

U. S. DEPARTMENT OF AGRICULTURE,
BUREAU OF SOILS—MILTON WHITNEY, Chief.

SOIL SURVEY OF HILLSBOROUGH COUNTY,
FLORIDA.

BY

CHARLES N. MOONEY, IN CHARGE, T. M. MORRISON,
GROVE B. JONES, E. C. HALL, AND N. M. KIRK.

W. EDWARD HEARN, INSPECTOR, SOUTHERN DIVISION.

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



WASHINGTON:
GOVERNMENT PRINTING OFFICE,
1918.

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LETTER OF TRANSMITTAL

U. S. DEPARTMENT OF AGRICULTURE,
BUREAU OF SOILS,
Washington, D. C., August 9, 1917.

SIR: In the extension of the soil survey in the State of Florida work was undertaken in Hillsborough County and completed during the field season of 1916.

The accompanying report and map cover this survey and are submitted for publication as advance sheets of Field Operations of the Bureau of Soils for 1916, as authorized by law.

Respectfully,

MILTON WHITNEY,
Chief of Bureau.

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

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MAP.

Soil map, Hillsborough County sheet, Florida.

SOIL SURVEY OF HILLSBOROUGH COUNTY, FLORIDA.

By CHARLES N. MOONEY, In Charge, T. M. MORRISON, GROVE B. JONES,
E. C. HALL, and N. M. KIRK.—Area Inspected by W. EDWARD HEARN.

DESCRIPTION OF THE AREA.

Hillsborough County is situated in the west-central part of the Florida Peninsula. It is bounded on the north by Pasco and Polk Counties, on the east by Polk County, and on the south by Manatee County. Pinellas County borders the county on the west for a distance of about 12 miles south of the north county line. The remainder of the western boundary follows a curved line drawn through the middle of Tampa Bay. All the land boundaries follow the township and range lines established in the survey of the State. Tampa Bay extends well into the county from the southwest. A peninsula, averaging about $2\frac{1}{2}$ miles wide, reaches south from the vicinity of Tampa for a distance of about 9 miles, separating upper Tampa Bay into two parts, the east one being known as Hillsborough Bay and the west and larger one as Old Tampa Bay. Hillsborough County embraces a total land area of 1,045 square miles, or 668,800 acres.

The topographic range in Hillsborough County is from level to rolling and hilly. The bay is bordered by distinct tidal marshes, beyond which is a belt of low coastal flatwoods, several miles wide, ascending gradually toward the interior. This belt has very little relief. Inland from the narrow belt of flatwoods the surface rises rapidly to the rolling to undulating uplands of which the greater part of the county consists. The boundary between the flatwoods and the uplands extends approximately from the northwest to the southeast corner of the county.

North and northwest of Tampa the surface is undulating or slightly billowy, and there are numerous depressions occupied by ponds and lakes. To the southeast, along the Hillsborough River

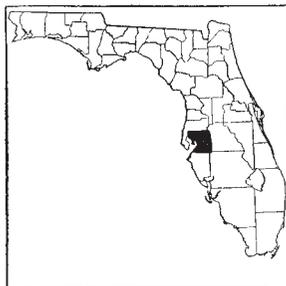


FIG. 1.—Sketch map showing location of the Hillsborough County area, Florida.

and between Lake Thonotosassa and Tampa, the country is rolling to hilly. Northeast of Tampa the surface in large part is hilly or hillocky and in part billowy, with deep basin and sinklike depressions, in some of which are ponds and lakes. Many of the slopes are steep, but as a rule not too steep for cultivation. The highest elevation attained in this rougher part of the county is probably 100 feet above sea level. To the southeast the surface of the upland division is as a whole more gently undulating.

Toward the east the surface has less relief, consisting of flat country or of low, ridgy interstream areas with large bodies of typical flatwoods, especially in the southern part of the county, in the section east of Hillsborough River, as well as on both sides of Blackwater Creek. The surface of this section rises slightly to the east. A State geological map shows an elevation of 150 feet or more above sea level in the northeastern part of the county. This section like the more rolling upland section is also characterized by a large number of depressions of varying size, consisting at present mainly of prairies formed by the silting up of lakes and ponds, and innumerable cypress swamps or bays. Along the larger streams or creeks in this section there are more or less swampy bottom lands, in part typical and in part indistinct, and usually consisting of hammock areas.

The drainage of Hillsborough County is carried into Tampa Bay. In their upper courses most of the streams, even some of the rather large creeks, are intermittent, or consist of a series of pools, the water reaching the streams by seepage. The principal streams are the Hillsborough, Alafia, and Little Manatee Rivers, and Rocky, Sweetwater, and Sixmile Creeks. Except for the larger streams that pass through it the flatwoods section has no well-marked drainage ways, the water being removed slowly through slightly depressed sloughs. This section is marked by a great number of small, grassy depressions that hold water during the wet season and are dry or nearly so during the dry season, the water escaping largely by evaporation. The higher, billowy uplands are conspicuous for the absence of flowing streams, the depressions being occupied by ponds and lakes which receive the seepage from the porous sands of the surrounding highlands, and are probably supplied in part by springs. Their waters are either removed by subterranean outlets in the underlying limestone or through porous beds of the surrounding lands, emerging on the outer slopes as seepage places or springs.

The permanent settlement of Hillsborough County began a few years prior to 1850. The early settlers came from the near-by States, mainly Georgia and North and South Carolina. A little later settlers came from more distant States, and in the seventies, eighties, and early nineties there was considerable immigration. This was

interrupted by the freeze of 1894-95. In recent years, especially since small parcels of land have been offered for sale by development companies, the population has greatly increased, nearly all sections of this country, as well as Canada, contributing. In Tampa there are large numbers of Italians and Cubans and some Spaniards.

According to the census of 1910, Hillsborough was the leading county in the State in population, having 78,374 inhabitants, but the county at that time included the territory taken to form Pinellas County in 1911. Of this total, 37,782 were credited to Tampa, 4,127 to St. Petersburg (now in Pinellas County), and 2,481 to Plant City. These places have grown rapidly since that time. About one-fifth the population in 1910 was colored. Large areas in the more remote parts of the county are unoccupied.

Tampa, the county seat, is the second largest city in the State. It is an important cigar manufacturing center, and seaport and railroad terminal. Plant City, in the eastern part of the county, 22 miles from Tampa, is in an important agricultural section. Port Tampa City, Dover, Seffner, Sydney, Valrico, Brandon, Limona, Wimauma, Knights, Thonotosassa, and Stemper are small railroad towns.

The county has exceptionally good transportation facilities, both water and rail. Passenger and freight boats ply regularly between Tampa and Gulf and Atlantic points, as well as foreign ports, lumber and phosphate rock being important exports. Two railroad trunk lines, the Seaboard Air Line Railway and the Atlantic Coast Line Railroad, have docks at Tampa and Port Tampa City, respectively. A branch of the Atlantic Coast Line extends to Lake Thonotosassa, an important citrus-fruit producing section, and a branch of the Seaboard Air Line extends from Turkey Creek, near Plant City, into the southern part of the county. The Tampa Northern is a new railroad extending north from Tampa and is a branch of the Seaboard Air Line. The Tampa & Gulf Coast, a recently constructed line, connects Tampa with Clearwater, St. Petersburg, and other points in Pinellas County.

The public road system of the county is rapidly being improved. Graded roads are being constructed in all sections, following land lines as far as possible. A considerable mileage has been surfaced either with shell or limestone macadam, and during the past season (1915) 62 miles of brick pavement were laid outside the city of Tampa. Telephones are in use throughout the country.

The greater part of the truck crops grown around Tampa is sold in that city. Gary, a suburb of Tampa, is an important shipping point for celery, and Plant City for strawberries. Most of the citrus fruit, the production of which is large, is shipped to outside markets.

CLIMATE.

Hillsborough County has a subtropical climate. The mean annual temperature is 70.4° F. The summers are long, but not excessively hot, the heat being greatly modified by cool breezes from the Gulf. The winters are mild and pleasant as a rule, with occasional periods of moderately cool weather known as "northers," which last for a few days at a time. The temperature sometimes drops suddenly, but it rarely goes much below the freezing point. Occasionally thin ice is formed, and at rare intervals snow flurries occur. Tender vegetables and citrus fruits sometimes are damaged by frost. In the severe freeze of 1894-95 most of the citrus trees in this section were frozen down.

The average date of the last killing frost in the spring is February 8, and that of the first in the fall January 9, giving a normal growing season of about 11 months. The latest spring frost of which there is a record occurred on March 19 and the earliest fall frost on November 28. Vegetables are more likely to be injured by frost in the fall than in the spring.

The average annual rainfall is reported by the Weather Bureau station at Tampa as 51.49 inches, with a range from 89.86 inches for the wettest year on record to 32.25 inches for the driest year. The rainfall is not evenly distributed, being much more abundant in summer than in winter, so that the former is referred to as the wet season and the latter as the dry season. The rain frequently is torrential. The rainy season begins in June and continues into September, the normal rainfall for these 4 months amounting to 32.28 inches. The precipitation is lightest in April and November. Owing to the irregular occurrence of the rainfall, crops are likely to suffer from lack of moisture unless irrigated.

The accompanying table, compiled from the records of the Weather Bureau station at Tampa, gives the normal, monthly, seasonal, and annual temperature and precipitation for Hillsborough County.

Normal monthly, seasonal, and annual temperature and precipitation at Tampa.

Month.	Temperature.			Precipitation.		
	Mean.	Absolute maximum.	Absolute minimum.	Mean.	Total amount for the driest year.	Total amount for the wettest year.
	° F.	° F.	° F.	Inches.	Inches.	Inches.
December.....	59.5	83	19	2.29	0.39	0.56
January.....	57.4	82	23	2.56	2.14	2.60
February.....	60.9	86	22	2.88	1.10	1.00
Winter.....	59.3	86	19	7.73	3.63	4.16

Normal monthly, seasonal, and annual temperature and precipitation at Tampa—
Continued.

Month.	Temperature.			Precipitation.		
	Mean.	Absolute maximum.	Absolute minimum.	Mean.	Total amount for the driest year.	Total amount for the wettest year.
	° F.	° F.	° F.	Inches.	Inches.	Inches.
March.....	65.9	92	32	2.76	0.08	3.20
April.....	70.6	90	38	1.87	2.07	1.90
May.....	75.5	94	53	2.73	1.81	8.85
Spring.....	70.7	94	32	7.36	3.96	13.95
June.....	78.7	95	64	7.58	6.18	6.72
July.....	80.0	96	65	9.36	2.75	24.52
August.....	80.0	96	67	9.02	7.48	23.40
Summer.....	79.6	96	64	25.96	16.41	54.64
September.....	78.3	94	54	6.32	5.73	7.75
October.....	72.6	93	44	2.41	1.18	4.80
November.....	65.4	87	32	1.71	1.34	4.56
Fall.....	72.1	94	32	10.44	8.25	17.11
Year.....	70.4	96	19	51.49	32.25	89.86

AGRICULTURE.

The early settlers in Hillsborough County located on the well-drained hammock lands bordering the lakes and streams. Farming was necessarily confined to the production of sustenance crops, such as corn and vegetables, which were supplemented by game and fish. Settlement progressed slowly at first, the communities being small and widely scattered. The county was remote from other settled sections of the State, communication with which was largely by sailboat. Orange trees were set out at an early date in the Lake Thonotosassa settlement, but there was no market for the fruit at that time. Cattle and hog raising was gradually taken up, the county being in open range. With the building of railroads in the seventies the population increased rapidly, settlers coming from all parts of the United States, especially the North and Middle West. The growing of citrus fruits was extended and they became the cash crop.

According to the census, the value of orchard products in 1879 was \$49,268.¹ The main field crop was corn, which was grown on 4,968 acres, with a production of 48,719 bushels. There were 98 acres in

¹ Census figures include Pinellas County, which was not separated from Hillsborough County until 1911.

oats and 23 acres in rice. Sweet potatoes ranked next to corn in importance, being grown on 583 acres, with a production of 68,419 bushels. Cotton was grown on 556 acres, which produced 150 bales. An important crop at that time was sugar cane, which was grown on 238 acres, with a production of 35,366 gallons of sirup. No production of cotton is reported by the 1890 census, but the production of sugar cane is shown to have increased considerably, 81,700 pounds of sugar and 3,310 gallons of molasses having been made in that year. In the severe freeze of 1894-95, the greatest setback the agriculture of Florida has ever experienced, practically all the groves in the county were frozen down. The damage was only temporary, however, as the trees were of seedling stock, and sprouts sprang up from the roots and soon reached bearing age. The severity of the freeze is shown by the fact that the 1900 census gives the value of orchard products as only \$4,621. About the time of this check to citrus-fruit production a new industry, the growing of vegetables in the winter for northern markets, had begun to develop. The first carload shipment of celery from Florida to northern markets was made in 1894.

The increase of population in recent years has brought about development along all lines. At present the agriculture consists mainly of citrus-fruit growing and trucking, with general farming and stock raising carried on to some extent. Since the freeze of 1894-95 most of the seedling orange groves have been restored and additional groves have been planted. The larger bearing groves are in the vicinity of Lake Thonotosassa, the fruit from which is of excellent quality. There is also considerable development of the industry in the vicinity of Mango Lake, Limona, Brandon, Seffner, and Valrico. Groves are scattered throughout the extent of the Norfolk fine sand in favorable situations bordering ponds, lakes, and streams. In all the sections mentioned a great many trees have been set out in the last few years. Especially large groves have been established around Valrico, largely on the Gainesville fine sand. The later plantings consist entirely of budded varieties, principally the Pineapple and Hart, with some Parson and Ruby. The Parson is the earliest variety grown, being ready to pick in November. The Pineapple and Ruby are midseason varieties, maturing in January and February, and the Hart is a late variety, maturing in April and May. The bulk of the orange crop at present consists of a seedling variety developed in this section of the State. Its season is rather long; picking begins in November or December, but maximum production is not reached until January or February. The trees make a large growth, sometimes attaining a height of 30 feet in old groves, and unless care is exercised in fertilizing the fruit is large and coarse.

The seedling trees are subject to root rot, and for this reason they are being supplanted by budded varieties on the more resistant sour-orange stock. The new plantings include a large proportion of grape fruit, of which the principal varieties are the Marsh, Duncan, and Excelsior. There is also a considerable production of mandarins.¹ Kumquats are grown to some extent.

Strawberries and celery are the most important truck crops produced in the county. The section around Plant City is widely known for its strawberries. Approximately 700 acres in this section are devoted to the crop. Owing to the scarcity of pickers, plantings usually are restricted to what the grower's family can care for and pick and range in size from a fraction of an acre to 3 or 4 acres. The season extends from the latter part of November to about the first of April. The Missionary variety is grown exclusively. Yields range from 3,000 to 4,000 quarts per acre. With the exception of those grown in the vicinity of Tampa most of the berries are shipped to outside markets. Early in the season, when there are not sufficient berries for carload shipments, they are packed in specially designed refrigerator boxes holding 60 or 80 quarts. The cost of delivering berries in this manner to New York City is approximately 20 cents a quart, including express and icing charges. In carload lots they can be shipped much cheaper. Early in the season the berries bring as much as \$1.50 a quart in New York City, but after the holidays the price falls rapidly. Much of the crop is sold to buyers at the shipping point, the price varying with the market conditions. Some growers contract to sell their entire crop for a stipulated price throughout the season, ordinarily about 20 cents a quart, delivered at the platform washed and packed.

Most of the celery produced in the county is grown in the vicinity of Tampa, in the section around Gary. The crop is grown to some extent also near Mango Lake, in the drained prairie at Wimauma, and near Plant City. The principal variety is the Golden Self Blanching.

Snap beans are an important crop, especially around Plant City, where they are grown following strawberries. Acreage yields of 100 to 125 30-pound hampers are obtained. The most popular varieties are Woods Earliest, Red Valentine, Black Valentine, and Henderson Refugee, or Thousand to One.

Tomatoes and Irish potatoes are important crops. Two varieties of tomatoes are planted, Livingstons Globe and June Pink. Yields range from 100 to 200 crates to the acre. The Irish Cobbler, grown from Maine seed, is the variety of Irish potato generally grown. Yields range from 30 to 45 barrels an acre. Sweet potatoes are

¹ The term "mandarin" as used in this report includes what is sometimes called "tangerine" or "tangeirine." See Bul. 66, Fla. Agr. Expt. Sta.

grown on practically every farm, but the production is not equal to the demand. They are grown primarily for home use.

Eggplant, peppers, squash, and cucumbers are grown in quantities sufficient to ship. Such vegetables as lettuce, radishes, onions, peas, turnips, okra, cabbage, cauliflower, and Lima beans are grown chiefly for local markets. Cantaloupes and watermelons are grown, and some of the former are shipped to outside markets. Sweet corn is grown to some extent for local markets. The principal varieties are Extra Early Adams and Stowells Evergreen.

According to the census, the total area devoted to vegetable crops in 1909 amounted to 3,719 acres. Since then the acreage has increased considerably.

An increasing acreage is devoted to the production of general farm crops. In 1909, according to the census, there were 6,833 acres in corn, with a production of 93,448 bushels, compared with 5,195 acres grown in 1899 and 4,023 acres in 1889. Corn usually follows spring truck crops, although it is also planted independently as a field crop. The census reports 25 acres in oats and 60 acres in rice in 1909.

Increasing interest is being taken in the production of cowpeas, velvet beans, peanuts, beggarweed, Japanese sugar cane, and Natal grass. Peanuts, velvet beans, and beggarweed, the latter a volunteer after being once seeded, are grown with corn for their beneficial effect upon the soil. Japanese sugar cane is grown both for forage and for making sirup. Ribbon cane is also used for the latter purpose. It is said that the Japanese cane supplies more roughage than any other crop, and that the long period during which it can be cut obviates the need of silos. Sandspur, crab grass, and beggarweed, volunteer growths following cultivated crops, are cut in the fall, yielding 1 ton or more of hay to the acre. Large areas in the uplands are being cleared and put in Natal grass,¹ a perennial which reseeds itself.

Raising cattle and hogs has been an important industry since the early days. Until recently stock has generally been allowed to roam at will, the country being unfenced except where crops were grown, but within the last few years some large land holdings have been fenced and the stock confined. Good pasturage generally is available from early spring to fall, but during the winter the grasses are mature and dry and of little value for grazing. The hogs obtain considerable mast in the hammocks and swamps. It is customary to burn over wooded areas in order to make the new growth of grass more accessible for grazing. There is considerable stock on the range; but it is generally in poor condition, owing to lack of care when the pasturage is poor and to the ravages of the cattle tick. Some cattle raisers are planning to grow forage crops to help the

¹ See Farmers' Bulletin No. 726.

stock over the winter season, and a movement is on foot to eradicate the tick. Attempts also are being made to improve the native stock by introducing sires of improved breeds. The "razorback" type of hog is being gradually improved by crossing with standard-bred animals. The Duroc Jersey is the favorite breed. Cattle are raised mainly to supply the local demand for meat, although a few are shipped to outside markets. Dairying is carried on in the vicinity of Tampa and Plant City to supply milk to these places. The better native cows and some grade Jerseys are used. According to the census, 655 calves, 2,960 other cattle, 2,932 hogs, and 914 sheep and goats were sold or slaughtered in Hillsborough County in 1909. The value of animals sold or slaughtered was \$69,125. Poultry is kept on most farms and there are a few farms devoted entirely to poultry raising, egg production being the main object. The value of poultry and eggs in 1909, according to the census, was \$157,816.

It is generally recognized that the higher lying, well-drained soils, especially those situated near bodies of water, are best suited to the production of citrus fruits. The elevated position facilitates air drainage, and the modifying influence of the water makes injury by frost less likely to occur. The lower lying soils, on account of their better moisture condition, are best for truck crops. The types of the Norfolk and Gainesville series are considered the most desirable soils in the county for the production of citrus fruits. The fruit grown on these soils is of excellent quality and stands shipment well. It is affected to some extent by the rust mite, which causes russetting, but this can be controlled by spraying. The Portsmouth fine sand, Parkwood fine sandy loam, Muck, and Peaty muck are recognized as the best soils for celery, lettuce, and onions; the Scranton fine sand and the hammock phase of the Norfolk fine sand for snap beans, eggplant, peppers, English peas, and tomatoes; and the Scranton fine sand for strawberries.

On the lower lying, poorly drained soils most crops are planted on beds or ridges; on the well-drained soils they are planted on the level surface. Some fields are plowed into lands, each usually about a rod wide. In growing strawberries the hill system is generally followed. The runners are cut from the plants to promote the development of large berries. New plantings are made every year, as the fruit is usually smaller the second season. The plants are set out in June and begin bearing the latter part of November. To prevent the berries from being bruised by the sand grains during transportation, they are washed by being stirred gently in pails or tubs filled with water. A straw mulch is used to protect the plants from frost, but not to keep the berries clean, as is done in many strawberry sections. Celery blanching is done largely by using a special waterproof paper like roofing paper. This comes in rolls and can

easily be placed in position alongside the rows. It is held in place by stakes until the crop is ready to be harvested, when it is rolled up and put away for future use.

Irrigation is practiced to some extent. The intensively worked truck farms are generally subirrigated, water from artesian wells being used where available, as around Tampa, and from ponds, lakes, and ordinary wells in other places. Some irrigation is done by overhead systems. Citrus groves are sometimes irrigated by overhead systems, the water being carried in iron pipes laid underground and distributed by means of spraying nozzles attached to pipe standards.

Truck crops and citrus trees are generally sprayed to prevent disease and injury by insects. Little effort is made to protect groves from frost by smudging.

As a rule, there are few buildings on the farms in this county. Many of the houses are of the bungalow type. Usually they are equipped with modern conveniences, including running water. A low shed is generally considered sufficient to shelter the work stock. Cattle are not given shelter. Cultivated land is fenced, as stock is allowed to roam on unused land. The woven-wire fence with barbed wire strands on top is used for inclosing the smaller holdings and fences of 3 to 5 barbed wires for the larger ones. Most of the farms are well equipped with farm implements.

All crops are given clean cultivation to keep down weeds and conserve soil moisture. The citrus trees, after the crop is gathered, are fertilized and cultivated a number of times before the rainy season, after which the weeds and grass are allowed to grow until the fall, when they are cut and left on the ground as a mulch to be turned under when cultivation begins again.

No systematic rotation is followed, but usually there is a succession of three crops during the year, including either volunteer grass or a cover crop. No intertilled crops are grown in the orange groves after the first year or two. In the vegetable gardens two crops are grown, one being planted in June and the other in January or February. The first includes eggplant, peppers, okra, cucumbers, and lettuce for shipment, with a number of garden vegetables for home use and for sale; and the second, snap beans, potatoes, and other vegetables. Strawberries are succeeded by corn, snap beans, or potatoes, the practice being to plant these between the rows toward the close of the strawberry season and have them well started when the berry vines are plowed under. At the close of the rainy season, where a cover crop is not planted, the volunteer growth of sandspur and crab grass or of beggarweed is cut for hay. Celery is set out in October or November and harvested in February and March.

It is followed usually by snap beans, potatoes, tomatoes or corn. In remote areas where general farming is practiced the principal field crop, corn, is followed by a volunteer growth of sandspur and crab grass.

Commercial fertilizers are used extensively. The total expenditure for this purpose in 1909, according to the census, was \$215,407, or an average of \$168.02 per farm for the 1,282 farms reporting outlay. For young citrus trees a fertilizer mixture containing about 4 per cent nitrogen, 6 per cent phosphoric acid, and 8 per cent potash, and for the older bearing trees one containing about 3 to 3½ per cent nitrogen, 8 per cent phosphoric acid, and 12 per cent potash is used. The fertilizer is applied at least twice a year, once in January or February and once in November, and the applications range from a few hundred pounds to 1 or 2 tons per acre, the larger applications being used for mature trees. Some growers apply home-mixed fertilizers, putting fully 60 per cent of the nitrogen used into the spring application in order to promote growth. For young trees some successful growers prefer to apply the fertilizer in small quantities throughout the spring and summer months the first and second seasons. A leguminous cover crop of cowpeas or beggarweed is grown in some young orchards; but this is not considered a good practice for older orchards, as it stimulates the growth of the trees too much. The use of organic matter is considered harmful, especially with older trees, causing them to suffer from a condition known as "die back." The use of lime gives good results in citrus groves.

For most truck crops acreage applications of 1 to 2½ tons of mixtures analyzing about 4 per cent nitrogen, 6 to 8 per cent phosphoric acid, and 4 to 8 per cent potash are used. For celery and tomatoes the proportion of potash is increased to 10 or 12 per cent. Celery is given larger applications than any other crop, as it must be forced rapidly to attain the proper size and quality. An initial application of fertilizer is made in the row or bed a week or two before planting, being followed by side applications as needed. Only small quantities of fertilizer are used for corn, sugar cane, and sweet potatoes. Truck growers as a rule use all the stable manure they can obtain, usually composting it.

Both white and colored laborers are employed in farm work, and good wages are paid. Laborers are not plentiful. Women and children are employed to pick strawberries and beans. In 1909 the total expenditure for labor amounted to \$212,217, or an average of \$234.49 for each farm reporting.

According to the 1910 census there are 1,983 farms in the county, with an average size of 57.5 acres. In 1900 the number of farms was

reported as 1,449 and the average size as 71.5 acres. The subdivision of bodies of land into 5 and 10 acre tracts by land-development companies is responsible for the reduction in the average size of the farms in the last few years. Land holdings range in size from a fraction of an acre to several thousand acres. The larger holdings are used for pasture.

In 1909, according to the census, 89.3 per cent of the farms were operated by the owners, 6.5 per cent by tenants, and 4.2 per cent by managers. Many of the owners live on their places only during the winter season, spending the remainder of the year outside the State.

The price of land ranges from about \$10 an acre for the least desirable areas to \$1,000 or more an acre for developed groves and truck farms. The average value of undeveloped land is between \$25 and \$50 an acre. Where large tracts are subdivided by land companies the prices range from \$50 to \$150 an acre, depending upon the location. Uncleared land is valued for its pine timber and turpentine as well as for pasturage. Over a large part of the county the timber has not been cut.

SOILS.

Hillsborough County lies in the Coastal Plain province. The soil-forming material consists of unconsolidated deposits washed from the Piedmont Plateau laid down on the sea floor in ancient times, and subsequently uplifted above the level of the sea. The underlying formations consist of limestone, marl, and phosphatic gravels. The oldest formations, the Vicksburg and Apalachicola groups of the Oligocene, occupy the northern half of the county. The Vicksburg underlies only the extreme northwest corner. It is covered by a superficial mantle of sands. The southern boundary of the Apalachicola group is represented by a practically straight line from Tampa to Plant City. This group consists of cherty and siliceous limestones, marl, sands, sandy clays, and fuller's earth, and also has only a thin covering. Its largest exposure occurs along the upper Hillsborough River, forming a semiswampy hammock of that stream, with occasional outcrops in the eastern part of the county. The Tertiary formation is represented by the Bear Valley gravel along Turkey Creek and the north fork of Alafia River. It contains some phosphatic pebbles and some mines are operated on it southeast of Plant City. The remainder, or southern part, of the county is formed of Pleistocene and recent depositions. These consist of sand, clay, marl, Coquina limestone, peat, and muck. The most recent deposition is in the areas of Tidal marsh, which are still in process of formation. The cumulose deposits, muck and peat, are still being added to by the growth and decay of vegetation.

The underlying rock formations have had comparatively little influence on the soils of the county. The greater part of the surface material consists of a siliceous sand of uniformly fine grade and varying from a few inches to many feet in depth. Wells dug in the higher, rolling areas do not encounter rock within 30 feet of the surface. Bordering the bay and some of the streams, especially the Alafia and Hillsborough Rivers and their principal tributaries, there are discontinuous strips, rarely more than 2 or 3 miles wide, having a clay or sandy clay to marl subsoil. In places the clay is encountered at the surface.

The soils of the county may be classed on the basis of origin and mode of formation as marine-sedimentary, alluvial, residual or partly residual, and cumulose, or, owing to the effect of their position and drainage, as light-colored and dark-colored soils, depending upon the accumulation of organic matter. Soils of similar origin, color, structure, and topography are grouped in series, the members of the series, or types, being separated on the basis of texture.

The light-colored upland soils of sedimentary origin are represented by the Norfolk and St. Lucie series. The types of the Norfolk series are characterized by light-gray to yellowish-gray surface soils and light-yellow subsoils. These soils have good to excessive drainage. The Norfolk fine sand, the only member of the Norfolk series encountered, covers a large part of the county and is a very important type. It is referred to locally as "rolling pine lands" or "blackjack-oak ridges." The hammock and scrub phases of this type are separated mainly on the basis of differences in topography and forest growth.

The St. Lucie series is represented only by the fine sand type. The soil material consists of a white fine sand more than 3 feet deep. It is excessively drained, and supports a growth of scrub spruce pine, scrub evergreen oak, rosemary, and saw palmetto. The flatwoods phase of this type resembles the soils of the Leon series, except that hardpan is not encountered within the three-foot section, as in the latter series.

The poorly drained "flatwoods" of the county are very extensive. They comprise the Leon, Portsmouth, Plummer, and Scranton soils. The differences in the color of these series are due to differences in elevation and drainage, which affect the accumulation of organic matter.

The Leon series occupies the higher positions, lying, as a rule, only slightly above the darker colored Portsmouth soils. It is represented by one type, the fine sand, which consists of a light-gray to white fine sand having an impervious hardpan stratum within the 3-foot section. This hardpan ranges from 4 to 12 inches or more in

thickness, and is underlain by white sand. The Leon fine sand is the most extensive soil of the flatwoods. It supports a rather stunted growth of longleaf pine, with an undergrowth of scrub saw palmetto, wire grass, and broom sedge.

The Portsmouth series is represented by one type, the fine sand, with a hammock and a prairie phase. The surface soil is black and the subsoil light gray to white. A black to rusty-brown hardpan layer occurs within the 3-foot section, and is underlain by a light-gray to nearly white, more or less water-soaked fine sand. The type is locally referred to as "gallberry flatwoods."

The types included in the Plummer series have gray surface soils, frequently containing brownish mottlings. The subsoil, encountered at depths of 4 to 12 inches, is a dingy-gray to nearly white material, more or less mottled with streaks of brown and yellow. One type, the fine sand, with a cypress-swamp phase, represents the series in Hillsborough County. The type supports a growth of sedges and wild grasses. It is covered with water during rainy periods.

The types in the Scranton series are distinguished by the black to dark-gray color of the surface soils and the yellow or grayish color of the subsoils. These soils in their typical development have a Portsmouth surface soil and a Norfolk subsoil. The fine sand is the only type of this series mapped in Hillsborough County.

The only alluvial soil mapped in the county is the Bibb fine sand. The surface soil of this type ranges in color from light gray to dark gray or black, and the subsoil is dingy gray to nearly white. The type occurs along streams, and is inextensive.

The residual or partly residual soils are classed with the Gainesville and Parkwood series. They are formed entirely or in part from the weathering of limestone and marl.

The Gainesville series occupies high, rolling areas and is well drained. The soil material is prevailingly snuff colored, with brick-red and amber-yellow variations, in places approaching the Norfolk soils in color. In places limestone in red clay is exposed in cuts or pits. The fine sand is the only type of this series recognized in the county.

The soils of the Parkwood series are low lying and poorly drained or semiswampy. The surface soils are grayish to grayish brown, with a darker colored, very plastic clay subsoil, usually resting upon marl and in places upon limestone. A heavy growth of oak, magnolia, cabbage palmetto, cedar, and many other trees is characteristic. In Hillsborough County the Parkwood fine sandy loam, with a flatwoods phase, and a dark-colored phase of the Parkwood clay are mapped.

The Cumulose soils are formed by the decomposition of vegetable matter under moist conditions, and are classed as Muck and Peaty

muck. Muck consists of the more thoroughly decomposed material containing a considerable quantity of mineral matter, and is somewhat plastic. It is dark brown to black in color. The typical areas occur in "bays" or "bay heads," with a hammock growth consisting mainly of cypress, magnolia, red bay, swamp maple, cabbage palmetto, myrtle, and sphagnum moss. A prairie phase of Muck is mapped, representing ponds and lakes which have become partly filled by the growth and decay of water-loving vegetation.

Peaty muck is formed under the same conditions as Muck, but the material is not so thoroughly decomposed, and there is a smaller admixture of mineral matter. It is, however, more thoroughly decomposed and less fibrous than Peat. The areas of Peaty muck occur in "bays" or cypress swamps. A prairie phase of Peaty muck is mapped, which corresponds with the prairie phase of Muck.

Swamp, Water and grass, Tidal marsh, Shell mounds, and Madeland are self-explanatory terms used to cover areas of miscellaneous materials of little present value for agriculture.

The names and the actual and relative extent of the different soils mapped in Hillsborough County are given in the following table:

Areas of different soils.

Soil.	Acres.	Per cent.	Soil.	Acres.	Per cent.
Leon fine sand.....	209, 024	31.3	St. Lucie fine sand.....	15, 296	} 2.4
Norfolk fine sand.....	125, 248	} 19.9	Flatwoods phase.....	768	
Hammock phase.....	6, 336		Tidal marsh.....	12, 736	1.9
Scrub phase.....	1, 600		Muck.....	6, 784	} 1.8
Portsmouth fine sand.....	108, 224	} 18.0	Prairie phase.....	5, 248	
Hammock phase.....	10, 112		Gainesville fine sand.....	8, 384	1.2
Prairie phase.....	1, 856		Parkwood clay, dark-colored phase.....	6, 464	1.0
Parkwood fine sandy loam.....	24, 128	} 6.6	Peaty muck.....	2, 752	} .6
Flatwoods phase.....	19, 840		Prairie phase.....	1, 408	
Scranton fine sand.....	40, 384	6.0	Madeland.....	1, 664	.2
Plummer fine sand.....	13, 248	} 3.5	Bibb fine sand.....	1, 152	.2
Cypress-swamp phase.....	10, 176		Shell mounds.....	192	.1
Swamp.....	18, 048	2.7			
Water and grass.....	17, 728	2.6			
			Total.....	668 800

NORFOLK FINE SAND.

The Norfolk fine sand consists of a light-gray to yellowish-gray fine sand, about 6 inches deep, grading into a pale-yellow to bright-yellow fine sand, which extends to a depth of more than 3 feet. In some of the lower lying spots the surface soil is darker gray in color to a depth of about 12 inches, and in some of the flatter areas both soil and subsoil are lighter colored than usual. The material is

slightly coherent when moist, but is loose and incoherent when dry. The texture is uniform.

The Norfolk fine sand, which is one of the most extensive soils in the county, occupies the greater part of the uplands. It is confined mainly to an almost continuous belt, several miles wide, extending through the central part of the county in a northwest-southeast direction.

The topography is undulating to ridgy and hummocky, with occasional gently undulating to nearly flat areas. The surface is marked by numerous depressions or sink holes, some of which are occupied by ponds and lakes. The topography is generally favorable to cultivation. Drainage is excessive, the loose, porous structure of the type permitting rain water to percolate rapidly to lower levels. Seepage places or springs are numerous at the foot of the slopes to the flatwoods and along the banks of streams. Crops are apt to suffer from lack of moisture even in ordinary dry periods.

The Norfolk fine sand is an important soil type, although only a small proportion of it is under cultivation. It is not naturally a strong soil and fertilization is necessary for satisfactory results. Its principal use is for the production of citrus fruits, the areas lying near bodies of water and those occupying the higher slopes being preferred as orchard sites. The fruit grown on this soil, especially around Lake Thonotosassa, is of good quality. The principal fruits are oranges and grapefruit. Mandarins are not extensively grown. Peaches are grown to a small extent. Corn is the principal field crop, but the yields usually are low, ranging from 10 to 20 bushels an acre. Some cowpeas and velvet beans are grown. Crab grass and sandspur are volunteer crops in cultivated fields and are cut for hay. Natal grass is being planted on a considerable acreage. Small patches of sugar cane are grown on the lower slopes and in the more nearly level areas.

The forest growth consists mainly of longleaf pine and forked-leaf blackjack, turkey, and water oak, with some live oak. In places there is a scattering of saw palmetto. Parts of the type support an open forest of longleaf pine. When the pine is removed, however, blackjack oak spreads over the land, with a scattering of turkey and water oak in the lower positions. The type is referred to as "rolling pine lands" or "blackjack-oak ridges." The surface usually is covered with wire grass.

For citrus groves liberal applications of commercial fertilizer are made, the quantity depending upon the age and condition of the trees. In young groves leguminous cover crops, especially cowpeas, are grown to supply nitrogen. Corn and other field crops are given small applications of fertilizer.

The price of uncleared land of this type ranges from \$10 to \$75 an acre, the average price being between \$25 and \$50. Orange groves consisting of mature trees bring from \$1,000 to \$1,500 or more an acre.

The Norfolk fine sand in other sections of the State, particularly the less rolling land, is successfully used for growing truck crops. For this purpose an overhead system of irrigation is generally necessary. Watermelons do well without irrigation, especially in newly cleared areas, and such land lying close to railroads would no doubt yield a profit from this crop the first season. Owing to the prevalence of the wilt disease, it is not safe to grow a crop of watermelons on the same land oftener than once in 10 or 12 years. Cantaloupes also succeed on the Norfolk fine sand in other parts of the State.

Norfolk fine sand, scrub phase.—The Norfolk fine sand, scrub phase, is separated from the main type largely on the basis of difference in vegetable growth. The phase supports a scrub growth similar to that of the St. Lucie fine sand, consisting mainly of spruce pine, evergreen, scrub live oak, and a shrub known as "rosemary," or crowberry, with some saw palmetto. Wire grass, which grows so abundantly on the typical soil, is lacking. The surface soil to a depth of an inch or two is a gray to brownish-gray fine sand. This grades into a deep-yellow to brownish-yellow fine sand which extends to great depths, there being no essential difference between the lower stratum of the soil and the subsoil. The material is uniform in texture and is loose and incoherent.

This phase occurs in small areas associated with the typical soil. The largest area lies south of Lake Thonotosassa. There are a few areas in the central part of the county and two along the Alafia River. The latter support a mixed scrub and hammock vegetation.

The phase is excessively drained and droughty, moisture passing through it rapidly to lower levels. The value of this soil is low, as it is considered unsuitable for cultivation on account of its droughty nature and as the growth upon it has no commercial value.

Norfolk fine sand, hammock phase.—The hammock phase of the Norfolk fine sand differs from the typical soil mainly in vegetation and to some extent in color and texture. The soil material consists of a slightly loamy fine sand, dark gray or brownish gray to light gray to a depth of 6 to 10 inches and pale yellow or amber yellow below. In some of the higher positions, where the phase adjoins areas of the Gainesville fine sand, the subsoil has a decidedly reddish tinge and the two soils merge imperceptibly. The surface soil in cultivated fields frequently has a brownish tinge, approaching the color of the Gainesville fine sand. It is probable that a substratum of clay, limestone, or hardpan occurs at no great depth.

The hammock phase of the Norfolk fine sand occurs in scattered areas associated with the main type bordering lakes and streams throughout the uplands, especially in the central and eastern parts of the county. It lies at elevations ranging from 1 foot to 20 feet above the water level. A number of areas occur north of Plant City and in the vicinity of Lakes Thonotosassa and Mango. The largest areas embrace several hundred acres each. The topography is pre-vaillingly flat to gently rolling.

The natural drainage is good. As with all the upland types, rain water sinks into the soil and there are no surface streams. Owing to the proximity of the phase to bodies of water and its slight elevation, the permanent water-table is not far below the 3-foot soil section.

The hammock phase of the Norfolk fine sand is one of the important soils of the county. The greater part of it is cleared and under cultivation. Uncleared areas support a heavy hammock growth, consisting mainly of live oak, hickory, and magnolia, with some cabbage palmetto, longleaf pine, and other trees, and usually a rather thick undergrowth of shrubs. It is known locally as "hammock land," "oak hammock," and "hickory hammock."

This phase is used for the production of all the crops grown in the county. It is especially prized for the growing of citrus fruits, to which most of the areas in the central part of the county are devoted. Oranges are the principal crop. Most of the groves consist of mature trees of the seedling variety, but the later plantings are of improved budded varieties, Pineapple and Hart. The trees grow luxuriantly, and with proper care and fertilization produce yields of excellent fruit. Some grapefruit and mandarins are grown. In the vicinity of Plant City this soil is used to some extent for truck crops, including snap beans, peppers, eggplant, and strawberries. Corn is grown to some extent, yielding 12 to 50 bushels per acre, the yield varying with the kind and quantity of fertilizer applied and the methods used. Following cultivated crops there is a volunteer growth of crab grass, which produces a ton or more of hay to the acre. Fertilizers are used on all crops, the citrus groves being given liberal application.

The location of the soil around lakes makes it desirable for home sites as well as for agriculture. The price of land not in citrus groves ranges from \$50 to \$150 an acre. Bearing groves are held at \$1,000 to \$2,000 an acre, the price varying with the location of the groves and the age and condition of the trees.

SCRANTON FINE SAND.

The Scranton fine sand consists of a dark-gray to black fine sand, 8 to 15 inches deep, underlain by a yellowish-gray fine sand which extends to a depth of more than 36 inches, the color becoming yellower

in the lower part. Variations from the typical color occur in both the soil and subsoil. The type contains sufficient organic matter to give it a slightly loamy feel, and as a whole it is more coherent than the Norfolk soils. In places the lower subsoil is decidedly loamy, clay probably underlying it at a slight depth. In a few places hard limestone is encountered within the soil section, occasionally outcropping at the surface.

The Scranton fine sand is an extensive soil type. It occurs mainly in separate areas extending from Blackwater Creek, in the northeastern part of the county, to the southeastern part. There are also some small areas scattered through the uplands.

The topography is level to gently sloping and the natural drainage is generally good, only the lowest parts of the type ever being covered by standing water. This soil is fairly retentive of moisture and is saturated at relatively shallow depths, owing to the presence of a more or less impervious substratum.

The Scranton fine sand is one of the most important soil types in the county, and it has been profitably farmed longer than any other soil except the hammock phase of the Norfolk fine sand. A large proportion of it is cleared and under cultivation, and it supports the most thickly populated rural sections of the county. Uncleared areas are forested with longleaf pine, various oaks, hickory, magnolia, cabbage palmetto, and other trees. The surface is covered with a luxuriant growth of wire grass and broom sedge.

Both general farming and trucking are practiced on this type, and it is used for a greater variety of crops than any other soil in the county. Strawberries are the principal crop, the section around Plant City, where this soil occurs, being the most important strawberry section of the State. Snap beans are next in importance, followed by tomatoes, Irish potatoes, cucumbers, peppers, eggplant, squash, and sweet corn. Other crops grown successfully are turnips, watermelons, cantaloupes, okra, lettuce, cabbage, Lima beans, sweet potatoes, field corn, cowpeas, and peanuts. There are a few small groves of oranges, grapefruit, and mandarins.

Strawberries yield about 3,000 to 4,000 quarts per acre, beans 100 to 125 hampers, peppers 300 to 400 crates, eggplant 350 to 400 crates, squash 200 to 400 crates, tomatoes 100 to 200 crates, cucumbers 100 to 200 crates, potatoes 30 to 45 barrels, sweet potatoes 80 to 100 bushels, and corn 15 to 40 bushels.

The soil is easy to cultivate. Fields are either cultivated level or slightly bedded, depending upon the elevation. All the available stable manure is used, and commercial fertilizer is applied to all crops. Usually a large application is made before planting, followed by smaller applications as needed. Strawberries receive more fertilizer than any other crop, the applications ranging from 1,000 to

2,000 pounds per acre. Liming is practiced to some extent, both hydrated lime and finely ground limestone giving satisfactory results. Finely ground phosphate rock, or "floats," also is used to some extent.

ST. LUCIE FINE SAND.

The St. Lucie fine sand consists of a light-gray to nearly white fine sand of considerable depth. The immediate surface may be slightly grayish, owing to the presence of a small percentage of organic matter. Where the type merges into the Leon fine sand and in flat areas, the hardpan typical of the Leon series may be encountered within or just below the 3-foot section, more often below. In places at relatively high elevations an orange-yellow sand underlies the type, and occasionally it is encountered within 36 inches of the surface. A characteristic of the type is the glittering white appearance of the surface when dry, and the soil is called locally "white sand."

The St. Lucie fine sand occurs in a number of areas ranging in size from a few acres to a square mile or more throughout the central and southern parts of the county. The topography is prevailingly ridgy and hummocky, the ridges usually being smooth and rounded.

The natural drainage of the type is excessive, the loose sandy character of the material permitting the rapid percolation of water. The soil is droughty, as indicated by the vegetation which it supports.

The St. Lucie fine sand is of practically no importance agriculturally, and none of it is under cultivation. The forest growth is in marked contrast to that of other soils of the county, consisting mainly of spruce pine, with an undergrowth of scrub evergreen oak, rosemary, and saw palmetto. There is a sparse growth of wire grass. The type is sometimes referred to as "scrub."

Before this soil can be utilized for cultivated crops it is necessary to incorporate large quantities of organic matter and commercial fertilizer. Along the east coast of Florida this type of soil is used for growing pineapples, and it might be successfully used for that purpose in Hillsborough County if means were employed to protect the fruit from frosts.

St. Lucie fine sand, flatwoods phase.—The soil material of the St. Lucie fine sand, flatwoods phase, is identical with that of the main type, except that a hardpan layer similar to that underlying the Leon fine sand usually is encountered at a depth of 40 to 60 inches, and occasionally within the 3-foot section. The phase represents a near approach to the Leon fine sand, in which the hardpan layer characteristically occurs within the 3-foot section.

This phase is inextensive. It occurs in the southern and south-central parts of the county, closely associated with the St. Lucie and Leon fine sands. The surface is flat to slightly ridgy, lying some-

what higher than the typical flatwoods. The phase has good to excessive drainage, but is not quite so droughty as the typical soil.

The native vegetation is similar to that on the Leon fine sand, consisting mainly of longleaf pine, with an undergrowth of dwarf saw palmetto and a cover of wire grass and broom sedge. There are a few scattered clumps of scrub evergreen oak, which occasionally reach tree size. The longleaf pine growth is rather sparse, but the trees are usually larger than on the Leon fine sand.

This phase is but little better suited to agriculture than the typical soil, and its market value is low.

Like the typical St. Lucie fine sand, the flatwoods phase will have to be built up by the addition of large quantities of organic matter and commercial fertilizer before it can be used successfully for cultivated crops.

LEON FINE SAND.

The Leon fine sand consists of a light-gray, fine-textured sand, grading within a few inches into a lighter colored fine sand. This type is characterized by a dark-brown layer, locally called a "hardpan," consisting of organic matter mixed with fine sand and some iron compounds. This hardpan layer ranges from 6 to 15 inches in thickness and is encountered within the 3-foot section, usually at a depth of 15 to 20 inches. It is underlain by a yellowish fine sand, which becomes lighter in color with depth, grading finally into white, compact fine sand. The color of the surface soil is affected by even slight differences in elevation and drainage, and in some of the lower lying positions it is dark gray to almost black, owing to the accumulation of organic matter.

The Leon fine sand is one of the most widely distributed and extensive soil types in the county, and is the principal flatwoods type. It is most extensive in the low flatwoods surrounding the bay shores and extending several miles inland. Large areas also occur in the northern and southern parts of the county. The elevation of the type ranges from a few inches or a few feet above sea level near the bay to considerably more in the interior of the county. The surface is generally flat, with numerous depressions of varying size. In the southern part of the county the depressions consist of shallow, grassy ponds, and in the northern part of cypress ponds.

Except where the larger streams pass through the type, the surface drainage is carried by intermittent streams or sloughlike depressions. The flat surface hinders the run-off, and the more or less impervious hardpan retards percolation, consequently during wet spells water stands on the surface for a time. In dry seasons the soil becomes very dry, as the hardpan prevents the upward movement of moisture from the substratum.

The Leon fine sand is of low agricultural value, and very little of it is cleared and under cultivation. Small patches of corn, sugar cane, sweet potatoes, Irish potatoes, and garden vegetables are grown, and in favorable seasons, with fertilization, fair yields are obtained. As a rule, without artificial drainage and irrigation, crops are uncertain. Most of the type supports a typical flatwoods growth of longleaf pine, scrub saw palmetto, wire grass, and broom sedge. The undergrowth includes some huckleberry and gallberry bushes and a shrub, closely related to the huckleberry, called the "false huckleberry." The pine trees, as a rule, are rather sparse and of small size. The scrub saw palmetto is small, much of it being referred to as "hog palmetto."

The main use of the type is for turpentine and as a range for live stock. It affords good grazing, especially in the spring. A large body of the type between Sixmile Creek and Alafia River has been cut over and the timber converted into charcoal, large quantities of which are used in Tampa.

The price of the Leon fine sand ranges from \$10 to \$75 an acre. Most of the land is held by development companies, which subdivide it into 5 and 10 acre tracts and sell it for \$30 to \$75 an acre, the price depending upon location with respect to towns and hard-surfaced roads.

In other sections of Florida, with artificial drainage and irrigation, this soil has been profitably used for the production of truck crops. The hardpan, where it does not lie too near the surface, is considered an advantage, in that it prevents leaching and less water is required for irrigation. The system used in other parts of the State is to lay tile upon the hardpan layer, thus providing a combination of subirrigation and underground drainage. In the low-lying sections around the bay shores artesian wells can be used for irrigation, but farther inland pumping must be resorted to. The soil also requires organic matter and fertilizer. Where stable manure is not available organic matter can be incorporated by turning under green-manure crops, the legumes being preferable. Large applications of commercial fertilizer are required, 1 to 2 tons per acre being used in other parts of the State. By breaking up the hardpan fair success has been obtained with general farm crops on land of this type.

PORTSMOUTH FINE SAND.

The surface soil of the Portsmouth fine sand consists of a black fine sand, 4 to 12 inches deep, containing a high percentage of organic matter—enough in places to give it a mucky texture. This is underlain, as a rule, by a light-gray to nearly white fine sand. Within

36 inches of the surface, usually between 12 and 24 inches, there is a compact stratum of brown or black fine sand containing considerable organic matter and iron compounds and resembling a hardpan. Below this compact layer the material consists of a brownish-yellow or dark-gray to nearly white, compact, water-soaked fine sand extending to considerable depth. The hardpan layer may occur at any depth within the 3-foot section. In places it directly underlies the dark surface soil and in others it lies below the 3-foot section.

The Portsmouth fine sand occurs throughout the flatwoods section of the county, being most extensive in the southern and eastern parts. It is typically a flatwoods soil and is associated with the Leon fine sand, occupying the lower and more poorly drained positions. It is also associated with the Scranton fine sand in the eastern part of the county, where it occupies lower slopes. The areas in the flatwoods have an almost perfectly flat and level surface. The type frequently occurs in strips around ponds and lakes and along streams or streamway depressions.

Owing to the flat surface, the drainage is poor. Water stands on the surface after rains and is removed very slowly by lateral seepage and evaporation. The soil is dry during short periods, and as the hardpan substratum prevents the rise of capillary water crops are likely to suffer for lack of moisture at such times. Before this soil can be successfully cultivated it is necessary to establish artificial drainage, which may be done by means of open ditches with small laterals. Where the type is intensively cultivated, as in the vicinity of Tampa, wooden conduits are used both for drainage and for sub-irrigation.

The larger part of this type is uncleared and supports a growth of longleaf pine, saw palmetto, gallberry, and broom sedge, with some wire grass on the higher areas. Pine and saw palmetto attain a larger size than on the Leon fine sand. Gallberry is a characteristic growth, and the type is locally referred to as "gallberry flatwoods."

The greater part of the farmed area of the type lies between Tampa and Sixmile Creek and is intensively cultivated. Very little of the type is used for general farming. It constitutes some of the best natural grazing land in the flatwoods. Celery is the principal truck crop. Other important crops are beets, turnips, spinach, radishes, beans, potatoes, and tomatoes, all of which are winter grown except beans, potatoes, and tomatoes, which follow the other crops in the spring. Good yields of all these crops are obtained. It is claimed that celery makes as good yields on this soil as on Muck, and the product is of good size and quality. Small patches of strawberries are grown for the local market.

Large quantities of barnyard manure and commercial fertilizer are used on this type. More fertilizer is used for celery than for any other crop, the quantity ranging from 1 to 2 tons per acre. Usually a heavy application is made before planting, with additional applications as required.

Land of this type in the flatwoods and in remote sections is held at \$20 to \$75 an acre, the latter price being asked for land that has been subdivided into 5 and 10 acre tracts by development companies. Unimproved land suitable for trucking usually sells at \$200 to \$500 an acre, although in the immediate vicinity of Tampa as much as \$1,000 an acre has been obtained for small patches.

Under cultivation this soil soon loses its organic matter unless the supply is constantly replenished. Where stable manure is not available organic matter may be added by turning under cowpeas, velvet beans, beggarweed, or other green-manure crops. Where the hardpan substratum is not too far below the surface to be reached by a subsoil plow the type can be successfully used for general farming.

Portsmouth fine sand, hammock phase.—The Portsmouth fine sand, hammock phase, consists of a black, more or less mucky fine sand, 8 to 12 inches deep, underlain by a gray, compact fine sand which becomes lighter in color with depth. In places a compact stratum resembling hardpan is encountered an inch or two below the surface.

This phase is inextensive and is developed mainly in the eastern and central parts of the county. It occurs as narrow areas in streamway depressions or along small streams. The drainage is naturally poor, but can be improved by ditching.

The phase has not been utilized to any great extent, but if cleared and drained fair yields of truck crops and of such field crops as corn, sugar cane, grasses, and potatoes could be obtained. It supports a hammock growth consisting mainly of oak, magnolia, bay, and cabbage palmetto, with some pine and an undergrowth of shrubs.

Portsmouth fine sand, prairie phase.—The Portsmouth fine sand, prairie phase, consists of a black, more or less mucky fine sand, 6 to 15 inches deep, underlain by a compact fine sand which extends to a depth of more than 36 inches. The subsoil is dark gray in the upper part and becomes lighter in color with depth. In the lower part of the surface soil there is some indication of a black hardpan. This, however, is generally wet and is easily penetrated by a soil auger.

This phase is scattered over the county in bodies ranging in size from a few to several hundred acres. It occupies pondlike depressions covered with water a large part of the year and supports a luxuriant growth of grasses and rushes and other aquatic plants. On account of the growth of grasses these depressions, especially the larger ones, are locally called "prairies." Most of them have outlets

and some have been drained and used for the production of truck crops. In their undrained condition they afford good pasturage. The crops and methods of cultivation on this phase are similar to those on the typical Portsmouth fine sand.

PLUMMER FINE SAND.

The surface soil of the Plummer fine sand consists of a dark-gray to dull-gray fine sand, 4 to 12 inches deep, frequently containing brownish mottlings. In lower spots the surface sometimes has a thin mantle of black, mucky material. The subsoil, which extends to a depth of more than 3 feet, consists of a dull-gray fine sand, becoming nearly white in the lower part, and frequently containing some brownish iron stains and yellow mottlings. A yellow or drab fine sandy clay underlies the type in a few spots and sometimes occurs as lenses in the subsoil.

The Plummer fine sand is not an extensive soil. It occurs as slight depressions scattered through the flatwoods. The larger areas are referred to as "prairies" and the smaller ones as "sand ponds." In places the depressions are basinlike, with a mucky soil which supports a growth of pond lilies, sagittaria, rushes, and other aquatic plants. The characteristic vegetation of the greater part of the type consists of a broom sedge, with some water-loving grasses and sedges in the wetter spots. There is no tree growth other than an occasional clump of cypress.

Owing to the depressed surface and the compact, more or less impervious nature of the underlying material, the natural drainage is poor and the areas are intermittently wet and dry. Water does not stand long enough on the surface, however, to favor the accumulation of organic matter.

The Plummer fine sand is naturally a poor soil, and it is doubtful if it could be profitably drained and cultivated. It has little value other than for pasture.

Plummer fine sand, cypress-swamp phase.—The soil material of the Plummer fine sand, cypress-swamp phase, as a rule does not differ much from that of the main type. In places, however, the surface soil is darker colored and mucky to a depth of 4 or 5 inches, and in spots it consists of a sandy muck to depths of 1 or 2 feet. Some drab-colored lenses of sandy clay are occasionally encountered within the 3-foot section.

This phase occurs in numerous depressed areas throughout the flatwoods, usually in association with the Leon fine sand. It is most extensive in the northwestern part of the county. Some of the areas are only an acre or two in extent, while others are quite large. They are covered with water most of the year and lie along and between ditchlike depressions which serve to carry overflow water.

The areas of the cypress-swamp phase resemble the "grassy ponds," or "prairies," except that they support a growth of cypress, being locally termed "cypress sand ponds." In a few of them there is also some myrtle, magnolia, and red bay. These ponds if cleared would be of no more value than the typical Plummer fine sand. None of them is under cultivation. Their chief value is for the cypress growth, which is used for making telephone poles and fence posts.

GAINESVILLE FINE SAND.

The Gainesville fine sand consists of a light-gray to brownish-gray or snuff-brown fine sand, 6 to 8 inches deep, underlain by a snuff-brown to reddish-yellow or dull-red fine sand which extends to a depth of considerably more than 36 inches. There is usually a noticeable quantity of coarse sand grains in both the soil and sub-soil, and in a few places the type approaches a medium sand in texture. There is also present a very small percentage of whitish nodules and reddish iron concretions. In a few spots the soil material is reddish brown to brick red throughout. In cultivated fields, when moist, it is generally snuff brown, with a reddish tinge. Spots occur on hilltops in which the soil material is dark gray or brownish gray and rests upon bedrock at varying depths, usually less than 12 inches, with occasional rock outcrops and some small fragments of rock scattered over the surface. This rock appears to be a siliceous limestone or calcareous sandstone. In other spots on hilltops in the larger bodies of the type brick-red clay containing strata of limestone occurs within the 3-foot section. This latter variation would be mapped as the Gainesville sandy loam if of sufficient extent.

The Gainesville fine sand is practically confined to the central part of the county, usually occurring in rather large bodies. It is referred to locally as "chocolate land," because of its color. The largest area lies west of Durant, extending north past Brandon and Valrico. Another large area extends from Seffner toward Lake Thonotosassa. The type occupies high, rolling positions and is marked by large depressions resembling sinks. Some of the highest elevations in the county are attained by the crests of ridges occupied by this type. The topography throughout is favorable to cultivation.

Drainage is good to excessive, the loose, porous structure of the type permitting the ready passage of water to lower levels. There is little if any run-off. Notwithstanding its porous nature, the type holds a fair supply of moisture, as indicated by the growth it supports.

The Gainesville fine sand has within recent years become one of the important soil types of the county agriculturally. Probably 50 per cent or more of it is under cultivation. The native vegetation

consists of longleaf pine and wire grass. There is an absence of undergrowth, and the type is locally classed as open pine woods. The trees are of large size and there is a rather good stand. On the tops of hills, where clay is close to the surface, and in some low spots there is a hammock vegetation consisting mainly of live oak. Where the pine is cut, blackjack and turkey oak come in, as on the Norfolk fine sand.

Citrus trees on this type make a thrifty growth and yield a fruit of good quality. The higher locations are preferred for growing citrus fruits. In the vicinity of Valrico there are many large groves of oranges and grapefruit that have not yet come into bearing. Large areas in this section are also planted to Natal grass for hay, the type being especially well suited to this crop, yielding 1 to 2 tons or more per acre. Corn, sweet potatoes, and sugar cane are the principal field crops, corn leading in acreage. Cowpeas, velvet beans, peanuts, and beggarweed are grown to a considerable extent as forage crops. A large dairy farm is located on this type. Corn yields from 12 to 30 bushels per acre. Sugar cane gives good yields of sirup and large yields of forage. Sweet potatoes do well.

The Gainesville fine sand is easy to cultivate and to keep in a condition of good tilth. Fertilizers are necessary for best results with crops, as on the other soils of the county, and the soil responds readily to their use. The citrus groves, especially, need large applications of fertilizer.

Land of this type brings \$50 to \$150 an acre. It is in demand and sales are constantly made at these prices.

In the cultivation of this soil large quantities of organic matter, especially leguminous crops plowed under, should be added in order to maintain its productiveness and increase its water-holding capacity. In adjacent counties this type of soil is highly developed in the production of truck crops. For the principal crops, including snap beans, peppers, eggplant, tomatoes, and onions, overhead irrigation is used. Cucumbers, cantaloupes, and watermelons can be grown profitably without irrigation.

PARKWOOD FINE SANDY LOAM.

The Parkwood fine sandy loam consists of a light-gray to dark-gray fine sand, underlain at about 6 to 15 inches by a drab to dull-yellowish or brownish-yellow, plastic clay or sticky sandy clay, which at varying depths within the 3-foot section passes into a whitish marl or rests upon limestone. The darker colored soil occurs in the low hammocks, but slightly elevated above the bordering tidal marshes and the lighter colored soil in the higher lying positions. The lower part of the surface soil has the appearance of the hardpan of the

region, but is not hard. The soil material frequently is slightly loamy, especially near the stream courses, where it is subject to modification by flood waters.

The Parkwood fine sandy loam is inextensive. The areas usually are not large, and most of them occur along the forelands of Tampa Bay, along the Alafia River and its tributaries, and along the Hillsborough River. Along the bay it is developed in narrow strips backed by the flatwoods phase of the type. The areas are referred to as "marl hammocks."

The topography generally ranges from flat and hummocky to gently sloping and ridgy. Some of the slopes are comparatively steep. As a rule, most of the type is well drained, although where it is cultivated shallow ditches are required to carry off excessive rainfall. It is inclined to be droughty, especially where there is not much clay and the marl is near the surface. A part of the type is in a semiswampy condition, lying only a few feet above normal overflow of the streams.

Only a small part of the Parkwood fine sandy loam is under cultivation. It is used for the production of general farm and truck crops. Corn is the principal field crop, and celery, lettuce, beets, and tomatoes the principal truck crops. Yields are similar to those obtained on the other trucking soils, including the Portsmouth fine sand, Muck, and Peaty muck, and with smaller applications of fertilizer. On remote areas of the type, where no truck crops are grown, good yields of corn are obtained without the use of fertilizer. Corn usually is followed by beggarweed or some other volunteer crop, which is cut for hay.

The typical Parkwood fine sandy loam supports a hardwood growth consisting mainly of live oak, magnolia, cabbage palmetto, gum, cedar, and holly, with a few cypress trees in the sloughs and some saw palmetto and longleaf pine. Areas bordering the bay support a growth consisting almost entirely of cabbage palmetto, the stand being thick and the trees growing to a good height.

As with most hammock types, the value of the Parkwood fine sandy loam, as a rule, is higher than that of the flatwoods or rolling sandy areas. It is usually sold in connection with larger areas of other types.

Parkwood fine sandy loam, flatwoods phase.—The flatwoods phase of the Parkwood fine sandy loam consists of a light-gray to dark-gray fine sand, which grades into a lighter colored fine sand. This phase is characterized by a brown stratum, 2 to 4 inches thick, resembling the hardpan of the region, but less compact and more or less loamy or clayey. Underlying this dark-colored stratum, usually within 15 to 24 inches of the surface, a greasy, plastic clay, contain-

ing more or less fine sand in places, is encountered. This usually is dull yellowish in color and frequently mottled somewhat with drab and shades of yellow, but in places it is nearly black, especially in the upper part, and grades into a grayish or whitish clay marl. Nodules of marl or limestone are common in the lower part of the subsoil, and generally limestone is encountered within the 3-foot section. In places, especially inland from the bay shore and approaching the Leon fine sand of the flatwoods, the surface soil, at depths ranging from 8 to 12 inches, rests directly upon a stratum of gray or whitish marl, 6 to 12 inches thick, which is underlain by a compact, light-gray to nearly white fine sand extending to a depth of more than 3 feet. Another variation occurs, especially in the southern part of the county, in which the underlying material consists of a bright-yellow, sticky sand or sandy loam to a depth of more than 3 feet.

The flatwoods phase of the Parkwood fine sandy loam covers a considerable area in the county. It is locally referred to as "flatwoods." It is most extensive along the shores of Tampa Bay from Sixmile Creek southward to the Little Manatee River. This area is broken somewhat by other soil types and streams with bordering marshes. It extends back from the shore or marsh lines as much as 2 or 3 miles in places. Other areas occur along the upper course of Hillsborough River and along Blackwater Creek in the northeastern part of the county.

This phase has the characteristic flatwoods topography, being level or nearly level to gently sloping, and is poorly drained. During wet periods water stands on the surface, and in dry seasons the soil becomes very dry. However, the underlying clay substratum renders the phase more retentive of moisture than the typical flatwoods soils, as indicated by the generally larger size of the trees and undergrowth. There are a number of intermittent streams through this phase.

The larger part of the flatwoods phase of the Parkwood fine sandy loam supports a native growth of longleaf pine, saw palmetto, wire grass, and broom sedge. The only area under cultivation is the one along Tampa Bay south of Sixmile Creek. The phase is most highly developed in the immediate vicinity of Ruskin, where it is used for truck and general farm crops. Good results are obtained where the soil is adequately drained and irrigated. In the Ruskin section irrigation is effected by means of ditches and furrows, the water being obtained from artesian wells. Tomatoes, potatoes, snap beans, and English peas are the principal truck crops. A large proportion of the product is canned. A crop known as "roselle" is grown and the product put on the market in the form of jelly. Good yields of corn

are obtained. Japanese sugar cane makes a luxuriant growth, and at Ruskin there is a large output of sirup. Commercial fertilizer is used, but less is required than on the flatwoods soils of the Leon and Portsmouth series.

The price of land of this phase ranges from \$25 to \$150 an acre, depending upon the location. The highest prices are obtained for small subdivisions of 5 or 10 acres along main roads.

PARKWOOD CLAY, DARK-COLORED PHASE.

The Parkwood clay, dark-colored phase, is a smooth, plastic, sticky, black clay to a depth of 8 to 12 inches, below which the material becomes gradually lighter in color. Fragments or nodules of soft limestone or marl usually are encountered at 15 to 20 inches, the material becoming more marly and grayish or grayish white in color with depth. Frequently in the lower part of the 3-foot section the marly condition becomes less pronounced, the material grading into a drabbish sandy clay or resting on solid limestone. Along the Hillsborough River there are low mounds or hummocks in the phase, which have a surface covering of 2 to 6 inches of fine sand. These areas would be mapped as a sandy loam if large enough to be shown separately on the soil map. A few prairie areas lying north of the Hillsborough River are included with this soil as mapped.

The Parkwood clay, dark-colored phase, occurs mainly along the Hillsborough River, where it is associated with the Parkwood fine sandy loam. It occupies low hammock or bottom positions, and the surface is flat, except for slight hummocks that are numerous in places. Slight depressions or sloughs are cut through it at times of high water. During wet seasons a large part of the phase is under water. It is difficult to drain this soil, especially in the lower situations.

On account of its lack of drainage, this soil is of little importance agriculturally, and only a few spots are cleared and cultivated. It supports a heavy hammock growth, consisting mainly of live oak, magnolia, hickory, cedar, ash, and cabbage palmetto, with some pine and cypress. The trees grow to a large size. On old clearings there is a thick stand of second-growth pine.

The Parkwood clay, dark-colored phase, is a strong, productive soil when reclaimed. Owing to its heavy, sticky nature, however, it is difficult to cultivate and inclined to be very cloddy. The prairie areas are valued for the pasturage they afford.

BIBB FINE SAND.

The surface soil of the Bibb fine sand is quite variable, ranging from a light-gray or whitish to a dark-gray or black fine sand, the darker areas carrying considerable organic matter. The subsoil is a

dull-gray to nearly white fine sand which usually extends to a depth of more than 36 inches. Small areas of Muck, Peaty muck, Parkwood fine sandy loam, Parkwood loam, and Portsmouth fine sand are included with this type as mapped.

The Bibb fine sand is inextensive and is confined mainly to the southern part of the county. A few small areas were mapped in the vicinity of Tampa. It occurs as narrow strips in the first bottoms of streams. The areas are not very clearly defined. The surface is very hummocky and is subject to frequent change by overflow waters.

The type supports mainly a hammock growth consisting of water oak, magnolia, myrtle, cabbage palmetto, and jack pine, with frequently a dense undergrowth of bushes of various kinds. It is of very little importance agriculturally, none of it being under cultivation. Its chief use is as a range for hogs and it affords considerable mast. Some cattle also are grazed on it.

MUCK.

Muck consists of a deposit formed mainly of more or less thoroughly decomposed vegetable matter, with a considerable admixture of sand, silt, and clay. It has originated from the growth and decay of vegetation in the presence of water. Muck extends to depths ranging from 8 inches to several feet, the average depth being between 18 and 24 inches. It is black when moist and dark brown when dry. The materials are finely divided, and when moist the soil is more or less plastic. In places there is a surface mantle, 1 to 4 inches deep, of coarse material consisting of recently accumulated vegetable matter. Quite frequently there is also a coarse, fibrous layer of Peat or Peaty muck overlying a substratum of fine sand, the upper part of which is black, grading into nearly white fine sand. This fine sand is compact and generally water-soaked.

Muck is scattered throughout this county, occurring in basinlike depressions in the flatwoods, in the rolling uplands, and along streamway depressions. Its total extent, however, is small. The areas are covered by water most of the year and are known as "bays" or "hammock swamps." The native vegetation consists mainly of cypress, gum, swamp maple, water elm, oak, magnolia, red bay, cabbage palmetto, and myrtle.

As the expense of clearing and draining Muck is large, only a small part of it has been brought under cultivation. When cleared and drained, it is suited to a wide variety of garden vegetables, including celery, onions, cabbage, and lettuce. Large applications of fertilizer are required for all crops, and the soil is generally in need of lime.

Some of the Muck areas in the vicinity of Tampa, which grade into the Portsmouth fine sand, sell for \$1,000 or more an acre when cleared

and brought under cultivation. The uncleared areas range considerably in price, depending upon the location.

Muck, prairie phase.—The material of the prairie phase of Muck is similar to that of the typical or hammock areas. The immediate surface is frequently fibrous or peaty, and also the lower part of the mucky section. The mucky material overlies fine sand and is itself quite sandy in places, the sand having been blown in from the surrounding land. The depth of the material ranges from about 8 inches in the margin of the areas to several feet in the center, the average depth being greater than that of the hammock areas. Included with this phase are some spots of Peaty muck and of brown, fibrous or nonfibrous Peat, which are too small to separate on the map.

The prairie phase of Muck occupies depressed areas representing filled-in ponds and lakes. It is mainly confined to the eastern part of the county, the most important areas occurring in the vicinity of Plant City. The vegetation consists of saw grass, pond lilies, rushes, sagittaria, and other aquatic plants. The areas are covered with water a large part of the year.

Very little of this phase is under cultivation. If drained, it would be a valuable soil for truck crops. In its undrained condition its best use is for pasture.

PEATY MUCK.

Peaty muck consists of a cumulose deposit of decayed vegetable matter in a less advanced stage of decomposition and containing less mineral matter than Muck. In part it is a mixture of Muck and Peat in separate layers or masses, and there is consequently considerable variation throughout the type. The color ranges from black to dark brown or rusty brown, the more mucky material being the darkest colored. The brown material usually is coarse and fibrous, approaching the character of Peat, but it may be finely divided in spots. The black material is only slightly fibrous. The depth of the material ranges from about 10 inches to several feet. Over most of the type, however, a compact, water-soaked, gray to white fine sand is encountered within the 3-foot section, generally at a depth of about 24 inches.

Peaty muck occurs throughout the county. Most of the areas are small, occupying depressions in the flatwoods and in the higher rolling sections. Some of the areas are connected by stream-way depressions which afford some drainage when the water is high, but as a rule water stands on the surface a large part of the year. In many places the surface is uneven, owing to the formation of hummocks around tree stumps or the burning out of the more peaty spots in dry spells. The vegetation in some of the areas consists almost

exclusively of cypress, while in others there is a mixed growth consisting mainly of cypress, gum, red bay, magnolia, swamp maple, and myrtle, with a carpet of sphagnum moss. When the growth is mixed, it is usually thick.

Owing to the expense involved in clearing and preparing this land, very little of it is cultivated. Some areas near Tampa have been cleared and drained and are devoted to truck crops. The newly cleared land usually is too raw for celery, although some good celery has been grown on it. It is better suited to such crops as tomatoes and potatoes. The more peaty spots dry out quickly and crops suffer greatly for moisture.

This soil requires large applications of commercial fertilizer, and stable manure is highly beneficial. The structure of the soil material in cultivated areas is improved by sand washed into it from other soil types.

The value of the areas of Peaty muck varies considerably, depending upon location and drainage possibilities. The prices range from \$10 to several hundred dollars an acre.

Peaty muck, prairie phase.—Peaty muck, prairie phase, consists of a variable mixture of mucky and peaty material of black to rusty-brown color. It is usually somewhat fibrous, and ranges in depth from 10 inches to 7 feet or more, but as a rule the underlying compact gray sand is encountered at 24 to 30 inches.

There are a number of areas of this phase, ranging in size from a few to several hundred acres, the largest occurring in the central part of the county. They represent shallow ponds and lakes which have been gradually filled by the growth and decay of vegetation. These areas are inundated most of the year, and in places throughout the year. Some of them are covered with saw grass, with a lily pond here and there, and others support a growth of rushes, sagittaria, and various water-loving grasses and sedges.

This phase is of little value for agriculture, and only a small part of it has been put under cultivation. Its main use is for grazing. The largest cultivated areas are in the vicinity of Mango Lake. These have been drained and fitted with means for subirrigation, and are successfully used for the production of truck crops, mainly celery, snap beans, potatoes, sweet corn, and lettuce.

Large quantities of commercial fertilizer are used. For celery 1 ton or more per acre is used, a large initial application being made, with side applications as needed. Where the phase is cultivated, sand has been hauled in and incorporated with the soil. This not only improves the texture of the soil, but makes it firm enough to hold the weight of animals; otherwise muck shoes have to be used on work stock.

There are several bodies of this phase convenient to railroads that could be profitably drained and cultivated.

SWAMP.

Swamp includes low-lying areas bordering streams and covered with water all or most of the year. The soil material is extremely variable in color, texture, and structure, but is usually of a mucky to peaty character.

The largest areas of Swamp occur along the Hillsborough River and its branches. Some of the areas were formerly flatwoods and have been formed by the damming of the Hillsborough River. The area lying between Harney and Lake Thonotosassa was largely formed by the building of a dam above Sulphur Springs.

Swamp is nonagricultural, and is valued only for the cypress timber it supports. Its reclamation would be very difficult.

TIDAL MARSH.

Tidal marsh consists of the low, flat, marshy areas surrounding Tampa Bay and extending up the streams. Some of the areas are subject to inundation by salt water during ordinary tides and others only at times of spring tides or when high winds drive the sea water inland. The Tidal marsh areas represent recent soil material, and are still in process of formation. The material consists mainly of compact gray sand, but in places where water stands much of the time it is a silty muck or silty peat and is inclined to be oozy.

Tidal marsh is nonagricultural and of practically no value. Most of it supports a growth of marsh grasses, which afford some grazing. A considerable part of the areas in the section extending from the mouth of the Alafia River south to the Little Manatee River is covered with a more or less dense growth of mangrove bushes. There are also bare spots, or "sand flats," in these marshes that are devoid of vegetation.

SHELL MOUNDS.

Shell mounds are heaps or mounds of oyster, clam, and other shells accumulated by aboriginal people, as evidenced by the presence of broken pottery and charcoal or ashy layers. These mounds occur along the shores of the bay and the lower courses of streams, and form low, rounded knolls a few rods wide to ridgelike areas several hundred feet in length. The depth of shells ranges from 1 to 5 feet. Only the largest of these mounds could be shown on the map. Two of these are on the Alafia River—one on each side of the ferry.

Shells for surfacing roads are obtained from most of the mounds. Only one of them is cultivated; it supports an orange grove. The use of large quantities of fertilizer is necessary.

MADELAND AND MINE DUMPS.

Madeland represents filled-in areas. This condition occurs at Tampa, where channels are being dredged and slips to docks dug, the material removed being used to fill up the low marshes or the areas covered by shallow water along the edges of the bay. In time, with the leaching out of the salt, these fills will support vegetation.

Around phosphate plants large excavations are made, the overburden and the material separated in washing being left on the adjoining land. These deposits are known as Mine dumps. Around the mines southeast of Plant City a considerable area is occupied by these excavations and dumps.

WATER AND GRASS.

Water and grass represents bodies of water in which there is a growth of grasses and other aquatic plants. Some of the areas are dry during short periods. The areas of water and grass are shown on the soil map by symbols.

The soil material occurring in these ponds is so variable that its classification with soil series is impracticable. It consists mainly of the Plummer fine sand and a pond or prairie phase of this type intermingled with spots of Muck and Peaty muck. Some of the areas if reclaimed should produce good yields of truck crops, but those known locally as "sand ponds" would be of very little value.

SUMMARY.

Hillsborough County is situated in the west-central part of the Florida Peninsula, partly surrounding Tampa Bay. It comprises an area of 1,045 square miles, or 668,800 acres.

The surface features of the county range from large, level or nearly level flatwoods areas to uplands varying from gently undulating to rolling and hilly.

The low, coastal flatwoods area is poorly drained. The uplands are generally marked by the absence of surface streams; but the higher interior section to the east is drained by the Hillsborough, Alafia, and Little Manatee Rivers and their tributary creeks.

Settlement of the county began just prior to 1850 and progressed slowly. In 1910 the population of the county, including the territory later taken to form Pinellas County, was 78,374, of which 37,782 was credited to Tampa. Tampa is the county seat and one of the largest cities of the State. It is an important cigar-manufacturing center. Plant City is the next largest town, and is an important agricultural center.

The county has good transportation facilities, both by rail and water, and many miles of hard-surfaced roads. Agricultural products are shipped in large quantities to northern markets.

Hillsborough County has a subtropical climate. The mean annual temperature is about 70° F., and the mean annual precipitation about 51.5 inches. There is a normal growing season of 11 months, but hardy vegetables are grown throughout the winter. The rainfall is much more abundant in the summer and early fall than in the winter and spring, and the former is recognized as the wet season and the latter as the dry season.

The agriculture of the county consists mainly of citrus-fruit growing and trucking, with some general farming, dairying, and stock raising. Oranges, grapefruit, and mandarins are the principal citrus fruits and celery and strawberries the principal truck crops. Native grasses are cut for hay. A large part of the county is unfenced and is used as range for cattle and hogs, which are raised in considerable numbers. Dairying is carried on in the vicinity of Tampa and Plant City. Poultry is kept on most of the farms, and a few farms are devoted entirely to poultry raising. Large quantities of commercial fertilizer are used in the citrus groves and for truck crops.

Both white and colored laborers are employed in farm work, and good wages are paid. Women and children are employed for picking strawberries and beans.

Land holdings range in size from an acre or two to several thousand acres. The average size of farms is reported in the 1910 census as 57.5 acres, and there are 1,983 farms in the county. The price of undeveloped land ranges from \$10 to \$150 an acre. Most of it brings \$25 to \$75 an acre in small tracts. Orange groves and trucking land near towns sell for \$1,000 or more an acre.

Hillsborough County lies in the Coastal Plain province. The materials from which most of the soils are formed consist of unconsolidated marine sediments. These rest at comparatively little depth on consolidated rocks, mainly siliceous and cherty limestones, and upon marls. In the eastern part of the county there are some "pebble" phosphates. The underlying rocks have had comparatively little influence on the soils.

The soils of the county, according to origin and mode of formation, fall into four groups, viz, marine-sedimentary, alluvial, residual or partly residual, and cumulose. The marine-sedimentary group may be divided into well-drained upland soils and poorly drained flatwoods soils. The former comprise the Norfolk and St. Lucie series. The flatwoods soils are classed with the Leon, Portsmouth, Plummer, and Scranton series.

The Norfolk series is characterized by light-gray to dark-gray surface soils and pale-yellow subsoils. The topography is flat to undu-

lating and rolling, the rolling areas constituting the roughest sections of the county. One type, the Norfolk fine sand, with a hammock and a scrub phase, is mapped in Hillsborough County. These soils cover a large part of the county. The main type and the hammock phase are very important citrus-fruit and trucking soils, but the scrub phase is of relatively little value.

The St. Lucie series is represented in the county by one type, the fine sand, with a flatwoods phase. This type consists of a white, siliceous sand, more than 3 feet deep. It is excessively drained and supports a scrub growth of spruce pine, evergreen oak, rosemary, and saw palmetto.

The Leon series occupies the higher positions in the flatwoods, lying as a rule only slightly above the darker colored Portsmouth soils. It is represented by one type, the fine sand, which consists of a light-gray to white fine sand having an impervious hardpan stratum within the 3-foot section. This is the most extensive soil of the flatwoods. It is of little agricultural value, and most of it supports a growth of longleaf pine, scrub saw palmetto, wire grass, and broom sedge. It is known as "palmetto flatwoods."

The Portsmouth series is represented by one type, the fine sand, with a hammock and a prairie phase. The surface soil is black and the subsoil light gray to white. A black to rusty-brown hardpan layer occurs within the 3-foot section. This is a good trucking soil when drained and irrigated. The greater part of the type supports a growth of longleaf pine, saw palmetto, gallberry bushes, and broom sedge, with some wire grass on the higher areas. It is locally referred to as "gallberry flatwoods."

The Plummer series is characterized by gray surface soils, frequently containing brownish mottlings and underlain at depths of 4 to 12 inches by dull-gray to nearly white material, more or less streaked with brown and yellow. One type, the fine sand, with a cypress-swamp phase, is mapped. This type occupies the shallow depressions in the flatwoods known as "prairie" or "sand ponds," and supports a growth of sedges and wild grasses. It is covered with water during rainy periods and is of little value other than for pasture.

The Scranton series is distinguished by the black to dark-brown color of the surface soils and the yellowish or grayish color of the subsoils. The fine sand is the only type of this series mapped in Hillsborough County. This is one of the more important soil types in the county and a large part of it is cleared and under cultivation. It is used for a wide variety of crops.

The alluvial group is represented by one soil type, the Bibb fine sand, which has a light-gray to dark-gray or black surface soil and a dingy-gray to nearly white subsoil. This type occurs along some of the stream bottoms; it is semiswampy and of little value.

The residual or partly residual soils are included in the Gainesville and Parkwood series. The Gainesville fine sand occupies high, rolling areas and is well drained. The soil material is prevailingly snuff colored, with brick-red and amber-yellow variations, and is more than 3 feet deep. It is comparatively productive.

The soils of the Parkwood series are low lying and poorly drained or semiswampy. The fine sandy loam, with a flatwoods phase, and a dark-colored phase of the clay are mapped. These soils support a heavy hammock vegetation. They are not extensively utilized, but when reclaimed are strong, productive soils.

The Cumulose soils are mapped as Muck and Peaty muck. They occupy filled-in depressions or ponds and lakes, and are in part forested and in part covered by water-loving plants and grasses. Only a small proportion of these soils is under cultivation, this being used for truck crops.

Swamp, Water and grass, Tidal marsh, Shell mounds, and Madeland and Mine dumps are classed as miscellaneous materials.



[PUBLIC RESOLUTION—No. 9.]

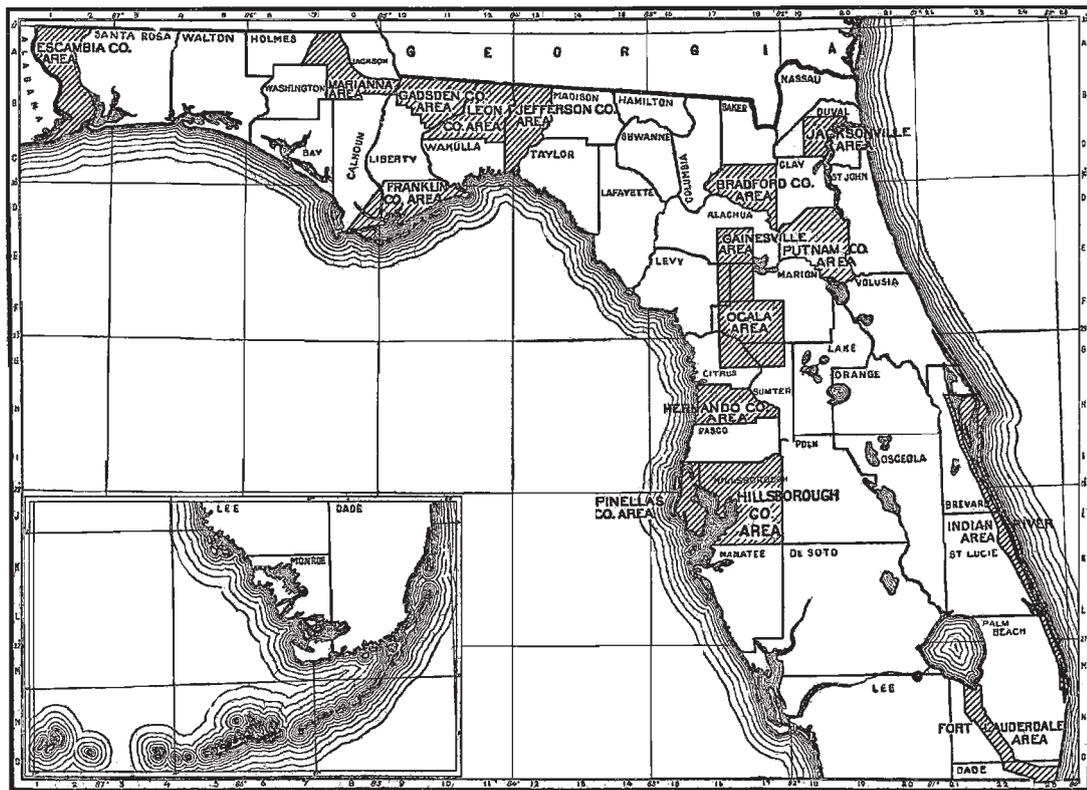
JOINT RESOLUTION Amending public resolution numbered eight, Fifty-sixth Congress, second session, approved February twenty-third, nineteen hundred and one, providing “for the printing annually of the report on field operations of the Division of Soils, Department of Agriculture.”

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

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

Approved, March 14, 1904.

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



Areas surveyed in Florida.

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