inclusive. The rainfall is lightest during the winter and spring.

The average date of the last killing frost in the spring is February 16, and of the first in the fall, December 6. The latest killing frost recorded in the spring occurred on April 10, and the earliest in the fall on November 12. On an average there is no danger from frost for about nine months of the year, but the growing season is very often extended beyond this. In some winters there is comparatively little frost. January and February are the months during which killing frosts are to be expected.

The following table, giving the normal monthly, seasonal, and annual temparature and precipitation, is compiled from the records of the Weather Bureau station at Jacksonville:

*Normal monthly, seasonal, and annual temperature and precipitation at Jacksonville.*

| Month. | Temperature. | | | Precipitation. | | |
|---|---|---|---|---|---|---|
| | Mean. | Absolute maximum. | Absolute minimum. | Mean. | Total amount for the driest year (1917). | Total amount for the wettest year (1885). |
| | ° *F.* | ° *F.* | ° *F.* | *Inches.* | *Inches.* | *Inches.* |
| December | 55.2 | 82 | 14 | 2.99 | 2.11 | 7.76 |
| January | 53.9 | 81 | 15 | 3.12 | .41 | 7.18 |
| February | 56.9 | 86 | 10 | 3.43 | 1.46 | 5.23 |
| Winter | 55.3 | 86 | 10 | 9.54 | 3.98 | 20.17 |
| March | 61.9 | 91 | 26 | 3.52 | 1.81 | 5.66 |
| April | 67.6 | 92 | 34 | 2.72 | .82 | 1.24 |
| May | 74.2 | 98 | 46 | 4.25 | 1.83 | 7.74 |
| Spring | 67.9 | 98 | 26 | 10.49 | 4.46 | 14.64 |
| June | 79.0 | 101 | 54 | 5.53 | 3.03 | 8.98 |
| July | 80.9 | 104 | 66 | 6.20 | 10.36 | 7.16 |
| August | 80.1 | 101 | 64 | 6.21 | 6.65 | 7.56 |
| Summer | 80.0 | 104 | 54 | 17.94 | 20.04 | 23.70 |
| September | 77.3 | 99 | 49 | 8.03 | 3.47 | 19.63 |
| October | 69.6 | 95 | 37 | 5.06 | .38 | 3.36 |
| November | 61.3 | 86 | 26 | 2.19 | .23 | .50 |
| Fall | 69.4 | 99 | 26 | 15.28 | 4.08 | 23.49 |
| Year | 68.2 | 104 | 10 | 53.25 | 32.56 | 82.00 |

## AGRICULTURE.

The early agriculture of Duval County was of the self-sustaining kind. In 1791 a small clearing was made in the woods, near the site of Jacksonville, and corn and vegetables were grown for home consumption. A little later sugar cane, rice, arrowroot, sweet potatoes, Irish potatoes, rye, and wheat were grown. Cotton and wool were

produced for making homespun clothing. In 1832 there was a sugar mill and a sawmill at Jacksonville. A writer (Williams) in 1837 states that Fort George Island and Talbot Island were cultivated, and that cattle, hogs, sheep, and goats did well on the open range.

In the hammock land along the St. Johns River sugar cane and cotton were grown extensively from 1850 to the beginning of the Civil War. The high prices after the war gave a strong impetus to the production of cotton. In the late seventies the growing of citrus fruit along the St. Johns River began, and this industry developed very rapidly until the big freeze in the winter of 1895, when practically all of the trees were killed. The development of the turpentine business began about 1885 and continued as a leading industry until recent years, the decline being due largely to a depletion of nature's supply. Lumbering has been an important business since the thirties, but to-day the forest resources are largely exhausted, though many small trees are still cut for crossties and fuel.

The present agriculture consists of general farming and stock raising on the open range. According to the 1920 census, about 2.6 per cent of the area of the county is under cultivation. The remainder is utilized mainly for grazing. Most farmers devote a large part of their time during the winter season to getting out sawlogs, crossties, and wood for fuel.

According to the census there were 1,939 acres in corn in 1879, producing 17,030 bushels, and 476 acres in sweet potatoes, with a production of 30,931 bushels. There were 121 acres in sugar cane, which produced 13,930 gallons of sirup, 57 acres in cotton, producing 23 bales, 92 acres in rice, with a production of 43,885 pounds, and 46 acres in oats, which produced 617 bushels. Oats, rice, hay, Irish potatoes, and cotton were grown to a smaller extent in 1889. By 1899 the area in corn had increased to 3,221 acres, sweet potatoes to 779 acres, and sugar cane to 345 acres. In that year 535 acres were devoted to hay, 285 acres to peas, 953 acres to vegetables, 108 acres to oats, and 104 acres to Irish potatoes. From 1899 to 1909 there was a decrease in the acreage of all crops except Irish potatoes, but from 1909 to 1919 there was an increase in the acreage of all crops except sugar cane and dry peas.

At present corn, sweet potatoes, and sugar cane, ranking in acreage in the order named, are the principal crops. Irish potatoes, oats, velvet beans, cowpeas, soy beans, snap beans, Lima beans, rice, rye, peanuts, Johnson grass, crimson clover, bur clover, Bermuda grass, carpet grass, Sudan grass, Napier grass, sorghum, Japanese cane, milo, and kafir are grown to some extent. Most farmers have cattle and hogs on the open range. There are some dairies. The principal wild grasses are wire grass and broom sedge in the flatwoods sections, needle grass and bunch grass in the fresh-water marshes, and salt weed and sword grass in the salt-water marshes.

Corn is the most important crop. It is used for feeding work stock and hogs and a small proportion is ground to furnish meal for home use. More corn is shipped into the county each year than is shipped out. The 1920 census credits the county with 3,501 acres in corn, with a production of 42,419 bushels.

Sweet potatoes are grown by most farmers for home consumption and for the local markets. They were reported on 964 acres, with a yield of 85,449 bushels in 1919.

Sugar cane was grown on 189 acres in 1919, yielding 23,976 gallons of sirup.

The most important minor crop is Irish potatoes. The crop is reported on 410 acres in 1919, with a production of 26,929 bushels. Oats occupied 89 acres in 1919, with a production of 1,388 bushels. This crop is used as feed for work stock. In 1919 there were 964 acres in cultivated grasses and 21 acres in wild grasses cut for hay, 77 acres in grains cut for hay, 278 acres of coarse forage, 124 acres of legumes cut for hay, 125 acres of silage crops, and 18 acres of root forage. The hay and forage crops are used exclusively for feed for stock on the farm. Velvet beans and cowpeas are grown by some farmers for hay, for fattening hogs, and for soil improvement. Peanuts are grown for hog pasture. Oats or cowpeas cut with a volunteer growth of crab grass usually constitute the hay crop. Other crops that have been used for hay in an experimental way with some success are soy beans, upland rice, Sudan grass, Napier grass, Bermuda grass, Japanese cane, and Jerusalem cane. Relatively few farmers grow sufficient hay for their own use.

There are a few small orange groves in the county. These are situated on the Norfolk fine sand along the St. Johns River between Mandarin and South Jacksonville. In 1919, according to the census, there were 13,924 orange trees, yielding 10,859 boxes; 1,288 pear trees; 2,232 plum and prune trees; 2,697 peach trees; 636 grapefruit trees; 8 acres of strawberries, producing 10,388 quarts; and 3,905 pecan trees, with a total production of 24,686 pounds.

The income derived from the sale of dairy products amounted to $362,846 in 1919, according to the census. There are dairy farms in the vicinities of Jacksonville, Baldwin, and Dinsmore, but these supply only a very small part of the home demand. Practically all of the milk produced is sold in Jacksonville. The number of cows kept on the dairy farms ranges from 10 to 90, Jersey cattle and grades of this breed predominating. There are some Holstein cattle, a few of which are purebred, but most are grades. In addition to the native wire grass, broom sedge, crab grass, and beggar weed, permanent pastures of Bermuda grass and carpet grass and temporary pastures of cowpeas, oats, and velvet beans are provided for the dairy cattle. The pasture grasses are supplemented with cottonseed meal, other concentrates, dry fodder, and silage consisting of corn, velvet beans, cowpeas, and Japanese cane. It is believed that dairying will be carried on much more extensively when the eradication of the Texas fever tick has been effected.

The raising of beef cattle for meat is an important industry. There are a few farms with herds ranging from 100 to 1,000 head, and many with from 10 to 50 head. These cattle are of a very inferior type, living entirely in the open and upon the native vegetation, principally wire grass. They receive very little attention. They are usually infested with ticks, and this, together with insufficient feed, causes many to die. The importation of purebred bulls is discouraged by the presence of the fever tick.

In 1909, according to the census, there were 4,404 hogs slaughtered in Duval County. The hogs are of better quality than other live stock. The importation of purebred boars and sows has greatly improved the original razor-back type of hog. Duroc-Jersey, Berkshire, and Poland-China, ranking in numbers in the order named, are

the leading breeds. Most of the hogs feed on the forage and mast of the swamps, hammocks, and flatwoods. Many farmers finish their hogs by first turning them into a field of velvet beans and peanuts or cowpeas and peanuts after the corn is harvested, and later, about five or six weeks prior to slaughtering, penning them and feeding corn. All of the pork produced in Duval County is consumed locally, and this supplies only a small part of the home demand.

Horses and mules are fed on about the same pasturage and roughage as the cattle, supplemented with corn, oats, alfalfa meal, and various mixed feeds. Not enough horses and mules are raised in the county to meet the local demand. A few small flocks of sheep and goats graze on the open range.

Farming in Duval County has not yet become a highly specialized industry, and there has consequently been no close study on the part of the farmers of the adaptation of soils to certain plants or varieties of plants. However, the difference in the adaptation of soils to certain crops are generally recognized. The Norfolk fine sand is usually selected for sweet potatoes and sugar cane, although the Bladen soils, where drained, are considered fully as well adapted to these crops. While most of the corn is grown on the Norfolk fine sand, because of its good natural drainage, it is generally understood that, with drainage, the best yields can be obtained on the Bladen fine sandy loam and very good yields on the Bladen fine sand and the Portsmouth fine sand. With drainage and lime, the loamy phase of the Leon fine sand and the St. Johns fine sand are known to be well suited to corn, sweet pototoes, and sugar cane. The better variations of Plummer fine sand, with drainage, are giving moderate yields of corn, sweet potatoes, and sugar cane. The Bladen fine sandy loam has been found especially adapted to the growing of the pecan, although some good groves are located on the Norfolk fine sand and Blanton fine sand. The Jewel, Waldo, Florida Gem, and Greensboro varieties of peaches do very well on the Norfolk, Blanton, and Bladen soils, and the loamy phase of the Leon fine sand. The Norfolk soils are considered best for producing plums, and the Bladen soils for the Scuppernong and Thomas grapes, although plums do well on the Blanton fine sand, the well-drained Bladen soils, and the loamy phase of the Leon fine sand; and grapes do well on the Norfolk and Blanton soils and the loamy phase of the Leon fine sand.

The cultural methods employed in general in Duval County have not changed materially from long-established practice. Corn usually occupies about half of the cultivated land, and sweet potatoes constitute the leading cash crop. Sugar cane is grown in patches of one-half acre to 2 acres. Sometimes a small acreage of oats is grown for winter pasture and hay, and a small part of the corn is interplanted with velvet beans, cowpeas, or peanuts for hog pasture. No system of rotation is practiced, and corn often follows corn on the same land for several years.

In growing corn the land is plowed 4 to 8 inches deep between October and February. Deep plowing in October results in increased yields and is effective in conserving a maximum amount of the winter rainfall for the use of growing crops. Corn is usually planted in March or early April and is harvested in September or October. The better farmers often interplant velvet beans and sometimes peanuts with the corn, using a planter that will plant hills of corn and beans alter-

nately. It is said that this practice does not materially reduce the yield of corn, and the other crops not only furnish food for stock but improve the condition of the soil.

Velvet beans interplanted with corn are not harvested, but after the corn is gathered hogs are turned into the field. The vines make a rank growth and overrun the corn, so that they are difficult to handle, and the small quantity of velvet bean hay made is harvested where the crop is grown in separate fields. The velvet bean is growing in favor with the farmers.

Cowpeas are sown broadcast or planted in the middles of the corn at the last cultivation, for hay and for pasturage for hogs. The cowpea is not as popular as the velvet bean, principally because of the root knot. For this reason only the Iron and Brabham varieties, which are more resistant to the root knot, can be safely grown.

The sweet-potato slips are set out in March, April, May, or June, and the potatoes are dug in November. Sugar cane is planted from the middle of January to early in March, and is harvested in the fall. Oats are sown from October to February.

About 25 per cent of the farmers grow some Irish potatoes for the local market, but only a few plant large fields and ship to the outside markets. The larger growers break their land in December and early January, and throw it into beds 3 or 4 feet wide with disk cultivators. There are 10 to 12 of these beds in a plat. Between the plats are water furrows, and these are connected at both ends with drainage ditches. Commercial fertilizer is applied to the bed about the middle of January, after which the potatoes are planted in the top of the bed with a planter. The crop matures in May. Spaulding's Early Rose No. 4 and Bliss Triumph are the two leading varieties.

In the better farming sections of the county some farmers have large two-story houses, and fair barns are provided for the work stock and the storage of feed. Most of the houses, however, consist of small, unpainted cottages of two to four rooms. As a rule the farms thus improved have little more than a shed for accomodation of the stock. The absence of capacious barns, such as are seen on farms in the Northern States, is due to the mildness of the winters. Although the old-style equipment is used on the majority of farms, the small 6-inch turning plow and the narrow implements with sweeps used in subsequent cultivation are gradually giving way to the 10-inch and 12-inch turning plow and the two-horse cultivator. Mules are preferred as work animals, since they are more easily kept and endure the warm weather better than horses. The mules are small and the horses are of a light harness type. Oxen are used to some extent for clearing and especially for hauling logs to the landings along the streams.

Commercial fertilizers are used extensively. For corn 200 pounds per acre of a commercial fertilizer containing 8 per cent of phosphoric acid, 2 per cent of nitrogen, and 1 per cent of potash is commonly used. Some of the more progressive farmers use 400 pounds of cottonseed meal and acid phosphate for corn, applying half of it about 10 days before planting and the remainder as a top dressing about 6 weeks after planting. About 800 to 1,200 pounds of cottonseed meal are used for sugar cane. Land for sweet potatoes is generally fertilized by "cowpenning" only. This consists of penning the stock at night on 2 to 4 acres of land for 2 to 6 weeks prior to planting.

Larger yields of sweet potatoes are obtained by applying to the beds before the plants are set out from 500 to 600 pounds of a commercial fertilizer analyzing 8 per cent available phosphoric acid, 2 per cent nitrogen, and 2 per cent potash, in addition to cowpenning. In normal times a fertilizer containing 6 to 7½ per cent available phosphoric acid, 4½ per cent nitrogen, and 4 per cent potash is used for Irish potatoes at the rate of 1,500 to 2,000 pounds per acre. On the truck crops around Jacksonville large quantities of high-grade fertilizers are used. Special brands carrying varying proportions of the different ingredients required for particular crops are made by the fertilizer companies represented in this section. Most of these are cottonseed-meal mixtures, and contain some dried blood and tankage as a part of the nitrogen supply. Some use nitrate of soda for nitrogen instead of cottonseed meal. A few farmers mix their own fertilizers.

Ground limestone and air-slaked lime have been used successfully by a few farmers in correcting soil acidity. The usual application consists of 2,000 to 3,000 pounds of ground limestone or 1,000 to 1,500 pounds of air-slaked lime per acre. As the quantity of stable manure available is very small, proper soil management must include the growing of crops to be turned under. In no other way can organic matter, in which the soils are mostly deficient, be economically supplied. Even those soils containing considerable organic matter are improved by plowing in some coarse material. It has been found that the growing of velvet beans, cowpeas, and peanuts makes the soils much more productive.

Laborers are plentiful and most of them are colored. For general farm work, laborers hired by the month are paid $30 with board or $40 without board, and day laborers receive $1.25 with board or $1.50 to $2 a day without board. Most farmers exchange help.

The size of the farms depends largely upon the character of the soil, nearness to Jacksonville and transportation facilities, and the condition of the roads. The smaller farms are located on the Norfolk and Blanton soils, the better drained tracts of the Bladen soils, and the loamy phase of the Leon fine sand. The 1920 census reports 916 farms in the county, comprising 13 per cent of the total land area. The average size of the farms in that year was 71.1 acres, of which 14.7 acres, or about 20.6 per cent, was improved land.

Of the total number of farms, 82.3 per cent were operated by owners, 14 per cent by tenants, and 3.7 per cent by managers. In leasing farms the cash-rent system is the most common. From $1 to $20 is paid per acre, the high rents being paid for land near Jacksonville. Under the share plan, when the tenant supplies all the labor and equipment, he usually receives two-thirds of the crop, and when the owner provides the equipment and work stock, one-half of the crop.

With the exception of land very near Jacksonville, which is valued more for building sites than for agricultural purposes, the selling price of the better cleared land ranges from $50 to $400 an acre, depending upon the quality of soil, drainage, improvements, roads, and location with respect to shipping points and Jacksonville. Uncleared land of the better quality ranges from $10 to $100 an acre, and uncleared land of inferior quality from $3 to $30 an acre, the range in price depending upon the quality of the soil, the amount of merchantable timber and fuel, and the location with respect to roads, transportation points, and Jacksonville.

SOILS.

The soils of Duval County have fine sand textures and, with the exception of the St. Johns and Portsmouth soils and Peaty muck, are light in color. They are naturally divided into two major groups, the one being characterized by poor drainage, the other by fair to good drainage.

A generalized section of the poorly drained soils shows from 1 to 12 inches of a dark-gray fine sand with a high content of loose, unhumified organic matter, then a light-gray fine sand, which in many places, and at depths ranging form 12 to 60 inches but usually 18 to 24 inches, is interrupted by a dark-brown to black layer of organic hardpan, next a light-gray fine sand like the material above the hardpan, continuing to depths ranging from 2 to 8 feet, where there may be some mottling with yellow.

In the poorly drained group of soils there is a striking difference in the degree of loaminess. East of Tiger Ridge, which extends south and a little west from the south bluff of St. Johns River near Gilmore to a point about 1½ miles northwest of Greenland, the various soil layers are characteristically loose and incoherent, while west of this ridge a considerable percentage of the soils show a distinct loaminess. To the loamy group belong the soils having gray to dark-gray surface soils, grading downward through gray and into mottled gray and yellow fine sands, which are underlain by yellow sandy clays mottled with gray. They occur more or less throughout the western half of the county, but most extensively in the northwest quarter. When well drained these are the best agricultural soils of the county. They are known as Bladen soils. Other loamy soils which are intimately associated with the Bladen are the loamy phase of the Leon fine sand and the St. Johns fine sand. Both of these soils are distinguished by their loaminess and dark-brown to black organic hardpan layers at depths ranging from 12 to 36 inches. Another poorly drained soil with less loaminess than the Bladen is the Portsmouth, the surface soil of which is featured by a dark-gray to black, somewhat loamy fine sand, underlain by a light-gray, slightly loamy fine sand, mottled here and there with shades of yellow. West of Dinsmore, Whitehouse, and Pelham, east of Bayard, and in small scattered areas throughout the county, the soil is incoherent and has a gray to dark-gray surface layer, 4 to 5 inches thick, underlain by a layer of a light-gray or dingy-gray color, and is classed as Plummer fine sand.

A generalized section of the well-drained soils consists of a gray surface layer ranging in thickness from a mere film up to 10 inches, underlain by a light-gray to white fine sand ranging also from an inch or so to as much as 6 feet. Below this is a layer of pale-yellow fine sand. The dark color at the immediate surface in forested areas is due to the accumulation of organic matter, which has combined with the inorganic matter only to a very small degree, if at all; it generally exists in a loose condition and quickly disappears when the land is put under cultivation. However, in the hammock phase of the Norfolk fine sand the organic matter is finer in texture and tends to give a distinct loaminess to the surface layer.

With the exception of the Palm Beach soils, which are composed largely of shells and sand, the soils are acid and respond to treat-

ment with lime. In all cases where an acid, organic hardpan layer of the Leon or St. Johns series is within 14 inches or less of the surface, the soils are so extremely acid that staple crops will not grow until after a heavy application of lime.

The soil of these various groups are classified into soil series on the basis of color, origin, structure, topography, and drainage. Each series is divided into individual soil types, which differ in texture, or the proportions of different-sized particles, such as sand, silt, and clay, which they contain. Minor differences in the soil, not of sufficient importance to be used as a basis for type distinctions, are treated as phases of types.

The Bladen, Leon, Norfolk, St. Johns, St. Lucie, Lakewood, Blanton, Plummer, and Portsmouth soils owe their origin to the weathering of unconsolidated fine sands and fine sandy clays of Pleistocene or Recent age. The Palm Beach sand is derived through the weathering of unconsolidated shelly sands, coquina, and other shelly formations. Some of the soils along streams, including areas of the Bladen fine sandy loam and fine sand, the swamp phase of the former, and the Plummer and Portsmouth fine sands, have been modified by alluvial deposits. In addition to the soils of these series, Peaty muck, Coastal beach, Swamp, Madeland, and Tidal marsh, have been mapped. The Peaty muck has originated from the partial decomposition of organic matter in the presence of water. These classifications do not represent sufficiently definite material to be classed as true soils.

The surface soils of types of the Bladen series are gray to almost black in color. The subsoil is a gray to mottled yellowish and grayish loamy fine sand to sandy clay. The surface is flat and very poorly drained. The Bladen fine sand, with a swamp phase, and the fine sandy loam, with a swamp phase, were mapped.

The types of the Leon series consist of gray to dark-gray, incoherent to loamy fine sands, underlain at about 6 to 10 inches by a grayish to almost white fine sand, which grades at about 18 to 24 inches into a dense, compact layer of fine sand, or so-called hardpan ranging in color from brown to dark-brown or black. The material underlying the compact layer ranges from a loose white to loamy yellow fine sand. The Leon soils occupy low ridges and level areas in which the drainage is poor. The fine sand and the fine sand, loamy phase, are developed.

The Norfolk series consists of types with light-gray to yellowish-gray surface soils and a yellow subsoil. The soils occupy level to gently rolling surfaces. The Norfolk fine sand and also the hilly, shell, and hammock phases were mapped.

In the types of the Plummer series the surface soils are gray and thin and the subsoil is light gray to dingy gray. The topography is prevailingly low and flat, and the drainage is poor. Only one type, the fine sand, occurs in this county.

The surface soils of types of the St. Johns series are dark gray to black, and the subsoil is gray, except for a rusty-brown to black "hardpan" layer, which is usually from 3 to 4 inches in thickness and is encountered at a depth of 12 to 30 inches. The soils occupy flat surfaces and are poorly drained. The St. Johns fine sand is the only type mapped in Duval County.

The soils of the St. Lucie series consist of white, loose fine sand extending to a depth of more than 3 feet. They occur on ridges, invariably above the associated flatwoods soils. The St. Lucie fine sand and a hammock phase of the fine sand are mapped.

The Lakewood series consists of types characterized by light-gray to almost white surface soils and upper subsoils and a yellow or orange-yellow lower subsoil. Both soil and subsoil are incoherent and well drained. Only one type, the fine sand, is mapped.

The surface soils of types of the Blanton series are gray, and the subsoil is yellowish gray to pale yellow with light-gray or white splotches. The topography is level and the drainage is fair to poor. One type, the Blanton fine sand, occurs in this county.

The surface soils of types of the Plummer series are gray and very thin. The subsoil is light gray or dingy gray, mottled locally with yellow. The types occupy poorly drained areas of the flatwoods. The Plummer fine sand is mapped in Duval County.

The types of the Portsmouth series have dark-gray to black surface soils and a subsoil of gray, loose fine sand or mottled yellowish, grayish, and drab, loamy fine sand. These soils occupy flat areas and are poorly drained. The Portsmouth fine sand and the swamp phase are developed here.

The surface soils of the Palm Beach types are gray to dark gray and from 5 to 10 inches deep. The subsoil is grayish-brown or speckled gray and brown material, composed of shells and sand. The soils occupy low, narrow ridges and are well drained. The Palm Beach sand is the only type mapped in Duval County.

The soils of Duval County are described in more detail in the following pages of this report. Their actual and relative extent are given in the table below, and their distribution is shown on the accompanying soil map.

*Areas of different soils.*

| Soil. | Acres. | Per cent. | Soil. | Acres. | Per cent. |
|---|---|---|---|---|---|
| Leon fine sand | 63,872 | 23.6 | St. Johns fine sand | 22,848 | 4.6 |
| Loamy phase | 54,144 | | Bladen fine sandy loam | 15,552 | 4.3 |
| Norfolk fine sand | 77,376 | 18.0 | Swamp phase | 5,888 | |
| Hammock phase | 10,176 | | Blanton fine sand | 8,832 | 1.8 |
| Shell phase | 1,536 | | Peaty muck | 5,888 | 1.2 |
| Hilly phase | 832 | | St. Lucie fine sand | 3,840 | .9 |
| Bladen fine sand | 52,544 | 13.1 | Hammock phase | 896 | |
| Swamp phase | 12,928 | | Coastal beach | 2,944 | .6 |
| Plummer fine sand | 47,360 | 9.5 | Lakewood fine sand | 2,432 | .5 |
| Tidal marsh | 46,272 | 9.2 | Madeland | 1,792 | .3 |
| Swamp | 35,136 | 7.0 | Palm Beach sand | 768 | .1 |
| Portsmouth fine sand | 5,248 | 5.3 | | | |
| Swamp phase | 21,376 | | Total | 500,480 | |

BLADEN FINE SAND.

The surface soil of the Bladen fine sand consists of a dark-gray loamy fine sand, 6 or 7 inches deep. This is underlain by a light-gray loamy fine sand, which passes below into mottled grayish and yellowish, or mottled grayish and dingy-brown, loamy fine sand. Below 30 inches the material usually includes a small proportion of clay, which imparts a slight stickiness. The subsoil may be uniformly gray, drab, or yellow, or it may be mottled throughout. Most of the areas of Bladen fine sand contain patches of the loamy phase of the Leon fine sand

and of St. Johns fine sand. In places the inclusions are so numerous that it is difficult to determine whether or not the Bladen fine sand is the predominating type.

The Bladen fine sand is the most widely distributed type of the Bladen series. It is the predominating soil in the region lying north of the National Highway east of Marietta and Plummer, south of Thomas Creek, and west of the Yulee Road. It is also well developed between Baldwin and Maxville, along Yellow Water Creek, west of Brandy Bay, between Hogan and Loretto, east of Tisonia, west of Dosia, and southeast of Duval. Many small areas occur throughout the western half of the county.

The topography of the Bladen fine sand is flat and the drainage is poor, the ground-water table being near the surface. The soil is often soggy or covered with standing water during rainy periods.

The Bladen fine sand, because of its extensiveness and relatively high agricultural value, is the most important soil of the county. Probably 3 per cent of it is cultivated. The remainder serves as open range for cattle and hogs, and is known as the "grassy flatwoods," "prairie flatwoods," or "meadow." The virgin areas are characterized by scattered Cuban pine, and a comparatively heavy growth of wire grass, broom sedge, and occasionally such plants as sundew, pitcher plant, and bunch grass. The Cuban pine is boxed for turpentine and is cut for logs, crossties, and fuel.

Corn, sugar cane, and sweet potatoes are the principal crops, corn occupying the largest acreage. Velvet beans, cowpeas, Irish potatoes, and oats are important crops. Rice, peanuts, Bermuda grass, carpet grass, Sudan grass, Napier grass, rye, soy beans, sorghum, and Japanese cane are grown to a small extent. The corn is used almost entirely for feeding work stock and fattening hogs. The sugar cane is used in making sirup, and the sweet potatoes to supply the table and the local market. Velvet beans and cowpeas are used as pasturage for fattening hogs and as a green-manure crop. Velvet beans are preferable on account of their freedom from root knot. The Brabham and Iron varieties of the cowpea have been affected the least from root knot. All the garden vegetables common to this region are produced, and small quantities are sold on the local markets. There are a few small pecan orchards. Most of the dairies of the county are on this type.

Corn yields from 12 to 40 bushels per acre, the average being 20 to 25 bushels. Sugar cane ranges in yield from 50 to 190 gallons per acre, with an average of about 110 gallons. Sweet potatoes yield from 90 to 250 bushels, with an average of about 135 bushels. Irish potatoes return 10 to 60 barrels per acre, with an average of 28 barrels.

The methods of cultivation and fertilization on this type are similar to those prevailing in general throughout the county. All farmers use commercial fertilizer for corn and sugar cane. Cowpenning is effective in fertilizing the land for sweet potatoes and other crops.

Uncleared areas of the Bladen fine sand sell for about $15 to $80 an acre, the price depending upon the condition of the roads, the amount of marketable timber and fuel, and the position with respect to towns and shipping points. Improved farms sell for $80 to $150 an acre.

In improving and maintaining the productiveness of the Bladen fine sand, the first essential is to provide adequate drainage. By deepening and extending natural drainage ways, and by constructing open ditches, much of the type could be brought into good condition without a prohibitive outlay. With fair to good drainage, it is essential to maintain the supply of organic matter, either by the liberal application of barnyard manure and pine needles or by plowing under green-manure crops. The growing of leguminous crops greatly improves the soil and furnishes sufficient nitrogen, so that this element may be largely eliminated in fertilizer mixtures.

Early Irish potatoes are especially adapted to this soil, which is excelled for this crop only by the Bladen fine sandy loam. Dairying, with the introduction of creameries and cheese factories, would make possible a steady income, would encourage the growing of legumes and other forage crops, and would make larger quantities of manure available. The raising of more beef cattle and hogs of better grade would be profitable. Bermuda grass and carpet grass make good permanent pastures, and oats, barley, or rye sown in September or October provide good winter pasturage. Johnson grass, Sudan grass, upland rice, soy beans, crimson clover, and bur clover do well on this soil. Napier grass, which grows from the latest killing frost of spring until the earliest killing frost of fall, makes excellent yields, is very succulent, and provides green feed. Japanese cane is reported to give a yield of 25 tons per acre, and can be used for feed, silage, or sirup.

*Bladen fine sand, swamp phase.*—The surface soil of the Bladen fine sand, swamp phase, is a dark-gray to black, loamy fine sand, 8 or 9 inches deep, underlain by an inch or two of gray, loamy fine sand. The subsoil is mottled gray, drab, and various shades of yellow, and below 30 inches is usually slightly sticky.

This phase is found in low-lying situations in areas of the typical soil. The areas range in size from a fraction of an acre to a square mile or more. The largest developments lie in the vicinity of Maxville and northwest of Dosia.

The surface of this phase is basinlike. It lies 1 to 4 feet below the general level of the typical Bladen fine sand and is covered with water except during long dry periods. Owing to its swampy condition, the phase is not farmed, but it furnishes comparatively good grazing for beef cattle and hogs. The forest growth consists of cypress, Cuban pine, slash pine, gum, and water oak. The larger trees are cut for logs and the smaller ones are used for crossties and fuel.

When drained, the Bladen fine sand, swamp phase, will be found adapted to all crops grown on the typical Bladen fine sand.

### BLADEN FINE SANDY LOAM.

The Bladen fine sandy loam is a gray to dark-gray loamy fine sand, from 6 to 12 inches deep, grading into a gray loamy fine sand mottled with yellow. This passes at about 20 to 30 inches into mottled gray and yellow fine sandy clay loam, having a plastic structure, which continues to a depth of more than 3 feet.

This type is characterized by local color variations, which are of little or no significance in relation to the agriculture of the county.

In some areas the material is gray or drab throughout the soil section. In others the upper subsoil is gray or drab in color with faint mottlings of yellow, and the lower subsoil is yellow with faint mottlings of gray or drab, while within a short distance the upper subsoil is yellow with faint mottlings of gray or drab. Low-lying, dome-shaped mounds of Leon fine sand, loamy phase, and St. Johns fine sand are of common occurrence, and there are many included irregular patches of Bladen fine sand.

Broad tracts of the Bladen fine sandy loam occur west of Baldwin, between Marietta, Plummer, and Thomas Creek, and west of Jacksonville. Smaller areas are found in the vicinities of Grand Crossing and Tisonia.

The surface is characteristically flat, relatively low lying, and very poorly drained. With each heavy rainfall the uncleared land is inundated. Even with drainage the lower subsoil is normally saturated and the ground-water level is very near the surface.

The Bladen fine sandy loam is the most productive soil of the county but because of its poor drainage less than 10 per cent of it is cultivated. A large part of the remainder is forested with Cuban pine and supports a relatively heavy growth of grasses, consisting of wire grass, broom sedge, and bunch grass. In some places near streams there are small areas covered with a heavy hammock growth of live oak, hickory, cabbage palmetto, gum, bay, magnolia, and myrtle.

Corn is the chief crop, occupying an acreage about 70 per cent greater than sugar cane or sweet potatoes, the next most important crops. Velvet beans, oats, Irish potatoes, and most garden vegetables common to the area are grown in a small way. A few farmers west of Baldwin have commercial groves of pecans. Muscadine grapes do very well on this type, but are not extensively grown. Corn yields from 15 to 45 bushels per acre, with an average of about 25 bushels; and sugar cane from 50 to 200 gallons of sirup, with an average of about 125 gallons. Sweet potatoes yield from 100 to 300 bushels per acre and average about 150 bushels. Irish potatoes return from 10 to 70 barrels per acre, with an average of 30 barrels. The prevailing practices in farming are followed on this type.

Uncleared areas of the Bladen fine sandy loam sell for about $25 to $100 an acre, the price being governed by the location with respect to Jacksonville, shipping points, and improved roads. Improved farms sell for $100 to $400 an acre.

The needs of the type and the methods of improvement are practically the same as those suggested for the Bladen fine sand. Artificial drainage is an absolute necessity if general farming is to be pursued. Early Irish potatoes, which mature from about April 20 to May 20, have been very profitably produced on this soil. The Hastings potato district (in St. Johns County), which is the most important potato-growing section in the State, is confined very largely to this type.

*Bladen fine sandy loam, swamp phase.*—The surface soil of the Bladen fine sandy loam, swamp phase, consists of 8 to 10 inches of dark-gray to black loamy fine sand. The subsoil is a gray loamy fine sand, which passes at about 12 to 15 inches into a mottled gray, drab, and yellow loamy fine sand, and this at about 24 to 36 inches into a mottled gray, drab, and yellow fine sandy clay loam or fine sandy

clay. In places the surface material consists of 1 to 12 inches of black to brown Peaty muck.

This phase is closely associated with the typical soil and occurs mainly in the flood plains of Trout, Thomas, Ninemile, Sixmile, and Cedar Creeks. While the surface is in general flat, it is broken in many places by sloughs, stream channels, and occasional depressions and inequalities due to erosion by overflow water. The natural drainage is very poor, and water stands on the surface for long periods after heavy rains.

The phase is not farmed but is used as range for cattle and hogs. It is forested with cypress, slash pine, water oak, gum, bay, magnolia, cabbage palmetto, and hickory. When this phase is drained it will be found essentially similar to the typical Bladen fine sandy loam in its crop adaptations and fertilizer requirements.

### NORFOLK FINE SAND.

The Norfolk fine sand consists of a light-gray or pale yellowish gray, incoherent fine sand, from 1 to 6 inches deep, but usually 2 to 4 inches, underlain by a yellowish-gray, to pale-yellow, loose fine sand. Locally the soil is slightly darker at the surface, owing to a higher content of organic matter. In the eastern part of the county there is in places a thin veneer of incoherent, white fine sand at the surface, usually less than 1 inch in thickness, but occasionally reaching 6 inches. This is underlain by pale-yellow, incoherent fine sand, which extends to a depth of 3 feet without any important change.

The type is developed in large areas along the St. Johns River and in smaller areas throughout the county.

The Norfolk fine sand occurs characteristically on ridges or undulating highlands. Some of the slopes along streams are abrupt. Drainage is well established, and the areas on the crests of ridges and on the steeper slopes are inclined to suffer from excessive drainage by reason of the open, loose nature of the soil material.

About 5 per cent of the Norfolk fine sand is cultivated, and practically all farming is done where the surface soil has a depth ranging from 4 to 6 inches. On this deeper soil the timber growth consists of Cuban pine, blackjack oak, and some live oak; but on the lighter soils, blackjack oak is the principal tree growth.

Corn, sweet potatoes, and sugar cane, ranking in acreage in the order named, are the leading crops. Oats, cowpeas, velvet beans, and peanuts are grown in small patches. Corn yields 10 to 30 bushels per acre with fertilization. Sweet potatoes produce about 150 bushels per acre where cowpenning is practiced. Grapes of the Muscadine group are grown for home consumption.

The practices common to the county in growing corn, sweet potatoes, and sugar cane are followed on this type. The soil is enriched for sweet potatoes by keeping the cattle during the nights in an inclosure of a few acres from about April until June. After this the soil is plowed and bedded, and the slips are set out. The following year either corn or sugar cane is grown in this field. Small quantities of barnyard manure occasionally are distributed over a part of the land intended for corn and sugar cane. The better farmers use about 1,200 pounds of cottonseed meal and 800 pounds of acid phosphate per acre for sugar cane. About 400 pounds per acre of an 8–2–1 fertilizer is applied to the corn land.

Uncleared areas of the Norfolk fine sand sell for about $4 to $20 an acre, the price depending upon the amount of standing timber, the position with respect to Jacksonville and shipping points, and the condition of the roads. Improved farms range in price from $30 to $100 an acre.

Until the demand for farm products is decidedly greater than it is at present in Duval County, it would seem best that only the deeper variations of the Norfolk fine sand, where the surface layer is from 3 to 6 inches deep should be farmed, the remainder continuing as an open range for stock. The type, owing to its topographic relief and loose, open structure, is droughty during dry periods, so that irrigation is almost necessary for successful truck farming. Irrigation must be by the sprinkling method, as the deep, porous soil can not be subirrigated. The Norfolk fine sand is very deficient in organic matter, and the liberal application of barnyard manure or the plowing under of vegetation will increase the moisture-holding capacity and supply plant food. The destructive method of burning off the vegetation should be discontinued. An application of lime would correct the acidity and would be especially helpful in growing the legumes.

*Norfolk fine sand, hammock phase.*—The Norfolk fine sand, hammock phase, to a depth of 2 to 7 inches, is a dark-gray, loose fine sand, the dark color and somewhat loamy character of the material in places being due to the presence of organic matter. Below this is a yellow, pale-yellow, or grayish-yellow fine sand, which is locally somewhat loamy.

This phase lies along the St. Johns River and Pablo and Pumpkin Hill Creeks. Small areas occur on Fort George Island. The surface ranges from almost level to gently sloping. Drainage is good.

About 20 per cent of the Norfolk fine sand, hammock phase, is cultivated, and the remainder serves as range for stock. A distinguishing feature is its hammock growth, which consists principally of live oak, cabbage palmetto, magnolia, and hickory.

This soil is devoted to practically the same crops as the Norfolk fine sand, but the yields are somewhat better. The phase can be improved by the methods suggested for the typical soil.

*Norfolk fine sand, shell phase.*—The Norfolk fine sand, shell phase, to a depth of about 10 to 14 inches, consists of a gray, dark-gray, or dark-brown loamy fine sand in which large quantities of oyster-shell fragments are incorporated. Because of the abundance of this material on the surface the soil is known locally as "shell land." The subsoil is practically free from shell fragments and is similar to the subsoil of the typical Norfolk fine sand in texture, structure, and color. The shell fragments apparently are the remnants of shells spread on the land prior to 1819 by the Spaniards. Writers state that the Spaniards used a method of improving the soil by covering it with shells and that in some instances this covering was a foot thick.

This phase is developed in small areas around Mill Cove, south of Mayport, in the vicinity of Greenfield, and on Talbot and Fort George Islands. The drainage is good.

This is a productive fine sand, and about 20 per cent of it is under cultivation. It is forested with a hammock growth of live oak, magnolia, hickory, bay, and cedar. Some of the first farms in Duval County were situated on this soil.

Corn, sugar cane, sweet potatoes, berries, and all kinds of garden vegetables do well on this phase. The shells furnish sufficient lime to keep the soil in a sweetened condition, so that legumes do especially well.

*Norfolk fine sand, hilly phase.*—The Norfolk fine sand, hilly phase, consists of a light-gray or pale yellowish gray, incoherent fine sand, underlain at about 1 to 4 inches by a yellow or pale-yellow, loose fine sand, which extends to a depth of more than 3 feet without material change.

This phase occurs in small areas south and east of Mill Cove, south of St. Johns Bluff, and west of Drummond Point. The surface is rolling and shows evidences of wind erosion and deposition. The porous structure permits the rainwater to pass rapidly downward to considerable depths, resulting in excessive drainage.

The Norfolk fine sand, hilly phase, is used only for grazing. Blackjack oak is the predominating tree growth, but there are a few spruce pines and a scattering of Cuban pines. Because of the rolling surface and extreme droughtiness, it is probable that this soil is better adapted to grazing or forestry than to the growing of crops.

### LEON FINE SAND.

The Leon fine sand consists of a gray to dark-gray fine sand, 3 to 6 inches deep, grading into a dingy-gray to almost white fine sand, which is underlain at depths ranging from 10 to 36 inches, but usually 18 to 24 inches, by a black to dark-brown, compact fine sand or so-called hardpan. This layer of hardpan, averaging 3 or 4 inches in thickness, but with a range of 1 to 24 inches, is underlain by a dark-brown fine sand, which passes abruptly into a wet, compact, gray fine sand. This, when disturbed, is loose and incoherent and flows like quicksand. The dark color of the surface is due to the presence of loose organic matter. Where the type occurs in association with the St. Johns fine sand the surface tends to be darker than typical. There are numerous included areas of St. Johns fine sand and Plummer fine sand, the small extent of which did not warrant separation.

The Leon fine sand is the most extensive soil in Duval County. It occurs in medium to large bodies scattered throughout the eastern half and the southwest quarter of the county, and between the Mandeville School and Plummer.

The Leon fine sand occupies low ridges and level areas in which drainage is poorly established. During most of the year, with the exception of prolonged dry seasons, the soil is wet, and water sometimes stands upon it for long periods, especially in the slightly depressed areas. Its position is low, and the surface so flat that water is removed mainly by lateral seepage and evaporation, the slope not being sufficient for surface run-off.

Less than 1 per cent of the type is under cultivation. Its chief use is as a range for cattle and hogs. Practically all of the type supports a forest growth of Cuban pine, which is usually boxed for turpentine and to some extent is being cut for logs, crossties, and fuel. Scrub saw palmetto, gallberry, wire grass, and broom sedge grow in most places.

Cultivation of this soil in most cases has been a failure, as numerous abandoned fields bear witness. Where limed and cowpenned, low yields of corn, sugar cane, and sweet potatoes have been obtained.

The value of land of this type is dependent upon the character of the range, the quality and amount of merchantable timber, and the distance from improved roads, lines of transportation, and Jacksonville. It is held at prices ranging from $3 to $30 an acre.

Owing to the high cost of clearing, the difficulty of draining on account of the ditches filling up with the loose, wet sand, and the inferior quality of the soil, the greater part of this type is best suited to grazing and forestry. For improving and maintaining the fertility of the Leon fine sand, the establishment of adequate drainage, the use of heavy applications of lime or ground limestone, and the plowing under of organic matter, preferably in the form of stable manure or legumes, will be absolute necessities.

*Leon fine sand, loamy phase.*—The Leon fine sand, loamy phase, consists of a gray to dark-gray loamy fine sand, 6 to 10 inches deep, grading into a grayish to almost white loamy fine sand, which passes at about 18 to 24 inches into a brown, dark-brown, or rusty-brown and sometimes black, hardpan layer. This averages from 3 or 4 inches in thickness but ranges from 2 to 24 inches, and is underlain by a gray or mottled grayish and yellowish loamy fine sand. From 30 to 36 inches the sand usually has a small content of clay, which gives the material a slight stickiness.

As mapped this phase is somewhat variable. In many places it is interrupted by small, depressed bodies of the Bladen fine sand. In many of the lower situations the subsoil has a uniform drab or gray color below the hardpan, and in other places the color is a uniform yellow or may be a mottling of gray and various shades of yellow and brown.

The phase is well represented and occurs in both large and small bodies in a broad region which extends through the center of the county from the St. Johns County line to the Nassau County line.

The topography is level to flat and the drainage is poor, the ground-water table being near the surface. The soil is often soggy or covered with standing water during rainy periods.

This is an important soil agriculturally, though probably only 1 per cent of it is cultivated. The rest is used as an open range for beef cattle and hogs. The native vegetation consists of Cuban pine, saw palmetto, gallberry, wire grass, broom sedge, and false huckleberry. The Cuban pine is boxed for turpentine and is cut for crossties, logs, and fuel.

Where the phase has received an application of 2 to 4 tons per acre of ground limestone or 1 to 2 tons of air-slaked lime to correct the acidity, very fair yields of corn, sugar cane, sweet potatoes, and velvet beans have been produced. Corn occupies the largest acreage, and yields 12 to 45 bushels per acre, averaging about 25 bushels. The farm practices common to the county are followed on this type.

Unimproved land of the Leon fine sand, loamy phase, varies in selling price from $5 to $35 an acre, depending principally upon location with respect to Jacksonville and shipping points, the condition of the roads, and the amount and quality of marketable timber.

The Leon fine sand, loamy phase, can be made fairly productive. Means of improvement include liming, artificial drainage, and breaking the hardpan layer, which obstructs the movement of moisture. While the acidity is always sufficient to be detrimental to the growing of the staple crops, the degree varies decidedly, the amount of acid in the

surface soil and the upper subsoil being dependent upon the nearness of the hardpan or brown-colored layer to the surface. The lime requirement for this soil varies from about 6 tons of ground limestone per acre or about half as much of quicklime, where the brown layer is within 10 to 14 inches of the surface, to 3 tons of ground limestone per acre where the hardpan occurs at a depth of 24 to 30 inches. After a few years of cultivation the organic matter in the surface soil is largely depleted, and the soil assumes a light-gray color. In general the soil needs the incorporation of large quantities of vegetable matter. Owing to the fact that cowpeas are usually affected by the root knot, it has been found preferable to use the velvet bean as a soil builder.

### ST. JOHNS FINE SAND.

The surface soil of the St. Johns fine sand consists of a dark-gray to black fine sand, 5 to 10 inches deep, overlying a light-gray to dingy-gray fine sand, which, at depths ranging from 12 to 30 inches, though usually at about 16 to 22 inches, passes into a dark-brown or rusty-brown or black, compact fine sand or so-called hardpan. This hardpan layer, averaging 3 or 4 inches in thickness, but with a range of 1 to 24 inches, is underlain by a dark-gray fine sand, which grades abruptly into a wet, gray fine sand. The black color of the surface is due to the presence of organic matter, the content of which varies from merely enough to impart a dark color to quantities sufficient to give a mucky character. East of Tiger Ridge both the soil and subsoil, with the exception of the hardpan layer, are incoherent and flow like quicksand when saturated. To the west of this ridge, where the type is associated with the Bladen soils or the Leon fine sand, loamy phase, both the soil and subsoil, except the hardpan layer, show a distinct loaminess, and in places there is a slight stickiness and a mottled gray and yellow color below the hardpan layer in the lower subsoil.

The St. Johns fine sand occurrs in small to rather large areas in all parts of the county, being more conspicuous in the vicinities of Sal Taylor Creek, Braddock School, Salamander Landing, Powers Bay, and Durbin Swamp. It occupies level flatwoods areas that have very poor drainage. The land is low and flat and does not have sufficient slope for run-off, so that the water seeps to the depressions, swamps, or branches, or is removed by evaporation.

The St. Johns fine sand is not cultivated; it is a part of the open range and is used mainly for grazing. The forest is practically all Cuban pine, which is found on all areas of the type. It is usually boxed for turpentine and in many cases is being cut for logs, crossties, and fuel. Scrub saw palmetto, gallberry, wire grass, and broom sedge grow in most places.

The type has a value of $3 to $30 an acre, depending on the stand and quality of timber and the nearness to shipping points and Jacksonville.

Where the soil and subsoil, except the hardpan layer, flow like quicksand when wet, this land should remain in forest and permanent grazing land; but where there is a distinct loaminess throughout the soil section, with the exception of the brown to black hardpan layer, it could be made fairly productive by draining and liming, and by breaking the hardpan layer, which obstructs the movement of

moisture. The fertilizer requirements and methods of improvement necessary are essentially the same as those suggested for the Leon fine sand, loamy phase.

### ST. LUCIE FINE SAND.

The surface soil of the St. Lucie fine sand is a very light gray or white, incoherent fine sand, about 3 inches deep, underlain by a very light-gray to white fine sand to a depth of 36 inches or more. No hardpan is encountered within the 3-foot section, but in places it occurs at lower depths. There is a distinct variation of the subsoil near St. Johns Bluff, on Talbot Island, and west of Atlantic and Pablo Beaches, where a brown to black layer, commonly known as hardpan, occurs at a depth of 32 to 36 inches.

The St. Lucie fine sand is found in a number of small, scattered bodies in the eastern half of the county. It usually occurs in areas of the Leon fine sand, occupying long, narrow ridges running parallel with the coast line. In the vicinity of St. Johns Bluff the topography becomes hilly and shows evidence of wind erosion and deposition.

Because of its excessive drainage and lack of organic matter, this land is practically worthless for ordinary crops and is not farmed. The predominating tree growth is a scrubby evergreen oak. The undergrowth consists of saw palmetto, rosemary, and oak runner.

While it would be possible, through the incorporation of large amounts of organic matter and heavy fertilization, to grow the crops common to the area, it would not be practical to incur the expense of clearing and preparing this land for cultivation. Farther south along the east coast of Florida, where the climatic conditions are favorable, this soil, with heavy fertilization, is used for the production of pineapples, oranges, and light truck crops.

*St. Lucie fine sand, hammock phase.*—The St. Lucie fine sand, hammock phase, to a depth of 2 to 4 inches, is a light-gray to gray, incoherent fine sand, in places slightly darker at the surface owing to a higher content of organic matter. The subsoil to a depth of 36 inches or more is a very light gray to white, loose fine sand. At St. Johns Bluff a very compact shell formation is encountered in places at depths ranging from 4 to 7 feet.

The phase occurs at St. Johns Bluff, 3 miles north of Dosia, on the north shore of Fort George Island, and along Trout Creek north of Panama Park. The surface is rolling at St. Johns Bluff, but gently sloping elsewhere. The porous structure permits the rainwater to pass rapidly downward, resulting in excessive drainage.

Possibly 2 per cent of this phase is cultivated. A distinguishing characteristic of this soil is its hammock growth, consisting principally of live oak, cabbage palmetto, magnolia, and hickory. At St. Johns Bluff and on Fort George Island the hammock growth may be due in part to the presence of a shell formation underlying the fine sand. The suggestions made for the improvement of the typical St. Lucie fine sand are applicable also to this phase.

### LAKEWOOD FINE SAND.

The Lakewood fine sand is a light-gray to almost white, incoherent fine sand, which in places is gray at the surface owing to a larger content of vegetable matter. This is underlain at about 20 inches by a yellow or orange-yellow fine sand, extending to a depth of over 3 feet.

Included with this type are areas developed on Talbot and Fort George Islands, which vary from the type. Here the surface soil to a depth of about 6 inches is a light-gray fine sand containing large quantities of oyster-shell fragments, and the surface is thickly strewn with shell fragments, but the subsoil is almost free from shell and is essentially the same as that of the typical Lakewood fine sand in texture, structure, and color. The shell fragments are probably the remnants of shells spread on the land prior to 1819 by Spanish settlers.

This type occurs in irregular areas south of Weldbow Landing, on Fort George, Talbot, Black Hammock, Pelotes and other islands. Near the coast in the vicinity of Pablo Beach and Atlantic Beach it occupies low, long narrow ridges running parallel with the coast line.

The topography of the Lakewood fine sand ranges from flat to undulating or ridgy. The drainage is excessive.

The type is not cultivated, but is used as open range for stock. It is characterized by a dense growth of scrubby evergreen oak, with an undergrowth of saw palmetto, rosemary, and oak runner.

Owing to its low content of organic matter and its porous and loose structure, this type in general can best be used for grazing; but it can be improved by the addition of organic matter through the turning under of leguminous cover crops or coarse manures in conjunction with a liberal use of commercial fertilizer. The Lakewood fine sand is a very important truck and citrus-fruit soil farther south along the east coast of Florida.

### BLANTON FINE SAND.

The Blanton fine sand is a gray fine sand or loamy fine sand passing at about 6 inches into a pale-yellow fine sand or loamy fine sand with light-gray or white splotches. This is underlain at about 30 inches by a yellow loamy fine sand, which in places is slightly sticky at a depth of 36 inches.

This type is associated with the Norfolk and the Leon soils, generally occurring as a gradational soil between the types of these series. It is also found as isolated tracts in areas of Leon soils, standing slightly above the latter. The type, though not extensive, is well distributed throughout the western half of the county. The surface is flat to gently undulating and the drainage is fair to poor.

Probably 5 per cent of the Blanton fine sand is under cultivation; the rest is part of the open range and is used as pasture. The tree growth consists of Cuban pine and blackjack oak. Corn, sweet potatoes, and sugar cane, the leading crops, do moderately well. Oats, velvet beans, cowpeas, and peanuts are grown to a small extent. The crops grown on this type and the yields obtained, as well as the methods of treatment, are about the same as on the Norfolk fine sand. Uncleared land ranges in value from $4 to $20 an acre.

### PLUMMER FINE SAND.

The Plummer fine sand consists of a gray to dark-gray fine sand with a depth of about 5 inches. The material at the immediate surface carries considerable organic matter, giving it a dark color and loamy feel. The subsoil is a light-gray or dingy-gray fine sand extending to depths of more than 3 feet. There is considerable variation in the structure of both soil and subsoil of this type in Duval County. In the western half the material usually has some compactness, while in the eastern half it is very incoherent and has the

nature of quicksand. In the vicinities of Maxville, Fiftone, Baldwin, Yellow Water Creek, Caldwell Branch, Brandy Bay, Whitehouse, Cambon, Pelham, Plummer, Dinsmore, and Joels Landing, where the type is closely associated with the Bladen fine sand, the soil and subsoil show a distinct loaminess. In the southwest corner of the county, and around Powers Bay and Durbin Swamp, the soil is similar to the Leon fine sand in being extremely acid. Here the subsoil is a gray, loose fine sand, darkened by a substance that approaches the hardpan layer of the Leon and St. Johns soils.

The Plummer fine sand occurs in comparatively large areas west of Dinsmore, Whitehouse, and Pelham and east of Bayard. Small areas are scattered throughout the county.

The topography is prevailingly low and flat. The drainage, because of the nearness of the ground water to the surface, is very poor, and the soil is water-logged except during dry periods.

The Plummer fine sand is unimportant in the agriculture of the county. Possibly one-fourth of 1 per cent of this soil is cultivated, and this is of the variation that approaches the Bladen fine sand, where a slight loaminess characterizes both soil and subsoil. Practically all of the type is open range for cattle and hogs. A scattered growth of Cuban pine is used for turpentining, crossties, and sawlogs.

The Plummer fine sand is devoted to the general type of farming prevailing in the county, consisting of the growing of corn, sugar cane, and sweet potatoes in conjunction with the raising of cattle and hogs on the open range. The unimproved land has a value of $3 to $20 an acre.

Owing to the incoherency and quicksand nature of both the soil and subsoil, the nearness of the ground water to the surface, and the inferior quality of the soil, the greater part of this type is best suited to grazing and forestry. However, the more compact and loamy variations, with thorough drainage and heavy fertilization, can be used for crops.

### PORTSMOUTH FINE SAND.

The surface soil of the Portsmouth fine sand consists of a dark-gray to black loamy fine sand, 6 to 12 inches deep. The subsoil is a light-gray loamy fine sand, which is mottled here and there with various shades of yellow in the lower subsoil. In places a slight stickiness occurs at a depth of about 3 feet. In the vicinity of Pablo Beach the subsoil is a light-gray to dingy-gray, incoherent fine sand. The lower subsoil is usually saturated, and where exposed the material has a tendency to flow like quicksand. One mile west of Manhattan Beach there is an area of about 10 acres covered with a hammock growth of live oak, hickory, magnolia, and bay. Here the soil is a black loamy fine sand, passing at about 10 inches into a gray fine sand, which may continue to a depth of 3 feet or more, but in many places a bed of coquina shell is encountered at depths of 30 to 36 inches. A prairie development of this type occurs one-half mile west of Fulton and 1 mile southwest of Bayard.

The type has a relatively small total area. The principal bodies occur between Brandy Bay and Whitehouse and in the vicinities of McGirts and Sal Taylor Creeks, Loretto, Hogan, and Pablo Beach. The surface is flat and wet, and without artificial drainage this soil can not be used for general farming. The vegetation consists of Cuban pine, wire grass, bunch grass, and broom sedge.

This type is not cultivated, but is used as open range. When drained all the areas having the loamy soil and subsoil will be almost as productive as the Bladen fine sand. The suggestions offered for the improvement of the Bladen fine sand are applicable to this type.

*Portsmouth fine sand, swamp phase.*—The Portsmouth fine sand, swamp phase, consists of 5 to 12 inches of dark-gray to black loamy fine sand to black mucky fine sand, passing into a light-gray to dingy-gray, incoherent fine sand, which continues to a depth of more than 3 feet.

The phase as mapped is not uniform, but contains a number of variations. In many of the areas, especially the larger ones, throughout the county, the surface soil consists of black finely divided muck and fine sand to a depth of 6 to 22 inches. Where the soil occurs within one-half mile or less of areas of the Bladen soils or the Leon fine sand, loamy phase, the soil is more loamy than typical and the subsoil is a gray, loamy, rather compact fine sand. Many small areas similar to the Hyde fine sand are included with this phase. In these areas both the soil and subsoil have a dark-gray to black color throughout and are usually of a mucky nature. The material of the subsoil in the eastern part of the county is generally incoherent and flows like quicksand when wet. A number of small bodies of a swamp phase of Plummer fine sand, occurring mainly in the eastern part of the county, have been included in this phase as mapped. In these the surface soil is a gray fine sand and the subsoil is a light-gray to dingy-gray, incoherent fine sand to a depth of more than 3 feet.

The Portsmouth fine sand, swamp phase, is the most extensive of the swampy soils and is developed in all parts of Duval County except in those parts occupied mainly by the Bladen soils and the loamy phase of the Leon fine sand. It occurs along stream courses where the flow is intermittent and sluggish, and in shallow basins. Drainage is very poor, the land being submerged during the wet season.

In the large areas and along stream courses the phase is usually characterized by a heavy growth of cypress, bay, hickory, water oak, sweet gum, black gum, swamp maple, ash, slash pine, black pine, myrtle, cabbage palmetto, and magnolia, and in places by an almost impenetrable network of bamboo vines, briers, and shrubs. In many of the small shallow basins the tree growth consists of Cuban pine and slash pine, with cypress in the wetter parts.

A few acres of the phase, where it is loamy in both soil and subsoil, have been drained and put under cultivation, and have proved productive, giving excellent yields of corn, onions, cabbage, and strawberries. Rather heavy applications of lime are necessary to put the soil in the most productive condition.

### PALM BEACH SAND.

The Palm Beach sand, to a depth of 5 to 10 inches, consists of a gray to dark-gray fine sand with considerable loose organic matter. The subsoil is a grayish-brown or speckled grayish and brownish, shelly fine sand, which usually extends to a depth of 24 to 36 inches, where it grades into beds of coquina, consisting of stratified shell fragments, principally of the coquina clam, but to a less degree of the conch, oyster clam, and other shell-bearing mollusks. The strata vary from well-cemented shell rock to loose shell fragments. The

white and brown shells give a speckled appearance to an exposed section.

Included with this type are areas on Black Hammock, Pelotes, Fort George, Fanning, and Pine Islands, and small areas at Weldbow Landing and along the east shore of Mill Cove, where the soil is similar to the Dade fine sand. The surface soil consists of a gray to dark-gray fine sand, underlain at about 4 to 8 inches by a light-gray to almost white fine sand, which rests, usually at depths of 24 to 36 inches, upon a formation consisting largely of cemented oyster shells. Shells are abundant thoughout the soil section.

The only occurrence of the typical Palm Beach sand is in a low, narrow ridge extending parallel with the coast line from East Mayport to Atlantic Beach. The drainage is excessive, water passing down rapidly through the porous soil and subsoil.

This type is not farmed, but is a part of the open range. It supports a heavy hammock growth of live oak, hickory, cabbage palmetto, magnolia, bay, and some cedar.

### PEATY MUCK.

Peaty muck consists of dark-brown to black, fibrous to rather finely divided vegetable matter mixed with small amounts of mineral matter, mainly fine sand. At depths ranging from 1 foot to several feet this is underlain by a black, loamy fine sand, which quickly grades into a gray fine sand. In Baldwin Bay and a few other places, where the Peaty muck is associated with the Bladen fine sandy loam, the underlying stratum is a sandy clay. Included with the Peaty muck are many areas of Peat, in which the partly decayed vegetable matter is more than 3 feet deep and almost free from grit.

The Peaty muck is developed in large areas in Baldwin Bay and Gum Swamp and between Hogan and Center Park. Small areas are scattered throughout the county. The type occurs in swampy depressions and in swamps along streams.

Peaty muck is not farmed. The forest growth consists mainly of red bay, which ranges in size from bushes to fairly large trees, cypress, slash pine, ash, sweet gum, black gum, swamp maple, titi, magnolia, and hickory, with a dense undergrowth of bamboo vines, myrtle, briers, smilax vines, and sphagnum moss. This forest supplies mast for hogs.

The value of the Peaty muck land depends largely upon the stand and quality of cypress and other marketable timber.

Until drained this soil can not be used for farming. With drainage, the application of lime to correct the acidity, and the proper use of fertilizers it can be used for the production of celery, onions, corn, cabbage, tomatoes, and Irish potatoes.

### SWAMP.

Swamp constitutes the flood plains along the creeks and larger branches and other low-lying areas that are more or less covered with water throughout the year. It comprises such an intermingling of soils that it is practically impossible to separate them into series and types. In many places the surface material is mucky, or it may be Peaty muck or Peat. The material in the flood plains of streams is often a mixture of soils, including the Bibb fine sand, a light-gray

fine sand extending to a depth of 3 feet or more; the Ochlockonee fine sand, a brown loamy fine sand underlain by a mottled brownish, yellowish, and gray fine sand; and the Johnson fine sand, a dark-gray fine sand passing into a gray or mottled brownish, yellowish, and gray fine sand. Where the Swamp soils are associated with the Bladen fine sandy loam, the lower subsoil is usually a sandy clay. The water in the swamp south of the Dixie Highway and along Julington Creek is influenced by the tides.

Swamp areas occur in all parts of the county. The largest are in Durbin Swamp, Powers and Tiger Bays, along Thomas and Julington Creeks, in the vicinity of Braddock School, and between Baldwin and Otis.

This land is not farmed, but is a part of the open range. It supports a heavy tree growth of cypress, slash pine, water oak, bay, magnolia, hickory, sweet gum, black gum, ash, water maple, elm, cabbage palmetto, tulip, persimmon, titi, and ironwood. Cypress is the predominating tree in the wetter swamps.

The value of Swamp depends mainly on the quantity and quality of the forest growth.

If well drained, some of the Swamp would become very good farm land, especially in the areas that have a sandy clay in the lower subsoil.

### COASTAL BEACH.

The Coastal beach materials consist of light-gray to whitish, incoherent, siliceous fine or medium sand mixed with small quantities of broken shells. In basinlike areas, occurring between ridges and sand dunes, the surface material has a dark-gray color, owing to the presence of organic matter.

The Coastal beach is confined to a belt that varies in width from 100 yards to 2 miles and extends along the coast from the St. Johns County line to Nassau Sound. In general the topography consists of a series of broken sand-dune ridges running parallel with the coast, with the exception of the low sand flats, which are frequently swept by the waves, at the south end of Little Talbot Island, on the island south of Fort George Inlet, and at St. Johns Point.

Coastal beach is not farmed and furnishes only a small amount of grazing in the swampy areas between dunes. Because of the excessive drainage and the salt spray, the land will never be farmed. Its chief value is for residence and resort sites near the ocean.

### TIDAL MARSH.

Tidal marsh includes the low-lying, wet areas that are subject to salt-water inundation at times of high tide. The soils vary from fine sand to fine sandy loam, Peat, Peaty muck, and Muck.

Tidal marsh occupies extensive areas along the Nassau River, up the St. Johns River as far as Eastport, along Pablo Creek, and between Pumpkin Hill Creek and the ocean. Except for a little grazing, the Tidal marsh is nonagricultural. The inundation by sea water has brought about such a salty condition that when the surface dries crystals of salt are formed. The salt is sufficient to preclude the growth of plants other than those of a salt-tolerant character. Salt weed and sword grass are the characteristic plants. Expensive diking, which would be impracticable under present conditions, would be necessary to reclaim this marsh land.

### MADELAND.

Madeland in this area comprises a number of long narrow islands along the channel of St. Johns River, between Jacksonville and the ocean, and in the lower lying districts of Jacksonville, where the material dredged out of the St. Johns River channel has been dumped. The material is a loose, highly siliceous, light-gray fine sand throughout the 3-foot section. It has no agricultural value.

### SUMMARY.

Duval County lies in the northeast corner of Florida. It has an area of approximately 782 square miles, or 500,480 acres.

The county consists of an almost level to gently undulating flatwoods region, broken by low, isolated ridges and by belts of low, narrow ridges along the coast, the St. Johns River, and its principal tributaries.

The first settlement was made in 1791 near the site of Jacksonville, and the county was established in 1822.

Jacksonville, the county seat, with a population of 91,558, is the largest and most important city and seaport in the State.

The transportation facilities are good. Eight railroads operate in the county,and steamboats run regularly between Jacksonville and Habana, Brunswick, Savannah, Charleston, Baltimore, New York, and Boston. The county is fairly well supplied with hard-surface roads.

The climate is subtropical. The mean annual precipitation is 53.25 inches. The mean annual temperature is 68.2° F. The growing season is about 9 months.

Most of the land is owned in large tracts. About 13 per cent of the area of the county is in farms, of which 20.6 per cent is improved. About 82.3 per cent of the farms are operated by the owners.

The present agriculture of Duval County consists of general farming and stock raising, principally cattle and hog raising on the open range.

Corn, sweet potatoes, and sugar cane are the principal crops. Velvet beans, cowpeas, peanuts, Irish potatoes, upland rice, oats, rye, Japanese cane, sorghum, soy beans, snap beans, lima beans, Johnson grass, Bermuda grass, carpet grass, Napier grass, Sudan grass, crimson clover, bur clover, milo, and kafir are supplementary crops grown mainly for home use and for forage.

The soils of Duval County are prevailingly sandy and poorly drained, although in topography and drainage there is a range from shallow, undrained basins, through flat, poorly drained to excessively drained ridges. The soils fall principally in the Bladen, Norfolk, Leon, St. Johns, St. Lucie, Lakewood, Blanton, Plummer, Portsmouth, and Palm Beach series. Some of the soils in areas along streams, though mapped in the Bladen, Plummer, and Portsmouth series, are really alluvial in origin. The Peaty muck is the only representative of the cumulose group.

The Bladen fine sand is extensively developed throughout the western half of the county, and is the most important soil type of the survey. When drained, it is well adapted to all crops common to the area. The Bladen fine sandy loam is the best soil of the county for Irish potatoes.

The Norfolk soils generally occur on low ridges and are well drained. A larger acreage of these soils is under cultivation than of any other series of the county. Corn, sweet potatoes, and sugar cane are the principal crops. The yields on the hammock and shell phases are a little better than on the typical Norfolk fine sand. The hilly phase is not cultivated.

The Leon fine sand is the most extensive type of the area. While the typical soil is not cultivated and is considered poorly adapted to crops, the loamy phase, after draining, liming, and breaking the hardpan layer of the subsoil, is next to the Bladen soils in crop production.

The St. Johns fine sand is well distributed throughout the area. It is not farmed, but where associated with the Bladen soils or the loamy phase of the Leon fine sand, it is more loamy than typical and would be fairly productive after draining, liming, and breaking the hardpan layer of the subsoil.

The St. Lucie fine sand is almost white in color. Because of its lack of organic matter and its excessive drainage it is considered almost valueless for crops.

The Lakewood fine sand, because of its low content of organic matter and its porous and loose structure, can best be used for grazing.

The Blanton fine sand occupies flat to gently undulating areas and the drainage is imperfect to fair. About 5 per cent of it is cultivated, the remainder being used as an open range for cattle and hogs. Corn, sweet potatoes, and sugar cane, the leading crops, do moderately well.

The Plummer soils are characterized by their light-gray to dingy-gray, incoherent subsoil and poor drainage. The greater part of the Plummer fine sand is best suited to grazing and foresty. Only the more compact and loamy variations are suitable for farming.

The Portsmouth soils are inextensive, flat, poorly drained, and undeveloped. The more loamy variations, when drained, will be adapted to corn and truck crops.

The Palm Beach sand has a gray to brown, shelly fine sand subsoil, which grades into stratified coquina shell beds at a depth of 24 to 36 inches. It occurs in a low ridge, is excessively drained, and is not farmed.

The Peaty muck consists of partly decomposed vegetable matter mixed with a small amount of mineral matter. It occurs in swamps and bays and is not farmed. With drainage and the application of lime, it will be found adapted to such crops as celery, onions, corn, cabbage, tomatoes, and Irish potatoes.

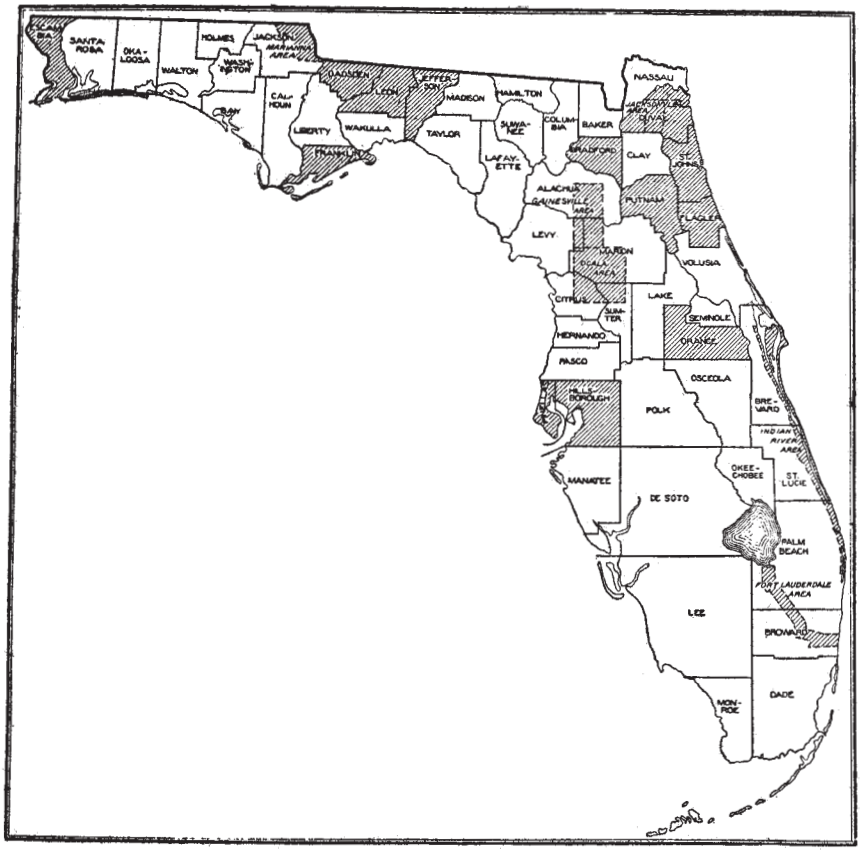
Swamp consists of the flood plains along the creeks and larger branches, and other low-lying areas that are more or less covered with water throughout the year, and comprises such an intermingling of soils that it is practically impossible to separate them into series and types.

Coastal beach includes a series of long, narrow sand-dune ridges along the coast. It has no agricultural value, except as supplying a little grazing in the swampy areas between sand dunes.

Tidal marsh consists of extensive salt marshes in the eastern and northern parts of the county. Except for a little grazing, it is non-agricultural.

Madeland constitutes a number of long narrow islands in the St. Johns River, consisting of sand dredged out of the river channel. The material has no agricultural value.

○




Areas surveyed in Florida, shown by shading.

# Accessibility Statement

This document is not accessible by screen-reader software. The Natural Resources Conservation Service (NRCS) is committed to making its information accessible to all of its customers and employees. If you are experiencing accessibility issues and need assistance, please contact our Helpdesk by phone at (800) 457–3642 or by e-mail at ServiceDesk-FTC@ftc.usda.gov. For assistance with publications that include maps, graphs, or similar forms of information, you may also wish to contact our State or local office. You can locate the correct office and phone number at http://offices.sc.egov.usda.gov/locator/app.

The U.S. Department of Agriculture (USDA) prohibits discrimination against its customers. If you believe you experienced discrimination when obtaining services from USDA, participating in a USDA program, or participating in a program that receives financial assistance from USDA, you may file a complaint with USDA. Information about how to file a discrimination complaint is available from the Office of the Assistant Secretary for Civil Rights. USDA prohibits discrimination in all its programs and activities on the basis of race, color, national origin, age, disability, and where applicable, sex (including gender identity and expression), marital status, familial status, parental status, religion, sexual orientation, political beliefs, genetic information, reprisal, or because all or part of an individual's income is derived from any public assistance program. (Not all prohibited bases apply to all programs.)

To file a complaint of discrimination, complete, sign, and mail a program discrimination complaint form, available at any USDA office location or online at www.ascr.usda.gov, or write to:

USDA
Office of the Assistant Secretary for Civil Rights
1400 Independence Avenue, S.W.
Washington, DC 20250-9410

Or call toll free at (866) 632-9992 (voice) to obtain additional information, the appropriate office or to request documents. Individuals who are deaf, hard of hearing, or have speech disabilities may contact USDA through the Federal Relay service at (800) 877-8339 or (800) 845-6136 (in Spanish). USDA is an equal opportunity provider, employer, and lender.

Persons with disabilities who require alternative means for communication of program information (e.g., Braille, large print, audiotape, etc.) should contact USDA's TARGET Center at (202) 720-2600 (voice and TDD).