Series 1954, No. 6

Issued November 1959

SOIL SURVEY

Sarasota County Florida

UNITED STATES DEPARTMENT OF AGRICULTURE
Soil Conservation Service
In cooperation with
UNIVERSITY OF FLORIDA AGRICULTURAL EXPERIMENT STATIONS

HOW TO USE THE SOIL SURVEY REPORT

THIS SOIL SURVEY of Sarasota County will serve several groups of readers. It will help farmers and livestock men in planning the kind of management that will protect their soils and provide good yields; assist engineers in selecting sites for roads, buildings, ponds, and other structures; and add to the knowledge of soil scientists.

In making this survey, soil scientists walked over the fields and marshlands. They dug holes and examined surface soils and subsoils; noticed differences in growth of crops, weeds, and grasses; and, in fact, recorded all the things that they thought might affect the suitability of the soils for farming, engineering, livestock production, and related uses.

The scientists plotted the boundaries of the soils on aerial photographs. From the photographs, cartographers prepared the detailed soil maps in the back of this report on which woods, pastures, roads, bays, creeks, and many other landmarks are shown.

Locating the soils

Use the index to map sheets to locate areas on the large map. The numbered rectangles on the index map show the parts of the county covered by each of the soil maps. Select the sheet showing that part of the county on which your farm is located. The boundaries of the soils are outlined in red, and there is a symbol for each kind of soil. All areas marked with the same symbol are the same kind of soil, wherever they appear on the map. Suppose, for example, an area located on the map has a symbol Da. The legend for the detailed map shows that this symbol identifies Delray fine sand. This soil and all the others mapped in the county are described in the section Descriptions of the Soils.

Information on the soils

Special sections of this report will interest different groups of readers. The introductory part, which discusses climate, physiography, and some statistics on agriculture, will be of interest to those not familiar with the county.

Farmers and those who work with farmers can learn about the soils in the sections Soil Series and Their Relations, and Descriptions of the Soils. After the scientists had mapped and studied the soils, they judged what use and management each soil should have. Then they listed it in a soil capability unit; that is, in a group of soils that need similar management and respond in about the same way. For example, in the section on soil descriptions, Delray fine sand is placed in capability unit IIIw-2. The management this soil needs, therefore, will be stated under the heading Capability Unit IIIw-2, in the section Capability Units. The farmer who has Delray fine sand on his farm may want to study table 4, which tells what principal crops can be grown and the quantity that can be harvested from Delray fine sand under two levels of management. Table 5 shows the carrying capacity of native range and the estimated average yields under two levels of management for Delray fine sand and other soils.

If you find that you need help in farm planning, consult the local representative of the Soil Conservation Service or the county agricultural agent in Sarasota County. Supervisors of the Sarasota Soil Conservation District will arrange for you to get technical help on a farm conservation plan. Members of the staff of your State agricultural experiment station will also be glad to help you.

Engineers will want to refer to the section Engineering Properties of the Soils. Tables in that section show the depth to bedrock, the texture of the soil layers, drainage, and other characteristics of the soils that affect engineering.

Soil scientists will find information about how the soils were formed and how they are classified in the section Genesis, Morphology, and Classification of Soils.

Fieldwork for this survey was completed in 1954. Unless otherwise indicated, all statements in the report refer to conditions in the county at that time.

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Series 1954, No. 6

Issued November 1959

SOIL SURVEY OF SARASOTA COUNTY, FLORIDA[1]

Field survey by ROBERT WILDERMUTH, in charge, and JOSEPH L. HUBER, U. S. Department of Agriculture; RALPH G. LEIGHTY, U. S. Department of Agriculture and University of Florida Agricultural Experiment Stations; and ORLANDO E. CRUZ, VICTOR W. CARLISLE, and JAMES H. WALKER, University of Florida Agricultural Experiment Stations

Report by ROBERT WILDERMUTH and DAVID P. POWELL, Soil Conservation Service, U. S. Department of Agriculture

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United States Department of Agriculture in cooperation with University of Florida Agricultural Experimental Stations

General Nature of the Area

SARASOTA COUNTY, in the southwestern part of the Florida peninsula, borders the Gulf of Mexico. The climate is favorable for growing vegetables, ornamental plants, and citrus fruits. Celery is planted on the largest acreage, but other crops grown commercially are beans, cabbage, sweet corn, lettuce, escarole, peppers, spinach, cucumbers, and tomatoes. Truck crops are cultivated intensively in the western part of the county. Commercial citrus groves are near the coast The native forage is generally sparse and the soils are low in inherent fertility, but in recent years improved pasture has been established on many areas. Commercial cattle raising is expanding rapidly into all sections of the county.

The subtropical climate and a water frontage along the gulf attract numerous tourists, many of whom settle in the area. The tourist trade has been an important factor in the development of Sarasota County, although the spread of urban subdivisions has removed large areas from commercial agriculture.

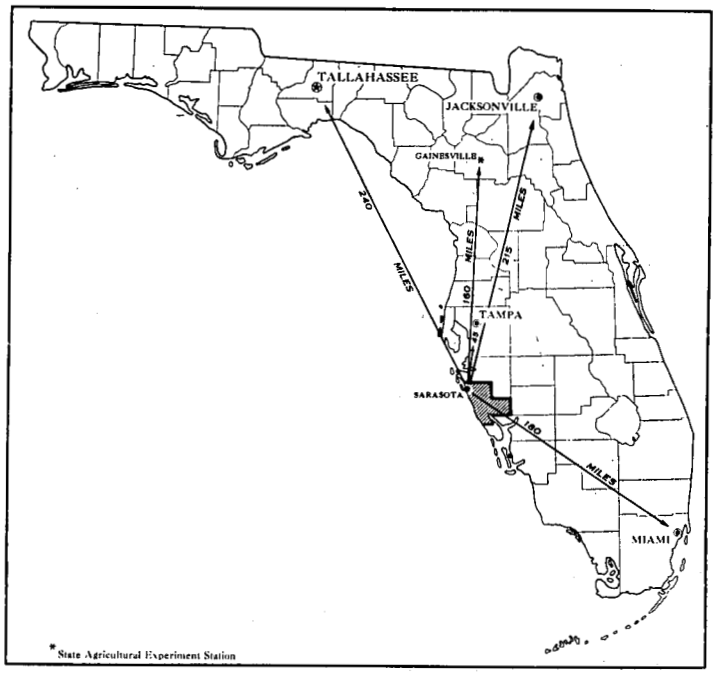

Figure 1.—Location of Sarasota County in Florida.

Location and Extent

Sarasota County occupies approximately 375,040 acres, or 586 square miles, in southwestern Florida. In addition, 21,760 acres of water occur within the boundary of the county. The county is bounded on the west by the Gulf of Mexico; on the north by Manatee County; on the east by Manatee and De Soto Counties; and on the south by Charlotte County (fig. 1). Sarasota, the county seat and largest city, is on the gulf.

Physiography

Sarasota County occupies a part of the Floridian section of the Coastal Plain province (*5*).[2] The Florida peninsula, as described by Cooke (*3*), consists of five topographic divisions. The principal and most extensive ones are the Central Highlands and the Coastal Lowlands, which border the entire coastline of the State. All of Sarasota County falls within the Coastal Lowlands. The lowlands, for the most part, consist of level to nearly level plains where practically no stream dissection has taken place. The flood plain of Myakka River, the chief drainage stream, is only a few feet below the adjoining upland. Short slopes of low gradient, paralleling drainageways, have been formed for short distances in scattered areas.

Changes in elevation are very gradual, and the rise is barely perceptible over long stretches of landscape. A few localities have small, narrow, low ridges with nearly flat tops that are a few feet above the surrounding terrain.

Sarasota County is made up of parts of several marine terraces that were constructed by ocean waters during the Pleistocene epoch. Different invasions of marine seas left successive shores over the Coastal

[1] Part of the fieldwork of this survey was done while Soil Survey was a part of the Bureau of Plant Industry, Soils, and Agricultural Engineering. Soil Survey was transferred to the Soil Conservation Service November 15, 1952.

[2] Numbers in italics refer to Literature Cited, p. 71.

Lowlands at elevations of approximately 100, 70, 42, and 25 feet. The terraces, corresponding to these several inundations, have been named, respectively, Wicomico, Penholoway, Talbot, and Pamlico (*3*). The Pamlico terrace is the most extensive in the county. Changes from one marine terrace level to another, for the most part, are indefinite and poorly defined. The most apparent terrace escarpments are in the northeastern part of the county.

Relief

Elevations in the county range from sea level to about 95 feet. The highest points are in the northeast, several miles north of old Miakka. The highest measured elevation, 95.5 feet, is near the Manatee County line, a short distance south of Verna (*7*). Other elevations are Bee Ridge, 36 feet; Laurel, 13 feet; Osprey, 17 feet; Sarasota, about 10 to 31 feet; and Venice, about 7 to 15 feet.

Numerous slight depressions or shallow wet areas and sloughs about 1 to 3 feet deep are common. They range from less than an acre to many acres in size, but their total area is considerable. Many are round or oval, whereas others are irregular in shape. These depressions have no particular pattern in the landscape. The water level in these depressions fluctuates significantly. In the rainy season, it is a few feet higher than in dry periods. Many of the depressions are shallow intermittent ponds without natural outlets (fig. 2).

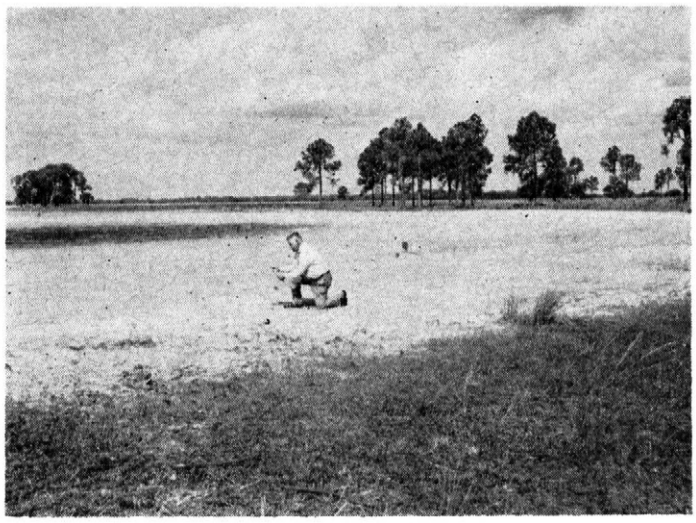

Figure 2.—**Many poorly drained soils occur in small saucerlike depressions that have no natural outlet.**

Drainage

Much of the county is level or nearly level, and the drainage is imperfect to poor. As a whole, the county slopes very gradually southward toward the Gulf of Mexico. About 75 percent of the area in the county is in the Myakka River watershed. This stream has its headwaters in Manatee County and flows southward through the central part of Sarasota County. Its principal tributaries are Cow Pen, Deer Prairie, and Big Sloughs. Above Lower Myakka Lake, the channel is choked in places by water-hyacinths. Below the lake, the river flows more rapidly and drainage is more effective. Ditches have been cut in Cow Pen and Big Sloughs to facilitate the removal of excess surface water.

A drainage district has been established near Fruitville. In this celery-growing area, an extensive system of canals and lateral ditches has been constructed to control the water level. Drainage from this locality empties into Phillippi Creek.

Several small creeks in the western part of the county flow into the gulf and locally drain areas several miles inland. Canals connect some of these creeks and drain adjoining wet areas.

Most of the county has a high water table. The "flatlands" may be saturated at times, and their depressions are entirely submerged during the rainy season. Dry sandy land is not extensive. It occurs as small tracts or as narrow, fairly short bodies, mostly over the western part of the county. Several areas of well-drained land are near Miakka. Narrow strips of mangrove swamps border parts of the coast and some stream channels. This swampy vegetation grows on a few small islands between the mainland and the keys.

Alluvial plains along the Myakka River usually are flooded during rainy periods, and the floodwaters recede slowly. Natural drainage of excess water from most sections of the flatwoods is slow. Some water seeps into sloughs and depressions by underground movement, but evaporation and transpiration lower the water table in many localities. Ditches have been dug to connect numerous ponded areas and provide an outlet for excess surface water.

Tidewaters extend inland for several miles into some of the embayments, lagoons, and streams along the coastal section and up the Myakka River to a point east of Venice. The change from salt to fresh water is gradual and is usually accompanied by a change in the kind of water vegetation.

Organization and Population

Indians once occupied this part of Florida, as is evidenced by their mounds and shell banks along the coast. The first white man known to have visited this area was Hernando De Soto, the Spanish explorer, who landed on Longboat Key on July 9, 1539 (*6*). Fishermen, hunters, and some pioneers occasionally came from nearby areas during early colonial times, but no definite settlement was established. Maps of the coastline and bays were published as early as 1774. Settlers gradually arrived from Georgia, Virginia, and the Carolinas, and some from New England. They located along the bays and near the coast.

Following the Civil War, newcomers settled along the coast and in inland sections. The land was cleared and cultivated to sustaining crops. In time, herds of cattle grazed the open range. Citrus groves were planted in different parts of the county. The first post office was established August 16, 1878, and was named Sara Sota. A group of Scotch colonists came in 1885 and made the first major attempt to develop Sarasota. The town was

incorporated in 1920. Bee Ridge, Fruitville, and Miakka came into existence between 1867 and 1883.

Sarasota County was created by the State legislature on May 14, 1921. According to the 1950 census, it had a population of 28,827.

By the turn of the century, people from the north were being attracted to the area by its mild climate, and winter visitors came in increasing numbers. Sarasota has become a popular resort and is expanding rapidly. Venice and Englewood, coastal communities, also attract tourists. Myakka River State Park, a wildlife refuge and picnic site, is in the county.

At the present time the population is concentrated within a short distance of the gulf coast. Most of the resident population is in Sarasota (18,896 people in 1950) and Venice (727 in 1950). Longboat, St. Armand, Siesta, and Casey Keys are narrow sand islands fringing the gulf. They are connected with the mainland by causeways.

Climate

The climate of Sarasota County is subtropical (*13*). The coastal area is warmer in winter and cooler in summer than the interior. The summer heat is tempered by sea breezes, and the warm water of the gulf modifies the winter temperatures. Afternoon thunderstorms during the rainy season (June to September) modify the extremely high temperatures. Winds sweeping across the Gulf of Mexico and the Atlantic Ocean also influence the weather. Dense fogs are rare and are generally confined to early mornings during the cooler months. Climatic data taken at the nearest Weather Bureau Station at Bradenton, Manatee County, are given in table 1.

Although rainfall is fairly abundant in Sarasota County, total precipitation may vary greatly from year to year. The fluctuations in rainfall are apt to be greater than the fluctuations in temperature. From about the first of July through October, tropical disturbances that reach hurricane intensity develop in the Caribbean Sea and West Indies. Occasionally, one of these storms crosses the peninsula, and the accompanying rain generally causes more damage to crops than the wind. The winds of high velocity are more destructive to tall vegetation, trees, and buildings.

According to a 40-year record, the latest frost in spring recorded at Bradenton, Manatee County, was March 25, and the earliest in fall was November 18. In this period there were 13 years in spring and 21 years in autumn that had no killing frosts. Because several years go by without killing frosts, no attempt has been made to give the average frost dates nor the average duration of the growing season.

Temperatures below freezing are uncommon and seldom occur more than once or twice a season. Some localities near the coast are frost free throughout the year, and these areas are favorable for growing vegetables and fruits. Occasional cold waves may cause such a sudden drop in temperature that citrus growers heat their groves to prevent damage to fruit and trees. Such conditions, however, are rare.

TABLE 1.—*Temperature and precipitation at Bradenton Station, Manatee County, Florida*

[Elevation, 10 feet]

Month	Temperature[1]			Precipitation[2]		
	Average	Absolute maximum	Absolute minimum	Average	Driest year (1944)	Wettest year (1912)
	°F	°F	°F	Inches	Inches	Inches
December	62.6	86	19	2.35	0.47	1.21
January	61.5	88	20	2.63	1.69	5.98
February	62.5	89	21	2.78	.27	1.95
Winter	62.2	89	19	7.76	2.43	9.14
March	66.2	91	30	2.34	4.83	1.86
April	70.7	93	37	2.31	1.90	1.13
May	75.6	97	45	3.06	2.30	3.84
Spring	70.8	97	30	7.71	9.03	6.83
June	79.8	100	55	6.90	3.10	25.62
July	80.8	99	61	9.73	5.75	9.03
August	81.2	98	62	9.58	3.09	6.45
Summer	80.6	100	55	26.21	11.94	41.10
September	80.0	98	56	7.64	2.37	16.65
October	74.5	96	39	3.39	3.38	5.61
November	67.2	90	27	1.89	.30	2.10
Fall	73.9	98	27	12.92	6.05	24.36
Year	71.8	100	19	54.60	29.45	81.43

[1] Average temperature based on a 72-year record, through 1955; highest temperature on a 61-year record, and lowest temperature on a 60-year record, through 1955.

[2] Average precipitation based on a 72-year record, through 1955; wettest and driest years based on a 72-year record, in the period 1869-1955.

A combination of high temperature and high humidity is prevalent during the summer months. The winters are mild and have many bright sunny days that insure a long growing season. Many kinds of vegetables, grasses, and fruits can be grown, as well as sensitive plants that require a long maturing period free from frost. The climate is also favorable for the cattle industry. Shelter is seldom needed or provided for range cattle. Many kinds of native grasses and other vegetation are available for forage throughout the year. The climate is one of the chief assets in developing the agriculture of Sarasota County.

The tourist trade has become the chief source of income for many people. Much of the most highly developed agricultural land along the coastal area is now urbanized.

Water Supply

Plenty of water is available for agricultural and community purposes in Sarasota County. Local rains run off slowly through wide shallow sloughs, shallow ditches, small streams, and subsurface drainage. Dur-

ing wet seasons the ground-water level rises near the surface over most of the land, and water collects in depressions and sloughs. Proper disposal of excess surface water through drainage thus becomes a problem during much of the year.

During seasonal dry spells, however, surface water is dissipated through gradual drainage, evaporation, and transpiration. The shallow ponds become dry, and the water table recedes to a depth below the normal root zone of most crops. The sandy soils, which are dominant in the county, then become very droughty, and the crops need additional water. During dry seasons, therefore, water shortages are serious. The natural basins that have stored some excess water during wet seasons are too limited for extensive use. Small dug ponds supply limited amounts of surface water for stock and irrigation. These ponds, however, are not widely used. The major source of water for irrigation and stock during dry spells comes from water-bearing limestone formations that underlie the county. These underground reservoirs also supply water for domestic use.

The principal underground supply of water in Sarasota County comes from the Hawthorn formation, which begins near the surface. It consists of interbedded clay, sand, sandy phosphatic limestone, and marl. The underlying Tampa formation and the Ocala group are also water bearing. Water from these formations, however, contains a large amount of chlorides and may not be so well suited to farm or domestic use.

Water in the Tampa and Ocala limestone and Hawthorn formations is under artesian pressure. Wells that penetrate these formations are in most of the western part of the county (*10*). Flowing wells are the source of most water used for irrigation. Although the supply of water in the artesian reservoirs seems adequate, the increased demand for water for farm and urban use during peak periods reduces the artesian pressure to a point where pumping is necessary. Under excessive pumping, artesian wells are endangered by the encroachment of salt water.

Vegetation

Many kinds of plants grow in Sarasota County as a result of the subtropical climate. The native vegetation is affected not only by climate but also by differences in soil characteristics and in drainage. A number of native plants are almost consistently identified with particular kinds of soils.

Originally, much of the county was heavily forested with pine, but most of the original trees have been cut for timber from large tracts. The subsequent stands, generally of smaller growth, have been cut in some sections for timber or to clear the soils for agricultural use.

Wooded and treeless areas are intermingled in all parts of the county. Pine forests, with an undergrowth of saw-palmetto and wiregrass, dominate the flatwoods. Scrub oaks prevail on the drier sand ridges. Numerous grasses and low-growing types of plants grow over the prairie areas. Cabbage palmetto and live oak form a dense growth on the hammocks that commonly occur in narrow belts near ponds, sloughs, and drainageways.

The natural vegetation of the county can be classified as follows (*4*) : (1) Pine flatwood forests, (2) pine and cabbage-palmetto forests, (3) prairies, (4) scrub forests, (5) hammock forests, (6) swamp forests, (7) marshes, and (8) coastal margins.

The pine flatwood forests (fig. 3) support a sparse to moderate stand of slash pine and longleaf pine, with an undergrowth of saw-palmetto, wiregrass, gallberry, huckleberry, and runner oak. Some myrtle and ferns occur on the more moist sites. This type of growth is characteristic on the Leon, Immokalee, Pomello, and Ona soils.

***Figure 3.*—Pine has reseeded on the flatwoods over an undergrowth of saw-palmetto and shrubs. Leon and Immokalee are typical soils in the flatwoods area.**

Pine and cabbage-palmetto forests (fig. 4) occur on landscapes similar to those on which the pine flatwood forests have developed. The vegetation is similar except for a moderate growth of cabbage palmetto and, locally, some live and water oaks. This forest type is commonly associated with Adamsville, Sunniland, Keri, Bradenton, and Broward soils, which are sweeter and have a higher pH value than Leon, Immokalee, Pomello, and Ona soils.

Prairies are treeless areas covered with grasses and shrubs. They are too dry to be classified as marshlands. Two types of prairies occur in Sarasota County, based on the degree of drainage and the nature of the ground cover, as follows:

(1) Saw-palmetto prairies (fig. 5) have vegetation consisting chiefly of saw-palmetto, wiregrass, runner oak, huckleberry, gallberry, and native grasses. Leon and Immokalee soils have developed in such areas.
(2) Seasonally wet prairies have a variety of grasses, shrubs, and sedges suited to poorly drained sites. They include such plants as switchgrass, Ft. Thompsongrass, broomsedge, carpetgrass, pickerelweed, water iris, arrowhead, St. Johnswort, and dollarplant. The soils on these prairies are the Pompano, Charlotte, Delray, Plummer, and Rutlege.

Scrub forests are composed mainly of scrub live oak and saw-palmetto, with an intermingling of sand pine, turkey oak, slash pine, rosemary, pricklypear cactus,

Figure 4.—**Pine and palmetto and scattered cabbage palmetto on Adamsville, Keri, and Sunniland soils. Cabbage palmetto is usually a good indicator of neutral or calcareous substrata.**

and many native grasses. Lakewood, Lakeland, Blanton, and St. Lucie soils support such a cover.

Hammock forests (fig. 6) have a dense mixed growth of cabbage palmetto and hardwoods, such as live and water oaks, and a scattering of slash pine. The undergrowth is saw-palmetto, shrubs, vines, and various grasses. Parkwood and Bradenton soils dominate in areas occupied by hammock forests.

Swamp forests have a heavy growth of cypress, bay, gum, ash, and swamp maple, and an undergrowth of ferns.

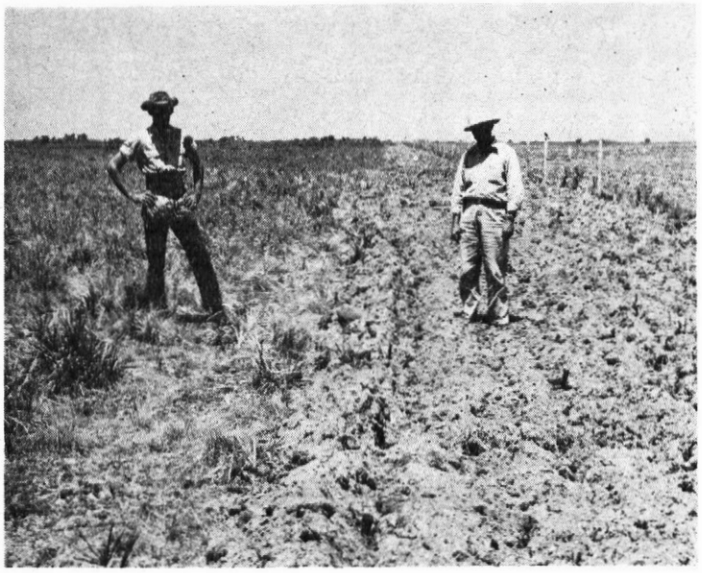

Figure 5.—**Saw-palmetto prairies on which saw-palmetto, runner oak, huckleberry, wiregrass, and other native grasses occur extensively. These areas can be cleared easily, and good pastures can be developed.**

Marshes include tidal marsh and mangrove swamps. A dense growth of cordgrass, bulrush, and other aquatic plants and grasses is associated with tidal marsh. The growth in the swamps consists principally of red mangrove and black mangrove and a few salt-tolerant plants.

On coastal margins are sparse to dense growths of various trees, shrubs, and grasses. The trees include cabbage palmetto, water oak, cedar, and mangrove. The undercover consists of miscellaneous shrubs, as Spanish-bayonet, myrtle, and oaks. In the open spaces are sawgrass, saltwater bermudagrass, small cordgrass,

Figure 6.—**The characteristic vegetation of hammock forests is cabbage palmetto, live oak, water oak, and other hardwoods. This type of growth usually indicates calcareous soils, such as those of the Parkwood or Bradenton series.**

other grasses, sandbur, and sea oats. Many vines, such as beach morning-glory and greenbrier, grow in this area.

A list of the scientific and common names of the grasses, plants, vines, shrubs, and trees native to Sarasota County follows:

VEGETATION COMMON TO SARASOTA COUNTY, FLORIDA

Scientific Name	*Common Name*
Acer sp	Maple.
A. rubrum	Red maple (swamp maple).
Acrostichum daneaefolium	Fern.
Andropogon sp	Beardgrass (bluestem).
A. elliottii	Elliott beardgrass.
A. gerardi	Big bluestem.
A. scoparius	Little bluestem.
A. virginicus	Broomsedge.
Ardisia escallonioides	Marbleberry.
Aristida sp	Three-awn.
A. affinis	Longleaf three-awn.
A. rhizomophora	Florida three-awn.
A. stricta	Pineland three-awn.
Arundinaria sp	Cane.
A. tecta	Switchcane.
Avicennia nitida	Black mangrove.
Axonopus sp	Carpetgrass.
A. affinis	Common carpetgrass.
A. compressus	Tropical carpetgrass.
A. furcatus	Big carpetgrass.
Blechnum serrulatum	Sawfern.
Bouteloua hirsuta	Hairy grama.
Cenchrus sp	Sandbur.

Ceratiola ericoides ..... Sandheath.
Coccolobis sp ..... Sea grape.
Crotalaria sp ..... Crotalaria.
Cynodon dactylon ..... Bermudagrass.
Desmodium polycarpum ..... Beggarweed tickclover.
Digitaria sp ..... Crabgrass.
Distichlis spicata ..... Seashore saltgrass.
Eichhornia crassipes ..... Common water-hyacinth.
Eirochloa polystachya ..... Caribgrass.
Fraxinus sp ..... Ash.
Hydrocotyle sp ..... Pennywort (dollarplant).
Hypericum sp ..... St. Johnswort.
Ilex glabra ..... Inkberry (gallberry).
Indigofera hirsuta ..... Hairy indigo.
Ipomoea pes-caprae ..... Soilbind morning-glory (black morning-glory).
Iris savannarum ..... Prairie iris (water iris).
Juniperus sp ..... Juniper (cedar).
Litchi chinensis ..... Lychee.
Lunaria annua ..... Dollarplant.
Magnolia sp ..... Magnolia (bay).
M. virginiana ..... Sweetbay.
Mariscus sp ..... Sawgrass.
Myrica sp ..... Bayberry (waxmyrtle).
M. cerifera ..... Southern bayberry.
Nymphaea sp ..... Waterlily.
Nyssa sp ..... Tupelo (gum).
Opuntia sp ..... Pricklypear.
O. floridana ..... Pricklypear cactus.
Panicum hemitomon ..... Maidencane.
P. purpurascens ..... Paragrass.
P. virgatum ..... Switchgrass.
Paspalum dilatatum ..... Dallisgrass.
P. distichum ..... Knotgrass (Ft. Thompsongrass).
P. notatum ..... Bahiagrass.
Pennisetum purpureum ..... Napiergrass.
Pinus clausa ..... Sand pine (scrub pine).
P. elliottii ..... Slash pine.
P. palustris ..... Longleaf pine.
Pontederia cordata ..... Pickerelweed.
P. lanceolata ..... Lance pickerelweed.
Quercus sp ..... Oak.
Q. laevis ..... Turkey oak (scrub oak).
Q. laurifolia ..... Laurel oak (water oak).
Q. myrtifolia ..... Myrtle oak (scrub oak).
Q. nigra ..... Water oak.
Q. stellata var. *margaretta* ..... Sand post oak (runner oak).
Q. virginiana ..... Live oak.
Rhizophora sp ..... Mangrove.
R. mangle ..... Mangrove (red mangrove).
Rosmarinus officinalis ..... Rosemary.
Sabal palmetto ..... Cabbage palmetto (cabbage palm).
Sagittaria sp ..... Arrowhead.
Salix sp ..... Willow.
S. caroliniana ..... Coastal Plain willow.
Serenoa repens ..... Saw-palmetto.
Sesbania sp ..... Sesbania.
Smilax sp ..... Greenbrier.
S. glauca ..... Cat greenbrier.
Spartina sp ..... Cordgrass.
S. cynosuroides ..... Big cordgrass (sawgrass).
Sporobolus curtissii ..... Curtis dropseed (wiregrass).
Stenotaphrum secundatum ..... St. Augustine grass.
Taxodium sp ..... Baldcypress.
T. distichum var. *nutans* ..... Pondcypress.
Typha angustifolia ..... Cattail.
Uniola paniculata ..... Sea oats.
Vaccinium sp ..... Blueberry (huckleberry).
Vigna sinensis ..... Cowpea.
Yucca sp ..... Yucca bayonet (Spanish-bayonet).

Transportation and Markets

Public transportation is provided in the county by two railroads, an airline, and buses. Motortrucks transport large quantities of agricultural and industrial products. United States Highway No. 41, popularly known as the Tamiami Trail, passes through the county near the gulf. It is the main artery for north and south traffic in the western part of the State. United States Highway No. 301 terminates in Sarasota. It is a common route north to cities on the eastern seaboard.

About 250 miles of graded dirt and paved roads are maintained by the county, most of them in the western part. Large areas in the central and eastern sections are without roads. Between public roads there are unimproved privately owned trails that cross broad expanses of ranch land.

Packing houses are operated in Fruitville and Sarasota for crating and shipping vegetable and truck crops. Cattle are bought and sold at auction near Fruitville. Most of the agricultural products are sent by freight or express to northern and eastern cities; only small quantities are sold locally or to nearby markets.

Community Facilities

Numerous cultural activities and educational opportunities are available in Sarasota County. Schools, churches of many denominations, cultural societies, and various civic, patriotic, and fraternal organizations add to community life. Mail routes serve all rural areas.

The public school system provides grade schools and junior and senior high schools. Consolidated schools are in the larger rural communities. Children are transported by bus to town and city schools. No tuition is charged, and text books are free. However, nonresidents with children in school are required to purchase Florida automobile licenses.

Hospitals and public libraries are located in Venice and Sarasota. An air-conditioned auditorium in Sarasota is available for many types of entertainment. An art museum in Sarasota contains many paintings by great masters. A community theatre, music clubs, and a symphony orchestra give programs from time to time.

Large trailer camps are available, and many individuals retain their trailer sites the entire year. Sarasota is the spring training ground for a major-league baseball club and the winter quarters for a large circus. Pier facilities are obtainable for boats and yachts.

Myakka River State Park, covering about 27,000 acres in the northeastern part of the county, is one of the largest parks in the State park system. It abounds with many kinds of wildlife. Swimming, fishing, hunting, golfing, boating, and other recreational sports attract tourists to the coastal communities.

Agriculture

Mild year-round temperatures, ample rainfall, abundant sunshine, long growing seasons, and responsive soils are favorable to agriculture in Sarasota County. Some of the soils are inherently suited to the production

of citrus fruits, and most of the groves are located on them. Other soils are well suited to the intensive cultivation of truck crops and the growing of ornamental plants. Pasture grasses and legumes flourish on certain soils and provide range for cattle. Consequently, the agriculture of the county is diversified and specialized; it is exceeded only by the tourist trade in economic value.

Crops

Data on acreages of various market vegetables and fruits grown in the county are given in table 2. General farm crops are of minor importance, as many of the soils are not well suited to their production. Cereal crops are grown on a small scale, but their acreage fluctuates from year to year. No definite rotation is followed when corn or cereals are grown with other crops.

Vegetables and citrus fruits, although produced commercially on a fairly small scale, together form a major source of agricultural income. Celery is the principal truck crop, but the trend has been toward smaller plantings in recent years. Cucumbers were grown on 355 acres in 1949, but only a small acreage is grown at the present time. The acreage in potatoes, peas, squash, spinach, escarole, watermelon, and strawberries is also small.

The vegetable farms are concentrated chiefly near Fruitville. They are distributed elsewhere in small areas, chiefly in the western part of the county.

TABLE 2.—*Acreage of principal crops and number of bearing fruit trees in stated years*

Crop	1949	1954
	Acres	*Acres*
Corn for grain	130	355
Corn, sweet	242	67
Celery	997	665
Cabbage	50	48
Cucumbers	355	36
Beans (snap)	2	4
Eggplant	24	19
Lettuce and romaine	40	114
Sweet peppers and pimientoes	28	12
Tomatoes	17	27
Watermelons	15	17
	Number [1]	*Number*
Grapefruit trees	39,920	51,958
Orange trees	134,487	52,993
Tangerine and mandarin trees	233	1,468
Lemon trees	123	286
Lime trees	67[1]	651

[1] 1950.

Oranges and grapefruit, the main citrus crops, are grown principally on a commercial basis. Small plots are used for lemons, limes, tangerines, avocados, mangoes, bananas, lychee, and other subtropical fruits. Most citrus groves are very small and are generally in a narrow strip near the gulf. Nearly all of the land well suited to citrus has been used so that any large expansion of the groves is probably restricted. The acreage in lime trees is increasing.

Local nurseries supply lawn grasses and ornamental plants and shrubs. A demand for lychee nuts in northern markets has encouraged the planting of lychee trees.

A more detailed account of the principal crops is given in the section Use and Management of Soils.

Pasture

Large tracts of unimproved cutover land are fenced and grazed by cattle for the available forage. Areas of flatwoods composed of many kinds of soils are cleared annually for the establishment of improved pasture. All parts of the county contain soils suitable for growing good-quality grasses and legumes. Most of the areas being converted to pasture are on imperfectly drained soils. At present, only a small acreage of the poorly drained bottom lands and few of the ponded soils have been cleared for crops or improved pasture, because of the expense involved and the difficulty of reclamation. Soils on scrub land usually remain undeveloped because of their droughtiness and infertility.

The availability of native pasture has resulted in development of many livestock farms. These farms are called ranches. A few ranches are in excess of 10,000 acres; consequently, the total acreage in ranches covers a considerable part of the county.

Pastures are so important to the agriculture of Sarasota County that a separate discussion of Pastures is included in the section Use and Management of Soils.

Livestock and Livestock Products

Sarasota County, having an extensive acreage of soils favorable to improved pasture, a long grazing season, and a mild climate, is well suited to cattle production. It now ranks eighth in the State in number of cattle produced. The livestock enterprise continues to expand into all areas and is now one of the principal agricultural activities in the county. The census for 1950 recorded 13,636 head of cattle and calves, but by 1954 this number had increased to 24,364 and included 15 herds of purebred cattle.

About 25 percent of the beef cattle are grades of native stock of an inferior type. The animals that graze native range most of the time tend to be thin because the feeding value of the plants is low and the supply of forage is small. Progressive cattlemen are improving their pastures and the quality of their animals. They are building up their herds by the introduction of better breeding stock.

Several breeds of beef cattle are used to improve the herds. Brahman cattle are popular on a number of ranches because the animals are able to withstand intense heat and also can adapt themselves to some cold. They are hardy and good foragers (fig. 7). Crossing this breed with native cattle and with grade cattle of any beef breed has proved very successful.

Hereford is also a popular beef breed. These animals thrive on good pastures and make excellent growth in

Figure 7.—**Brahman cattle grazing on improved pangolagrass pasture.**

the feed lot. They cross successfully with native and grade stock.

Some cattlemen make a specialty of Santa Gertrudis cattle. This breed has a high resistance to heat and insects. The animals grow rapidly and produce a high percentage of quality cuts. Small herds of Aberdeen Angus are preferred on a few ranches.

Most beef cattle are shipped to other sections of the country to be fed and finished for market. Some are sold at local or nearby auction markets. An auction market near Fruitville holds weekly auctions. It can accommodate 600 head of cattle.

The future of the local cattle business appears promising and, in time, cattle raising may become the dominant agricultural activity. A large acreage of unimproved land can be developed for ranches. A livestock association has been formed through which the members can work together to improve their herds and lands. However, those interested in this industry should weigh the price of cattle and land carefully against future market possibilities.

Seven dairy farms were in operation in 1954. Their total acreage is comparatively small in the county. The dairy breeds are mainly Jersey, Guernsey, and Holstein.

Poultry and eggs are produced on a small scale. These items are sold mainly in local markets. A large volume of eggs is shipped into the county from northern markets. The poultry enterprise probably could be expanded to meet local needs.

A few hogs of common stock are produced. They are slaughtered for local use. Some run wild and graze on range pasture.

Types of Farms

According to the 1954 census data, 52.5 percent, or 196,785 acres, of the county is farmland. This acreage is divided into 349 farms having an average size of 563.9 acres. Of the land in farms, 17,569 acres are classified as cropland. Approximately 1,288 acres are cultivated intensively for commercial vegetables, and 3,498 acres are planted to tree fruits other than citrus.

The census for 1954 also groups the farms of the county into types on the basis of their major source of income. Only commercial farms are classified in this way. Of the farms tabulated, 31 were classified as vegetable farms; 56 as fruit farms; 20 as poultry farms; 48 as livestock farms; and 7 as dairy farms. In addition, 186 farms were in a miscellaneous and unclassified group.

Sizes of Farms

According to the 1954 census, farms vary in size from less than 3 to more than 1,000 acres. About 87 farms are less than 10 acres, 141 farms are between 10 and 49 acres, 38 are between 50 and 99 acres, 48 are between 100 and 499 acres, 10 are between 500 and 999 acres, and 25 are more than 1,000 acres. Most of the smaller farms are along or near main highways in the western part of the county.

Farm Tenure

According to the 1954 census, owners operated 92.8 percent of the farms reported in the county; 3.5 percent were operated by managers; and 3.7 percent by tenants. Tenants generally rent the land for cash on an acreage basis.

Farm and Home Improvements

Farm dwellings and barns are well constructed and painted. The homes on most farms are equipped with modern plumbing, water systems, and electric utilities, particularly in the western part of the county. The rural population is centered in small communities in a narrow belt paralleling the gulf coast. The population living directly on farms is small and scattered; very few live away from the coastal area. Large expanses through the center and eastern regions are without dwellings.

Farm Power and Mechanical Equipment

The 1954 census reports 258 horses and colts on farms. Horses are used mainly as workstock on the smaller farms. Tillage on such farms is generally done by one-animal implements. Horses on cattle ranches are used mainly in rounding up and looking after cattle. Many operations are accomplished by motorized or power equipment.

Modern mechanized tools and equipment are generally used, particularly on specialized farms and livestock ranches. The census for 1954 enumerates 306 motortrucks and 255 tractors, of which 18 were garden tractors. Tractors are usually equipped with tools for plowing, disking, harrowing, cultivating, and other tillage operations. Both track- and wheel-type tractors are used. Heavy power equipment is necessary for clear-

ing and preparing land for pastures and tilled crops. Bulldozers, graders, and machines of special design are available by contract for this purpose. Citrus growers have power machinery for grading, washing, and elevating the fruit, and for spraying and irrigating the trees.

Soils of Sarasota County

The soils of Sarasota County differ from each other in many characteristics. Among these are parent material, drainage, texture, consistence, color, tilth, natural fertility, and reaction.

Most of the soils of the county were derived from thick formations of acid sands. Such soils are dominant on flat pineland or saw-palmetto prairies. A few of these soils are droughty; others are moderately well drained. The somewhat poorly drained soils are the most extensive. Associated in many places with the soils derived from thick formations of acid sands are soils developed from a shallow mantle of acid sands overlying beds of alkaline clay. Such sandy soils over clay occur in many of the poorly drained sloughs and shallow depressions. Adjacent to the Myakka River and some of its tributaries is a belt of soils derived from or influenced by alkaline or calcareous materials in the subsoil. In most places the surface layers of these soils are acid, but they become neutral to alkaline at shallow depths. These soils are frequently called sweet soils. They have a somewhat greater natural productivity and a wider range in use capability than the more acid soils.

In most of Sarasota County, the soils have inadequate drainage and water control is a problem. Very little water flows or drains from the surface because the relief is level or nearly level. Although most soils are composed of porous sandy materials, the slowly permeable underlying materials significantly impede the movement of water within the soil. Seasonal high water tables saturate the soils for long periods. Accumulated or excess water is removed by transpiration, or it evaporates or drains away slowly.

The parent material from which the soils of the county developed ranges in texture and consistence from incoherent coarse sand to plastic fine sandy clay. Nearly all soils, however, have a surface soil of fine sand. Some soils have a fine sandy loam surface, but they occupy a comparatively small acreage. The fine sands have a loose or incoherent consistence and are easily shifted by wind if they are not protected by vegetation. Some soils have a layer of fine sandy clay loam in the subsoil.

The soils of the county range in color from white through gray, yellow, and brown to black. Color is one indication of natural productivity. Generally soils having darker colors have higher yields than those with lighter colors. Light colors are common in the upper layers of most mineral soils. In contrast, black and very dark gray predominate in organic soils and in mineral soils that are influenced by large amounts of decomposed organic matter. Subsoil layers are white to light gray, yellow, or brown, and in places they are mottled with gray, yellow, and brown.

All of the light, sandy soils are easy to work and to keep in good tilth. For the most part, they are suitable for normal root development. In some soils a high water table or a pan layer restricts root growth. Heavy farm machinery can be used on the nearly level relief that occurs in most of the county. The acreage of gently sloping areas is very small and is significant on only a few farms. Erosion is a minor hazard in Sarasota County and can be controlled through simple practices.

The soils are fairly low in natural fertility and productivity. Most of them have a small amount of organic matter and essential plant nutrients. The soils that contain a greater than average amount of organic matter are darker in the upper layers. Some of the dark-colored soils are fine textured, and some are calcareous. They are more productive than light-colored, more sandy soils. Most soils are continuously leached until the essential plant nutrients are depleted. Such soils require heavy applications of commercial fertilizers, organic matter, and other amendments.

Some soils of the county are medium to strongly acid in all layers. Others have some degree of acidity in their upper layers but are neutral or alkaline in subsoil layers that have been influenced or modified by calcareous materials. A few soils are neutral or alkaline throughout the profile. In places drainage water that carries lime in solution imparts a temporary neutral reaction to some low wet soils. The reaction, or pH value, of a soil affects the growth of crops.

Soil Series and Their Relations

On the basis of the differences in their characteristics, the soils of Sarasota County have been classified into series, types, phases, complexes, and miscellaneous land types. Some of these soils are of minor importance agriculturally because of small extent, unfavorable use capability, or both.

In order to make full use of this soil survey, it is helpful to know the soils and how they are related to each other. The soil series have been grouped in the following list according to parent material, drainage, and other characteristics as a guide to their identification and their relation to one another. Each of the groups is briefly discussed.

Group 1.—Soils developed from unconsolidated acid marine deposits:

Excessively drained:
Lakewood.
St. Lucie.

Somewhat excessively drained to moderately well drained:
Lakeland.
Blanton.
Pomello.

Somewhat poorly drained:

(*a*) With dark-colored surface layers and light-colored sandy subsurface layers:
Scranton.
Ona.

(*b*) With organic pan subsoil:
Immokalee.
Leon.

Poorly to very poorly drained:
Rutlege.
Plummer.

Group 2.—Soils developed from unconsolidated marine deposits underlain or influenced by calcareous sediments:
Somewhat poorly drained:
Adamsville.
Bradenton.
Broward.
Keri.
Parkwood.
Sunniland.
Poorly to very poorly drained:
Arzell.
Charlotte.
Delray.
Felda.
Manatee.
Pompano.

Group 3.—Organic soils:
Pamlico.
Terra Ceia.

Group 1

Excessively drained soils were derived from thick deposits of acid incoherent sands. They usually occur on poorly defined, rather inconspicuous low ridges, a few feet above the level of the surrounding terrain, or on short slopes near drainageways.

The St. Lucie soil has a gray or light-gray surface layer several inches thick. This layer overlies white fine sand that extends to depths of 42 inches or more. The upper part of the Lakewood soil is similar to the St. Lucie surface soil, but at depths of about 12 to 24 inches the Lakewood soil is yellow or brownish yellow.

Somewhat excessively drained to moderately well drained soils are inextensive in the county. They developed from thick beds of unconsolidated sandy acid sediments on level or slightly undulating ridges several feet above adjoining soils.

The top layers of the Blanton and Lakeland soils are somewhat alike in color and texture, but the Pomello soil is lighter colored. Lakeland profiles have yellow, yellowish-brown, or brownish-yellow subsurface and subsoil layers. The subsurface layer of the Blanton soils is gray or light brownish gray but grades at shallow depths into grayish brown or pale yellow and contains rust-colored mottles. The lower subsoil is light gray or white. The Pomello series has an almost white subsoil and usually has an organic pan below 42 inches.

Somewhat poorly drained soils with dark-colored surface layers and light-colored sandy subsurface layers were developed from thick layers of acid loose sand. They occupy a small total acreage and are level or on nearly level slopes of less than 2 percent.

Members of the Scranton series have a black or very dark gray surface layer, about 10 to 18 inches thick, that grades into light-gray sandy material in the subsoil. Ona soils also have a dark-colored surface layer, about 6 to 14 inches thick. This layer is underlain abruptly by a characteristic brown-stained layer of mixed sandy material and organic matter, 4 to 6 inches thick. The stained layer overlies loose, light-gray or white sand.

Somewhat poorly drained soils with an organic pan subsoil were developed from thick formations of acid sand. They are the most extensive soils in the county. These soils—the Immokalee and Leon—are generally level or nearly level, although near some drainageways they occur on short, gentle slopes. The surface soil is gray to dark gray and is underlain by light-gray to white very sandy materials. The sandy layer rests abruptly upon a dark-brown to very dark gray organic pan. In the Leon series the pan layer occurs at 14 to 30 inches, and in the Immokalee series it is at 30 inches or deeper.

Poorly to very poorly drained soils of group 1 developed from marine accumulations of acid sand. Their total acreage in the county is small. They occur in shallow depressions having level or nearly level relief.

Rutlege soils are black to depths that range from 8 to about 30 inches and are underlain by light-gray or white sand. The Plummer series has a thin (2 to 6 inches) dark-gray surface layer. This layer occurs over light-colored material like that of the subsoil material of the Rutlege series. The color of Rutlege and Plummer soils is similar to that of the Delray and Pompano soils, but the Delray and Pompano are neutral or alkaline in reaction.

Group 2

Somewhat poorly drained soils in group 2 make up about 17 percent of the county. They occur in the flatwoods along or near sloughs, depressions, or streams. They are level to nearly level. All have a thin gray to very dark gray surface soil, but they are distinguished by their underlying layers.

The Adamsville series is the only member having sandy materials in all layers of the profile. The subsoil is variegated with shades of yellow, brown, and light gray and is neutral or mildly alkaline. Bradenton soil has a thin sandy surface layer overlying a finer textured layer of dark-gray or grayish-brown clayey material that rests on marl. Sunniland soils are like Bradenton soils in composition and sequence of layers, but the clayey material is brighter colored and is mottled yellow, gray, and light gray. The Broward series is easily recognized by a shallow mantle of loose sand over hard limestone. Keri soils are somewhat comparable to Adamsville soils, but they have a layer of marl 6 to 12 inches thick interbedded at about 12 to 30 inches. The Parkwood series consists of hammock soils having a layer of sandy material over a thick bed of marl that occurs within 42 inches.

Poorly to very poorly drained soils over calcareous materials are the most extensive in the depressions and sloughs. The relief is level or nearly level, and the soils are affected by a high water table. The Arzell, Charlotte, Delray, and Pompano series developed from moderately thick formations of sandy marine sediments, whereas the Felda and Manatee developed from a shallow layer of sandy material overlying finer textured deposits.

The Arzell series is dominantly light gray to white throughout the profile. It contains very little or no organic matter to darken the upper part. It is the lightest colored soil of the group. Soils in the Pompano series, however, have a gray to dark-gray layer, about 3 to 6 inches thick, that is underlain by light-gray or white sandy material to depths of 30 inches or more.

The upper part of the Charlotte soil is similar to that of the Pompano soil, but yellow sandy material occurs at depths of about 8 to 18 inches. The Delray series contains enough organic matter to produce a black or very dark gray layer that extends to depths of about 10 to 30 inches. Below this layer is gray or light-gray sandy material.

Typical profiles in the Felda series have a thin layer of light-colored sand over a light-gray or gray clayey formation that contains yellow and brown mottles. The Manatee series is similar to the Felda series in composition of the different layers. However, the sandy material and the upper part of the clayey subsoil of the Manatee soils is black to very dark gray. In addition, it may be interbedded with marl of various thicknesses.

Group 3

Organic soils cover less than 1 percent of the county. They occupy shallow depressions, have level or almost level relief, and are very poorly drained. In their natural state, they are covered with water much of the year. They were derived mainly from debris from aquatic herbaceous plants.

The surface layer of the Pamlico series is composed of brown, partly decayed organic matter. This layer is underlain by light-colored acid sand. The depth of the organic material may range from a few inches to several feet. The Terra Ceia series differs from the Pamlico in that it overlies neutral or alkaline stratified beds of sand, clay, and marl.

Descriptions of the Soils

In the following pages the soils are described in detail and their relation to agriculture is discussed. Their location and distribution are shown on the map at the back of this report. The acreage and proportionate extent of each mapping unit are listed in table 3.

Adamsville fine sand (Aa).—This somewhat poorly drained, noncoherent, moderately deep soil is in the cabbage palmetto and pine flatwoods. It has developed from beds of sands, 42 inches or more deep, that overlie finer textured alkaline material. The upper layers are acid, but the deeper layers are neutral to mildly alkaline. Runoff is slow because of the nearly level relief and porosity of the soil material. Internal drainage is rapid. Internal moisture depends on the level of the water table. The water table is normally 30 to 36 inches below the surface but may drop to 60 inches or more in dry seasons or rise to the surface in very wet seasons.

Areas of this soil are associated with Leon, Immokalee, Bradenton, Sunniland, Keri, and Parkwood soils. Leon and Immokalee soils are distinguished from it by their well-developed organic pan, and the Keri and Parkwood by a marl layer at less than 42 inches. The Bradenton and Sunniland are distinguished from Adamsville by a fine-textured horizon within 30 inches.

This soil occurs mainly in the eastern and central parts of the county. The native vegetation is cabbage palmetto interspersed among pine, saw-palmetto, wiregrass, huckleberry, gallberry, and runner oak.

TABLE 3.—*Approximate acreage and proportionate extent of the soils*

Soil	Area	Extent	Soil	Area	Extent
	Acres	*Percent*		*Acres*	*Percent*
Adamsville fine sand	40,644	10.8	Mines, pits, and dumps	347	0.1
Adamsville fine sand, shallow phase	4,457	1.2	Ona fine sand	2,651	.7
Arzell fine sand	1,127	.3	Ona fine sand, light colored surface phase	891	.2
Arzell fine sand, shell phase	1,004	.3	Pamlico peaty muck	1,695	.5
Blanton fine sand, low phase	740	.2	Parkwood fine sand	1,222	.3
Bradenton fine sand	3,228	.9	Parkwood fine sand, deep phase	4,675	1.2
Broward fine sand, shallow phase	1,270	.3	Plummer fine sand	11,443	3.1
Charlotte fine sand	2,280	.6	Plummer fine sand, shallow phase	249	.1
Coastal beach	683	.2	Pomello fine sand	8,147	2.2
Coastal beach ridges	3,588	1.0	Pompano fine sand	39,535	10.5
Delray fine sand	13,090	3.5	Pompano fine sand, shallow phase	13,023	3.5
Delray fine sand, shallow phase	4,771	1.3	Pompano fine sand, shallow phase-Adamsville fine sand	1,102	.3
Delray mucky fine sand	1,982	.5	Pompano-Adamsville fine sands	3,331	.9
Delray mucky fine sand, shallow phase	788	.2	Rutlege fine sand	3,412	.9
Felda fine sand	1,842	.5	Rutlege mucky fine sand	298	.1
Immokalee fine sand	109,352	29.3	St. Lucie fine sand	161	(1)
Keri fine sand	4,076	1.1	Sandy alluvial land	1,229	.3
Keri fine sand, thick surface phase	560	.1	Scranton fine sand	466	.1
Lakeland fine sand, deep phase	158	(1)	Sunniland fine sand	2,928	.8
Lakewood fine sand	2,060	.5	Sunniland fine sand, deep phase	3,008	.8
Leon fine sand	64,063	17.1	Terra Ceia muck	1,273	.3
Leon fine sand, light colored surface phase	3,562	.9	Tidal marsh	1,708	.5
Leon fine sand, heavy substratum phase	708	.2	Tidal swamp	1,065	.3
Made land	240	.1			
Manatee fine sandy loam	502	.1			
Manatee loamy fine sand	3,174	.8	Total land area	375,040	100.0
Manatee soils, overflow phases	1,232	.3			

[1] Less than 0.1 percent.

Profile description:

0 to 6 inches, very dark gray or dark-gray, nearly loose, strongly acid fine sand; salt-and-pepper appearance; ranges from 4 to 10 inches in thickness.
6 to 16 inches, gray or light-gray loose fine sand; strongly acid to medium acid; ranges from 8 to 15 inches in thickness.
16 to 19 inches, dark-brown or brown, loose fine sand or loamy fine sand; slightly acid; ranges from 2 to 4 inches in thickness.
19 to 24 inches, brown, light-brown, or yellowish-brown, loose fine sand; a few, medium, faint, brown and gray mottles in places; neutral; ranges from 5 to 10 inches in thickness.
24 to 40 inches, light-gray, loose fine sand; a few, medium, distinct, brownish-yellow and gray mottles; neutral to mildly alkaline; ranges from 15 to 20 inches in thickness.
40 to 52 inches, dark grayish-brown or grayish-brown, loose fine sand; contains common or many, medium, distinct or prominent gray and rust-colored mottles; neutral to mildly alkaline. Marly material or calcareous, gray sandy clay is at a widely variable depth below this layer.

The surface soil has a small amount of organic matter. The soil is deficient in such essential plant-food elements as nitrogen, phosphorus, and potassium and has a moderately low natural fertility. It is very permeable to air, roots, and moisture. The available moisture capacity is low, and the soil may become droughty during dry seasons.

In some areas, the light-gray layer, commonly present in the subsurface layer, is lacking and a brown fine sand is just below the surface. In some profiles, however, the light-gray material is fairly thick, extends to about 30 inches, and is strongly acid to similar depths.

As mapped, small patches of Keri and Immokalee soils form a spotted, irregular pattern in this soil. In some areas, no well-defined boundary has developed between the Immokalee and Adamsville soils, and the transition from one to the other is gradual. In places in the transition band between the two soils, a dark-brown or brown sandy organic layer about 2 to 4 inches thick occurs below the gray or light-gray layer. It resembles the organic pan present in the Immokalee soil but is not so well defined. In some localities on old terracelike positions adjacent to or near the Myakka River, a profile has developed that has a color and texture comparable to that of Adamsville fine sand, but it differs from the Adamsville profile in being strongly acid to depths of 5 feet or more. This variation also supports a denser, higher, more vigorous vegetation. It is included with Adamsville fine sand because of its resemblance and small acreage.

Suitable uses (capability unit IVs-2).—Much of Adamsville fine sand is in its native state and serves as range for cattle. Only a small part is cleared and used for improved pasture. A small acreage in the western part of the county is used for homesites.

Native range supplies poor to fair grazing and has a carrying capacity of 1 cow per year to each 10 to 25 acres. About 2 or 3 acres of improved pasture, however, will support 1 animal for a year. Some areas are burned annually to dispose of mature grass and to stimulate a new growth of more succulent forage.

The soil is fairly well suited to improved pasture grasses, such as pangolagrass, Pensacola bahiagrass, and bermudagrass, and to legumes such as whiteclover and Hubam or annual sweetclover. Liberal applications of commercial fertilizer are needed.

The soil is somewhat limited in its suitability for crops because of low fertility, rapid leaching, and droughtiness in dry periods. Proper water control makes it more suitable for crops and pasture. The soil is easy to work and can be cultivated within a wide moisture range.

The soil is fair for citrus if adequate drainage is provided. Bedding and controlling the water level are needed. Otherwise, the trees cannot grow a good root system. Use of this soil for citrus is hazardous unless adequate water control is provided. Heavy applications of fertilizer containing minor elements are needed for good yields. Hairy indigo is a suitable legume cover crop in groves. It can be used as mulch or chopped into the ground to supply humus.

This soil is benefited by a fairly high water table and is moderately good for specialized truck crops. In other counties, Adamsville fine sand is used successfully for tomatoes, cabbage, sweet corn, cucumbers, peppers, lettuce, eggplant, beans, cauliflower, watermelons, and strawberries.

Adamsville fine sand, shallow phase (Ab).—This is a somewhat poorly drained sandy soil of the cabbage palmetto and pine flatwoods. It is underlain by clayey material at shallow depths. It developed from beds of marine sands, 30 to 42 inches deep, that were deposited on unconsolidated alkaline fine sandy loam or fine sandy clay loam. It is distinguished from Adamsville fine sand by this finer textured material. Runoff is slow. Internal drainage is medium to rapid and is influenced by a seasonal high water table.

Adamsville fine sand, shallow phase, occupies comparatively small acreages, principally in the central and eastern parts of the county. It occurs in association with Adamsville fine sand and with soils of the Bradenton, Leon, Immokalee, Keri, and Parkwood series. The plant cover is chiefly cabbage palmetto, pine, sawpalmetto, wiregrass, gallberry, huckleberry, and runner oak. Under natural conditions, cabbage palmetto usually grows on soils having a neutral or alkaline reaction in some layer of the soil. Therefore, it may be considered indicative of a neutral or alkaline soil.

The profile of this soil is essentially the same as that of Adamsville fine sand in texture, color, reaction, and layering. At 30 to 42 inches, however, it is underlain by gray, slightly plastic, alkaline, heavy fine sandy loam or fine sandy clay loam. This material has a few, medium, distinct, rusty colored and yellow mottles.

The soil is low in organic matter and essential plant nutrients. Moisture conditions are better for plants than in Adamsville fine sand. The sandy layers are rapidly permeable to air and water, and their capacity to hold water that plants can use is low. The underlying clayey layer is more slowly permeable to air and water, but it is penetrated easily by deep-rooted plants.

Suitable uses (capability unit IVs-2).—At present most of this soil is in its natural state. It is used principally for range, along with associated soils. About 10 to 25 acres of this soil are needed to support a cow.

A small acreage has been converted to improved pasture along with some adjoining soils. If simple drain-

age practices are used, this soil is fairly well suited to improved pasture and is slightly more productive than Adamsville fine sand. The popular pangolagrass and Pensacola bahiagrass are suited to it. If heavy applications of commercial fertilizer are used annually, this soil produces high-quality herbage. Well-managed pasture will grow enough grass on 2 or 3 acres to sustain one animal for a year.

With adequate water control and fertilization, this soil is moderately good for truck crops. Commercial fertilizer and green-manure crops are needed to improve soil productivity. This is a little better soil for citrus than Adamsville fine sand. However, its use for this purpose is hazardous because adequate water control is difficult to establish.

Arzell fine sand (Ac).—This very light colored soil occurs on poorly drained, shallow, flat depressions or in intermittent ponds. The parent materials consist of moderately thick deposits of unconsolidated sands. The plant cover is very sparse or may be lacking in places. Native plants, mainly St. Johnswort and other moisture-loving plants, are scattered and have poor growth. The soil is associated with Plummer, Pompano, Delray, Immokalee, and Parkwood soils. It occurs in very small tracts and is one of the minor soils of the county.

Profile description:

0 to 2 inches, light-gray, gray, or white, loose, acid fine sand; small local spots contain dark-gray fine sand.
2 to 42 inches, white fine sand; loose in upper part but slightly compact in lower part when moist; slightly acid to neutral.

The amount of organic matter is extremely low in this soil. In some places organic matter is almost entirely lacking. The supply of plant nutrients is very small, and natural fertility is very poor. The soil is rapidly permeable to air and water and is favorable for deep penetration of roots. For a number of months each year, it is waterlogged or covered with several inches of water.

The reaction, for the most part, is slightly acid to neutral. The lower subsoil of some areas contains a few, small, fine streaks of dark gray or yellow. A layer of grayish-brown moderately compact fine sand occurs abruptly at 30 to 40 inches in places. This material is underlain by fine sandy clay loam in places. In some areas Arzell fine sand is so intricately mixed with Pompano and Plummer soils that separate mapping is impractical.

Suitable uses (capability unit VIIs-1).—Almost all of this soil is unimproved; very little has been used for cultivation. It is used as range pasture along with associated soils. It produces very little desirable forage, and its value for range pasture is negligible. Because it is very wet and is closely associated with other poorly drained soils, it probably should be used as a refuge for wildlife.

Arzell fine sand, shell phase (Ad).—This light-colored, alkaline, poorly drained soil has developed from recent deposits of marine sands. It is confined to several of the keys in the western part of the county. It is a low-lying, depressional soil, just above normal levels of high tide and is part of former marine beaches. It occurs for the most part as nearly level, comparatively broad swales or depressions. Some areas, however, are long, parallel, very narrow, winding low ridges. These ridges are several feet high and were piled up by wind. The soil is subject to blowing if it is not covered by vegetation, and small blowouts occur in places.

Sea oats, sea grapes, cabbage palmetto, pricklypear cactus, wiregrass, saw-palmetto, myrtle, coarse grasses, and weeds are the principal plants.

Profile description:

0 to 6 inches, light-gray or gray, very loose fine sand; contains a very few dark-gray fine sand particles; alkaline; this layer ranges from about 4 to 7 inches in thickness.
6 to 34 inches, white, loose fine sand; alkaline; ranges from about 25 to 30 inches in thickness.
34 to 45 inches, white, loose fine sand mixed with a moderate amount of broken shells; calcareous.

This soil has an extremely small amount of organic matter and is very deficient in plant nutrients. It has a high water table, and the lower areas are covered with water part of the year. Water and air circulate very freely through the material when the high water table is lowered. Root systems are confined to the upper layers, although the material is suitable for deep rooting. The available moisture-holding capacity is very low.

None of this soil is used for agriculture. It is in high-priced resort areas and is used principally for real estate development. Some residential sites have been improved by drainage or covered with fill material, but the soil is poorly suited to native lawn grasses, flowering plants, or shrubs. Good landscaping requires the addition of topsoil and drainage, irrigation, and constant applications of complete fertilizer. This soil is in capability unit VIIs-1.

Blanton fine sand, low phase (Ba).—This moderately well drained soil occurs on low ridges and knolls within the flatwoods. It has developed from deep beds of acid sands. The relief is nearly level, but some areas have slopes up to about 5 percent. Runoff is slow, and internal drainage is medium to rapid. This soil occurs in small areas associated with Immokalee, Pomello, Lakewood, and Lakeland soils. Immokalee and Pomello soils have organic pan layers and poorer drainage than Blanton fine sand, low phase, whereas the Lakewood and Lakeland soils are better drained.

The vegetation is mostly slash pine, but there are some stands of scrub, turkey, and live oaks. The undergrowth includes saw-palmetto, broomsedge, wiregrass, gallberry, and some cactus.

Profile description:

0 to 4 inches, dark-gray or very dark gray, loose fine sand having a salt-and-pepper appearance; strongly acid; this layer ranges from 3 to 6 inches in thickness.
4 to 9 inches, light-gray to gray, loose fine sand; medium acid; ranges from 4 to 6 inches in thickness.
9 to 20 inches, light brownish-gray or grayish-brown, loose fine sand; common, medium, and fine, faint to distinct, gray and rust-colored mottles; strongly acid; ranges from 8 to 12 inches in thickness.
20 to 50 inches, light gray, loose fine sand; a few, fine or medium, faint to distinct, yellow, white, and gray mottles; strongly acid.

The soil has a small amount of organic matter and is deficient in essential plant nutrients. Its natural fertility is low. It is suitable for deep growth of roots and free circulation of air and moisture. The moisture content in the lower layers is increased by a moderately deep water table, especially during the rainy season. The capacity of the soil to hold water that plants can use is very low, and in periods of low rainfall the soil may be droughty.

Variations are common in color, content of humus, mottling, and thickness of layers. Sharp distinction between areas of this soil and of others is difficult to establish because of these variations. One inclusion that forms a complex pattern with this soil in some areas consists of dark-gray or very dark gray fine sand, 4 to 8 inches deep, that grades to light-gray to light brownish gray fine sand, 2 to 8 inches thick. In places this layer of light-gray to light brownish-gray fine sand is absent or weakly developed. The next layer has an abrupt upper boundary. It is dark grayish-brown or brown friable fine sand, 2 to 6 inches thick, that is weakly cemented by organic matter in places. The underlying material is light-gray, incoherent fine sand with an irregular light splotching of pale yellow. The conspicuous brown layer distinguishes this included soil from the normal soil.

A small included acreage occurs in gentle slopes that reach a maximum of about 5 percent. This inclusion is similar to Blanton fine sand, low phase, in profile, but it is subject to erosion if left unprotected and requires erosion control practices. It has somewhat better internal drainage and air circulation and is more suitable for citrus than the level areas of Blanton fine sand.

Suitable uses (capability unit IIIs-1).—Cleared areas of Blanton fine sand, low phase, are used principally for citrus, but some are used for improved pasture and vegetables. About 15 to 20 acres of range are necessary to supply enough forage to maintain one cow for a year. Some wooded areas are included with the range. Areas of this soil are some of the best in the county for homesites, and much of the soil is used for urban subdivisions.

This moderately good soil is suited to the production of crops and pasture grasses common to the area. It is low in organic matter and plant nutrients; it responds readily to fertilizer, lime, and green manure. Fair to good yields of crops can be obtained under efficient management. In other counties this soil is effectively used for intensive production of truck crops, watermelons, strawberries, peanuts, and general farm crops. It is well suited to citrus and subtropical fruits, although heavy fertilizing is required for high yields. Pensacola bahiagrass, pangolagrass, bermudagrass, and such legumes as hairy indigo and Hubam clover are suitable for improved pasture. Most lawngrasses, ornamental trees, and shrubs do well on this soil. Heavy additions of fertilizer are needed for good yields of herbage.

Bradenton fine sand (Bb).—This somewhat poorly drained soil of the hammock lands occupies positions intermediate between adjoining flatwoods and ponded soils. It has developed from thin beds of sands underlain by clayey and marly materials. The relief is nearly level to flat. Runoff is slow, and internal drainage is medium to slow. This soil is widely distributed over the county in small areas. It is associated with Parkwood, Pompano, Manatee, Delray, Adamsville, Keri, Sunniland, Leon, and Immokalee soils. Pompano, Manatee, and Delray soils occupy wetter positions. Bradenton fine sand is characterized by a mottled gray or grayish-brown subsoil of clayey material that is within 30 inches of the surface and is underlain by marl.

The plant cover is a moderately heavy growth composed chiefly of cabbage palmetto, live oak, water oak, pine, and an undercover of saw-palmetto, vines, shrubs, and native grasses.

Profile description:

0 to 6 inches, dark-gray or very dark gray, nearly loose fine sand; contains a small quantity of light-gray fine sand; somewhat lighter in color in lower part; strongly acid; this layer ranges from 4 to 9 inches in thickness.
6 to 18 inches, gray, grayish-brown, or light-gray, nearly loose fine sand; strongly acid; ranges from 10 to 14 inches in thickness.
18 to 22 inches, very dark gray or dark grayish-brown loamy fine sand, fine sandy loam, or fine sandy clay loam; a transitional layer of irregular development; strongly acid; ranges from 3 to 5 inches in thickness.
22 to 30 inches, grayish-brown or olive-gray, heavy fine sandy loam or fine sandy clay loam; contains common, medium, faint to distinct, yellow and gray mottles; sticky and plastic when wet, hard when dry; slightly acid to neutral; ranges from 6 to 10 inches in thickness.
30 to 44 inches, light-gray or gray, light fine sandy clay loam or heavy fine sandy loam; common, medium to coarse, faint and distinct, gray and yellow mottles; contains pockets, lenses, and intermittent interbeddings of light-gray or white marly material; no orderly development in size, texture, depth, or arrangement of the pockets; some of the marl forms hard, or cemented, rounded nodules about the size of a walnut; mildly alkaline; ranges from 6 to 24 inches in thickness.
44 to 60 inches, light-gray to white fine sandy marl with thin layers and nodules of soft limestone.

This soil has a small amount of organic matter and is deficient in essential plant nutrients. Permeability to air and water is very rapid through the sandy layer and moderate in the finer textured material. Roots will grow in all the layers above the marl. The moisture-supplying capacity of the upper layer is low, but that of the clayey material is high. A seasonal high water table rises above the finer textured material and restricts the movement of air and moisture.

Some variations in color, texture, thickness, and reaction of the several layers exist within short distances. Depth to the fine-textured subsoil varies from 18 to 30 inches. In some areas, particularly south of the Myakka River, along the county line, the clayey layer is about 6 to 15 inches thicker than usual, the soil is more acid, and the depth to marl is therefore greater. In places the marl is below 42 inches. Locally, a layer of compact, dark-brown fine sand, 4 to 6 inches thick, lies above the clayey material. Patches of medium and coarse sands occur in some small areas.

Included with this soil are areas of a thin surface phase of Bradenton fine sand (not mapped in this county) that has less than 18 inches of surface soil. In texture, color, and material it is similar to the normal soil, but a fine-textured subsoil layer occurs at depths of

less than 18 inches. The natural productivity of this included soil averages a little better than that of the regular soil. The areas of this included soil are small and scattered.

Suitable uses (capability unit IIIs-2).—Only a small acreage has been cleared for improved pasture; most of this soil is in forest. Suitable forage for cattle is sparse on undeveloped areas.

Bradenton fine sand is one of the more productive soils in the county and is moderately good for crops and pasture. It is physically well suited to most crops commonly grown in the area, although its use is somewhat limited by imperfect drainage. The soil is easy to work and maintain in good tilth.

This soil is suited to improved pasture grasses, as pangolagrass, bahiagrass, and bermudagrass, and to such legumes as Hubam clover and white clover. Liberal use of fertilizer each year is important to maintain a high yield of forage. Truck crops are also suited. Under good management, including adequate water control and use of fertilizer, good yields are possible. In nearby counties, this soil has proved to be one of the best for growing vegetables. It requires somewhat less fertilizer than many other soils under cultivation. Citrus trees do well where the soil is properly drained and irrigated.

Slash pine makes moderately good growth on this soil. The hammock growth on virgin areas is excellent cover for many kinds of wildlife. Where the soil is used as range, some of this cover ought to be left as a cover for wildlife and shelter for cattle.

Broward fine sand, shallow phase (Bc).—This soil is somewhat poorly drained. It developed from an uneven but shallow mantle of sand overlying hard, dense limestone. It occurs on flat or nearly level areas in association with Leon, Immokalee, Adamsville, Keri, and Bradenton soils. In areas of the Broward soil, the sandy material rests directly on the lime rock or on a thin layer of clayey residuum from the limestone, whereas in Bradenton soils the sandy layers overlie a clayey layer, which is underlain by unconsolidated marly material. The Keri soil has limy material in the form of marl instead of hard rock.

The vegetation is principally pine, cabbage palmetto, saw-palmetto, runner oak, gallberry, wiregrass, and a few live oak, scrub oak, and cactus.

Profile description:

0 to 4 inches, dark-gray or gray, nearly loose fine sand of salt-and-pepper appearance; this layer ranges from 3 to 6 inches in thickness.
4 to 10 inches, white or light-gray to pale-yellow, loose fine sand; ranges from 6 to 10 inches in thickness.
10 to 15 inches, light yellowish-brown or pale-brown, friable fine sand, slightly compact in places; contains a few, medium, faint, yellow and brown mottles; ranges from 8 to 12 inches in thickness.
15 to 17 inches, grayish-brown, brown, or light olive-brown, heavy fine sandy clay loam with a few, fine to medium, faint, gray and rusty stains; plastic and sticky when wet, hard when dry; alkaline; an irregular transitional layer of material derived through decomposition of limestone.
17 inches +, dense, hard, fossiliferous limestone.

Broward fine sand, shallow phase, has very little organic matter and is greatly deficient in essential plant nutrients. Its natural fertility is low. Its sandy material is very permeable to roots, air, and moisture. During periods of low rainfall, the soil becomes droughty because of its shallowness and low available moisture-holding capacity. This soil is strongly acid to within a few inches of the limestone bedrock, where the reaction is slightly acid to neutral. In small spots, the upper layers are slightly acid.

The depth to limestone usually ranges from about 10 to 40 inches, although in places only a thin veneer of soil material covers the limestone. Within short distances this difference in depth causes variations in thickness of soil layers, color, mottling, moisture, and fertility. In places small pockets and lenses of fine sandy loam and fine sandy clay loam occur in the lower part. Slabs and broken fragments of limestone of irregular size and shape outcrop in many places. The upper part of the rock formation generally is very hard and dense; the lower part is brittle and fractures more easily than the upper part.

Suitable uses (capability unit Vs-1).—Nearly all of Broward fine sand, shallow phase, is sparsely wooded and undeveloped; it is used for range pasture. The carrying capacity is low. About 15 to 30 acres of native pasture are required to maintain a cow for a year. Some soil has been removed from a few acres to mine limestone for road material or for use as fill. A few small tracts associated with better soils have been cleared for improved pasture.

Numerous rocks hinder water control and limit the use of heavy farm machinery. This soil is suitable for pasture but not very productive. Because this soil holds little moisture that plants can use, pasture does not grow much during periods of low rainfall, even under high levels of management. When the soil is used for improved pasture, Pensacola bahiagrass, bermudagrass, hairy indigo, and Hubam clover are suitable. Each year large amounts of fertilizer are needed to maintain permanent pasture.

This shallow soil is not satisfactory for citrus. The woodland growth ranges from poor to fair. Areas occurring among soils that are cultivated are usually left idle. Such areas can be used best by encouraging the growth of native plants that will provide food for wildlife.

Charlotte fine sand (Ca).—This poorly drained soil has a distinctive yellow subsoil. It is in shallow basins or sloughs and is the only soil in the county in such positions that has this coloration. The parent materials are moderately deep accumulations of unconsolidated sands that were deposited on fine-textured calcareous materials. Relief is level or nearly level, so most of the rainfall seeps into the soil. Water accumulates in the subsoil and keeps it saturated except during exceptionally dry spells. During wet seasons the ground is covered with a thin sheet of water.

Most areas are small and are widely scattered over the county. They are a minor part of the soil pattern formed mostly of Pompano, Delray, Adamsville, and Immokalee soils.

The natural vegetation on most areas is of a wet prairie type, that is, a sparse to moderate growth of coarse grasses and sedges. Locally, Charlotte fine sand supports a variable growth of cabbage palmetto, pine, water oak, and saw-palmetto.

Profile description:

0 to 4 inches, gray to grayish-brown, nearly loose fine sand; contains a small amount of light-gray material; slightly to strongly acid; layer ranges from 3 to 8 inches in thickness.
4 to 12 inches, light-gray or white, loose fine sand; slightly to strongly acid; 4 to 12 inches thick.
12 to 25 inches, yellow or brownish-yellow, loose fine sand streaked with pale yellow; slightly acid to medium acid; ranges from 10 to 15 inches in thickness.
25 to 35 inches, yellow, yellowish-brown, or brownish-yellow fine sand, slightly compact in place; contains thin streaks of yellow and pale yellow; slightly acid to neutral; weakly to moderately cemented in some places; ranges from 8 to 12 inches in thickness.
35 to 48 inches, light-gray to pale-brown, loose fine sand with a few, medium, distinct, gray and yellow mottles; slightly acid to mildly alkaline.

The soil has a very small amount of organic matter. Its natural fertility is poor because it contains a small amount of plant nutrients. The porous and sandy soil permits rapid movement of air and moisture, but at times circulation is retarded by the high water table. Excessive moisture confines plant roots to a shallow zone, although the profile would permit deep penetration.

The surface layer is modified by organic matter and ranges from light gray to very dark gray. The darker color increases toward the boundaries of Delray soils. In some places the light-colored layer between the surface soil and yellow subsoil is absent. Small, rounded, firm iron concretions form in parts of the lower subsoil.

Included with this soil is a small acreage of Charlotte fine sand, shallow phase, not mapped as a separate unit in this county. In the upper part this included soil is similar to Charlotte fine sand, but in the lower part it has a layer of fine-textured calcareous material at depths of 30 to 42 inches. This gray, firm, plastic, slowly pervious layer of fine sandy clay loam contains a few, medium, distinct, yellow and light-gray mottles. The included soil becomes saturated more quickly than the normal soil, but it holds more moisture during periods of low rainfall.

Suitable uses (capability unit IVs-3).—Practically all of Charlotte fine sand is in unimproved range. About 10 to 20 acres are needed to support one cow for a year. Little of the soil is cleared for cultivation. Under native conditions, Charlotte fine sand is wet and poorly suited to crops or pasture much of the time. It can be used for range where it occurs with better soils, but its forage is sparse and of low quality.

Artificial drainage is needed if Charlotte fine sand is to be cultivated. If water is controlled, this soil is suitable for truck crops and improved pasture. It is not suitable for citrus. Few areas are large enough to be managed efficiently as a single unit. Most areas of this soil form an irregular pattern with soils of similar drainage. To improve these soils, the same remedial measures should be applied to all.

In extensive cattle-raising sections, it is advisable to leave the smaller units in range. If this soil occurs in broad flat areas, it can be reclaimed. With an adequate outlet for ditches and careful water control, it is suited to improved pasture consisting of bermudagrass, pangolagrass, bahiagrass, caribgrass, and other grasses. Lime and heavy annual applications of fertilizer are needed to support the improved pasture.

Charlotte fine sand is good for specialized crops when properly drained. In adjacent counties it is valued along with the associated Pompano and Felda soils as a producer of tomatoes, peppers, beans, cucumbers, spinach, and other market vegetables.

In its natural state, this soil is not very productive of forest trees and is not a suitable site for planting timber species. Much of it is so located that agricultural development is not practical. These areas, along with associated wet soils, serve their best purpose if they are left in their native state as habitats for waterfowl or are improved for other wildlife.

Coastal Beach (Cb).—This minor land type occurs in narrow strips bordering islands or keys and along parts of the mainland reached by tides. These beaches are composed of sand and broken seashells that have been deposited, mixed, and reworked by the waves. They are covered with water at high tide or during storms. Long stretches are practically devoid of vegetation, but there is a sparse growth of salt-tolerant grasses and plants in some places. The beaches range from a few feet to about 300 feet in width. They are nearly level or have gentle slopes that reach a maximum of about 4 percent. Coastal beach is not suited to agriculture, but the larger beaches are used for recreation. No capability classification has been assigned to this miscellaneous land type.

Coastal beach ridges (Cc).—This land type occurs in well-drained positions slightly higher than the adjoining Coastal beach areas. It consists of thick beds of sand mixed with seashell fragments. These materials were washed up by waters of the gulf and reworked by the wind. The relief is level to very slightly undulating. There are parallel, narrow, low, uneven ridges of windblown sand about 3 to 4 feet high, separated by narrow troughs.

This land type is confined to the keys or islands that form the western boundary of the county. The native vegetation is chiefly a dense growth of cabbage palmetto and an undergrowth of saw-palmetto, sea oats, sea grapes, wiregrass, cactus, myrtle, cedar, beach morning-glory, bracken fern, and some Spanish-bayonet.

Profile description:

0 to 2 inches, mixture of dark-gray to very dark gray, nearly loose fine sand, sand, and shell fragments.
2 to 5 inches, mixture of nearly loose fine sand, sand, and shell fragments.
5 to 42 inches, light-gray or white mixture of nearly loose fine sand, sand, and shell fragments.

The proportion of sand and shell fragments varies greatly, often within short distances. Particles of white fine sand in the top layer give a salt-and-pepper coloration in some areas. The shell material consists of finely ground fragments or slightly broken and whole shells. The amount of organic matter is very small and is in only a very small part of the surface layer. The material in the profile is alkaline throughout.

This land type is droughty; it has low moisture-holding capacity and rapid internal drainage. It is

rapidly permeable to air and moisture. Winds move some of the material where there is no vegetation. Blowout holes have formed in places. The soil is low in natural fertility because it is greatly deficient in the principal plant nutrients.

At present, most of this land type is used for homesites or recreation, or is held for real estate development. None is used for farming, and small parcels are wasteland. The soil is suited to lawngrasses and to many of the landscape plants adapted to the area. Many of these plants are grown successfully around homes. Coastal beach ridges have not been classified in a capability unit.

Delray fine sand (Da).—This dark-colored, very poorly drained mineral soil has a large amount of organic matter. It occurs in the deeper parts of shallow depressions, intermittent ponds, and sloughs. The soil developed from moderately thick deposits of sand overlying calcareous materials. It has a level or almost level surface. Areas of the soil occur in all parts of the county in association with Pompano, Charlotte, Parkwood, Adamsville, Keri, Leon, and Immokalee soils. It is distinguished from all of them by its dark color and lower topographic position.

The vegetation in most areas is aquatic, principally water iris, pickerelweed, dollarplant, water-tolerant grasses, ferns, and sedges. A dense growth of trees, chiefly willow, swamp maple, bay, ash, and gum, has spread over a small, scattered acreage.

Profile description:

0 to 10 inches, black or very dark gray, very friable fine sand mixed with a large amount of well-decomposed organic matter; contains some light-gray fine sand that is conspicuous when dry; strongly acid; layer ranges from 8 to 14 inches in thickness.

10 to 36 inches, black to very dark gray, nearly loose fine sand interspersed with thin vertical veins or seams of light-gray sand; medium to slightly acid.

36 to 48 inches, gray or light-gray, very friable fine sand, slightly compact in place; a few, fine or medium, distinct mottles of yellow and gray; narrow projections of dark-gray material extend to various depths from the overlying layer; slightly acid to mildly alkaline.

Typical of this soil is its dark color extending to depths of 2 to 3 feet. Though this soil is high in organic matter and nitrogen, it is low in other plant nutrients, as phosphorus and potassium. A high water table saturates the soil for prolonged periods. Most areas receive seepage and surface water from surrounding soils. When drained, this soil is rapidly permeable to air and moisture and can be deeply penetrated by roots. It has a moderate capacity to hold water that plants can use.

Delray fine sand is similar to Rutlege fine sand in most respects except reaction. Delray fine sand is less acid; its subsoil is neutral, mildly alkaline, or only slightly acid.

Some places have a somewhat lower amount of organic matter than average and are consequently not quite so dark or productive. In such places, the surface soil is a dark-gray fine sand that contains a moderate amount of light-gray fine sand. At depths of about 10 to 18 inches, the surface soil grades to a gray, loose fine sand, which continues to depths of about 16 to 24 inches. This horizon, in turn, is underlain by light-gray, loose fine sand.

Toward the center or slightly lower parts of some depressions, the amount of humus increases enough to produce a mucky fine sand texture at the surface. This change is usually gradual and without a well-defined boundary.

Small patches of Delray mucky loamy sand (not mapped in this county) form a complex pattern in places and are included with Delray fine sand. The reaction of the deep subsoil of this inclusion is influenced to some degree by percolation of alkaline waters. When wet, it is sweeter than when dry.

Suitable uses (capability unit IIIw-2).—Most of Delray fine sand is unimproved and in scattered areas over rangeland that is grazed. Many ponded areas without natural outlets serve as reservoirs of drinking water for cattle. A few areas of Delray fine sand near residential sections are excavated for fill material used on lawns.

Some Delray fine sand associated with Terra Ceia muck in the Fruitville area is drained and developed for truck crops and pasture. Beans, radishes, lettuce, endive, cabbage, onions, squash, and escarole are produced under intensive management (fig. 8). High yields are obtained.

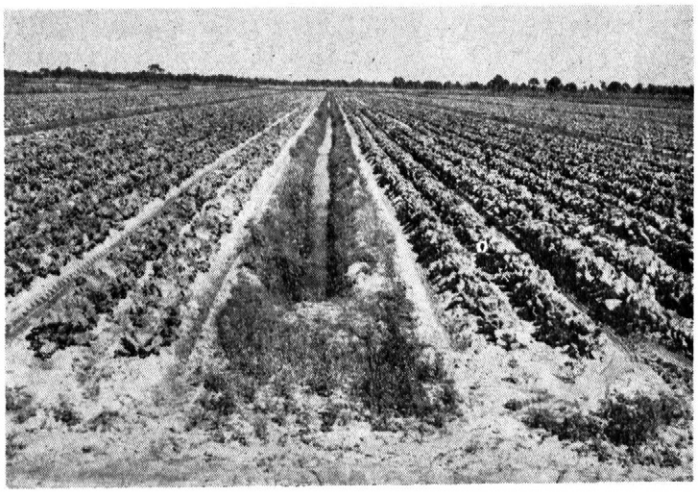

Figure 8.—**Under intensive management, truck crops can be grown successfully on most poorly and very poorly drained soils.**

Improved pastures are planted to pangolagrass, Pensacola bahiagrass, whiteclover, and other forage crops that are maintained by heavy fertilizing. Water control is provided by ditches or canals.

Delray fine sand in its normal wet environment is not suited to row crops and is not productive of good-quality forage. Most areas form a pattern with other wet soils, which are normally in the same pond or depression and are of lower fertility. Consequently, drainage involves control of water for the entire basin. Many of these shallow depressions either are so small or are so isolated that it is impractical to improve them for intensive cropping. Their most suitable uses are for range pasture, reservoirs, and wildlife. Areas in the broader sloughs are more favorably located.

If water is adequately controlled, Delray fine sand is one of the more productive soils and is suited to crops common to the region. It is a good soil for growing winter truck crops. High yields can be obtained under efficient management that includes heavy fertilization, the use of minor elements, irrigation, and proper tillage. Legume cover crops, as crotalaria and sesbania, should be plowed under to help maintain the humus content.

When water is properly controlled, the suitability of this soil for improved pasture is increased significantly. High-quality pastures can be established and maintained with suitable grasses. Pangolagrass, bahiagrass, bermudagrass, and caribgrass are suitable for drained areas, and winter clovers also are responsive. To maintain heavy stands of herbage, annual applications of fertilizer are needed. Because of its moderate fertility, this soil produces good yields with less fertilizer than most soils require. This soil is not suitable for citrus trees.

In its natural condition, in association with nearby wet soils, Delray fine sand is a favorite habitat for many kinds of waterfowl. Small areas that cannot be drained feasibly should be left undisturbed as a wildlife refuge. Food plants and some degree of water control should be provided.

Delray fine sand, shallow phase (Db).—This soil differs from Delray fine sand in having a layer of distinctly finer textured material at depths between 30 and 42 inches. This finer material, a gray to light-gray heavy fine sandy loam or fine sandy clay loam, has common, medium, distinct, yellow and rust-colored mottles. Irregular, thin projections of dark-gray fine sand extend into it from layers above. This finer textured layer is slightly acid to mildly alkaline.

This soil has very poor natural drainage; internal percolation is restricted by the slowly permeable fine-textured material. It has a large amount of organic matter and nitrogen but is low in phosphorus and potassium. Its natural productivity is medium.

This soil occupies the lower part of shallow depressions and is associated with other poorly drained light- and dark-colored soils. Scattered over the alluvial plain of the Myakka River are small areas that are subject to flooding. Flooding, prolonged saturation, and lower positions limit the suitability of these areas for agriculture.

Most areas of Delray fine sand, shallow phase, have a wet prairie type of vegetation. A few are covered with a dense growth of water-tolerant hardwoods, such as gum, bay, swamp maple, ash, and willow.

Suitable uses (capability unit IIIw-2).—Most of the virgin areas are distributed over unimproved range. Although this soil is normally covered with a dense, heavy growth of low-growing plants, little of this vegetation is relished by cattle. A small acreage, mostly near Fruitville, has been cleared and drained for improved pasture and vegetables. This land is under excellent management, and the crops receive heavy applications of fertilizer.

Without adequate drainage, this soil is poor for crops or pasture. Many small units that have no natural outlets create special drainage problems. They are best left in their natural condition as a source of water for livestock or as a wildlife habitat.

This soil, however, is well suited to crops and pasture if water is properly controlled. Some of the larger tracts that are favorably located in the wider drainage sloughs can be cropped intensively. If properly drained, the soil is easy to work and to keep in good tilth. It permits deep root growth and favorable circulation of air and moisture. Its available moisture-holding capacity is good. As cropland, it is well suited to most vegetables and other farm crops adapted to the climate. Water control and heavy fertilization are needed to obtain high yields. High-quality pastures can be established and maintained if fertilizer that contains minor elements are added. Pangolagrass, bahiagrass, improved bermudagrass, and caribgrass are suitable for improved pastures.

Some of this soil can be improved for wildlife by planting additional feed plants and by providing water controls that will keep areas ponded as long as possible for waterfowl.

Delray mucky fine sand (Dc).—This very poorly drained dark soil contains much well-decomposed organic matter. It usually occurs in the lower parts of shallow depressions and has developed from moderately deep beds of marine sands modified by large amounts of organic matter.

This soil is mainly in small areas, and it occurs in all parts of the county. In most places it is associated with Pompano soils, which are at slightly higher levels in the same depression. Relief is level or nearly level. During wet seasons the surface is ponded, but in some periods of low rainfall, it becomes dry for a short time.

The organic matter has developed from the native cover, largely water iris, sedge, fern, grass, pickerelweed, and other water-tolerant plants. A few areas are covered with a dense growth of sweetbay, swamp hardwoods, and waxmyrtle.

Profile description:

0 to 15 inches, black or very dark gray, very friable, mellow, mucky fine sand; contains a large amount of well-decomposed organic matter; medium to slightly acid; this layer ranges from 10 to 16 inches in thickness.
15 to 25 inches, dark-gray or very dark gray, very friable fine sand; moderate amounts of organic matter; medium to slightly acid; ranges from 8 to 15 inches in thickness.
25 to 35 inches, gray, loose fine sand interspersed with thin fingers of very dark gray or dark-gray material that extends from the layer above; medium to slightly acid; ranges from 8 to 15 inches in thickness.
35 to 45 inches, light-gray, loose fine sand with a few, medium, faint to distinct, yellow mottles; slightly acid to mildly alkaline.

Delray mucky fine sand has a large amount of organic matter and nitrogen in its upper layers. New supplies are added annually as the plants decay. The soil is low in phosphorus, potassium, and minor elements. If drained, it is rapidly permeable to air and water. The soil material allows roots to penetrate deeply. The available moisture-holding capacity is high.

In some areas this soil forms a complex pattern with small patches of other Delray soils. The areas of Delray mucky fine sand on the bottoms along the Myakka River are covered during floods.

Suitable uses (capability unit IIIw-2).—Practically none of Delray mucky fine sand has been improved. Most areas are associated with soils that are in unimproved range pasture. The lush growth of aquatic plants on this soil is low in forage value, and cattle seldom feed on it. The small individual bodies, low topographic position, very poor drainage, and the availability of larger tracts of better drained land have retarded agricultural development. The areas of this soil and adjacent wet ponded soils make up an important part of the wildlife habitat of the county.

Delray mucky fine sand is one of the more productive soils of the county when reclaimed. Observations outside the county indicate that with adequate water control and liberal use of fertilizer, it is good for intensive cultivation of many kinds of truck crops. Tomatoes, lettuce, cabbage, sweet corn, beans, celery, peppers, onions, and other vegetables can be grown successfully. This soil is better for crops than Delray fine sand because it contains more organic matter. It has good workability and is easily kept in good tilth.

If drained, this is also one of the better soils for improved pasture. Productive grass-and-legume pastures of high quality can be established and maintained under careful management. Heavy applications of fertilizer are necessary. Pangolagrass, Pensacola bahiagrass, improved bermudagrass, caribgrass, white clover and Hubam clover are suitable for the artificially drained areas.

Delray mucky fine sand, shallow phase (Dd).—This dark-colored soil occupies some of the lower areas in the very poorly drained shallow depressions of the flatwoods. It is similar to Delray fine sand, shallow phase, but differs in having a significantly greater amount of organic matter in the surface layer. This soil formed from thin beds of sandy sediments that were deposited over alkaline clayey material. Enough well-decomposed humus from grasses, sedges, and other plants is incorporated to modify the original texture of the upper layers. The soil is associated with Terra Ceia and Pompano soils and with other soils of the Delray series. It occurs principally near Fruitville.

The top 8 to 12 inches is black to very dark gray, well-decomposed, fine, smooth organic matter containing some fine sand. Below this material is gray or dark-gray, loose fine sand that contains narrow columns of organic matter fingering from above. Gray or light-gray very friable fine sand occurs at about 25 to 35 inches. This fine sand is slightly compact in place and is interspersed with narrow tongues of material from the overlying layer. It rests abruptly, at depths of 30 to 42 inches, on gray or light-gray, plastic, neutral or mildly alkaline fine sandy clay loam. This last layer commonly has medium to coarse, distinct, yellow and rust-colored stains.

The quantity of organic matter and sand varies somewhat in the top layer, but this soil is distinguished by the presence of a small amount of mineral matter and by the mucky texture. It is rich in nitrogen and deficient in other plant nutrients. The organic matter and underlying clayey formation have a high capacity to hold water that plants can use. Air circulation is rapid through the upper layers when they are free of a high water table.

Suitable uses (capability unit IIIw-2).—About 60 percent of this soil has been cleared, drained, and improved for permanent pasture or market vegetables. The rest is in its original wet condition. The principal truck crops are cabbage, cauliflower, cucumbers, lettuce, beans, onions, and radishes; they are produced for winter and early spring markets. The crops are grown under intensive management and receive large quantities of fertilizer.

Delray mucky fine sand, shallow phase, needs proper drainage and management. High-quality permanent pastures can be obtained by planting pangolagrass, bahiagrass, improved bermudagrass, caribgrass, and legumes. For good yields, all crops require large amounts of fertilizer that contains minor elements. Cover crops, as sesbania and beggarweed, are required on cultivated areas to help maintain the supply of organic matter. Small, isolated areas are used as a wildlife habitat and for water storage.

Felda fine sand (Fa).—This light-colored, poorly drained soil developed from a thin bed of fine sand that overlies finer textured, mildly alkaline materials. It occurs in level to nearly level, shallow, saucerlike depressions and sloughs. Areas of this soil commonly make up a pattern with Pompano, Manatee, and Delray soils.

Felda fine sand differs from the Pompano soils mainly in having a clayey layer not more than 30 inches from the surface. In Pompano soils, the sandy layers are thicker than in the Felda. Manatee and Delray soils are darker in color and richer in organic matter than Felda fine sand.

Felda fine sand has a high water table and may be flooded for a long time each year. Some ponded areas have no natural outlets and receive seepage from surrounding higher soils.

Most of the native cover is a sparse to moderate growth of water-loving plants, principally switchgrass, sedges, shrubs, moisture-adapted grasses, and wax myrtle. In places a scattering of water oak, cabbage palmetto, and saw-palmetto occurs.

Profile description:

0 to 3 inches, gray to very dark gray, nearly loose fine sand; contains a small amount of light-gray fine sand mixed with a small amount of organic matter; medium acid; this layer ranges from 1 to 4 inches in thickness.

3 to 18 inches, light-gray or white, loose fine sand; medium acid; ranges from 14 to 25 inches in thickness.

18 to 24 inches, dark-gray or very dark gray fine sandy clay loam or heavy fine sandy loam that has a few, small, faint-brown, yellow, and gray mottles; narrow columns of light-gray fine sand extend from layer above; plastic when wet, hard when dry; acid to neutral; ranges from 4 to 8 inches in thickness.

24 to 34 inches, gray, fine sandy clay loam; few, medium, distinct, yellow and brown mottles; plastic when moist, hard when dry; a few narrow fingers of dark material extend from layer above; slightly acid to neutral; ranges from 8 to 14 inches in thickness.

34 to 44 inches, light-gray fine sandy clay loam with common to many, medium to coarse, distinct and prominent, yellow and brown mottles; plastic when moist, firm when dry; neutral to alkaline.

The content of organic matter is low, as evidenced by the prevailingly light color of this soil. The depth to the fine-textured subsoil layer ranges from 12 to 30 inches. The sandy layers are rapidly permeable to water and air; they have a low available moisture-holding capacity. On the other hand, the clayey material has moderately slow permeability and a high available moisture-holding capacity. The subsoil is permeable to roots, but excessive moisture restricts their growth to the upper part of the soil.

Minor variations in color, texture, thickness of layers, and mottling occur at short intervals in most areas. In places the clayey stratum is only about 10 to 20 inches thick. It is underlain by light-gray fine sand or by stratified beds of shell, fine sand, and thin layers of clay.

Suitable uses (capability unit IIIw-2).—Felda fine sand is one of the minor soils in the county. Small areas have been cleared for improved pasture. Virgin areas are grazed by cattle, but the small amount of native cover suitable for grazing is of poor quality.

This wet soil is poorly suited to crops or pasture. For farming it needs artificial drainage. If water is properly controlled, the soil is moderately good for intertilled crops and improved pasture. In other counties, Felda fine sand is used successfully for commercial truck crops. Good yields are obtained under management that includes proper drainage, irrigation, and liberal use of fertilizers. In Sarasota County, most of this soil is in cattle-raising areas. In such places it is best suited to range or improved pasture. Bahiagrass, bermudagrass, and pangolagrass, and legumes, such as white and Hubam clovers, make good growth on drained areas and are desirable for improved permanent pasture. Heavy applications of fertilizer, weed control, and careful control of grazing are needed to get a good yield of high-quality herbage.

The isolated ponded areas that are not easily drained are most suitable for storing water or as wildlife habitats.

Immokalee fine sand (Ia).—This somewhat poorly drained sandy soil of the saw-palmetto prairies and pine flatwood forests has a characteristic organic pan layer below 30 inches. It developed from thick stratified beds of acid sands in flat or nearly level areas. Runoff is very slow. Internal drainage is slow to rapid and is influenced seasonally by the high water table.

Immokalee fine sand is extensive in all parts of the county. It is associated with Leon, Pomello, Ona, Adamsville, Pompano, Plummer, and Delray soils. It resembles Leon, Ona, and Pomello soils in having an organic pan. The Ona has an incipient pan immediately below the surface, whereas the pan is strongly developed between 14 and 30 inches in Leon soils and below 42 inches in Pomello soils.

The ground cover on Immokalee fine sand consists mostly of saw-palmetto, gallberry, runner oak, huckleberry, and wiregrass and other grasses. The principal trees are longleaf pine and slash pine. Some areas are treeless.

Profile description:

0 to 8 inches, dark-gray or very dark gray, nearly loose fine sand that has a salt-and-pepper appearance in many spots; material is bound together by small plant roots; strongly acid; layer ranges from 6 to 12 inches in thickness.
8 to 18 inches, light-gray, loose fine sand; strongly acid; ranges from 8 to 12 inches in thickness.
18 to 36 inches, white, loose fine sand, slightly compact in place; strongly acid; ranges from 18 to 22 inches in thickness.
36 to 41 inches, black or very dark gray pan of fine sand and organic matter; hardness influenced by moisture content and degree of cementation; moderately to slowly pervious to water; strongly acid.
41 to 45 inches, dark-brown or very dark grayish-brown, weakly cemented fine sand; strongly acid.
45 to 51 inches, grayish-brown or pale-brown, nearly loose fine sand with common, medium, faint and distinct mottles of gray, yellow, and dark brown; acid; this layer ranges from 5 to 8 inches in thickness.
51 to 60 inches, light-gray or white, loose fine sand; a few, small, faint, yellow and rust-colored mottles in some places.

This soil has a very small amount of organic matter and is deficient in all essential plant nutrients. Its natural productivity is low. The depth of the sandy layers above the organic pan is distinctive in this soil. The pan varies from feebly to strongly cemented. When dry, it is ordinarily harder than when moist. The layers above the pan are rapidly permeable to air and moisture but retain little water. The material above the pan is easily penetrated by roots. Most roots are in the upper part, but a few penetrate the pan.

Locally, areas of Leon and Pomello soils are included with Immokalee fine sand. They are too small or too intricately interwoven to be mapped separately. In places, a secondary pan layer has developed several feet below the top one. Between these pan layers, the nearly loose sand varies in color and mottling. In several localities near drainageways, small areas of Immokalee soils on 2 to 5 percent slopes are mapped with the normal soil because of their small total acreage. These areas have inherent fertility similar to the normal soil, but they need protection from erosion if cleared and cultivated.

Suitable uses (capability unit IVs-2).—Approximately 95 percent of Immokalee fine sand is in unimproved range pasture. Much of the native vegetation has a low feeding value, although some grasses provide fair grazing. An estimated 10 to 25 acres are needed to carry one animal for a year.

On a number of ranches, areas are cleared, fenced, and planted to improved permanent pastures. Pangolagrass and Pensacola bahiagrass are the most popular, although other suitable grasses are grown. Improved pasture usually yields enough herbage to support one cow on 2 or 3 acres. The soil is limed and fertilized before sowing, and fertilizer is applied every year to maintain a good growth.

A small acreage is in citrus trees, but the soil is poorly suited to commercial growing of citrus fruits. Some homeowners use this soil for citrus trees, but they generally give careful attention to each tree. Small tracts of Immokalee fine sand are used for garden vegetables with varying success. A few acres are cultivated

intermittently for watermelons, strawberries, tomatoes, and other truck crops. Some areas have been used successfully for growing pine trees.

Immokalee fine sand has somewhat limited suitability for crops and pasture because of its low natural fertility, susceptibility to rapid leaching, very low available moisture-holding capacity, and low supplies of plant nutrients and organic matter. This soil is easy to work and is responsive to good management. It is a fairly good soil for specialized truck crops grown under high levels of management. Lime and liberal applications of a complete fertilizer that contains minor elements are needed to obtain good yields. A legume cover crop, such as beggarweed, sesbania, or hairy indigo, should be turned under to improve the supply of humus. A complete water-control system is necessary for the successful production of cultivated crops.

This soil is moderately suitable for improved pasture, if simple water-control practices are used. It has better water relationships for improved pasture than the associated Leon soils. Pensacola bahiagrass, pangolagrass, and improved bermudagrass are well suited to this soil. Legumes, such as hairy indigo, Hubam clover, and white clover, are grown with varying degrees of success. Lime and fertilizer should be applied before or at the time of planting. Heavy applications of fertilizer each year and occasional liming are important in maintaining maximum production of high-quality pasture. Minor elements should be added as needed.

Unimproved range pasture needs protection from fire. A system of firebreaks aid in fire control. Controlled burning of old vegetation encourages a new and more nutritious growth of wild grasses. Although a considerable acreage of this soil is grazed in its natural state, new sections of improved permanent pasture are established every year to meet the needs of the expanding cattle industry.

A large acreage is in slash pine, which makes a fairly good growth on this soil. Although many trees have been cut for timber, new stands have grown on cutover areas. The growth should be protected from fire and overgrazing to promote natural reforestation. Artificial planting is also advantageous. Timber can be grown on all areas not needed for pasture, or the trees can be left in small compact stands as shelter for livestock.

The large expanses of this soil provide natural habitats for many kinds of wildfowl and game, among them quail, turkey, and deer. Good management of these lands includes the maintenance of an abundant supply of food and shelter for wildlife.

Keri fine sand (Ka).—This somewhat poorly drained soil of the pine flatwoods developed from moderately deep deposits of sand interbedded with a thin layer of marl. Runoff is very slow because the soil is porous and level or nearly level. Internal drainage is medium to slow and is somewhat restricted by the density of the marl.

Keri fine sand occurs in all parts of the county in association with Adamsville, Leon, Immokalee, Pompano, and Parkwood soils. Adamsville soils lack the marl layer that is a distinguishing feature of Keri soils. Leon and Immokalee soils have organic pan layers not present in Keri soils. Parkwood soils have a darker surface soil than Keri fine sand and a thick layer of marl below the sand. Pompano soils occupy wetter positions than the Keri soil.

The native vegetation includes pine, cabbage palmetto, saw-palmetto, gallberry, runner oak, and wiregrass and other grasses.

Profile description:

0 to 5 inches, dark-gray or very dark gray, nearly loose fine sand of a salt-and-pepper appearance; strongly acid; layer ranges from 3 to 6 inches in thickness.
5 to 14 inches, light-gray, loose fine sand; strongly acid; ranges from 2 to 12 inches in thickness.
14 to 21 inches, grayish-brown, very dark grayish-brown, or pale-brown, loose fine sand; a few, small, distinct, gray and light-gray mottles in places; medium to slightly acid; ranges from 4 to 8 inches in thickness.
21 to 27 inches, white, firm, marly material; a few, medium, distinct, yellow mottles in places; degree of firmness or cementation affected by amount of moisture present and composition of material; in places, strongly cemented when dry but may be friable when moist; marly material is mixed with a large amount of sand and some clay; calcareous; ranges from 1 to 12 inches in thickness.
27 to 35 inches, pale-yellow, loose fine sand with thin streaks of light gray and yellow.
35 to 46 inches, light-gray or white, loose fine sand; a few, medium, faint to distinct, yellow mottles in places.

The soil has a very small amount of organic matter. It is deficient in essential plant nutrients and is moderately low in natural fertility. Permeability to air and water is rapid in the upper layers, but aeration and percolation are restricted seasonally by a high water table. The root system of plants is generally close to the surface because of the marl and high water table. The texture of the soil is such that roots could penetrate to the marl. The sandy layers above the marl have a very low available moisture-holding capacity.

The depth to marl ranges from 18 to 30 inches. The texture and composition of the marl layer vary within short distances. The color of the sandy layer immediately above the marl ranges from light gray to shades of yellow and brown. Lenses and small pockets of medium and coarse sand occur in some parts of the profile.

Included with this soil is a small acreage of Keri fine sand, thin surface phase, that has marl at depths of less than 18 inches. Such areas are usually less than 3 acres in size.

Suitable uses (capability unit Vs-1).—Keri fine sand is one of the minor soils in the county. Practically all of it is undeveloped rangeland; less than 1 percent is improved for pasture or row crops.

This soil is poorly suited to crops. It is fairly good for improved pasture if simple water-control practices are used. Pensacola bahiagrass, pangolagrass, bermudagrass, and whiteclover are some of the suitable pasture plants. Yearly use of fertilizer, weed control, and careful control of grazing are needed.

This soil is not generally suited to citrus trees. It is fair as woodland. The growth of pine trees is poor to medium. Areas of Keri fine sand occurring with soils that are tilled are often left idle. Such areas are best used as sources of food for wildlife.

Keri fine sand, thick surface phase (Kb).—This soil differs from Keri fine sand in having marl at depths

between 30 and 42 inches. The overlying sandy layers are much the same in texture, color, consistence, and reaction, but on the average they are somewhat thicker than those of Keri fine sand. This soil resembles Broward soil, but its sandy layers are underlain by marl instead of hard limestone. The marl layer in this soil varies in texture, thickness, composition, and content of lime. Commonly, the layer is a sandy marl, but in places it is plastic marly clay underlain by stratified beds of loose sand and fine sandy clay loam.

Nearly all areas are in woods grazed by range cattle. About 15 to 25 acres are needed to maintain one animal for a year.

Suitable uses (capability unit IVs-2).—This soil is similar to Adamsville fine sand. The uses and management requirements for crops and pasture are essentially the same on both soils.

Lakeland fine sand, deep phase (La).—This deep, well drained to somewhat excessively drained yellow soil occurs in areas where the natural vegetation is predominantly turkey oak. Other plants are some scattered pine, occasional clumps of saw-palmetto, cactus, broomsedge, and wiregrass.

The soil developed from thick beds of loose, acid sand. It is nearly level and is on low ridges a few feet higher than adjoining land. Very little rainfall runs off this soil. Most of it percolates downward rapidly.

This soil occurs in a few small tracts, principally near Nokomis and Miakka. It is associated with Blanton, Leon, Immokalee, and Pomello soils. The Blanton soil has paler colors in the profile. The other soils are differentiated from Lakeland fine sand, deep phase, by having an organic pan layer at some depth.

Profile description:

0 to 4 inches, dark-gray, very dark gray, or very dark grayish-brown, nearly loose fine sand; strongly acid; layer ranges from 2 to 5 inches in thickness.
4 to 14 inches, pale-brown or light yellowish-brown, loose fine sand; strongly acid; ranges from 8 to 14 inches in thickness.
14 to 31 inches, brownish-yellow or yellowish-brown, loose fine sand; contains a few, small, distinct lumps of slightly cemented fine sand; strongly acid; ranges from 15 to 20 inches in thickness.
31 to 60 inches, brownish-yellow, loose fine sand; a few, small, faint streaks of rust-colored material; strongly acid.

This soil has a very small amount of organic matter and essential plant nutrients. Air and water circulation are very rapid, and roots easily penetrate to a considerable depth. Because this soil is porous and sandy, it has a very low available moisture-holding capacity and is droughty. A small acreage is on narrow, short, gentle slopes that are usually less than 5 percent. If cleared, these areas are subject to erosion during heavy rains, and, consequently, require erosion control practices.

Suitable uses (capability unit IIIs-1).—This soil is not agriculturally important in the county, because of its small extent. About 40 percent is in small citrus groves, some of which are in poor condition. The remaining acreage is wooded and is used occasionally for range pasture or for urban development. The pasture has rather sparse forage; about 15 to 25 acres are needed to support one animal for a year.

The soil has some limitations in its suitability for row crops and for intensive cultivation. It is fairly good for watermelons and cantaloups. Lakeland fine sand, deep phase, is not suitable for cultivation, unless intensive management that includes growing of cover crops is practiced. A leguminous cover crop, such as hairy indigo, should be plowed under for green manure before cultivated crops are grown. All crops need heavy applications of fertilizer.

This is one of the better soils in the county for growing citrus and subtropical fruits. The trees require an annual cover crop, as hairy indigo, for mulch and humus. Liberal amounts of fertilizer are also needed for successful fruit production and tree growth.

The soil is moderately suitable for improved pasture if adequately fertilized and limed. Pangolagrass and Pensacola bahiagrass grown with Hubam clover or hairy indigo are good forage crops.

Lakewood fine sand (Lb).—This soil is commonly called scrub land because a growth of dwarf live oak predominates. Other plants growing on it are sand pine, rosemary, pricklypear cactus, runner oak, saw-palmetto, and wiregrass.

This soil developed from thick beds of incoherent acid sands. It occurs on low-lying, nearly level ridges and is excessively drained and droughty. The principal areas are in the western part of the county, although some are scattered over other sections. The soil is associated with Pomello, Blanton, Leon, Immokalee, and St. Lucie soils. It is distinguished from them by a characteristic shallow white layer over thick strata of yellowish sands:

Profile description:

0 to 1 inch, gray or very dark gray, loose fine sand mixed with a moderate quantity of light-gray fine sand; modified irregularly by decaying organic matter; strongly acid.
1 to 12 inches, white, loose fine sand; strongly acid; layer ranges from 4 to 18 inches in thickness.
12 to 18 inches, very pale brown to pale yellow, loose fine sand; strongly acid; ranges from 5 to 10 inches in thickness.
18 to 25 inches, pale brown, yellow, or brownish-yellow loose fine sand; contains common, small, distinct, slightly cemented lumps of fine sand; strongly acid; ranges from 6 to 12 inches in thickness.
25 to 50 inches, very pale brown or pale yellow, loose fine sand; contains a small amount of white and yellow fine particles.
50 to 70 inches, pale yellow, loose fine sand; common, coarse, distinct mottles of yellow, brown, gray, and rust color.

The amount of organic matter in this soil is negligible. Any accumulation from plants is quickly decomposed and leached away. Available supplies of essential plant nutrients and natural fertility are low. Permeability to water and air is extremely rapid, and roots penetrate very deeply into the soil. The capacity to hold water that plants can use is very low because the soil is loose and porous.

Relief is dominantly nearly level. A few areas with short slopes of 2 to 5 percent are mapped with this soil because of their small acreage.

Suitable uses (capability unit IVs-1).—This is a low-grade soil of limited agricultural value. A small acre-

age is used as rangeland with adjoining better soils. The native cover supplies very meager grazing; about 25 to 40 acres are required to support one animal for a year. Some areas near the gulf are used for residential sites or are held for real estate development. The cleared areas are in small fields and are used for improved pasture or citrus groves.

This soil is not well suited to cultivated crops or pasture. It is barely suitable for citrus trees. The groves require unusually large amounts of fertilizer and frequent irrigation.

This soil is not productive of forest trees. Lawn grasses and ornamentals grow successfully under intensive care.

Leon fine sand (Lc).—This somewhat poorly drained soil of the flatwoods is characterized by a dark-colored organic pan layer in the subsoil at depths between 14 and 30 inches. The parent material consists of deep, unconsolidated layers of acid sand. The soil forms a part of a level or nearly level landscape. Runoff is very slow because of the relief and sandy texture. Internal drainage is rapid to slow and is affected by seasonal fluctuation of the water table.

This soil occurs in all parts of the county and is associated with Immokalee, Ona, Pomello, Adamsville, Keri, Plummer, Rutlege, Delray, and Pompano soils. Leon soils are distinguished from Ona, Immokalee, and Pomello soils primarily by depth to the organic pan. In Ona soils, an incipient pan is within 14 inches of the surface. In Immokalee and Pomello soils, the pan layer has developed below 30 inches. Adamsville and Keri soils are less acid than Leon fine sand and have no organic pan, whereas the Plummer, Rutlege, Delray, and Pompano occupy more poorly drained sites.

Slash pine is the principal tree on this soil. The ground cover includes saw-palmetto, gallberry, runner oak, huckleberry, and wiregrass and other grasses.

Profile description:

0 to 7 inches, dark-gray or very dark gray, nearly loose fine sand that has a salt-and-pepper appearance; strongly acid; this layer ranges from 6 to 10 inches in thickness.
7 to 14 inches, light-gray, loose fine sand; strongly acid; ranges from 6 to 12 inches in thickness.
14 to 22 inches, white, loose fine sand; locally contains a few, medium, faint, light-gray and gray spotches; slightly compact in place; strongly acid; ranges from 6 to 12 inches in thickness.
22 to 26 inches, black or very dark grayish-brown fine sand cemented by organic matter; firmly cemented when dry; moderately firm or firm when moist; strongly acid.
26 to 28 inches, dark-brown or dark grayish-brown fine sand; hard and cemented when dry, pulverable and moderately firm when moist; strongly acid.
28 to 38 inches, pale-brown, dark grayish-brown, or brownish-yellow, loose fine sand; common, medium, distinct, rust-colored mottles; strongly acid.
38 to 50 inches, light-gray, loose fine sand; a few streaks of gray and yellow.

The amount of organic matter and supply of essential plant nutrients in the soil are low. Permeability to water and air is very rapid in the layers above the organic pan. The roots of most grasses are generally in the upper part of the soil, although a few penetrate the pan and enter layers below it. The roots of palmettos are concentrated in the upper part of the pan and increase its permeability. The rooting system and the circulation of air and moisture are affected by a water table that rises almost to the surface during wet periods and recedes to 3 or 4 feet below the surface in dry seasons. During periods of low rainfall, this soil may become droughty. Capillary action is very limited in such sandy soils. The upper soil layers have a very low capacity to hold water that plants can use. The root zone is restricted largely to the layer above the pan.

The relief of Leon fine sand is dominantly level, but adjacent to some drainageways are short, narrow bands, extending from one level to another, that have slopes of about 2 to 5 percent. The areas of sloping soil are so small that they are mapped with the typical Leon fine sand. They are more subject to erosion, however, and during heavy rains unprotected areas on slopes may lose surface soil. In some areas the pan occurs as a wavy layer at varying depths within a distance of 10 feet. In places it is deep enough that the soil can be classified as Immokalee. Thus, small patches of Immokalee soil occur within some areas of Leon fine sand and complicate the soil pattern. Elsewhere, small patches of Keri, Adamsville, and other Leon soils are so intermingled with Leon fine sand that they cannot be delineated separately on the map. Agricultural values and management problems are not altered materially by such inclusions.

Suitable uses (capability unit IVs-2).—Leon fine sand ranks second in total acreage among the soils in the county, being exceeded only by Immokalee fine sand. Most of this soil is wooded or in unimproved range for cattle. Native wild grasses furnish fair grazing, but it takes 15 to 25 acres of this soil to supply forage for one animal. The cleared areas are used mostly for improved pasture. A small acreage of this soil is included with soils used for citrus groves. Small tracts are used for growing truck crops or ornamentals. Some areas are cleared each year for permanent pasture, but lime and large amounts of fertilizer are required. Fertilizers are used on the pastures each year. Rotational grazing is practiced to prevent deterioration of the plants.

Leon fine sand is fair for crops and pasture. Its use capabilities, however, are restricted by low humus supplies, poor soil-moisture relationships, low natural fertility, and the hardpan layer. The soil is suited to the production of winter vegetables and specialty crops. However, good yields can be obtained only by careful management that includes liberal use of fertilizer, liming, and complete water control. Tomatoes, beans, peppers, sweet corn, cucumbers, cabbage, onions, watermelons, and strawberries are grown. Cover crops such as hairy indigo and sesbania should be grown for green manure. For best results, rotations should be used that provide cover crops or improved pasture for several years before a cultivated crop.

Satisfactory results have been obtained with improved pasture on Leon fine sand. Pangolagrass, Pensacola bahiagrass, bermudagrass, paragrass, and other pasture grasses do well. Legumes such as white clover, hairy indigo, Hubam clover, and alfalfa are grown

with varying success. Irrigation is practical if the water supply is easily available. Liming to reduce strong acidity, plus heavy applications of fertilizer, brings good results. Minor elements should be added as needed. Improved pasture, if carefully managed, produces enough forage on 2 or 3 acres for one cow the year round.

This soil is not generally suitable for citrus trees. In some sections where Leon fine sand has been included with other soils planted to groves, the yields are usually disappointing. Growth is retarded and many trees soon die when planted on this soil. Special management is required to grow citrus trees successfully. Mounding, drainage, irrigation, and frequent applications of fertilizer are among the necessary management practices.

Slash pine makes fairly rapid growth on this soil. Woodland can be improved by interplanting. Tracts in pine should be protected from overgrazing and fire. Like the Immokalee soils, Leon fine sand occurs in broad areas and is an important part of the natural habitat for many kinds of wildfowl and wild animals. Proper management of this soil for wildlife should be considered in a wildlife conservation program for the county.

Leon fine sand, heavy substratum phase (Le).—This soil comprises areas of Leon fine sand that are underlain by fine-textured material at depths of less than 42 inches. It has formed from shallow beds of sand deposited on a clayey formation. The relief—level or nearly level—is not significantly different from that of Leon fine sand, though some areas occur in slightly lower positions. Some small areas adjacent to drainageways have slopes of 2 to 5 percent. Drainage is somewhat poor. Runoff is slow; water generally penetrates directly into the soil. Internal drainage is slow to rapid, as it is affected by the seasonal fluctuation of the water table. The organic pan and underlying clayey material are usually slowly permeable, and they impede percolation. This soil is associated with Immokalee, Adamsville, Sunniland, and Bradenton soils and other soils of the Leon series. It usually occurs in the central part of the county.

The native plant cover includes pine, saw-palmetto, gallberry, runner oak, and wiregrass and other grasses.

Profile description:

0 to 6 inches, dark-gray or very dark gray, nearly loose fine sand; salt-and-pepper appearance; this layer ranges from 5 to 8 inches in thickness.
6 to 26 inches, light-gray or white, loose fine sand; boundary abrupt; ranges from 12 to 20 inches in thickness.
26 to 30 inches, black, very dark gray, or dark-brown, fine sand stained by organic matter; ranges from 4 to 8 inches in thickness.
30 to 48 inches, gray, plastic fine sandy clay loam with common, medium, distinct, rust-colored mottles.

The sandy layers are strongly acid, but the fine-textured subsoil ranges from medium acid to neutral. The soil has a small amount of organic matter and is low in supplies of plant nutrients. It is slightly more productive than Leon fine sand. The upper sandy layers are rapidly permeable to air and water, but the pan and clayey layer are slowly permeable. Most roots grow only to the pan, but a few penetrate it. Movement of moisture, aeration, and the depth of the root systems are affected by the height of the water table, which fluctuates seasonally.

Suitable uses (capability unit IIIs-2).—This is one of the less important soils in Sarasota County in extent and agricultural importance. About 80 percent is in its natural state and provides poor to fair grazing for range cattle. Cleared areas are in permanent pasture, which is mainly planted to pangolagrass or Pensacola bahiagrass. Lime and fertilizers are required.

Leon fine sand, heavy substratum phase, is fairly suitable for cultivated crops and improved pasture. This soil has low fertility, very low available moisture-holding capacity, low supplies of humus and plant nutrients, and other unfavorable characteristics. Consequently, careful management is needed to produce profitable yields.

Most of this soil is in cattle-raising areas where improved pasture is important. Pensacola bahiagrass, pangolagrass, and bermudagrass are suited to it. Legumes such as white clover, Hubam clover, and hairy indigo can be grown with pasture grasses. Heavy applications of fertilizer are needed each year to maintain maximum yields. Minor elements and lime should be supplied as needed. Rotational grazing and weed control should be a part of the management.

Under high levels of management, specialized crops can be produced with fair success. Liberal applications of commercial fertilizer and enough water for irrigation are necessary for good yields. Lime and minor elements should be used as needed. Legume cover crops and crop residues should be plowed under for green manure.

This soil is not desirable for citrus trees, because of inadequate drainage and unsuitable soil conditions.

Leon fine sand, light colored surface phase (Ld).—This soil differs from Leon fine sand mainly in having a lighter colored surface layer and slightly greater depths to the organic pan. It has developed from deep beds of acid sands. The relief is level to very gently sloping. Runoff is very slow. Internal drainage is rapid through the upper layers when the water table is not high. During rainy weather the soil may become waterlogged, but in dry weather it becomes droughty.

Most of this soil is near the gulf, although areas are distributed over the county. It occurs in association with Immokalee, Pomello, Ona, Lakewood, and Blanton soils and with other soils of the Leon series.

The plant cover is similar to that on other Leon soils. It is more sparse, however, and includes some dwarf live oak and pricklypear cactus.

Profile description:

0 to 3 inches, light-gray to gray, loose fine sand; this layer ranges from 1 to 4 inches in thickness.
3 to 28 inches, light-gray to white, loose fine sand; ranges from 20 to 40 inches in thickness.
28 to 34 inches, black or very dark grayish-brown fine sand, cemented by organic matter; strongly acid; ranges from 4 to 10 inches in thickness.
34 to 44 inches, dark grayish-brown, brownish-yellow, or pale-brown, nearly loose fine sand; common, medium, distinct, brown mottles.

The amount of organic matter is exceedingly small; in places it is lacking entirely. The soil is strongly acid throughout. Supplies of all available plant nutrients are small, and the inherent fertility is low. Permeability to water and air is very rapid in the zone above the pan. Aeration, percolation of moisture, and depth of rooting are restricted to some extent by a fluctuating water table. The pan layer is irregular and undulating and therefore occurs at different levels within short distances.

Suitable uses (capability unit Vs-2).—More than 95 percent of this soil is in native range for grazing cattle. Because of the sparse growth of forage plants and the low carrying capacity of the wild grasses, from 15 to 30 acres are required to support one animal for a year. Cleared tracts are small and are included in citrus groves, improved pastures, and vegetable gardens.

This soil is poorly suited to crops and pasture because of its infertility, lack of organic matter, rapid leaching, poor moisture relationships, and undesirable soil conditions. It is used for truck crops infrequently.

Areas of this soil in improved pasture are border strips planted to grasses along with adjoining soils. Pangolagrass or Pensacola bahiagrass is suited, but lime and heavy applications of fertilizer are essential for good stands.

This soil is not suited to citrus trees. Fruit trees usually have a poor, stunted growth and do not yield well. Many become diseased and die.

Because of unfavorable soil conditions, this soil is not suited to intensive cultivation. Range pasture and forest are the most suitable uses.

Made land (Ma).—This miscellaneous land type comprises areas that have been altered by human enterprise. For the most part it is composed of sites along or near the coast. These sites are covered with sand and shells that have been pumped or dredged from the bottoms of bays and streams. Some low-lying, poorly drained areas or marsh have been improved by such materials, or new land has been created for homesites, business establishments, or real estate developments. Large quantities of such material have also been used as foundations for highways and for the construction of causeways that connect the mainland and the keys. Some ponded areas and stream channels have been deepened, and the excavated material has been dumped on adjoining land. No capability classification has been assigned to this miscellaneous land type.

Manatee fine sandy loam (Mb).—This dark-colored, fine-textured soil is in poorly drained, shallow depressions. It has developed from sandy and clay sediments that contained marl. The large quantity of organic matter and the clay in the upper part of the soil obscure the sandy texture and make the material smooth and sticky, especially when moist or wet. This soil is in nearly level areas or in saucerlike areas having no natural outlets. There is practically no runoff, and water remains on the surface for many months of the year. Internal drainage is very slow. Most areas of this soil are fairly small and are scattered among Felda, Bradenton, Sunniland, Pompano, and Delray soils. Manatee fine sandy loam is readily distinguished from these soils by the characteristic dark color and finer texture of the surface soil.

Most areas are treeless and covered with pickerelweed, sawgrass, various other weeds, and aquatic grasses. The few forested areas have stands of hardwoods such as swamp maple, ash, and water oaks.

Profile description:

0 to 9 inches, black or very dark gray fine sandy loam; contains considerable organic matter; plastic when moist, hard when dry, with small cracks over the surface; granular; slightly acid; this layer ranges from 8 to 12 inches in thickness.
9 to 20 inches, dark-gray or black fine sandy clay loam or fine sandy loam; contains narrow columns of light-gray material in places; moderate, medium angular blocky structure; plastic when moist, firm to hard when dry; slightly acid; ranges from 10 to 18 inches in thickness.
20 to 35 inches, gray fine sandy clay loam or heavy fine sandy loam having fingers of dark material 1 to 3 inches in diameter projecting from layer above; sticky and plastic when moist, hard when dry; slightly acid to neutral; ranges from 10 to 18 inches in thickness.
35 to 49 inches, light-gray fine sandy clay loam or heavy fine sandy loam interspersed with marly material; plastic and sticky when moist, very hard when dry; alkaline; a few narrow tongues of dark-colored material extend from upper layers.

The soil is mixed with a large amount of well-decomposed organic matter that produces a dark color to depths of about 18 to 30 inches. It is well supplied with nitrogen and is one of the more fertile soils of the county. It is very slowly permeable to water and air. Although it is suitable for a deep root growth, the roots are generally near the surface. They are affected by the excessive moisture in the soil most of the year. In some localities, the marl may be lacking or may occur only in small pockets or lenses. In places, where the marl is absent, the soil is more acid.

Suitable uses (capability unit IIIw-2).—This soil is inextensive. Practically all areas are unimproved and are naturally wet. Along with surrounding soils, they are used as native grazing areas for cattle and as feeding places for many kinds of wildlife. Their value for grazing is limited by the scattered sparse growth that is relished by cattle. At the time of the survey, probably less than 15 acres had been improved. Few units are large enough to warrant the special management required for their cultivation.

Manatee fine sandy loam is difficult to work and keep in good tilth. It must be cultivated within a fairly narrow range of moisture content. It is subject to flooding, and even when the soil is ditched, percolation of water through the soil is slow. With proper water control, special management practices, and favorable growing conditions, good yields of lettuce, cabbage, spinach, broccoli, collards, cauliflower, and other vegetables can be produced.

The soil is suited to the production of high-yielding, high-quality pasture if water is adequately controlled. Pangolagrass, bahiagrass, bermudagrass, caribgrass, paragrass, and legumes such as white clover and Hubam clover can be grown successfully.

Most areas are natural reservoirs and, as such, are valued in wildlife conservation. Under prevailing con-

ditions, they are best used as wildlife habitats, even though their inherent capabilities warrant more intensive use.

Manatee loamy fine sand (Mc).—This dark, poorly to very poorly drained soil has developed from shallow accumulations of sandy sediments laid down by marine waters on a prior deposit of clayey materials. The clayey materials were interspersed with marl at irregular depths. Manatee loamy fine sand occupies sloughs and shallow intermittent ponds having a level to nearly level relief. Runoff and internal drainage are very slow. During the rainy season, the soil is saturated and covered with several inches of water for long periods.

Areas of this soil occur in a landscape made up of Felda, Pompano, Delray, Sunniland, and Bradenton soils and other Manatee soils. The Sunniland and Bradenton areas occur on somewhat better drained sites. Manatee loamy fine sand is distinguished from the other soils mainly by its dark color, shallow sandy layer, and fine textured subsoil.

The plant cover is chiefly an association of sawgrass, pickerelweed, arrowhead, water iris, sedges, and various water-loving grasses. Most areas are treeless, but a few support a stand of water oaks, pine, willow, myrtle, cabbage palmetto, and other water-tolerant hardwoods.

Profile description:

0 to 10 inches, very dark gray or black, nearly loose loamy fine sand; contains a small amount of light-gray fine sand; strongly acid; this layer ranges from 8 to 15 inches in thickness.

10 to 30 inches, very dark gray or black fine sandy clay loam or heavy fine sandy loam; contains common, medium, faint to distinct, gray and rust-colored stains; contains narrow, vertical columns of light-gray fine sand; sticky and plastic when moist, hard and firm when dry; medium to slightly acid; ranges from 14 to 25 inches in thickness.

30 to 35 inches, gray or light-gray fine sandy clay loam or heavy fine sandy loam; few to common, medium, distinct, rust-colored mottles; plastic when moist, hard when dry; penetrated by small veins of light-gray fine sand and dark-gray heavy material from layer above; slightly acid to neutral; ranges from 4 to 15 inches in thickness.

35 to 42 inches, light-gray or white, marly fine sandy clay loam; few, medium, distinct, rust-colored mottles; a few tongues of dark-gray material continue from layers above; a few strongly cemented medium-sized nodules of lime in some places; alkaline; ranges from 2 to 10 inches in thickness.

42 to 56 inches, gray or light-gray fine sandy clay loam with a few to common, medium, distinct, rust-colored mottles; slightly plastic when wet, hard when dry; contains lenses or pockets of sandy materials.

This soil is well supplied with humus and nitrogen. It is moderately deficient in other plant nutrients, except for lime in the subsurface layers. It is slowly permeable to air and water. The texture favors root growth down to the marl. The clayey layer tends to retain moisture.

The soil is modified by a large amount of organic matter. The material containing organic matter extends to the lower subsoil as narrow columns in old root channels or as thin seams along fracture planes. Composition, texture, and reaction of the fine subsoil material are changed slightly by differences in relative amounts of clay, sand, and marl. The marl is an intermittent formation. Because the adjoining soils are intermingled and form a complex pattern, small patches of Delray and of other soils of the Manatee series are included with Manatee loamy fine sand.

Suitable uses (capability unit IIIw-2).—The larger areas of Manatee loamy fine sand occur in sloughs, and the smaller ones, in shallow ponds. A little more than 95 percent is undeveloped and, with associated soils, is used for range pasture. The available forage plants provide fair to good grazing for cattle. Cleared, drained land is used for improved permanent pasture. Most of the acreage used for pasture is in sloughs that have drainage ditches through them.

Manatee loamy fine sand is a good soil for the production of high-quality pasture and is suitable for truck crops if it is properly ditched and drained. It is not a satisfactory soil for citrus trees unless intensive water control is practiced. The chief problem on this soil is control of water.

This is one of the more productive soils in the county for improved pastures. Suitable grass-legume mixtures furnish a good yield of high-quality herbage. Pangolagrass, Pensacola bahiagrass, bermudagrass, St. Augustine grass, and paragrass, and such legumes as white clover and Hubam clover are suited to this soil. This soil requires less fertilizer than many other soils in the county, although yearly applications are suggested.

This soil is good for intensive cultivation of vegetable crops such as cabbage, corn, tomatoes, lettuce, lima beans, snap beans, and endive. Careful water management, including drainage and irrigation, is needed for best results. Ditches, dikes, and pumps may be required to control drainage. The use of fertilizer containing potash and phosphate and minor elements is necessary to obtain good yields. The soil is somewhat difficult to work when wet, and tillage should be done when the moisture is favorable. Green manure improves workability.

Undeveloped areas of this soil form an important part of the wildlife habitat in the county. Good wildlife planning should provide better shelter and more food for wildlife in some of these areas.

Manatee soils, overflow phases (Md).—This mapping unit includes all areas of Manatee soils that are flooded by the Myakka River. These areas occur on the flood plain of this river and extend to a short distance south of Lower Lake in the Myakka River State Park. They are submerged when the river is in flood stage. The river channel is shallow through this part of the flood plain. It is obstructed in places by a thick growth of water-hyacinths, and the gradient does not favor rapid cutting or flow. Any large accumulation of water therefore quickly fills the channel and overflows the riverbanks.

Most areas of Manatee soils, overflow phases, are on the prevailing level of the plain. Some, however, are in shallow depressions having no outlets or are in shallow, narrow, winding sloughs that were former courses of the river. A thin sheet of water remains over a large part of the bottoms for some months after flooding, but there are usually short periods when the water disappears. No significant quantity of sediments is carried

by the floodwaters and dropped over the plain. Textures of the different soils are changed very little by new accumulations.

In general, Manatee soils, overflow phases, have the same characteristics as other Manatee soils. They comprise, for the most part, a sequence of sandy layers darkened to various depths by organic matter, overlying clayey and marly materials.

Most of this separation is wet prairie that has a cover of water iris, lilies, sedges, pickerelweed, various wild grasses, and weeds. In places small stands of hardwoods grow on this soil—mainly water oak, ash, and maple, as well as some cabbage palmetto.

The textural types of Manatee soils that occur in other sections of the county have their counterpart in Manatee soils, overflow phases. A fine sandy loam stretches over the greater part of the plain, and there are significant areas of loamy fine sand. Small bodies of a fine sandy clay loam also occur in places. Locally, intricate patterns of several different soils occur.

Manatee soils, overflow phases, are characterized by a large amount of organic matter that affects the soil material to depths of about 25 to 40 inches. They are medium to slightly acid to about 30 inches and neutral to mildly akaline below this depth. Marl in these separations is at considerably greater depths than in the Manatee soils outside the flood plain.

Included with this separation is an open, fresh-water marsh that borders the northern part of Lake Myakka. It is swampy and waterlogged much of the time. It also occurs for a short distance along the Myakka River above the lake. Several winding, interconnected channels of the river have been formed in this area. The marsh supports a thick growth of water lilies, sedges, rushes, iris, water-hyacinth, and aquatic grasses. In a few places along the river channels there are narrow strips of soil composed of irregularly stratified beds of fine sand, silt, and clay. These deposits vary in thickness and arrangement. Small patches of Manatee soils have had shallow accumulations of silt and fine sand deposited over them. These materials are darkened by decayed organic matter.

When not too wet or deeply covered with water, these overflowed areas are used for grazing. Native plants furnish fair to good forage. The soils are well suited to grasses, and excellent pastures could be established and maintained in areas where clearing, drainage, and flood control are economically feasible. The best use for much of Manatee soils, overflow phases, is as a refuge for wildlife. No capability classification has been assigned to this land.

Mines, pits, and dumps (Me).—This miscellaneous land type consists of excavations and refuse dumps produced by mining, quarrying, and roadbuilding. North of Sarasota, along the county line, a large excavation has been made in mining limerock and marl for commercial use. This opening and the strippings piled on adjoining land are classified with this land type.

Pits made to obtain marl, shell, clay, or other materials for road construction or fills and the waste materials from them are included with this separation. No capability classification has been assigned to this miscellaneous land type.

Ona fine sand (Oa).—This is a somewhat poorly drained soil of the flatwoods. It has a dark, sandy surface soil that overlies at shallow depths (usually within 14 inches) a characteristic dark-colored, moderately firm layer that is stained with organic matter. This soil has developed from thick beds of marine-deposited sands. It is dominantly level to nearly level. Runoff is very slow; internal drainage is slow to rapid, depending on the level of the water table, which fluctuates seasonally. Areas of this soil are scattered but occur principally in the western and central parts of the county. They are associated with Scranton, Leon, and Immokalee soils.

The tree growth consists almost entirely of pines. The ground cover is a mixture consisting mainly of saw-palmetto, gallberry, runner oak, myrtle, and wiregrass and other native grasses.

Profile description:

0 to 10 inches, dark-gray or very dark gray, nearly loose fine sand; strongly acid.
10 to 14 inches, very dark gray or black fine sand, feebly cemented by organic matter; firmness increases with decrease in moisture content; strongly acid.
14 to 17 inches, dark grayish-brown or dark-brown, feebly cemented fine sand; harder when dry than when moist; strongly acid.
17 to 22 inches, dark-brown, brown, or dark grayish-brown, nearly loose fine sand; common, small, distinct, gray, yellow, and brown mottles; strongly acid.
22 to 48 inches, light-gray, loose fine sand; common to many, medium to coarse, distinct, yellow, gray, and brown mottles; mottles more abundant in upper part; strongly acid.

This soil has a moderate amount of organic matter and nitrogen, but it is deficient in other essential plant nutrients. It is rapidly permeable to water and air above the brown-stained layer, which is moderately permeable. During rainy seasons, however, the water table rises to near the surface and the soil becomes waterlogged. The capacity to hold water that plants can use, however, is low, and the soil is droughty when the water table sinks below the root zone in dry seasons. The roots of many native plants extend through the stained material and reach to moderate depths in the material below.

The dark color of the surface soil varies according to the amount of humus. The surface layer ranges from 8 to 16 inches in depth. The brown-stained layer is slightly undulating and is variable in thickness and firmness. A similar layer has developed at depths of 4 to 6 feet in places.

Locally, this soil includes small patches of Scranton fine sand, which resembles it in texture and color but has no brown layer. These two kinds of soil form an intricate pattern.

Suitable uses (capability unit IIs-1).—Ona fine sand is an important soil because of its inherent productivity. About 75 percent is in forest or cutover forest and is used as range with surrounding soils. The forage supplied by the natural vegetation is fair, but about 10 to 20 acres of this soil are needed to support one animal for a year. About 35 percent of the cleared land is used

for improved pasture, about 60 percent for citrus groves, and the rest for vegetables.

If water is carefully managed, this soil is well suited to cultivated crops, improved pasture grasses, and citrus trees. The tilled crops include tomatoes, cucumbers, beans, sweet corn, peppers, squash, potatoes, and strawberries. These crops are produced successfully under good management. A water control system is needed to remove excess water during wet seasons and to provide irrigation for crops. Heavy applications of fertilizer are required for high yields; lime and minor elements should be applied as needed.

If measures are used to control water, the soil is excellent for improved pasture. Productive pastures can be established and maintained with suitable high-quality grasses. Fertilizing, liming, weed control, and controlled grazing are good management practices. Pangolagrass, Pensacola bahiagrass, bermudagrass, whiteclover, and hairy indigo do well on this soil.

Ona fine sand is moderately good for citrus if adequate drainage can be established. However, it is difficult to provide adequate drainage during extremely wet seasons, and the use of this soil for citrus is hazardous. Irrigation may be needed during dry periods. A leguminous cover crop, such as hairy indigo, grown annually and disked into the soil, maintains the humus content and conserves moisture. It is important to fertilize this soil in order to get good yields.

Ona fine sand, light colored surface phase (Ob).—This soil is similar to Ona fine sand, but it has a surface layer that is markedly lighter colored and contains a smaller quantity of organic matter. It developed from thick beds of sedimentary sands laid down by marine waters. It is somewhat poorly drained; downward movement of water is impeded by a fairly high water table.

This soil occurs on nearly level to level relief in association with Scranton and Leon soils and Ona fine sand. The brown-stained layer is lacking in the Scranton soil. It occurs at greater depths in Leon soils than in Ona fine sand, light colored surface phase. Species of native vegetation are like those on Ona fine sand, but their growth is more restricted.

The surface layer is light-gray or gray fine sand that contains a few conspicuous particles of dark-gray fine sand. At depths of 9 to 14 inches, it is underlain by the characteristic brown-stained organic layer. Below this is a thin layer of nearly loose brown or grayish-brown fine sand containing rust-colored mottles. This layer merges with a light-gray, incoherent fine sand having some yellow and brown stains.

Suitable uses (capability unit IIIs-2).—This inextensive soil is distributed mainly over the central and western parts of the county. About 95 percent is woodland used with adjoining soils for range pasture. The grazing value of the land is somewhat lower than that of Ona fine sand because the stand of grass is thinner. Cleared areas, for the most part, are in strips of improved pasture that adjoin better soils.

This soil is used like Ona fine sand but it has less organic matter and nitrogen. Consequently, it has lower inherent productivity and is less suitable for continuous cropping. Hairy indigo and sesbania, used as green-manure crops, are helpful in overcoming these deficiencies. A rotation consisting of 1 or 2 years of a cultivated crop followed by 3 to 5 years of grass is desirable. Crops and pasture on this soil need larger quantities of fertilizer than on Ona fine sand.

Pamlico peaty muck (Pa).—This organic soil developed from decomposed aquatic plants, chiefly sedges, pickerelweed, water iris, lilies, bonnets, button bush, sawgrass, and other plants suited to a wet environment. A few areas contain water oaks and other hardwoods that grow in wet places. This soil occupies fresh water marshes and ponded depressions in the flatwoods. It is very poorly drained and is covered with water much of the year. It is associated with Pompano, Delray, Plummer, and Rutlege soils in all parts of the county.

Profile description:

0 to 8 inches, brown to dark grayish-brown, felty, partly decayed and raw organic matter; a small amount of fine sand; strongly acid; this layer ranges from 6 to 10 inches in thickness.

8 to 18 inches, black or very dark grayish-brown, smooth, well-rotted organic matter; contains thin laminations of partly decayed plant debris; strongly acid; some sandy material throughout layer; ranges from 8 to 14 inches in thickness.

18 to 32 inches, very dark grayish-brown or very dark brown, raw, felty, fibrous vegetable matter, intermatted with fine, partly decayed plant remains; strongly acid; contains a small amount of gray fine sand; some of the raw material retains the form of the roots and stems; ranges from 14 to 20 inches in thickness.

32 to 48 inches, gray or dark-gray, slightly compact fine sand; becomes light gray with depth; slightly acid to strongly acid.

The organic matter has accumulated to depths ranging from 15 to 48 inches or slightly more. Few areas have a uniform depth. The degree of decomposition in the organic matter is variable. The shallow deposits occupy narrow strips along the outside of an area; the material gradually deepens toward the center. A small amount of sandy material is mixed throughout the profile. This sandy material is obscured when the soil is wet but is noticeable as gray or light-gray grains when the soil is dry. Some areas have patches of thoroughly decomposed organic matter, granular in structure, in the upper part of the profile.

This soil is high in nitrogen but deficient in potassium, phosphorus, and other essential elements. It is rapidly permeable to air and moisture and can be penetrated deeply by roots. It absorbs large amounts of water but shrinks considerably upon drying. Areas of this soil along the flood plain of the Myakka River are inundated during floods. They are waterlogged and swampy most of the year and are difficult to drain because of the high water level in the river channel.

Suitable uses (capability unit IIIw-1).—Most of Pamlico peaty muck is very poorly drained and remains largely undeveloped. It supplies food and refuge for many kinds of wildlife. Such areas, when free of high water, supply some forage for cattle, although the value of the native cover for grazing is low. Some virgin areas provide water for cattle when other depressions are dry. A small acreage has been cleared and drained for improved pasture. Areas near Sarasota have been

drained, and the soil material is sold as fill or topdressing for lawns or as filler for fertilizer.

In its natural wet state, this soil is not suitable for pasture or crops. It needs thorough drainage before it can be cultivated. If water is controlled, this is an excellent soil for intensive cultivation of specialized crops such as celery, and is well suited to permanent pasture. It is not suitable for citrus trees. If properly drained, it is easy to work and keep in good tilth, and heavy tools and mechanized equipment can be used. When this soil is dry and does not have a protective cover, some surface soil may be lost through blowing. The effect of compaction, oxidation, and shrinkage makes it difficult to maintain proper ditch levels for water control. The soil is deficient in some essential plant foods but it responds to fertilizer.

Under good management that includes adequate water control, this soil produces high yields of many kinds of vegetables. Liberal applications of fertilizer, including minor elements, are necessary for high production. Productive pasture of high quality can be established on this soil and maintained with substantial applications of fertilizer. Suitable plants include pangolagrass, bahiagrass, improved bermudagrass, caribgrass, and winter clovers.

Pamlico peaty muck is associated with other poorly drained soils, and measures taken to improve it would involve adjoining soils. Many areas of this soil are best used for range or improved pasture or as wildlife habitats.

Parkwood fine sand (Pb).—In virgin areas, this somewhat poorly drained hammock soil generally supports a dense stand of cabbage palmetto. It has developed from very thin beds of sand deposited over marl. It occupies level or nearly level positions between soils of the flatwoods and those in sloughs or ponded areas. Elevations differ very slightly from those of the adjoining soils. There is very little runoff, and internal drainage is affected by the level of the water table.

This soil most commonly occurs in narrow bands of various lengths in a landscape composed of Pompano, Delray, Adamsville, Keri, Sunniland, Bradenton, Leon, and Immokalee soils. In addition to cabbage palmetto, this soil supports a mixture of oak, maple, and other hardwoods, and an undergrowth of shrubs and vines.

Profile description:

0 to 4 inches, dark-gray, dark grayish-brown, or black, nearly loose fine sand; contains small amounts of light-gray fine sand; slightly acid to neutral.
4 to 14 inches, gray or very dark grayish-brown, loose fine sand; a few to common, fine to medium, faint to distinct, light-gray, brown, and rust-colored mottles; neutral.
14 to 26 inches, light grayish-brown or dark grayish-brown, nearly loose fine sand; common, medium, faint to distinct, gray, yellow, and rust-colored mottles; neutral.
26 to 48 inches, white or light-gray marl interspersed with narrow veins of sand from layers above.

This soil has moderate to large amounts of organic matter and nitrogen but very limited supplies of other essential plant nutrients. Its sandy layers are rapidly permeable to air and water in the absence of a high water table, but the marl is very slowly permeable. The soil has only moderate capacity to hold water that plants can use. Physical conditions favor the penetration of roots down to the marl, but long periods of excessive moisture somewhat restrict the downward growth of roots.

Within short distances, the several layers are fairly variable in color, thickness, and mottling. Depth to marl commonly ranges from 18 to 30 inches, but in places it is about 8 to 12 inches. An interbedding of clay, several inches thick, occurs above the marl in some areas, especially where this soil is next to Sunniland and Bradenton soils.

Suitable uses (capability unit IIIs-2).—Most areas of this soil are about 1 to 10 acres in size. At present nearly all of it is in native cover that provides shelter for wildlife as well as some grazing and shade for cattle. The growth of desirable forage grasses and plants is limited by dense shade and is very sparse but of good quality.

Parkwood fine sand is moderately suited to truck crops and pasture if water is properly controlled. Good yields of vegetables are obtained if the land is drained, fertilized, and irrigated. The suitability for citrus trees is restricted somewhat by imperfect drainage and the shallow depth to marl. Citrus trees have been grown in other counties on this soil with various degrees of success. The location, the small size and pattern of individual areas, the soil associations, and the necessity for water control make the growing of row crops on this soil rather impractical at present. The use of adjoining soils should be considered.

Parkwood fine sand is almost entirely in a region used principally for livestock. Productive pasture and hay can be grown. Pangolagrass, Pensacola bahiagrass, and bermudagrass are adapted. Whiteclover responds well and can be grown with the grasses. Large annual applications of fertilizer are needed to maintain good sod. This soil is most useful as shelter for cattle and wildlife.

Parkwood fine sand, deep phase (Pc).—This soil is closely related to normal Parkwood fine sand in general characteristics, but it differs significantly in having a greater depth (30 inches) to the marl. The parent material is a slightly thicker deposit of sand over the marl. The two soils have similar drainage, relief, association with other soils, and vegetation.

Profile description:

0 to 4 inches, dark-gray, very dark gray, or dark grayish-brown, nearly loose fine sand; contains a small amount of light-gray fine sand.
4 to 15 inches, dark grayish-brown or very dark gray, nearly loose fine sand; locally a few, medium, faint, gray and rust-colored mottles.
15 to 25 inches, light grayish-brown or gray, nearly loose fine sand (slightly coherent when moist); a few, medium, faint mottles of yellow and brown.
25 to 50 inches, light-gray, nearly loose fine sand; a few to common, medium, distinct, yellow and rust-colored mottles.
50 to 60 inches, marly material mixed with variable quantities of sand and some clay.

This soil is slightly acid to neutral in the upper part but becomes mildly alkaline with depth. In some areas it is medium or slightly acid to the marl layer. It contains a moderate supply of organic matter and nitrogen

but is deficient in other primary plant nutrients. The soil layers have good aeration and good moisture percolation and permit deep penetration of roots when they are not saturated with water. The available moisture-holding capacity is moderately low.

Some areas in the western part of the county are characterized by a dark-gray or very dark gray color to depths of 24 to 30 inches and are medium acid. The marl layer is somewhat deeper in such places, or at depths below 42 inches. There is considerable irregularity in the depth to marl in some areas.

Suitable uses (capability unit IIIs-2).—Most areas of this soil are less than 25 acres in size. They occur mostly as a thin fringe, or narrow band, along sloughs and intermittent ponds or as occasional hammock islands. All areas are wooded and serve primarily as shelter for wildlife and cattle. Wild grasses and vegetation suitable for forage have a scattered, sparse growth.

As this soil occurs in small elongated areas, its management and use for agriculture would be influenced by the prevailing practices on dominant adjoining soils. When cleared and drained, Parkwood fine sand, deep phase, is suitable for improved pastures or truck crops. Heavy applications of fertilizer are required for good yields. The standard pasture grasses—pangolagrass, Pensacola bahiagrass, and bermudagrass—are suited to the soil. High-producing pastures can be maintained by use of fertilizer, weed control, and controlled grazing. This soil, with its native hammock vegetation, is suitable as shelter areas for wildlife.

Plummer fine sand (Pd).—This poorly drained, light-colored, acid soil of intermittent ponds, sloughs, and slight depressions occurs in the flatwoods. It developed from moderately thick deposits of sandy sediments. The relief is nearly level to level. Flow of surface water is negligible, and internal drainage is slow and impeded by a high water table. For a few months each year the soil is normally covered with shallow water.

The soil occurs in all parts of the county in association with Rutlege, Leon, and Immokalee soils. The Rutlege are darker colored soils and frequently occupy part of the same depression. The Leon and Immokalee are in slightly higher positions than the Plummer and have organic pans. Plummer fine sand is very similar to Pompano soils in color, but the Pompano are less acid.

Most areas of Plummer fine sand are treeless. They have a sparse to moderate growth of St. Johnswort, broomsedge, rushes, weeds, and wiregrass and other water-tolerant grasses. In a few places a scattered stand of slash pine, myrtle, and saw-palmetto grows on this soil.

Profile description:

0 to 4 inches, gray or dark-gray, nearly loose fine sand; small spots of light-gray fine sand in places; little organic matter; strongly acid; this layer ranges from 2 to 6 inches in thickness.
4 to 12 inches, light-gray, loose fine sand; strongly acid; ranges from 6 to 12 inches in thickness.
12 to 40 inches, white or light-gray, nearly loose fine sand; slightly compact when moist; usually free of mottles but contains a few to common, medium, distinct, yellow and gray splotches in places; strongly acid; ranges from 25 to 35 inches in thickness.
40 to 46 inches, very dark grayish-brown, slowly pervious fine sand; firm or moderately cemented with organic matter; water table seldom falls below this layer; strongly acid.
46 to 55 inches, light grayish-brown or light-gray, loose fine sand.

This soil has very little organic matter and is deficient in all major plant nutrients. It is rapidly permeable to air and water, and roots can penetrate deep in the subsoil. It has a very low available moisture-holding capacity. It is naturally wet, and the root zone is confined to the upper part of the soil. The excessive water restricts aeration. Like many poorly drained soils, this soil varies in color, thickness of layers, and degree of mottling. The underlying organic pan layer is characteristic in many areas and occurs at depths ranging from about 30 to 50 inches.

Suitable uses (capability unit IVs-3).—Most areas of Plummer fine sand are from about 1 to 15 acres in size. Less than 1 percent of this soil is cleared. The rest is in range and is used for grazing. The growing plants supply poor forage for cattle. The carrying capacity is about 15 to 30 acres per animal unit a year. Cleared areas form a part of improved pasture. Most depressions in which the soil occurs are ponded seasonally and provide water for livestock and good feeding grounds for waterfowl.

This soil is poorly suited to most cultivated crops because of excess water and unfavorable soil conditions. With adequate water control, heavy liming, and liberal applications of fertilizer, it has been successfully used for specialized truck crops in other counties.

Plummer fine sand is suitable for improved pasture if water control is provided. The broader areas, where an outlet can be established for shallow ditches, are favorable for improved pasture grasses. The soil will grow caribgrass, carpetgrass, pangolagrass, bahiagrass, and water-tolerant grasses, but adequate liming and a liberal use of fertilizer are required to maintain their growth.

Plummer fine sand, shallow phase (Pe).—This soil differs from Plummer fine sand primarily in having a layer of fine-textured material at depths of 30 to 42 inches. This fine-textured layer is fine sandy clay loam or heavy fine sandy loam. It is gray or light-gray and has a few to common, fine to medium, distinct, yellow and brown mottles. It is plastic when wet but hardens when dry. Downward percolation is slow and is restricted further by a high water table.

This inextensive soil occupies poorly drained shallow depressions and sloughs and has level to nearly level relief. It is associated chiefly with Rutlege, Leon, and Immokalee soils and with Plummer fine sand. Runoff and internal drainage are very slow. Water usually covers the ground during rainy periods.

Suitable uses (capability unit IVs-3).—Nearly all of this soil is in virgin areas used for range. Its value for range is limited by the scarcity of desirable forage plants. When ponded, the soil provides drinking water for animals and a feeding ground for waterfowl.

If water is adequately controlled, the soil can be used for truck crops or other cultivated crops. The plow layer is easily tilled. The upper part of the profile is permeable to roots, air, and moisture. This soil has a

poor supply of essential plant nutrients and organic matter, and heavy fertilization is necessary to obtain fair yields. Most areas cannot be drained easily and are better used for pasture and wildlife than for tilled crops. Management, water control, and suitability of grasses for improved pasture are essentially the same on this soil as on Plummer fine sand.

Pomello fine sand (Pf).—This moderately well drained to somewhat excessively drained soil of the flatwoods has a well-developed organic pan at depths greater than 42 inches. Its parent materials were thick beds of unconsolidated, acid sand. Pomello fine sand occurs on a nearly level to level relief along with Immokalee, Leon, Ona, and St. Lucie soils. Moisture conditions are more favorable than those in St. Lucie fine sand. Ona, Leon, and Immokalee soils have a pan layer at higher levels than Pomello fine sand and are darker in the surface soil.

Little rainfall flows from the surface; most of the moisture soaks into the ground and drains downward. During some rainy periods the soil is saturated to the surface. During dry months the moisture content may be low and the soil droughty.

The native cover consists principally of saw-palmetto, pine, runner oak, pricklypear cactus, small scrub oak, gallberry, and wiregrass. The growth is less vigorous and less abundant than on Leon and Immokalee soils.

Profile description:

0 to 6 inches, gray or light-gray, nearly loose fine sand having a salt-and-pepper appearance; strongly acid; this layer ranges from 4 to 8 inches in thickness.
6 to 20 inches, light-gray, loose fine sand; strongly acid; ranges from 12 to 18 inches in thickness.
20 to 52 inches, white or light-gray, loose fine sand; strongly acid; 30 to 36 inches in thickness.
52 to 60 inches, very dark gray, black, or dark-brown fine sand stained with organic matter; very firm to indurated when dry; more friable with increasing moisture content.

This soil is very low in its supply of organic matter and plant nutrients. Its sandiness favors deep root penetration, good aeration, and rapid internal drainage if the water level is controlled. Its capacity to hold water that plants can use, however, is very low, and the soil may be dry during periods of low rainfall. A few small areas along some streams have slopes between 2 and 5 percent. Near Laurel a small area is included that is like Pomello fine sand except for neutral reaction. Small areas of Leon fine sand, light colored surface phase, are included. These areas occur where the pan is shallower than 42 inches.

Suitable uses (capability unit Vs-2).—A few small patches are used for citrus groves along with adjoining soils; about 1 percent is included with areas in improved pasture. The rest is native range that supplies poor to fair grazing. Much of the plant cover has a low feeding value for cattle. About 20 to 30 acres are needed to support one animal for a year.

Pomello fine sand is poorly suited to crops. This use is not generally feasible. However, under a high level of management, fair yields of crops and pasture can be obtained.

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Pompano fine sand (Pg).—This poorly drained, light-colored, slightly acid to neutral soil occurs in the shallow basins and sloughs of the flatwoods. It has developed from a moderately thick formation of water-deposited sands overlying calcareous materials. The relief is nearly level to level. Numerous areas are in intermittent ponds that receive seepage from surrounding higher soils. Internal drainage is rapid where the water table is lowered. Pompano fine sand occurs in all sections of the county and is associated with most other lime-bearing soils. In ponded areas it is commonly associated with Delray soils. It frequently occupies the slightly higher parts in bands that encircle Delray fine sand.

Most areas are wet prairies covered with water-tolerant grasses, shrubs, weeds, and some flowering plants. A heavy growth of switchgrass is characteristic on this soil. Some areas are wooded with slash pine and water oaks and some cabbage palmetto and saw-palmetto.

Profile description:

0 to 5 inches, gray or dark-gray, nearly loose fine sand; has a very small content of organic matter; slightly acid to neutral; this layer ranges from 3 to 8 inches in thickness.
5 to 14 inches, light-gray or light brownish-gray, loose fine sand; slightly acid; ranges from 7 to 12 inches in thickness.
14 to 35 inches, light-gray or white, compact, very friable fine sand; a few to common, medium, distinct, yellow and brown mottles; slightly acid to neutral; ranges from 18 to 30 inches in thickness.
35 to 42 inches, gray, nearly loose fine sand with fine seams of light-gray fine sand; neutral; this layer may be lacking in places.
42 to 58 inches, dark grayish-brown, compact fine sand mottled with gray and light gray.

This soil has a very low supply of organic matter and is substantially lacking in essential plant nutrients. Its layers are rapidly permeable to air and water and permit deep rooting except when the water table is high. During dry periods, moisture supplies are very low and evaporation is high.

At short intervals there are numerous minor differences in the color, thickness, mottling, and reaction of each layer. In places a complex pattern is formed with Charlotte fine sand and the Plummer soils. Small patches of these soils are necessarily included with Pompano fine sand on the map. Some irregular interbeddings of shell, marl, or clay occur in the substratum in slough areas.

Pompano fine sand is one of the more extensive of the poorly drained soils in the county. Some areas are in isolated depressions an acre or two in size; others are of considerable extent. During the rainy period, most of the acreage becomes flooded and grazing is not possible for several months. Shallow ditches have been cut to drain individual ponds. Some areas of this soil are interconnected in order to drain surface water. Water control in sloughs made up largely of Pompano fine sand usually involves complex engineering as well as agreements among property owners adjoining the sloughs.

Suitable uses (capability unit IVs-3).—Less than 1 percent of the total acreage of this soil has been

cleared. Most of the cleared acreage is in improved pasture. A few small patches are used with adjoining soils for truck crops. The rest is in range pasture. Native plants suitable for forage are sparse; about 15 to 30 acres are needed to maintain one animal for a year.

Use of this soil is limited by excessive water, low supplies of organic matter, and poor natural fertility. If adequately drained, the soil is fair for pasture. Pangolagrass, Pensacola bahiagrass, and improved bermudagrass are suitable, but large amounts of fertilizer are needed to produce satisfactory yields. Minor elements and lime may be needed. Hairy indigo, whiteclover, and other legumes may be grown with these grasses to improve the quality of the pasture.

Truck crops can be grown on this soil, but large amounts of fertilizer are needed to produce good yields. Crop residues, green-manure crops, and native plants help build up the soil and supply needed humus. Cultivated crops should follow grass or legumes in a long-term rotation. This soil is not suitable for citrus trees under prevailing conditions.

In its natural state, this soil is a good habitat for waterfowl. Many areas could be improved as feeding grounds for wildlife. In some counties this soil produces fair to good yields from citrus trees planted in areas receiving intensive water control and other good management practices.

Pompano fine sand, shallow phase (Ph).—This soil is distinguished from Pompano fine sand by having a clayey layer at depths between 30 and 42 inches. This fine-textured layer is gray or light-gray fine sandy clay loam with common, medium to coarse, distinct, yellow and brown mottles. It is neutral to alkaline. It is plastic when moist but hardens upon drying. Water and air movement through the surface layers is rapid, but the heavy layer is slowly permeable. This heavy material ranges from about 6 inches to 3 feet or more in thickness. In places the heavy material is a thin interbedding in sandy layers; in others it rests upon formations of marl or shell.

Pompano fine sand, shallow phase, occupies parts of poorly drained shallow depressions, intermittent ponds, or sloughs. It may be flooded during the rainy season. The relief is level or nearly level. The soil supports a growth of water-tolerant grasses. It is associated with Delray, Felda, Adamsville, Leon, and Immokalee soils and with other Pompano soils.

The clayey material occurs at irregular depths. Consequently, small patches of Pompano fine sand and Felda soils are included with this mapping unit. Where the clayey layer is deeper than 42 inches, the included patches are Pompano fine sand. Where this layer is at depths of less than 30 inches, the inclusions are Felda fine sand.

Suitable uses (capability unit IVs-3).—This extensive soil is distributed in all areas of the county. Much of it remains in its natural state and is used for grazing. The vegetation furnishes poor to fair feed. A few scattered acres have been cleared and are used with adjoining soils for improved pasture.

This soil is somewhat better suited to crops and pasture than Pompano fine sand. It is fairly good for specialized truck crops if water control is adequate. Leguminous cover crops, as sesbania and hairy indigo, supply humus and nitrogen. Heavy applications of complete fertilizer are necessary for best results.

Pangolagrass, bahiagrass, bermudagrass, and other high-quality grasses provide moderately good pasture on this soil. If water is properly controlled, suitable legumes can be planted with these grasses to improve the quality of the herbage. Systematic use of fertilizer is necessary to maintain a productive sod.

This soil, like Pompano fine sand, is a favorite feeding ground for waterfowl. Its development should include provision for continued use by wildlife.

Pompano fine sand, shallow phase-Adamsville fine sand (Pk).—This mapping unit is composed mainly of Pompano fine sand, shallow phase, and Adamsville fine sand. However, small inclusions of Keri and Immokalee fine sands occur in this unit. The Pompano soil comprises 75 percent or more of most mapping areas. Many areas of Adamsville fine sand are oval or rounded, low mounds less than 100 feet in diameter. The Pompano soil occurs in the lowest positions and is poorly drained. The other soils are only slightly higher and have imperfect drainage. They do not occur in any orderly pattern with the Pompano soil.

Although the soils of this mapping unit cover a minor acreage, they are agriculturally significant. The Pompano is saturated for longer periods and has a higher water table during the rainy season; consequently, it requires more exacting management than the other soils in the mapping unit.

The physical features and agricultural uses of the soils in this complex are like those of the separate soils described elsewhere in this report. This unit of undifferentiated soil is associated with Pompano-Adamsville fine sands in the southeastern part of the county.

Suitable uses (capability unit IVs-3).—The total area in this mapping unit is 1,102 acres. All of it is undeveloped range and is used with adjoining soils for grazing. The native vegetation supplies fair to poor forage. The carrying capacity is about 15 to 30 acres per year per animal. If cleared and effectively managed, these soils are fairly good for improved pasture.

Pompano-Adamsville fine sands (Pm).—This soil complex consists of Pompano fine sand and Adamsville fine sand, and minor inclusions of Keri, Parkwood, Immokalee, and Charlotte soils. Pompano fine sand makes up about 75 to 80 percent of the mapping unit. Adamsville fine sand is the second largest component. The Keri, Parkwood, Immokalee, and Charlotte soils occur as small islands, usually less than 3 acres in size, within the delineated area. Some are on small, low mounds about 25 to 100 feet across that are conspicuous on the landscape. Each soil has its characteristic plant cover. The distance from one mound to another varies. In places the included soils are so closely grouped that they are more dominant than Pompano fine sand. All areas of the included soils, however, are too small to be shown separately on the map.

The Pompano and Charlotte members of this complex occupy the lowest positions, are nearly level or level, and are poorly drained. The Adamsville, Keri, Parkwood, and Immokalee soils have a similar relief but are slightly higher and have somewhat better drainage. Development and the range in characteristics of soils in this complex are like those described for the normal types elsewhere in this report. This soil complex is mapped chiefly in the southern part of the county; the largest units are in sloughs in the southeast.

Suitable uses (capability unit IVs-3).—All of this soil complex is in unimproved range. Its grazing value is poor to fair, and the carrying capacity per cow ranges from 15 to 30 acres per year. The use capabilities for crops and pasture are limited by characteristics of the least favorable soils in the complex. Pompano-Adamsville fine sands occur in areas used primarily for cattle ranches, and their best use is for grazing and improved pasture.

Rutlege fine sand (Ra).—This very dark, acid, very poorly drained soil occurs in shallow, wet depressions or intermittent ponds. It has developed from moderately thick beds of water-deposited sands. It has nearly level to level relief and is covered by several inches of water part of the year. Many areas have no natural outlets and receive water from surrounding soils.

This soil and Plummer fine sand are commonly associated in the same depression. The Plummer soil surrounds the Rutlege on slightly higher positions. The Plummer soil is readily distinguished from the Rutlege by its contrasting lighter color. Delray soils are similar to the Rutlege in color, drainage, and position, but the Delray soil is neutral or alkaline.

The principal vegetation on this soil is water-tolerant native grasses, sedges, weeds, reeds, and flowering plants. Some areas support hardwoods.

Profile description:

0 to 8 inches, very dark gray or black, very friable fine sand mixed with a large amount of organic matter; interspersed in layer is a small quantity of light-gray fine sand; layer is strongly acid; ranges from 6 to 14 inches in thickness.

8 to 32 inches, very dark gray or black, nearly loose fine sand; contains thin streaks or seams of light-gray fine sand; strongly acid; ranges from 18 to 30 inches in thickness.

32 to 45 inches, gray or light-gray, loose fine sand; short, narrow projections of dark material extend from the layer above; some parts of this horizon have few to common, medium, faint to distinct, brown and yellow mottles; strongly acid.

Rutlege fine sand contains a large supply of well-decomposed humus. Reserves of essential plant nutrients other than nitrogen are scanty. The soil material is very permeable to roots, air, and moisture if it is not limited by a high water table. The capacity to hold water that plants can use is low. A conspicuous feature of this soil is the dark color that extends to depths of about 24 to 36 inches. In places the gray lower subsoil is underlain abruptly by a dark-gray or grayish-brown, slowly permeable, hard or weakly cemented layer of fine sand and organic matter.

Suitable uses (capability unit IIIw-2).—Rutlege fine sand occurs in all parts of the county. Nearly all areas are naturally wet. They provide poor to fair grazing for range cattle. Most tracts are small and isolated. They are associated with areas of less fertile soils. In most places it is more practical to use this soil with adjoining more arable soils than to develop it separately.

Rutlege fine sand is moderately fertile if adequately drained. It is good for crops and pasture and is well suited to truck crops. Liberal amounts of fertilizer, supplemented by minor elements and lime, are needed to obtain good yields. Pangolagrass, bahiagrass, bermudagrass, and other moisture-tolerant grasses and whiteclover are suitable for this soil. Improved pasture needs heavy applications of fertilizer to maintain a good sod.

The undeveloped areas provide food and shelter for many species of wildlife. They are ideally suited to development as refuge areas, and many plots would be most useful for this purpose.

Rutlege mucky fine sand (Rb).—This soil is comparable to Rutlege fine sand in general characteristics, but it has been modified materially by larger amounts of well-decomposed organic matter derived from plant remains. It has developed from moderately deep beds of acid sand. This soil occupies the deeper sites in shallow saucerlike basins that have very poor natural drainage. It is submerged for a number of months each year. Generally, this soil and Plummer fine sand are in the same depression. This soil is surrounded by the light-colored Plummer soil that developed on slightly higher positions. The native cover on the Rutlege soil is usually a heavy growth of water iris or pickerelweed and some sedges and aquatic grasses.

The surface layer of the Rutlege soil is black, mellow, very friable mucky fine sand or fine sandy muck about 6 to 12 inches thick. It overlies very dark gray or black, nearly loose fine sand that extends to depths of 25 to 36 inches. This layer grades to gray or light-gray, loose fine sand that has a few to common, medium, distinct, yellow and brown mottles in places. Generally, the gray or light-gray, loose fine sand rests abruptly, at depths of 3 to 4 feet, upon a dark grayish-brown or dark-gray fine sand moderately cemented by acid organic material.

There is enough organic matter in the top layer to give it body. The soil is high in nitrogen but low in other plant nutrients. It is strongly acid throughout and is distinguished from Delray soils chiefly by this characteristic. The surface soil and subsoil are very similar to those of Pamlico peaty muck in places, but the mucky surface of the Rutlege is 12 inches or less in thickness. Rutlege mucky fine sand is easily penetrated by roots. Because of its large amount of organic matter, it has a good capacity to hold water that plants can use. In places there are small inclusions of Rutlege fine sand.

Suitable uses (capability unit IIIw-2).—Rutlege mucky fine sand is less extensive than Rutlege fine sand. All areas are comparatively small; they occur throughout the county in unimproved range. The vegetation is of poor quality; cattle graze it occasionally when other grazing is lacking.

If drainage is improved, this soil is excellent for crops and is good for pasture. High yields of specialized truck crops can be obtained under careful management

that includes proper water control and heavy fertilization. Most of the soil is in cattle ranches, and its most practical use is for grazing or improved pasture. When improved pastures are established on this soil, it is generally necessary to control water on adjoining soils.

Pangolagrass, bahiagrass, caribgrass, paragrass, dallisgrass and such legumes as Persian, hop, bur, and white clovers are suited. Although this soil is highly suitable for agriculture if properly drained, most of it is in positions where it is not feasible to control the water. These areas are natural wildlife habitats and can be developed to provide more food and shelter for wildlife.

St. Lucie fine sand (Sc).—This light-colored, deep, dry soil occupies low ridges, slight knolls, or gentle slopes. It is commonly called scrubland because of its characteristic natural cover of scrub oak. The other vegetation consists of a few scattered sand pine and saw-palmetto, pricklypear cactus, and native grasses suited to droughty sites. The soil formed from thick beds of acid marine sands. The relief is nearly level to gently sloping.

This soil occurs on a few small widely scattered areas in the western part of the county. It is associated with Lakewood, Leon, Blanton, and Pomello soils. It is lighter colored and more droughty than the Blanton soils, lacks the pan of the Leon and Pomello soils, and does not have the yellow color typical in the subsoil of Lakewood fine sand.

Profile description:

0 to 2 inches, light-gray or gray, loose fine sand; contains sufficient organic matter to impart a salt-and-pepper appearance; strongly acid.
2 to 5 inches, light-gray, loose fine sand; strongly acid.
5 to 60 inches, white, loose fine sand; strongly acid.

This soil has an exceedingly low amount of organic matter and has only a very thin veneer of organic debris over the surface. It is greatly deficient in essential plant nutrients and rapidly permeable to air and water. This soil permits deep root growth. Its available moisture-holding capacity is very low.

Suitable uses (capability unit VIIs-2).—St. Lucie fine sand is a minor soil in the county. None is used for cultivated crops or improved pasture. Most of it is included in range grazed by cattle, but it supplies sparse, very poor forage. This soil has very limited possibilities for agriculture because of droughtiness, very low inherent fertility, and very small amount of organic matter. It is not suited to cultivated crops or improved pasture. Citrus trees do not grow successfully on it or produce profitable yields. The soil in its natural state furnishes limited food and good cover for wildlife.

Sandy alluvial land (Sa).—This miscellaneous land type is composed of mixed alluvium deposited over bottom lands during floods. Most of it is along the Myakka River and several of its tributaries. The channels are cluttered with debris, fallen trees, and sandbars that hinder stream flow and divert the water to new channels. The flood plain on which this land type occurs is cut to various depths by many narrow, irregular sloughs, depressions, and intermittent drainageways. As a result, low benches are formed that are flooded during high water. Areas of Sandy alluvial land are so intermingled that it is not feasible to delineate each unit separately on the map.

This land type is made up mainly of sandy alluvium that in places includes some clay. The soil characteristics may be changed with each flooding, as a result of scouring and redeposition of material. Extensive variations in color, texture, bedding, reaction, and depth of material occur within short distances. The alluvium ranges from light gray to black. The texture ranges from fine sand to sandy clay loam. Drainage is imperfect to poor. The vegetation is a moderately heavy growth of water-tolerant hardwoods, cabbage palmetto, and some pine, shrubs, and vines.

Included with this mapping unit are small terraces having soils resembling Sunniland fine sand, deep phase, and Immokalee fine sand. They are covered with a dense growth of saw-palmetto.

Suitable uses.—None of Sandy alluvial land has been cleared for agriculture or cut over for timber. Its use for farming is somewhat limited by inadequate drainage and the possibility of alteration by floods. The natural fertility ranges from poor to moderately good. Some pasture grasses are suitable. This land type, however, is not suited to improved pasture. Better land is available for grazing. The vegetation is sparse on this land type, but the trees provide some shade for livestock. Gum, pine, and water oak, hickory, and other hardwoods have some commercial value, and selected trees may be harvested for timber. Sandy alluvial land is suitable as a refuge for wildlife.

No capability classification has been assigned to this miscellaneous land type.

Scranton fine sand (Sb).—This is a somewhat poorly drained soil of the flatwoods. It has a deep, dark-colored sand surface layer underlain by contrasting light-colored layers of similar texture and consistence. It has developed from moderately thick beds of acid sand deposited by marine waters. The relief is level to nearly level; slopes have gradients of less than 2 percent. Runoff is slow; internal percolation is affected by a fluctuating water table and varies from rapid to slow. Most of this soil is in the western part of Sarasota County, though a few areas occur in the eastern part.

This soil is associated with Ona, Blanton, and Leon soils. It has a deeper and darker surface layer than the Blanton. It lacks the brown-stained layer immediately below the dark surface layer that is in the Ona soils and lacks the organic pan layer present in the Leon soils. Natural vegetation is principally pine, myrtle, saw-palmetto, gallberry, wiregrass, and other grasses.

Profile description:

0 to 12 inches, very dark gray or black, nearly loose fine sand; strongly acid.
12 to 18 inches, dark-gray to very dark grayish-brown, loose fine sand; strongly acid.
18 to 22 inches, gray to light brownish-gray, loose fine sand; common, medium, faint to distinct, yellow and gray mottles; strongly acid.
22 to 30 inches, light-gray, loose fine sand that has common, medium, distinct, yellow and brown mottles in places; strongly acid.
30 to 50 inches, light-gray or white, loose fine sand; common, medium, distinct, yellow and gray mottles in places; strongly acid.

The surface layer has a relatively high content of organic matter, and its dark color extends to depths of about 14 to 22 inches. The soil is moderately well supplied with nitrogen but is deficient in other plant nutrients. Its natural fertility is medium. Air and water penetrate the soil rapidly, and deep-rooting plants are suited to it. The upper layers have a fair moisture-holding capacity because of the presence of humus.

Some areas contain small patches of Ona fine sand. Locally, the surface layer is gray to dark-gray, nearly loose fine sand with a sprinkling of light-gray fine sand to a depth of 4 to 6 inches. The surface soil is underlain by very dark gray or black, nearly loose fine sand that is comparable to Scranton fine sand. This gradually becomes lighter colored with depth. These small areas are not so dark in the top layer as areas of the typical soil and contain less organic matter. In other respects they are similar.

Suitable uses (capability unit IIs-1).—Scranton fine sand is inextensive but is one of the better agricultural soils. The areas are comparatively small, but some adjoin soils of similar agricultural capability and are managed like them. About 40 percent of the soil is cleared and tilled. Of this, about 40 percent is in citrus groves, 10 percent is in vegetable crops, and 10 percent is in improved pasture grasses. The rest is in range that is used for grazing.

Scranton fine sand has characteristics, including fertility and relief, that are favorable for intensive cultivation. If properly managed, it is a good soil for growing specialized truck crops and strawberries. Lime and fertilizer, supplemented with minor elements, are needed to obtain high yields. Crop residues and leguminous green-manure crops, such as hairy indigo and sesbania, help to maintain humus supplies. This soil is good for improved pasture if simple water-control practices are used. Pangolagrass, bahiagrass, and bermudagrass do well. White, Hubam, bur, and black medic clovers are suited. If the soil is heavily fertilized annually, high-producing herbage can be grown. Citrus trees grow satisfactorily if water is adequately controlled.

Sunniland fine sand (Sd).—This somewhat poorly drained soil of the flatwoods has developed from a shallow deposit of sand laid down on a clayey formation either containing calcareous material or overlying an irregular bedding of marl. It occurs on nearly level or level areas in all parts of the county. It is associated with Leon, Immokalee, Bradenton, Pompano, Manatee, and Felda soils. It is better drained and has brighter colors than Felda, Manatee, and Pompano soils. The fine-textured subsoil layer is more yellowish than the corresponding layer in Bradenton soil, and it is not underlain by a definite marl substratum. Sunniland fine sand lacks the strongly acid reaction and the organic pan common to Leon and Immokalee soils. Runoff is very slow. Internal drainage is moderate to slow, as it is restricted by clayey material and a fluctuating high water table.

The natural vegetation is principally pine, cabbage palmetto, saw-palmetto, runner oak, gallberry, huckleberry, wiregrass, and other grasses.

Profile description:

0 to 8 inches, dark-gray or very dark gray, nearly loose fine sand with salt-and-pepper appearance; strongly acid; this layer ranges from 6 to 10 inches in thickness.
8 to 15 inches, light-gray or gray, loose fine sand; a few to common, medium, faint or distinct, yellow and brown mottles in some places; strongly acid; ranges from 6 to 9 inches in thickness.
15 to 22 inches, light brownish-gray or brown, nearly loose fine sand with a few to common, small to medium, faint, gray, light-gray, and brown mottles; strongly acid; ranges from 6 to 8 inches in thickness.
22 to 34 inches, gray fine sandy clay loam with common, medium, distinct, light-gray and yellow mottles; in some places contains thin seams or veins of sandy material; plastic when moist, hard when dry; medium acid to neutral; ranges from 10 to 14 inches in thickness.
34 to 40 inches, light-gray to gray fine sandy clay loam; has common, medium, distinct, yellow and brown mottles and small lumps, pockets, or seams of marly material; plastic when wet, hard when dry; mildly alkaline; ranges from 5 to 8 inches in thickness.
40 to 50 inches +, light-gray to gray, firm fine sandy loam with common, medium, distinct, yellow and gray mottles; small and medium firmly cemented nodules of lime scattered irregularly in places; alkaline.

Sunniland fine sand contains a small amount of organic matter but has medium fertility. The sandy layers are more deficient in plant nutrients than the clayey materials. Air and water penetrate the sandy layers rapidly and the fine-textured materials at a moderate rate. All layers can be penetrated by roots. Internal drainage is influenced by the seasonal fluctuations of the water table. The clayey layer has a good capacity to hold water that plants can use, but shallow-rooted plants may lack moisture during dry spells.

The surface layer ranges from gray to very dark gray, according to the amount of humus present. Depth to the fine-textured subsoil ranges from 18 to 30 inches. Differences in color intensity and degree of mottling are common within a few feet. Locally, an alkaline substratum is at depths below 4 feet.

In places no sharp or well-defined boundary exists between this soil and the Bradenton and Keri soils or Adamsville fine sand, shallow phase. Consequently, small patches of these soils are mapped with Sunniland fine sand. A small area having slopes between 2 and 5 percent has been included because of its limited extent and generally similar agricultural use. Such land, when cleared, requires simple erosion control practices.

Suitable uses (capability unit IIIs-2).—This soil is of moderate extent. Nearly all of it is wooded and used for range pasture. Its grazing value is poor to fair. The carrying capacity is about 10 to 25 acres per animal unit per year. Small acreages are cleared and used with adjoining soils for improved pasture.

Sunniland fine sand is moderately good for crops, improved pasture, and citrus trees if water is properly managed. Drainage and irrigation are necessary if this soil is to be used for tilled crops or citrus. Specialized truck crops, as strawberries, watermelons, or other cultivated crops suited to this climate, produce good yields if they are well managed. They need lime, heavy applications of fertilizer, and some minor elements. Leguminous cover crops should be included in the rotation. Pangolagrass, bahiagrass, and improved ber-

mudagrass are suited to this soil. They may be grown with white clover, hairy indigo, and Hubam clover. Lime and minor elements are needed each year for maximum yield of pasture. Because of its location near cattle ranches, Sunniland fine sand is used mainly for grazing or improved pasture.

If this soil is used for citrus, both drainage and irrigation are required. Mounding for the trees is advisable. Liberal use of commercial fertilizer is necessary to produce good yields of fruit.

In its natural state, Sunniland fine sand is a favorite feeding ground for quail, turkey, and deer. Good management would increase the quantity and kinds of food plants attractive to wildlife.

Sunniland fine sand, deep phase (Se).—This is a somewhat poorly drained to moderately well drained soil of the flatwoods. It has developed from a thin layer of sand underlain by a moderately thick layer of acid clayey material that is thicker than the corresponding layer in Sunniland fine sand. Commonly this clayey material overlies calcareous clays at depths of 42 inches or more. This soil occurs almost entirely along or near the Myakka River and several of its tributaries. The relief is dominantly level or nearly level. Drainage is slightly better than that of Sunniland fine sand because it is not affected by a high water table for so long a time. Proximity to deeper channels of the Myakka River may account for the better drainage. This deep phase is also more acid throughout the subsoil than Sunniland fine sand.

In its virgin state, this soil has a distinctive growth of palmetto that frequently reaches 6 or 7 feet in height. This growth is more luxuriant than on the Sunniland fine sand or most soils of the flatwoods. Palmetto is the dominant cover, but the vegetation includes huckleberry, gallberry, runner oak, wiregrass and other grasses, and an occasional pine and cabbage palmetto.

Profile description:

0 to 5 inches, gray to very dark gray, nearly loose fine sand; light-gray fine sand gives this layer a salt-and-pepper appearance in places; strongly acid; layer ranges from 4 to 8 inches in thickness.

5 to 14 inches, light-gray or white, loose fine sand; strongly acid; ranges from 8 to 14 inches in thickness.

14 to 23 inches, pale-brown, grayish-brown, or light brownish-gray, nearly loose fine sand; a few to common, small to medium, faint to distinct, rust-colored mottles; locally includes small lumps of firmly cemented sandy materials; strongly acid; ranges from 4 to 10 inches in thickness.

23 to 52 inches, gray, moderately firm sandy clay loam; a few to common, medium, distinct, rust colorations; strongly acid; ranges from 18 to 25 inches in thickness.

52 to 60 inches, light-gray, calcareous clay.

This soil has a very small amount of organic matter. The sandy layers have a very low supply of plant nutrients; the clayey layer has substantially larger amounts. There is very little runoff, and most of the surface water drains into the ground. Permeability to air and water is rapid in the upper part of the soil but moderate in the clayey layer. The soil material is suited to a deep root growth. The available moisture-holding capacity is low in the upper layers and high in the underlying layers. Shallow-rooted plants are damaged more during dry periods than deep-rooted plants.

Variations in color and thickness of the sandy layers occur at short intervals. In places the sandy materials extend to depths of 30 to 36 inches. The clayey layer ranges from about 24 to 30 inches in thickness, and in places the underlying calcareous clay may be 5 to 7 feet below the surface. A few bodies having gradients between 2 and 5 percent are included with this soil because their acreage is too small to be mapped separately.

Suitable uses (capability unit IIIs-2).—Most of this soil is in native vegetation, and little effort has been made to develop it agriculturally. Its location and dense undergrowth and the expense of reclamation make its use for agriculture difficult. Few cattle penetrate the cover for the small amount of desirable forage. This soil is used as a haven for many kinds of wildlife.

Use of this soil is limited by imperfect drainage, low supply of organic matter, unfavorable soil characteristics, and need for water control. If excess water is removed, the soil is moderately good for cultivated crops suited to this area. It is also suitable for high-grade improved pasture grown under simple water-control practices. Pangolagrass, bahiagrass, and bermudagrass, white and Hubam clovers, hairy indigo, and other legumes can be grown successfully. Lime, minor elements, and large quantities of commercial fertilizer are required for maximum yields from crops and pasture.

Terra Ceia muck (Ta).—This organic soil developed from decayed water-tolerant grasses, sedges, and weeds that accumulated over stratified calcareous beds of sand and clay. It supports a heavy growth of water iris, pickerelweed, sawgrass, and other water-loving grasses. In its natural state, it is very poorly drained and is submerged much of the time. This soil occupies the deeper parts of shallow basins in association with Delray, Manatee, and Pompano soils, but it has a greater amount of organic matter than any of these soils. Relief is nearly level to level. Most of this soil occurs near Fruitville.

Profile description:

0 to 10 inches, black or very dark gray, well-decomposed organic matter; contains small, fibrous, stringy masses of partly decayed plant remains; smooth and loamy when wet, granular when dry; strongly acid to slightly acid; contains a very small quantity of light-gray fine sand.

10 to 18 inches, very dark gray or very dark grayish-brown, well-decomposed, smooth vegetable matter interlaminated with thin layers of brown, felty, finely fibrous, partly rotted plant matter; small amount of light-gray fine sand throughout the layer; strongly to slightly acid.

18 to 24 inches, dark-gray, nearly loose fine sand; a few, small, distinct, rust-colored mottles; contains thin layers or seams of light-gray fine sand; slightly acid to neutral.

24 to 30 inches, gray to light-gray, nearly loose fine sand; narrow fingers of dark-gray material project from layer above; slightly acid to mildly alkaline.

30 to 40 inches, very dark gray fine sandy clay loam; plastic and sticky when wet; contains a small amount of partly decayed organic matter; slightly acid to mildly alkaline.

40 to 50 inches, light-gray or white, marly fine sandy clay loam.

This soil has medium natural fertility. It is rich in nitrogen but low in other plant nutrients. Air and moisture penetrate easily. Roots readily penetrate to

the marl. The available moisture-holding capacity is high.

In cultivated fields this soil, when moist, is definitely black, and the organic matter appears to be thoroughly decomposed. When the soil dries, however, thin laminated layers of brown or grayish-brown, partly decayed and raw fibrous material can be seen in the upper layer. The organic horizon is fairly shallow, or 12 to 24 inches in thickness. The organic matter overlies beds of sand, clay, and marl that are variable in color, bedding, and thickness.

Suitable uses (capability unit IIIw-1).—This soil occurs in only a very few fairly large areas. The three largest have been reclaimed and drained by deep canals. Uncleared areas are included in range that provides some grazing for cattle. Most of the soil is used primarily for growing vegetables and, to a lesser extent, for improved pasture. Truck crops, chiefly celery (fig. 9), are grown intensively under high levels of management for winter and early spring markets. Most of the celery produced in the county is grown on Terra Ceia muck.

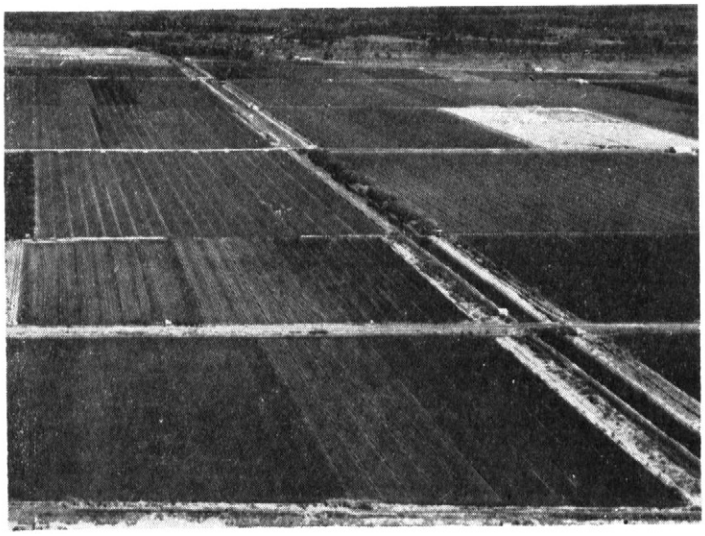

Figure 9.—**Terra Ceia muck is intensively cultivated near Fruitville. A system of canals having many small lateral ditches keeps the water level within the desired limits.**

If water is properly controlled, this soil is excellent for vegetables or pasture grasses. High yields are obtained under prevailing management. Applications of about 1,500 to 2,000 pounds of fertilizer an acre are made to crops; some lime is applied at intervals. Heavy growths of cover crops are turned under annually. It is a common irrigation practice to pump water from drainage canals into shallow ditches that extend through the fields. Up-to-date equipment and machines are used in planting, cultivating, spraying, and harvesting. The water table should be kept as near the surface as practicable to prevent unnecessary oxidation and subsidence of the organic material.

Tidal marsh (Tb).—This land type occupies level or nearly level wet positions slightly above sea level. Areas commonly occur in narrow strips adjacent to tidal swamp and along streams emptying into the Gulf of Mexico. All areas are covered by or affected by salt water or brackish water during high tide. The strong salt concentration inhibits the growth of all vegetation except wet-prairie types of salt-loving weeds and grasses.

Individual soil units within Tidal marsh have not been mapped separately but are grouped in this land type. All have developed from deep deposits of sandy material. Their surface layers are dark-colored fine sand that contains a large amount of organic matter. Below, at irregular depths, are layers of gray or light-gray fine sand mixed with fragments of shell.

All areas of Tidal marsh are in native cover that serves as feeding grounds or breeding sites for birds and other wildlife. The land is essentially nonagricultural, and reclaiming it would require expensive dikes and drainage operations. Its best use is as a wildlife refuge. No capability classification has been assigned to this miscellaneous land type.

Tidal swamp (Tc).—Tidal swamp designates low-lying, coastal swamps that are covered by salt water or inundated by high tide. Such areas support a thick growth of mangrove trees and small intermittent patches of other salt-tolerant plants.

This miscellaneous land type varies considerably in color, texture, composition, and thickness of the profile. The surface layer is usually gray or dark-gray fine sand mixed with plant debris. It overlies light-gray or gray fine sand that contains shell fragments.

Tidal swamp is not extensive. Most of it remains in its native cover and is a refuge for wildlife. In its present state, it is nonagricultural. Some Tidal swamp near populated areas has been cleared and filled for real estate development.

No capability classification has been assigned to this miscellaneous land type.

General Patterns (Soil Associations)

For some broad interpretations, a map of soil associations is useful. A soil association is a fairly well defined pattern of geographically associated soils. This grouping makes it possible to construct a generalized soil map. From such a map, general predictions of the potentialities of whole farm units, either existing or prospective, can be made. In a general way, one can determine from soil association groups the type of agriculture suited to a geographic area. Specific information about use and management of the soil, as required in acre-by-acre planning on a farm, is given more fully in the descriptions of the soil units and in the land capability groupings.

The 50 mapping units shown on the detailed soil map of Sarasota County are combined into 8 soil association areas. The 8 soil association areas are shown on a colored map in the back of the report. One of these consists of miscellaneous land types that are not classified into soil series and types. The dominant soils of each of the other soil associations have many similar morphological features relating to kind of parent material, geologic formation from which derived, drain-

age, relief, and reaction. The soils in the same association may differ in color and texture of horizons, in amount of organic matter in the surface soil, and in depth of profile. The soils of different associations differ in one or more of the following characteristics: Drainage, relief, color, amount of organic matter, reaction, and parent material.

1. Excessively drained deep soils (LAKEWOOD, ST. LUCIE).—This association consists mostly of Lakewood and St. Lucie fine sands. They occur on level to very gently sloping areas, usually near the coast. St. Lucie fine sand occurs as small isolated areas and is intermingled with Lakewood fine sand. It has 1 to 4 inches of light-gray, loose, incoherent fine sand over white fine sands that continue to depths greater than 48 inches. Lakewood fine sand has similarly colored sands to 10 to 24 inches, but it is underlain by brownish-yellow fine sand.

Lakewood and St. Lucie soils produce very poor range grazing and forest, and they are not generally suitable for cultivated crops or for improved pasture. They have very little organic matter and mineral plant nutrients and are droughty. These shortcomings must be overcome before satisfactory crops can be produced. However, under good management practices, some citrus and other subtropical fruits can be produced on selected areas of Lakewood fine sand. Because of its high elevation, good drainage, and location near the coast, much of this association is being developed as urban subdivisions.

2. Somewhat excessively to moderately well drained deep soils (BLANTON, LAKELAND).—This association includes Blanton and Lakeland fine sands that occur on level to very gently sloping areas. Blanton soils are characterized by a grayish-brown or dark-gray surface layer and pale-yellow or splotched pale-yellow, light-gray, and white subsoil layers. Lakeland soils have a grayish-brown or dark-gray surface layer and yellow, yellowish-brown, or brownish-yellow subsoil layers.

Blanton and Lakeland soils produce suitable cultivated crops, citrus and other subtropical fruits, improved pasture, and forest. Under favorable weather conditions and good management, fair to good yields can be obtained. During dry periods some areas may be somewhat droughty for citrus trees and improved pasture. Irrigation is needed to produce maximum yields of most truck crops, fruits, and pasture.

3. Somewhat poorly drained deep soils (ONA, SCRANTON).—This association consists largely of Ona and Scranton fine sands that occur on nearly level sites northeast and south of Sarasota, and near Fruitville, Miakka, and Laurel. Scranton soils have a black or very dark gray surface layer, 10 to 18 inches thick, underlain by light brownish-gray to pale-yellow fine sand. Ona soils have a dark-gray to black surface layer, 8 to 12 inches thick. The surface layer is underlain by a brown organic-stained layer that grades into lighter colored fine sands with increasing depths.

If water is adequately controlled, Ona and Scranton soils are suited to citrus and other subtropical fruits, vegetables, improved pasture, and forest. These soils usually have enough moisture for the crops during normal seasons. During extremely dry periods, however, vegetable crops and citrus should be irrigated. It is essential to have both drainage and irrigation on these soils to produce citrus satisfactorily. Under favorable weather conditions and good management, high yields can be expected from vegetable crops and fruit trees. In other areas within the State, good yields of strawberries are produced on Ona and Scranton soils.

4. Somewhat poorly drained soils, shallow over alkaline materials (ADAMSVILLE, BRADENTON, BROWARD, KERI, PARKWOOD, SUNNILAND).—This association consists mostly of Adamsville, Bradenton, Broward, Keri, Parkwood, and Sunniland fine sands. They occur extensively throughout the county on nearly level sites. These soils have gray or dark-gray surface layers, 4 to 8 inches thick.

Below the surface layer, Adamsville soils have pale-brown to brownish-yellow fine sands to depths of 30 inches or more. These soils occur in broad, fairly uniform flatwood areas.

The sandy surface layers of the Bradenton soils are underlain within 30 inches by grayish-brown sandy clay loam which, in turn, is underlain by fine-textured marl within 42 inches. They occur as small, isolated, irregular areas within larger areas of the more extensive soils of this association. In their native state, they usually stand out because of their dense growth of hammock vegetation.

Broward soils are in small scattered areas within larger areas of the more dominant soils. They consist of only a thin, gray mantle of sand over hard limestone. The Keri soils occur as very irregular, small- to medium-sized areas. They have a thin layer of marl, 6 to 12 inches thick, sandwiched between sand layers within a 42-inch depth. The vegetation on Broward and Keri soils usually is a poor growth of pine and palmetto.

Parkwood soils are shallow and dark colored. They normally occur in long, narrow palm-hammocks near sloughs and shallow ponds. They are composed of a dark-colored, thin, sandy mantle over a thick layer of fine-textured marl.

Sunniland soils are closely identified with the more dominant Adamsville soils, which they resemble in many ways. They produce the same native vegetation but differ principally in thickness of the fine sand surface layer. Sunniland soils have less than 30 inches of sand over alkaline clayey materials, which frequently contain calcareous concretions or fragments of limestone.

Under natural conditions, Adamsville, Broward, Keri, and Sunniland soils normally support a typical pine-palmetto flatwoods growth that includes many kinds of native herbage. This herbage supplies sparse grazing in range pastures. The growth of pine trees is fair to good on most of these soils. Improved pasture can be successfully developed on most soils of this group. If water is adequately controlled and other good management is practiced, the deeper soils of this association can be used successfully for truck crops. Some of them are suitable for citrus under intensive management.

5. Somewhat poorly drained soils, shallow over organic pans (IMMOKALEE, LEON, POMELLO).—This association consists mostly of Leon, Immokalee, and Pomello fine sands, which occur extensively on nearly level sites throughout the county. These soils are quite similar in many respects. They all have a gray to very dark gray fine sand surface soil and a highly leached, nearly white fine sand subsurface layer, which is underlain by a dark-brown to black organic pan. The organic pan occurs at depths between 14 and 30 inches in the Leon soils and below 30 inches in Immokalee soils. Pomello soils have an organic pan or brown-stained layer at depths of 42 to 60 inches.

Leon and Immokalee soils are in extensive, fairly uniform areas and support a pine-palmetto flatwoods vegetation. The Pomello soils occur as rather small, isolated low ridges and knolls within larger areas of Leon and Immokalee soils.

Leon, Immokalee, and Pomello soils are used extensively for improved pasture and unimproved range. The sparse growth of native grasses and other herbage provides only poor grazing for cattle. If these soils have adequate water control and are fertilized, limed, and planted to improved grasses, they produce good pastures. Leon and Immokalee soils have limited suitability for cultivated crops, but they can be successfully cultivated if intensively managed. The Pomello soils are more poorly suited to pasture or cultivation than the Leon or Immokalee soils. They generally are not considered suitable for cultivation. The soils of this association have a number of characteristics unfavorable to citrus tree growth and are not good soils for citrus.

6. Poorly to very poorly drained soils, shallow over alkaline materials (ARZELL, CHARLOTTE, MANATEE, FELDA, DELRAY, PLUMMER, POMPANO, RUTLEGE).—This association includes Arzell, Charlotte, Delray, Felda, Manatee, Plummer, Pompano, and Rutlege soils. These soils occur in shallow depressions, sloughs, and intermittent shallow ponds throughout the county. The association includes soils developed from thin beds of fine sand over alkaline materials and those developed from deeper beds of acid fine sands.

The Delray, Manatee, and Rutlege soils have very dark gray or black surface soils rich in organic matter. They are intricately mingled with other members in scattered small depressions or long, narrow sloughs that collect organic matter and are generally wet. The Pompano and Plummer soils are deep fine sands. The surface soils are light-colored fine sand that reaches to depths of more than 30 inches. The Arzell and Charlotte are also light-colored soils with deep sand surface soils. They occur as scattered small areas that form an intricate pattern with other members of the association.

Under natural conditions, the soils of this association are covered with water part of the year. Commonly, they support a natural cover of hydrophytic grasses and small shrubs that provide fair to good grazing during dry seasons. Such areas are easily cleared for improved pastures or for cultivation. In a few areas the natural vegetation consists of bays, gums, myrtle, cabbage palm, and other trees. These areas are more difficult to clear.

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Some of the soils of this association are suited to improved pasture and truck crops if water is adequately controlled and other good management practices are used. The dark-colored soils generally are better for cultivation than the lighter ones.

7. Very poorly drained organic soils (PAMLICO, TERRA CEIA).—This association consists of Pamlico peaty muck and Terra Ceia muck. These soils occur in very wet areas throughout the county. Their organic surface layer ranges from 12 to 48 inches in thickness. Pamlico soils are acid throughout, but Terra Ceia muck is underlain by neutral or alkaline materials.

During many months of the year, undeveloped areas of these soils are covered with several inches of water. When the water is lower, however, the natural vegetation of water-tolerant plants provides limited grazing for cattle. Water has been controlled on areas of Terra Ceia muck, east of Fruitville. These areas are used for celery and other vegetables. Under good management, which includes the use of fertilizer and adequate water control, good yields are obtained on these soils from many truck and special crops and from improved pastures. When the drained areas are not in crops or improved pastures, it is desirable to keep the water table near the surface to retard subsidence of the organic materials. Many of the smaller undeveloped areas would be best used as wildlife habitats and natural water reservoirs.

8. Miscellaneous (BEACHES, MADE LAND, MARSH, AND SWAMP).—This association includes Coastal beach, Coastal beach ridges, Tidal marsh, Tidal swamp, Sandy alluvial land, Made land, and Mines, pits, and dumps. These units consist of a mixture of materials that vary in color, texture, and composition. Coastal beach, Coastal beach ridges, Tidal marsh, and Tidal swamp occur along the coast. Most of Coastal beach is devoid of vegetation. Coastal beach ridges have a sparse cover of plants such as morning-glory, sea grape, sea oats, and other salt-tolerant plants and a few cocoanut trees and cabbage palmettos. Tidal marsh has a cover of salt-tolerant grasses and shrubs. Mangrove trees grow on Tidal swamp. Sandy alluvial land occurs along some of the larger streams and is inundated frequently during the rainy season. It has a vegetative cover of gums, oaks, maples, and cabbage palmettos. Mines, pits, and dumps consist principally of areas from which materials have been removed for roads and for fill materials. Much of this land type consists of pits and small lakes.

Use and Management of Soils[3]

This section has several parts that explain the use and management of the soils in Sarasota County. In the first part the capability groups are explained. Following this general information is a discussion of the 12 capability units, or groups of soils, in the county that need similar management.

[3] E. S. Vanatta, Jr., G. G. Moore, C. B. Blickensderfer, and J. B. Reed of the Soil Conservation Service assisted in writing this section.

Following the discussion of the capability units, the principal crops grown on these soils are described, as well as the cropping systems and fertilizer used and the irrigation and water-control practices needed in the area. The estimated yields of crops are given in table 4.

The cattle industry is expanding in Sarasota County and a special section on pastures is included. The estimated yields of the principal pasture grasses are given in table 5. Many areas, not suited to crops, make excellent feeding grounds or shelters for wildlife and waterfowl. A brief discussion of the use and management of some soils suited to wildlife is included.

Capability Groups

Capability grouping is a system of classification used to show the relative suitability of soils for crops, grazing, forestry, and wildlife. It is a practical grouping based on the needs, limitations, and risks of damage to the soils, and also their response to management. There are three levels above the soil mapping unit in the grouping. These are the capability unit, subclass, and class.

The capability unit, sometimes called a management group of soils, is the lowest level of grouping. A capability unit is made up of soils similar in kind of management they need, in risk of damage, and in general suitability for use.

The next broader grouping, the subclass, is used to indicate the dominant kind of limitation within a capability class. In the complete system, letter symbol "e" indicates that the main limiting factor is risk of erosion if the plant cover is not maintained; "w" means excess water that requires drainage or water control if the soil is to be cultivated for usual crops; "s" shows that the soils are shallow, droughty, or usually low in fertility; and "c" shows that the climate is the main limiting factor. In Sarasota County the main limitations are sandy soil or excess water, and all the soils have been placed in "s" or "w" subclasses.

The broadest grouping, the land class, is identified by Roman numerals. All the soils in one class have limitations and management problems of about the same degree, but of different kinds, as shown by the subclass. All the land classes except class I may have one or more subclasses.

In classes I, II, and III are soils that are suitable for annual or periodic cultivation of annual or short-lived crops.

Class I soils are those that have the widest range of use and the least risk of damage. There are none in Sarasota County.

Class II soils can be cultivated regularly but do not have quite so wide a range of suitability as class I soils. Those in Sarasota County need water control and fertilizers.

Class III soils can be cropped regularly but have a narrower range of use. These need even more careful management than the soils in class II.

In class IV are soils that should be cultivated only occasionally or only under very careful management.

In classes V, VI, and VII are soils that normally should not be cultivated for annual or short-lived crops, but they can be used for pasture and range, as woodland, or for wildlife.

Class V soils are nearly level and gently sloping but are droughty, wet, low in fertility, or otherwise unsuitable for cultivation.

Class VI soils (none in this county) are not suitable for crops because they are steep or droughty or otherwise limited, but they give fair yields of forage or forest products.

Class VII soils provide only poor to fair yields of forage or forest products.

In class VIII are soils that have practically no agricultural use. Some of them have value as watersheds, as wildlife habitats, or for scenery. Some of the coastal beaches and other miscellaneous land types in Sarasota County would be class VIII land, but these are not classified in the list that follows.

Capability Classes, Subclasses, and Units

Capability classes and subclasses used in Sarasota County are shown in the following list.

Class II.—Soils suited to tilled crops, pasture, and trees; moderate limitations when tilled.
- Subclass IIs: Soils that are limited by texture and the need for water control.
  - IIs-1: Dark-colored, somewhat poorly drained fine sands.

Class III.—Soils suited to tilled crops, pasture, and trees; moderately severe limitations when tilled.
- Subclass IIIs: Soils limited by moisture capacity and need for water control.
  - IIIs-1: Deep, moderately well drained or somewhat excessively drained fine sands.
  - IIIs-2: Light- to dark-gray, somewhat poorly drained fine sands.
- Subclass IIIw: Soils limited by excess water.
  - IIIw-1: Very poorly drained muck or peaty muck.
  - IIIw-2: Dark-colored, poorly or very poorly drained fine sands.

Class IV.—Soils suited to grazing or trees; severe limitations if tilled.
- Subclass IVs: Soils limited chiefly by moisture capacity and fertility.
  - IVs-1: Deep, excessively drained fine sand.
  - IVs-2: Light-colored, somewhat poorly drained fine sands.
  - IVs-3: Poorly or very poorly drained fine sands.

Class V.—Soils not suitable for tilled crops; few limitations for grazing or trees.
- Subclass Vs: Soils limited by depth and moisture capacity.
  - Vs-1: Somewhat poorly drained fine sands, shallow over limestone or marl.
  - Vs-2: Strongly acid fine sands with organic pan.

Class VII.—Soils not suitable for tilled crops and severely limited if used for grazing or trees.
- Subclass VIIs: Soils limited by low moisture capacity.

VIIs-1: Poorly drained, nearly white fine sands.
VIIs-2: Excessively drained, nearly white fine sands.

Capability Units

A brief description of each capability unit, a list of the soils in the unit, and some suggestions for use and management are given in this section.

CAPABILITY UNIT IIs–1

Dark-colored, somewhat poorly drained fine sands: Soils of this unit are nearly level. The dark-gray to black sandy surface soils are high in organic matter. The subsoil to a depth of 30 inches or more is porous, acid fine sand. The water table is normally within 36 inches of the surface. The soils are:

Ona fine sand.
Scranton fine sand.

Soils of this unit are among the most productive in the county. They are well suited to truck crops and improved pasture.

Water control is essential for tilled crops or pasture of high quality. Less intensive water control is required, however, on improved pasture. The relief, the texture of the subsurface layer, and the position of the water table make these soils well suited to subirrigation-drainage water control systems (see section Water Control and Irrigation). A system of properly designed shallow ditches having simple structures to control the water flow is adequate. These soils can be cultivated extensively if they are limed and fertilized and cover crops are used to maintain organic matter.

Under most conditions these soils are good for citrus crops if the trees are bedded and the supply of water is regulated. They are also suited to forestry and produce a good stand of pine in their natural state. They can be developed into excellent areas for wildlife.

CAPABILITY UNIT IIIs–1

Deep, moderately well drained or somewhat excessively drained fine sands: The soils of this unit are nearly level to gently sloping. The surface soil, 30 inches or more of acid fine sand, is very porous and has a very low capacity to hold moisture for plant use. The soils in the unit are:

Blanton fine sand, low phase.
Lakeland fine sand, deep phase.

Wetness is not a limiting factor on these upland soils. The low available moisture-holding capacity, rapid leaching of plant nutrients, and low supply of organic matter make these soils poorly suited to most cultivated crops without intensive use of soil-building crops, irrigation, and liberal applications of fertilizer. If these practices are followed, the soils are well suited to citrus.

The soils of this unit are not extensive; they usually occur in small scattered bodies, mainly near the coast.

CAPABILITY UNIT IIIs–2

Light- to dark-gray, somewhat poorly drained fine sands: These soils are nearly level or gently sloping. The surface soil is light to dark gray, and the subsurface layer is light-gray, gray, or grayish-brown fine sand. These soils are usually underlain by mottled, slightly acid to alkaline fine sandy clay material or marl. Some of these soils have a brown pan layer, stained with organic matter, above the fine-textured material. The natural ground water level fluctuates from 1 to 2 feet to about 4 feet below the surface. It normally occurs at depths of 24 to 30 inches. Soils in the unit are:

Bradenton fine sand.
Leon fine sand, heavy substratum phase.
Ona fine sand, light colored surface phase.
Parkwood fine sand.
Parkwood fine sand, deep phase.
Sunniland fine sand.
Sunniland fine sand, deep phase.

Soils of this group are suited to cultivation or improved pasture, but they have limitations that must be overcome. Water control is essential for tilled crops and high-quality pasture, although moderately good pasture can be developed under native moisture conditions. Nearly level relief, a porous sandy subsurface layer, and a water table near the surface make these soils well suited to subirrigation-drainage water control systems. A system of shallow ditches with simple control structures is adequate to provide drainage or irrigation water.

Intensive use of soil-building cover crops, fertilizers, and lime, as well as adequate water control, are needed for permanent high yields of cultivated crops. On these soils, citrus trees require more bedding and deeper drainage than truck crops. Water control for citrus groves should be designed to combat extremes of rainfall and drought.

Most of these soils sustain a good growth of pine trees in their native state. The natural hammock forest on some of these soils produces good hardwoods. The hammocks also have a very high capability for wildlife development.

Soils of this unit are well distributed throughout the county in small- or medium-sized areas.

CAPABILITY UNIT IIIw-1

Very poorly drained muck or peaty muck: The soils in this capability unit have 12 inches or more of peat or muck in the surface layer. The subsurface ranges from acid fine sand to fine-textured calcareous material. The soils in the unit are:

Pamlico peaty muck.
Terra Ceia muck.

These soils can be cultivated and used for improved pasture if water is controlled, but because they are highly organic, they have limitations that must be overcome if high yields are to be sustained. A complete water-control system is essential. It should include seasonal flooding of cultivated areas to control parasites and to retard subsidence caused by oxidation. In addition to water control, these soils require intensive use of soil-building cover crops and heavy applications of mineral plant food. Similar measures should be taken in areas of improved pasture.

These soils are not suited to forestry or citrus production. They are excellent areas for aquatic wildlife. Soils of this capability unit occur in small scattered areas throughout the county and in two or three fairly large sections in the northern part.

CAPABILITY UNIT IIIw-2

Dark-colored, poorly or very poorly drained fine sands: These nearly level soils occupy broad, flat drainageways and shallow ponds throughout the county. The thick surface soils are gray to black fine sands to fine sandy loams; they are usually high in organic matter. The subsurface layers range from thick (30 inches or more) beds of light-colored fine sand to mottled plastic fine sandy clay within 18 inches of the surface. Many of these soils are underlain by marl, shell, or limestone. The soils underlain by calcareous material normally have a slightly acid to alkaline surface soil and an alkaline subsoil, whereas the other soils may be strongly acid throughout. The water level is near the surface in soils of this capability unit; it may rise several inches above the surface for long periods each year. The soils are:

Delray fine sand.
Delray fine sand, shallow phase.
Delray mucky fine sand.
Delray mucky fine sand, shallow phase.
Felda fine sand.
Manatee fine sandy loam.
Manatee loamy fine sand.
Rutlege fine sand.
Rutlege mucky fine sand.

On these soils, water-control practices are essential for tilled crops or improved pasture. A fairly uniform water table can be maintained under subirrigation-drainage type systems. The danger of excess water is greater on these soils than on similar somewhat poorly drained soils, and consequently more intensive water-control practices are needed. Such practices include use of soil-building cover crops and heavy applications of fertilizer. The cultivated crops require more care than the improved pasture.

Soils in this capability unit are not well suited to trees. They are suited to citrus crops only under intensive water-control practices designed to cope with extremes of flood and drought. These soils in their natural state can be developed into excellent wildlife habitats. Small areas of this unit are scattered throughout the county.

CAPABILITY UNIT IVs-1

Deep, excessively drained fine sand: These deep soils have a very light colored fine sand surface soil and a loose brownish-yellow fine sand subsurface layer. Their available moisture-holding capacity is very low and, as a result, the soils are very droughty. They are highly leached of plant food and are strongly acid throughout. Only one soil, Lakewood fine sand, is in capability unit IVs-1.

Because of the elevated position of this soil, wetness is not a limiting factor. A very low capacity to hold water that plants can use, the rapid leaching of plant nutrients, and a very low supply of organic matter make this soil very poorly suited to most cultivated crops or improved pasture. With adequate irrigation, liberal applications of fertilizer, and cover crops, it is suited to citrus. Forest trees make only fair growth on it. This inextensive soil has very little value for agriculture in Sarasota County.

CAPABILITY UNIT IVs-2

Light-colored, somewhat poorly drained fine sands: The soils of this unit are nearly level to gently sloping. The surface soil is light-gray to gray, loose fine sand that is underlain by leached light-gray to grayish-brown, loose fine sand. Some of these soils have strongly acid surface soils and a subsurface layer that is underlain by a pan stained with organic matter. Other soils in the group have neutral to moderately acid surface soil and a slightly acid to alkaline fine sand subsurface layer that is underlain by calcareous material below 30 inches. The ground water fluctuates from surface level to a depth of about 4 feet; it normally occurs at 24 to 30 inches. The soils are:

Adamsville fine sand.
Adamsville fine sand, shallow phase.
Immokalee fine sand.
Keri fine sand, thick surface phase.
Leon fine sand.

Soils in this unit are suited to limited cultivation and well suited to improved pasture. Complete water-control systems are necessary for tilled crops and high-quality pasture, although moderately good pasture can be established under natural moisture conditions. The nearly level relief, porous sandy subsurface that permits rapid movement of water laterally and vertically, and a fairly high natural water table make these soils well suited to subirrigation-drainage water control systems. A system of properly designed shallow ditches and structures that will permit the water table to be raised or lowered serves this purpose.

The use of these soils for cultivated crops is restricted by a low available moisture-holding capacity, very sandy, highly leached soil material, and a low supply of organic matter. Intensive treatment is needed to maintain productivity of cultivated crops. Such treatment includes sod-based rotations, intensive use of soil-building cover crops, heavy applications of lime and fertilizer, and carefully managed water-control systems. Less intensive practices are necessary for improved pasture.

These soils are moderately well suited to forestry, and they support a moderately good growth of pine. They are poorly suited to citrus. Undeveloped areas support many kinds of wildlife, such as quail, turkey, and deer. With well-planned management, these areas can support more wildlife.

CAPABILITY UNIT IVs-3

Poorly or very poorly drained fine sands: Soils of this unit are nearly level. They occupy broad flat drainageways and positions in shallow ponds throughout the county. The surface soil is light-gray to gray, loose, fine sand, 6 to 10 inches thick. It is underlain at 30 inches or more by light-gray, yellow, or brownish-yellow, slightly compact fine sand. Some of these soils

are underlain below 30 inches by finer textured substrata or calcareous materials; others consist of acid fine sand to depths of 72 inches or more. Some of the soils are strongly acid throughout the profile, whereas others are neutral to calcareous. The water level is near the surface and rises several inches above the surface for long periods each year. The soils are:

Charlotte fine sand.
Plummer fine sand.
Plummer fine sand, shallow phase.
Pompano fine sand.
Pompano fine sand, shallow phase.
Pompano fine sand, shallow phase-Adamsville fine sand.
Pompano-Adamsville fine sands.

Water-control practices are essential for cultivated crops or improved pasture. Cultivated crops require more intensive water control than pasture. Nearly level relief and open porous texture make these soils well suited to subirrigation-drainage control systems. Shallow ditches having simple water-control structures are adequate for this purpose.

The suitability of these soils for cultivation is limited by their deep sandy texture and small amount of organic matter, which gives them a very low moisture-holding capacity and low nutrient-holding capacity. These soils therefore need intensive treatment, such as sod-based rotations, cover crops, fertilizer and lime, and carefully managed water control. Improved pasture requires less intensive management.

The soils in this group are not well suited to forestry or citrus fruits. In their native state they are suited to wildlife and should be developed for this use. This unit occurs in all sections of the county and contains the most extensive areas of poorly drained soils.

CAPABILITY UNIT Vs–1

Somewhat poorly drained fine sands, shallow over limestone or marl: Soils of this unit are nearly level. They have a light-gray to gray fine sand surface layer that overlies limestone and marl at shallow depths, usually within 24 inches. The soils are:

Broward fine sand, shallow phase.
Keri fine sand.

The soils are too shallow to be suited to tillage but are well suited to improved pasture. Their shallowness also restricts the use of intensive water-control practices that are necessary for cultivated crops. However, the simple water-control measures suited to pasture development are possible in most areas. If these practices are used and the soils are fertilized, fairly good pastures can be established.

These soils are not suitable for citrus and are poorly suited to forestry. Where they occur in small areas in association with cultivated soils, they can be developed as shelter and feeding ranges for quail and other wildfowl.

This is an inextensive group of soils. It occurs in small areas scattered throughout the county.

CAPABILITY UNIT Vs–2

Strongly acid fine sands with organic pan: Soils of this unit are somewhat poorly to somewhat excessively drained. They were formed from deep beds of fine sand. They normally have a thin gray to light-gray surface soil of loose fine sand. It is almost entirely lacking in finer soil particles and has very little organic matter. The subsurface layer is highly leached, light-gray to white fine sand that has a very low available moisture-holding capacity. Below the subsurface layer, at depths of 24 to 60 inches, is a dark-brown to black semicemented organic pan.

These soils occupy nearly level slopes. They normally have a water table at 24 to 60 inches. There is very little capillary rise, however, because the soils consist of loose sand. These soils are droughty much of the year. They are highly leached, and commercial fertilizers leach rapidly from them. The soils are:

Leon fine sand, light colored surface phase.
Pomello fine sand.

Cultivation is not generally feasible on the soils in this unit, because of droughtiness, low supply of organic matter and plant nutrients, and rapid leaching. Improved pasture of fair to good quality can be maintained by growing drought-resistant grasses and by liberal use of fertilizer and lime. Some of the better drained areas, however, have been used successfully for citrus fruit under intensive management and with overhead irrigation.

These soils are poorly suited to forest. The native scrubby vegetation offers some shelter but little feed for wildlife.

CAPABILITY UNIT VIIs–1

Poorly drained, nearly white fine sands: Soils of this unit are little more than thick beds of white quartz fine sand and shell. They have very little organic matter, and their available moisture-holding capacity is very low. They are highly leached of plant nutrients. The soils are:

Arzell fine sand.
Arzell fine sand, shell phase.

Soils of this unit are not suited to agriculture or forestry. They have a very limited use for pasture.

These soils occur in small scattered areas throughout the county. They usually are around the rims of shallow ponds or in depressions. Some occur on old marine benches on the several small islands and bays along the gulf coast.

CAPABILITY UNIT VIIs-2

Excessively drained, nearly white fine sands: The soil of this unit—St. Lucie fine sand—is very droughty. It developed from deep beds of nearly white, fine quartz sand and occupies positions high enough to be free of a high water table. The amount of organic matter and the available moisture-holding capacity are very low. Water and air move freely through the layers and cause rapid oxidation and leaching.

The soil of this unit is not suited to cultivation and has very limited suitability for pasture or forestry. It is limited to a few small areas in the western part of the county.

SOILS NOT CLASSIFIED AS TO CAPABILITY

A few small areas have not been classified according to capability. These areas are mapped as miscellaneous land types. They are:

Coastal beach.
Coastal beach ridges.
Made land.
Manatee soils, overflow phases.
Mines, pits, and dumps.
Sandy alluvial land.
Tidal marsh.
Tidal swamp.

No definite capability classification can be assigned to these miscellaneous land types. They occur principally along the coast.

Principal Crops

The soils of Sarasota County have important differences that affect to some degree their suitability for different plants and crops. Vegetables are grown almost entirely on the more fertile dark-colored soils. These soils, as Terra Ceia, Scranton, Ona, and Delray, have been strongly influenced by organic matter. The citrus groves are mainly on the better drained soils, such as the Blanton, Lakeland, and Lakewood. Soils used extensively for range or pasture are somewhat poorly to very poorly drained. Large acreages of wet soils occur throughout the county.

Vegetables are an important cash crop in Sarasota County. The vegetable farms are mainly near Fruitville. Here, truck crops are grown intensively on Terra Ceia and Delray soils. They are also grown in small plots on the western side of the county, almost entirely on Scranton, Ona, Leon, and Immokalee soils.

About 40 percent of Terra Ceia muck is planted to celery, the major truck crop. Some of the adjoining Delray soils are in beans, potatoes, cabbage, sweet corn, radishes, onions, peppers, tomatoes, eggplant, and leafy vegetables. The total acreage planted to such crops varies from year to year, as influenced by labor problems, market and economic factors, and the condition of the soil.

Nearly all poorly drained depressions contain moderately fertile soils well suited to specialized truck crops. Their development for vegetables has been restricted, however, by association with unsuitable soils, small size, drainage problems, and use for other projects.

Celery.—Celery production is concentrated on Terra Ceia muck, near Fruitville. This crop was planted on 665 acres in 1954; cultivation is very intensive.

Seed is sown on the surface of well-prepared, irrigated seedbeds. The plants are removed after 8 to 10 weeks' growth and are transplanted by machine to a well-prepared field. After the crop is planted, the ground is irrigated until growth starts. Management practices include strict water control, large applications of fertilizer, spraying, careful cultivation, and weeding.

Drainage canals, with control dams, have been constructed over the area for maintaining water at proper levels. Water is pumped from these canals for irrigation.

Fertilizer practices are intensive and begin with heavy applications several weeks before setting the plants. The crop is sidedressed with a mixture of nitrogen, phosphate, and potash about every 3 weeks while the crop is growing. A topdressing of a nitrate or a mixture of nitrogen and potash is applied a week or so before harvesting.

Celery is generally planted from September through January. Harvesting starts the middle of December and continues to about June 1. A second crop of celery is often planted in the same field after the first crop is harvested. Cover crops of sesbania or corn are grown after the last crop is harvested. Packing and shipping plants are operated in the area where celery and other vegetables are produced.

Citrus.—Citrus fruits were produced on 3,755 acres in the 1951-52 season in Sarasota County (*9*). Citrus production is one of the important agricultural activities in the county. The groves are scattered and small in size. They are principally on Lakeland, Lakewood, Blanton, Scranton, and Ona soils. Most of the groves are close to the gulf, which tends to modify the occasional freezing temperatures.

Because of a lack of desirable soils, few areas are now available that are naturally suited to citrus production on a large scale. In the existing groves, the poor growth of some trees may have resulted from inadequate water control. Most trees planted on Leon and Immokalee soils are stunted or have died. Citrus trees may be grown on mounds on some of the wet soils if water is carefully controlled. Such methods are too expensive on a commercial scale, although they may be practical for individual trees in backyard plantings.

No trend currently prevails toward new plantings or the expansion of old groves. If new groves are started, however, the soils should be checked thoroughly for their suitability for citrus or other subtropical fruits. Some of the existing citrus groves have deteriorated through neglect, whereas others are being replaced by real estate or housing developments. Much of the high land now in citrus fruits is particularly desirable for urban and suburban development and in time may be used for this purpose.

General cultural practices in citrus groves include growing a cover crop during the summer when there is plenty of rainfall. Native grasses and weeds are cover crops that may be mowed at least once. In some groves, leguminous cover crops, such as hairy indigo, beggarweed, or cowpeas, supply humus. During the fall, after rains are over, the cover crop is disked into the ground.

Bearing citrus trees are fertilized three times a year, before each normal flush of growth. Mixed fertilizers containing nitrogen, phosphorus, and potassium are commonly used. Minor elements, as copper, zinc, manganese, or boron, have been added to these fertilizers. The total amount of fertilizer used varies with the size of the trees and the fertility of the soil. Lime is spread at the rate of about 1 ton an acre every 3 to 5 years in some groves.

Pest control is necessary, and spraying or dusting schedules are followed. Some of the commercial groves are irrigated during severe droughts. During the occasional frosts, many growers heat their groves or use some other artificial means to protect the trees from damage.

Cabbage.—A fairly large acreage of cabbage is planted in some years, but census figures indicate that 50 acres or less are used for this crop in most years. Cabbage is grown on both dark- and light-colored soils. The seedbeds are usually started in October, and the plants are set out in the field when they are 4 to 6 inches high. The transplants are commonly set in double rows with 36-inch middles, 15 to 18 inches apart in the row. This crop requires irrigation and fertilizer.

Cucumbers.—In 1949 about 355 acres were used for producing cucumbers, chiefly near Venice. Since then, production has dropped.

Cucumbers do well on almost any soil, but the best results are obtained on fertile sandy soils having a large supply of moisture. Cucumbers are planted directly in the field and are grown as a spring and fall crop.

Tomatoes.—Tomatoes are a minor commercial crop in the county. The acreage varies widely from year to year. This crop is produced in small-sized fields, chiefly in the western part of the county.

Tomatoes are grown on sandy soils of the flatwoods that are subject to a considerable accumulation of water. Such soils require efficient water control for best yields.

The crop is grown both in the spring and fall. Tomato plants are transplanted from August to September for the fall crop and from November to December for the spring crop. The plants mature in 70 to 90 days. Some growers stake their plants. Yields of staked plants are usually higher.

Commercial fertilizers are applied several times. The heaviest applications are on the lighter colored sandy soils. Tomatoes are picked green for shipping but are ripened for local markets.

Peppers.—The annual production of peppers has dropped from 50 acres in 1939 to 12 acres in 1954. The crop can be grown successfully on many kinds of soil that have an adequate supply of moisture. The plants are started in seedbeds or are seeded directly in the field. The management practices include control of diseases and insects, heavy applications of commercial fertilizer, and water control.

Beans.—Green beans are grown as a fall and spring crop on a small total acreage. They can be produced on many of the sandy soils under careful management and with adequate water control. Planting starts in August or September for fall crops and continues until April for spring crops. Liberal applications of commercial fertilizer are necessary. Green beans are picked by hand and are then graded and packed for local or distant markets.

Sweet corn.—Sweet corn has not been grown extensively in Sarasota County. It is generally produced as a spring crop on muckland or on dark-colored soils. It is planted during January or February at 12- to 18-inch intervals in rows spaced 28 to 42 inches apart. Fertilizers are necessary; about 1,200 pounds per acre is commonly used. This crop is sold locally or shipped to distant markets.

Lettuce.—Lettuce is produced mostly on dark-colored soils. It usually is grown in double rows in beds about 42 inches apart. The plants are spaced about 14 inches apart in the row, and the crop is harvested about 80 to 90 days later. Commercial fertilizer is spread before and after planting. The heads are trimmed, graded, and packed in crates for shipping.

Eggplant.—Eggplant is grown during the fall and spring. The seed is sown in beds, and the young plants are transferred to the field. Eggplant is set in rows 36 to 48 inches apart at intervals of 24 to 36 inches in the row. Half the fertilizer, or a little more than half, is applied at planting time, and the rest is added when the crop is one-third to one-half mature.

Ornamentals.—Large-scale urban and suburban development in recent years has created a demand for ornamental trees, shrubs, and lawngrasses. Six large nurseries produce many kinds of tropical fruit trees, ornamental plants, and shrubs. Several growers develop lawngrasses commercially. Numerous backyard nurseries are in the coastal area. Many kinds of soils are used for the production of ornamentals.

Minor crops.—Radishes, onions, spinach, peas, sweetpotatoes, and escarole are grown on a small combined acreage for local and northern markets. These crops are produced mostly on dark-colored sands or muck in the truck crop area near Fruitville. Mixed fertilizers are used to obtain high yields.

Numerous other crops are grown in Sarasota County on a small acreage. They are important locally and represent a moderate investment. The 1954 census lists 355 acres of corn harvested for grain; 1 acre of cowpeas; 1 acre of potatoes; 5 acres of watermelons; and 11 acres of strawberries. In addition, many homeowners have fruit trees, such as avocado, fig, peach, mango, banana, lychee, pecan, lemon, and lime.

Lychee.—The production of lychee fruit is increasing in Sarasota County. The crop is sold commercially in northern markets as lychee nuts. The trees make popular backyard plantings. The climate and soil are favorable, and the groves are protected because of their proximity to the gulf.

The trees are reproduced by air-layering, and the shoots are kept moist until planted in the field. Water control is essential for successful growth. Lychee trees require fertilizing rates and schedules similar to those used for citrus trees. Fruiting usually occurs in June and July.

Fertilizers and Cropping Systems

All soils in the county are to some extent deficient in plant nutrients. A number of the soils are low in all elements important to plant growth. As a result, commercial fertilizers are essential. They are generally used on all areas that are planted to vegetables, field crops, fruits, and improved pasture. Most of the ready-mixed fertilizers contain nitrogen, phosphate, and

potash, supplemented with copper, zinc, manganese, or other minor elements. Some single fertilizer is used occasionally, such as sodium nitrate, potassium nitrate, superphosphate, caster pomace, muriate of potash, sulfate of potash, and basic slag.

Popular formulas for vegetables and fruit include 4–7–5, 4–8–8, 4–6–8, 4–8–6, 3–8–8, 2–12–12, and 4–12–10. The heaviest amounts— from 1,000 to 2,000 pounds of mixed fertilizer per acre—are applied to soils used for vegetables. Sodium nitrate is used as a side dressing on some plots. It is a common practice to apply about half of the fertilizer a week or two before planting and the rest as side dressings when the crops are half grown and as they mature. Some farmers apply all fertilizer before planting and use side applications of nitrates.

Citrus trees also receive heavy applications of fertilizer. They are fertilized according to the type of soil, age and size of tree, and condition of the grove. About 15 to 40 pounds of mixed fertilizer is applied to each tree per year.

Improved pasture grasses annually require 500 to 1,000 pounds per acre of a complete fertilizer (*2*). Popular mixtures are 6–6–6, 6–8–8, or 8–8–8. Legumes are often overseeded in pastures to supplement the nitrogen and to improve the quality of the grasses. When legumes are planted with grasses on mineral soils, formulas of 2–12–12, 2–10–12, or 0–12–24 can be used. On organic soils 0–8–24 or 0–12–24 fertilizer is good. Additional nitrogen is often applied during the fall and winter as sodium nitrate or ammonium nitrate.

Most soils need an initial application of 1 to 3 tons of ground limestone per acre. Additional applications are made later as needed. Generally an application of 2,000 to 4,000 pounds of dolomitic limestone is used every 2 to 4 years on acid soils if vegetables and fruits are grown. Lime is very beneficial, and the soils should be checked occasionally to determine their need for this amendment.

Most soils of the county are strongly acid in the upper layers where plant roots grow. They are also generally sandy, porous, and subject to rapid percolation and leaching of plant nutrients. Leaching or a downward movement of potassium, calcium, phosphorus, organic colloids, and other elements takes place more rapidly in highly acid soils than in soils that are slightly acid.

The availability of residual phosphorus increases as the acidity decreases. Copper, zinc, manganese, boron, and other minor elements are more available, however, under acid than under alkaline conditions. The minor elements are usually available unless too much lime is present.

The kind and amount of fertilizer needed depend on the requirements of a crop and the kind of soil on which the crop is grown. A dark-colored soil, high in organic matter, as Scranton, Delray, Manatee, or Terra Ceia, does not need so much nitrogen as the light-colored Pomello, Leon, Blanton, Lakeland, Immokalee, and Adamsville soils. The darker colored soils contain larger amounts of organic matter and nitrogen than the others. The organic matter and clayey material present in some soils enable them to absorb and retain plant nutrients better and to retard the leaching process. Some elements are lost quickly in a loose sandy soil.

No definite system for rotating crops is followed consistently in Sarasota County. A specialized type of farming prevails, and the production of general farm crops, as grains or cereals, is sporadic and on small farms.

Vegetables are produced intensively for winter and early spring markets. One or two truck crops may be grown on the same land during a single cropping season, and different crops are planted the following year. Occasionally, a field may be idle for a year or more. Frequently, the crop is repeated on the same acreage for several years. In such areas a cover or green-manure crop is planted after the last harvest. Some vegetables are alternated from one field to another, but the succession of crops on a field is not always in a definite order.

Soil-improving cover crops generally used in a rotation with vegetables include sesbania, crotalaria, cowpeas, beggarweed, corn, hairy indigo, and native weeds. The planted or volunteer cover is turned under several weeks before the new crop is started. In some citrus groves, the native plants are mowed and disked into the ground about once a year. A number of groves are maintained by using clean cultivation. In other groves, this tillage is discontinued at the beginning of summer and a cover crop of hairy indigo, crotalaria, and beggarweed is sown, or native grasses and weeds are permitted to grow. The cover crop is disked or chopped in to increase the amount of organic matter in the soil.

Sod-based rotations are used with good results in some areas where truck-crop farming and livestock farming are combined. This system tends to increase the content of organic matter and the moisture-holding capacity of the soils and to control insect pests, plant diseases, and weeds.

In a sod-based rotation, the land is cleared and planted to two successive crops of vegetables. The residue of the second crop is incorporated into the soil and the area is planted to pangolagrass, bahiagrass, or other improved pasture grasses. The sod is allowed to remain for 3 to 5 years, after which the plot is plowed and planted to vegetables. The cycle is then repeated.

Water Control and Irrigation

Water control—or water conservation—is important in Sarasota County. Some farming is done without it, but production in most areas is restricted during extremes of wetness or drought. In much of the county, the soil structure, topography, and availability of water are well suited to the establishment of water-control systems.

Water control is the key to successful use and conservation of most poorly and somewhat poorly drained soils. Most water-control systems consist principally of shallow ditches used to remove excess water during wet seasons and to irrigate during dry seasons. Such a system keeps the water table within favorable limits. It requires properly laid-out shallow ditches that have control structures that can be opened or closed; adequate outlets for excess water; and a supply of water

for irrigation during dry seasons (fig. 10). These dual-purpose subirrigation systems are popular in the county. They are economical and simple to operate.

Figure 10.—**Water is fed through shallow canals into lateral ditches to irrigate lychee trees on Leon fine sand. During wet seasons the gates are removed and the ditches carry away excess surface water.**

In subirrigation, the water is fed from a well or other source of water. The water seeps rapidly through the walls of the ditches and moves downward to the water table. It then moves horizontally and builds up the water level between the ditches. If the intake is controlled, the water table can be maintained at a level that will supply the root zone of plants with adequate moisture. During heavy rains the shallow ditches also provide surface drainage. Such a system has been constructed in the celery-growing area near Fruitville.

Overhead sprinkler irrigation is also used in Sarasota County, mainly on a small scale in areas planted to citrus and vegetables. Sprinkler irrigation consists of a series of perforated pipes or a rotating overhead sprinkler.

Estimated Yields

Estimated average acre yields of the principal crops on most soils of the county are given in table 4 (see the section on pastures for expected yields of pasture grasses). The crop yields in lines A result from practices most generally followed in the county. The yields in lines B are those that may be expected under suggested management. Under such management, suitable crops are carefully selected for each soil, a systematic rotation is followed where practical, heavy applications of fertilizer are made, lime is used regularly, adequate water control is maintained where necessary, organic matter is returned to the soil, and careful tillage is practiced. Little land is managed this way, and the yields are theoretical estimates.

The yield data are based on interviews with farmers, advice from the county agent or other agricultural leaders, and observation of similar soils in nearby counties.

Pastures

Many of the soils in Sarasota County are suitable for pasture. Extensive acreages of unimproved land suited to grazing occur in all sections. Each year more acreage is diverted to improved pasture. On a number of ranches, additional areas are cleared annually for this use. As cattlemen improve the quality of their herds and raise more pureblood stock, the demand for high-quality pasture is emphasized.

The carrying capacity of the soil is increased by using some areas for improved grasses to supply feed when the native range is poorest. Native grasses produce about 5 to 10 pounds of beef per acre, whereas a good stand of tame grasses of high quality produces 50 to 700 pounds of better grade beef (*2*). Some cattlemen rely on the native plants to furnish all the feed, whereas others have established pastures for better year-round grazing.

Native grasses include many plants suited to forage. Wiregrass, a perennial, is the most extensive and important plant on soils of the flatwoods. Other plants, as broomsedges and maidencane, are less common. These grasses are comparatively sparse because they are crowded by saw-palmetto, gallberry, runner oak, and huckleberry, which compete with them for plant nutrients. Although 5 to 40 acres or more of unimproved range are needed to supply enough feed for one animal (fig. 11), cattle can make fair gains on native grasses (*2*). These grasses are most succulent and contain the largest amounts of protein and minerals in their early stages of growth. Similar species grow in sparse stands on the higher well-drained soils, but their growth is less vigorous because these soils are droughty.

Figure 11.—**An area of unimproved range on the flatwoods.**

TABLE 4.—*Estimated average yields per acre of the principal crops under two levels of managements*

[Yields on lines A are to be expected under present management; those on lines B are to be expected under the suggested management. Blank spaces indicate that crop is not grown under the management specified or the soil is not suited to its production. Soils not used for any of the crops listed have been omitted from the table]

Soil	Beans (snap)	Cabbage	Cantaloups	Cauliflower	Celery	Corn (sweet)	Cucumbers	Lettuce	Peppers	Tomatoes (staked)	Watermelons	Oranges[1]	Grapefruit[1]
	Bu.	*Tons*	*Crates*	*Crates*	*Crates*	*Crates-sacks*[2]	*Bu.*	*Crates*[3]	*Bu.*	*Bu.*	*Number*	*Crates*	*Crates*
Adamsville fine sand:													
A	95	6	38	245		90	200	100	225	130	150	200	250
B	120	10	63	300		120	300	150	275	240	300	350	500
Blanton fine sand, low phase:													
A	95		40			70						270	275
B	120		65			85						360	550
Bradenton fine sand:													
A	100	6	40	260		90	200	110		150			
B	130	11	65	310		120	325	160		260			
Charlotte fine sand:													
A	95	6	38	245		85	200	100	175				
B	120	10	63	300		110	300	150	275				
Delray fine sand:													
A	100	7	40	250		90	210	125	250	160			
B	125	11	65	325		125	325	160	300	275			
Delray fine sand, shallow phase:													
A	100					90		125	250				
B	125					125		160	300				
Delray mucky fine sand, shallow phase:													
A	115	7.5		270		95	210	130	260	170			
B	135	14		360		140	350	170	325	280			
Delray mucky fine sand:													
A	110	7		265		95	210	130	260	170			
B	135	14		310		135	350	165	325	280			
Felda fine sand:													
A	95	6.5	40			90	200	100					
B	125	10	65			130	315	150					
Immokalee fine sand:													
A	80	5	35	240		85	130	95	200	125	125	200	300
B	100	9	61	290		110	275	140	260	230	300	240	400
Keri fine sand:													
A		6		250		90	200	110	225				
B		10		300		120	325	160	275				
Keri fine sand, thick surface phase:													
A										150			
B										250			
Lakeland fine sand, deep phase:													
A			40								140	275	350
B			65								290	360	600
Lakewood fine sand:													
A												275	350
B												360	600
Leon fine sand:													
A	80	5	35			85	130	95	200	125	125	180	275
B	100	9	60			110	275	140	260	230	300	240	400
Leon fine sand, heavy substratum phase:													
A	80	5	35			85	130						
B	100	9	60			115	275						
Leon fine sand, light colored surface phase:													
A		4.5				70	125		190	120			
B		8.5				80	265		250	225			
Manatee fine sandy loam:													
A		7.5				95		125	250				
B		12				125		160	300				

TABLE 4.—*Estimated average yields per acre of the principal crops under two levels of managements*—Continued

Soil	Beans (snap)	Cabbage	Cantaloups	Cauliflower	Celery	Corn (sweet)	Cucumbers	Lettuce	Peppers	Tomatoes (staked)	Watermelons	Oranges[1]	Grapefruit[1]
	Bu.	*Tons*	*Crates*	*Crates*	*Crates*	*Crates-sacks*[2]	*Bu.*	*Crates*[3]	*Bu.*	*Bu.*	*Number*	*Crates*	*Crates*
Manatee loamy fine sand:													
A		7.5				95		125	250	150			
B		12				125		160	300	250			
Ona fine sand:													
A	95	8	40	265		95	175	130	250	150		275	325
B	125	12	62	390		125	325	160	300	260		360	550
Ona fine sand, light colored surface phase:													
A	90	7.5		260		85	110	120			140	275	325
B	120	11		385		105	300	155			350	360	550
Pamlico peaty muck:													
A	115	7.5			730	95		140	260				
B	135	14			950	140		175	350				
Plummer fine sand:													
A						80	100			120	125		
B						100	250			225	300		
Pomello fine sand:													
A	85	4	35			70	100				125	275	300
B	95	6	60			95	250				300	360	450
Pompano fine sand:													
A	95					80				150			
B	125					100				225			
Rutlege fine sand:													
A	100	7		250		90	210	125	250	160			
B	125	11		325		120	325	160	300	275			
Rutlege mucky fine sand:													
A	115	7.5		270		95	210	130	260	170			
B	135	14		360		140	350	170	325	280			
Scranton fine sand:													
A	105	7.5	40	375		70	210	125	250	160	250	275	300
B	130	13	70	450		90	325	160	300	275	400	360	450
Sunniland fine sand:													
A	95	7.5	38	260			200	110	225	140	225		
B	125	11	65	310			300	160	275	250	350		
Terra Ceia muck:													
A	115	7.5		280	730	95		140	260				
B	135	14		475	950	140		175	350				

[1] Trees over 10 years of age.
[2] Five dozen ears packed to the crate or sack.
[3] Four to six dozen heads packed to the crate.

On the wet soils of the shallow depressions and sloughs, the native plants include carpetgrass, crabgrasses, maidencane, and other moisture-tolerant grasses. They are best during the summer months, but they are crowded by woody or unpalatable plants and produce only a small amount of forage.

Rotational grazing is practiced by some ranches; different areas are fenced, and the cattle are alternated on them. Some areas are burned over to remove old, tough grass and to stimulate a vigorous growth. In places, heavy disks or rotary choppers are pulled over the ground in an attempt to destroy objectionable vegetation and to give the native grasses a better chance to spread and develop.

An ample supply of water is available on most ranches during the greater part of the year. Intermittent ponds or shallow catch basins are so numerous that water is normally within short distances of any grazing area. Many of them become dry for several months each year, however, and in these areas the cattle suffer for lack of water. In places artesian wells supply water during dry seasons, and windmills are used on some ranches to fill the water tanks.

According to the 1949 census, 111,953 acres of woodland were grazed; 17,958 acres of cropland were pastured; and 16,433 acres of other land were used for unimproved pasture. In 1954 the corresponding figures for woodland grazed were 45,372 acres; cropland pastured, 4,134 acres; and other pasture, not cropland and not woodland, 130,644 acres.

Improved permanent pasture produces more feed per acre than native grasses (fig. 12). Improved pasture grasses are higher in minerals and protein than native grass. Winter clovers, however, are richer in these components than improved pasture grasses. Pastures that consist of mixtures of improved grasses and legumes are superior to permanent pastures that consist only of grass.

Figure 12.—**Highly productive pasture on cleared flatwoods.**

To establish a successful permanent pasture, all harmful plants should be destroyed, lime and fertilizers applied, and suitable species planted. Some areas require water control before an improved pasture can be developed.

During years when cattle prices were high, the land was cleared rapidly for improved temporary and permanent pastures. The possible further expansion will be influenced by economic factors in the cattle industry. Pasture improvement is a long-time project that requires careful planning. Initial cost as well as upkeep should be evaluated fully before any pasture enterprise is started. Improved pasture and native range should supplement each other to provide the animals with the longest possible grazing period each year.

Established pastures and the newly cleared land for improved pasture are mostly in the flatwoods. Several kinds of soils are included. The Adamsville, Sunniland, and Parkwood soils are more productive and better suited to pasture than soils of the Leon and Immokalee series.

Associated with the soils of the flatwoods are numerous areas of poorly or very poorly drained depressions, sloughs, or intermittent ponds containing Pompano, Plummer, Delray, Manatee, and Rutlege soils. Many of these areas have no natural outlet and are flooded much of the time. They are used for watering sites or by native wildlife or migratory waterfowl. Some are grazed for their available forage. Where the large sloughs have been drained by ditches or canals, rapid drainage of excess water takes place, and sections can be used for improved pasture. Structures to regulate the depth of the water are desirable on these areas.

Both improved grasses and legumes are used for high-quality pasture, but pure stands of grasses cover the largest acreage. Without special management, soils of the county are somewhat better suited to grasses than to legumes.

The principal pasture grasses are pangolagrass and Pensacola bahiagrass. About 95 percent of the improved pasture is in pangolagrass and bahigrass. Pensacola bahiagrass can be grown on highland or lowland soils. This variety is better suited to drier soils than other grasses because of its deep-rooting habit. Paragrass responds favorably on moist soils, although it succeeds on well-drained areas. Paragrass and torpedograss are suited to low, wet areas.

The carrying capacity of native range and the estimated average yields per acre of the principal pasture crops on soils in the county are given in table 5.

The acreage in legumes is increasing, and they may become more widespread on suitable soils. The Louisiana variety of whiteclover is grown most commonly, as it is suited to low, moist soils. It does fairly well as an annual, but most soils are too wet or too acid for its successful growth.

Hubam, an annual sweetclover, can be produced satisfactorily in pure stands with mixed grasses. It is not so tolerant of wet soils as the whiteclovers. It has been grown successfully on low, dark-colored soils that have been drained. Hubam clover produces forage of good quality, but for best results it should be grazed just before or at the early bloom stage.

Hairy indigo is produced by a number of ranchers. It is an annual summer legume suited to many soils. It can be used for grazing or as a hay crop.

A legume crop planted with grasses increases the amount of herbage and reduces the quantity of commercial nitrogen needed. Overgrazing should be avoided. A rotational or intermittent system of grazing permits the grasses to recover after each grazing. Most soils require some lime and fertilizer at planting time. Tests should be made to determine the amount of lime required. Minor elements should be used as needed. Additional applications of nitrogen are necessary to maintain growth on heavily grazed areas or to produce high yields of hay. Good pasture management also includes annual applications of fertilizer and lime, weed control, supplying ample moisture during droughts, and drainage in times of excess water.

Wildlife

Many kinds of native birds and animals live on the broad expanses of comparatively undeveloped land in Sarasota County. The open flatwoods and prairie lands, interspersed with swamps, marshes, shallow ponds, and dense hammocks, have provided them with favorable living conditions. Sarasota County is on one of the major flyways of migratory birds, and many birds winter in the area. Sportsmen and many landowners have an active interest in wildlife preservation in the county.

Development of the area agriculturally can disrupt the living habits and seriously endanger the survival of many species unless definite plans are made for wildlife conservation. Not all areas of soils described as suitable for cultivation or improved pasture should be indiscriminately drained. Many other factors influence the proper use and treatment of these areas. The engineering difficulty of establishing adequate water control, the economic feasibility of development, the type of agriculture that prevails in the area, and the importance of wildlife conservation are some of the factors to be considered.

TABLE 5.—*Carrying capacity of native range and estimated average yields per acre of principal pasture crops under two levels of management*

[Yields in columns A are to be expected under present management; those in columns B are to be expected under the suggested management. Blank spaces indicate that the pasture crop is not grown under the management specified, or the soil is not suited to its production. Soils not used for the production of any of the pasture crops listed have been omitted from the table]

Soil	Native range[1]	Improved pasture					
		Pensacola bahiagrass		Pangolagrass		Whiteclover	
		A	B	A	B	A	B
	Acres	*(Cow-acre-days)*[2]	*(Cow-acre-days)*[2]	*(Cow-acre-days)*[2]	*(Cow-acre-days)*[2]	*(Cow-acre-days)*[2]	*(Cow-acre-days)*[2]
Adamsville fine sand	10–25	160	220	220	260	80	175
Adamsville fine sand, shallow phase	10–25	220	250	250	295	80	175
Arzell fine sand	25–50	100	140	110	165	50	80
Blanton fine sand, low phase	15–20	100	150	125	230	60	90
Bradenton fine sand	15–30	200	275	275	325	100	150
Broward fine sand, shallow phase	15–30	75	130	130	185	40	90
Charlotte fine sand	10–20	160	220	220	260	80	175
Delray fine sand	10–25	250	330	275	360	160	200
Delray fine sand, shallow phase	10–25	250	330	275	360	160	200
Delray mucky fine sand, shallow phase	10–25	275	375	275	390	175	240
Delray mucky fine sand	10–25	250	330	275	360	160	200
Felda fine sand	15–30	250	375	275	325	100	175
Immokalee fine sand	10–25	160	220	220	260	75	165
Keri fine sand	10–20	220	250	250	295	80	175
Keri fine sand, thick surface phase	15–25	220	250	250	295	90	190
Lakeland fine sand, deep phase	15–25	100	140	110	165	60	90
Lakewood fine sand	25–40	.....	.....	.....	.....	.....	.....
Leon fine sand	15–25	200	220	220	260	75	165
Leon fine sand, heavy substratum phase	15–25	225	275	250	275	90	185
Leon fine sand, light colored surface phase	15–30	200	220	220	260	75	165
Manatee fine sandy loam	10–25	275	305	305	360	90	170
Manatee loamy fine sand	10–25	275	305	305	360	90	170
Manatee soils, overflow phases	10–25	.....	.....	.....	.....	.....	.....
Ona fine sand	10–20	225	275	275	325	90	140
Ona fine sand, light colored surface phase	10–20	200	250	250	300	85	138
Pamlico peaty muck	20–40	250	275	275	360	125	160
Parkwood fine sand	20–40	250	330	275	360	125	160
Parkwood fine sand, deep phase	20–40	250	330	275	360	125	160
Plummer fine sand	15–30	125	195	140	230	75	150
Pomello fine sand	20–30	100	150	110	175	50	80
Pompano fine sand	15–30	125	195	140	230	75	150
Pompano fine sand, shallow phase	15–30	150	240	160	250	75	150
Pompano-Adamsville fine sands	15–30	.....	.....	.....	.....	.....	.....
Pompano fine sand, shallow phase-Adamsville fine sand	15–30	.....	.....	.....	.....	.....	.....
Rutlege fine sand	10–25	250	330	275	360	160	200
Rutlege mucky fine sand	10–25	275	375	275	390	175	240
St. Lucie fine sand	25–50	.....	.....	.....	.....	.....	.....
Sandy alluvial land	10–25	.....	.....	.....	.....	.....	.....
Scranton fine sand	10–25	250	330	275	360	125	200
Sunniland fine sand	10–25	200	265	250	325	70	140
Sunniland fine sand, deep phase	10–25	.....	.....	.....	.....	.....	.....
Terra Ceia muck	20–40	250	275	275	360	125	160

[1] Number of acres required to carry one animal per year.

[2] Cow-acre-days is the number of days 1 acre will graze a cow without injury to the pasture.

The development of improved rangeland and high quality pastures for the increasing livestock production in the county can be beneficial to wildlife conservation. Well-planned water control of selected areas and other good management practices will improve the total wildlife habitat of the area. Other areas of wet land on which drainage is not economically feasible can be improved for wildlife by planned management. On the other hand, poorly planned drainage of wet land for cultivation, pasture, or other uses reduces wildlife and prevents full agricultural development of the area.

All of the poorly drained and very poorly drained soils normally produce more food and shelter for wildlife than the better drained soils. They are also watering grounds for birds and animals. Many of these soils —as Delray, Rutlege, Manatee, Felda, Pamlico, and Terra Ceia—have characteristics that make them productive of agricultural crops under intensive cultivation and proper water control. Others, as Charlotte, Pompano, and Plummer, are less productive, although

well suited to farming if water is controlled. The characteristics that make soils well suited to agriculture also make them good wildlife areas. Left in their natural state, these soils offer limited food and shelter for ducks, herons, cranes, and other waterfowl. They can be greatly improved as wildlife habitats by planting more abundant feed plants and by providing a degree of water control that keeps them from drying in dry seasons. Where these soils are surrounded by better drained soils in improved pasture, it is a good plan to keep them in their natural state for water storage and wildlife habitats.

The development of extensive areas of the better drained flatwoods soils—as Leon, Immokalee, Adamsville, and Keri—into improved rangeland is also beneficial to deer, turkey, and quail, if shelter areas are provided. Swamps and hammocks scattered throughout these areas should be left as a natural shelter. Quail thrive in areas developed for pasture or cultivation if a few simple provisions are made for them, such as the planting of partridgepeas, hairy indigo, or other desirable feeding plants. Scattered patches of ground cover, such as scrub oak, briers, and gallberry, should be provided as shelter for quail and other birds.

Genesis, Morphology, and Classification of Soils

Soil is produced by the action of soil-forming processes on materials deposited or accumulated by geologic agencies. The characteristics of the soil at any given point are determined by (1) the physical and mineralogical composition of the parent materials, (2) the climate under which the soil material has accumulated and existed since accumulation, (3) the plant and animal life on and in the soil, (4) the relief, or lay of the land, and (5) the length of time the forces of soil development have affected the soil material.

Factors of Soil Formation

Parent materials

Sarasota County occupies a position in the Coastal Lowlands forming a part of the Floridian section of the Coastal Plain province (*5*). During the Pleistocene epoch, most of Florida was covered by a succession of high seas that deposited the parent materials of most of the present soils. Locally, however, recent accumulations of organic matter have collected in depressions to give rise to the organic soils of the area.

Over the area now known as Sarasota County, the ocean formed four general levels or marine terraces during the Pleistocene epoch. The Pamlico terrace is the most recent. It extends from present sea level to an elevation of about 25 feet. Successive older, higher terraces are the Talbot, from 25 to 42 feet in elevation; the Penholoway, from 42 to 70 feet; and the Wicomico, from 70 to 100 feet (*3*). The mineral soil material of these terraces covers the harder rock, marl, or shell strata of older geologic origin. In places the covering on the terraces is only a few feet deep, but some deposits are several hundred feet deep. The present characteristics of many of the sandy soils were derived mainly from the original sedimentary materials but result partly from the aging of these materials under the influence of climate and plant cover.

According to a geological survey by Cooke (*3*), there are four distinct formations near the surface in Sarasota County. These have been designated the Hawthorn formation, the Bone Valley formation, the Caloosahatchee marl formation, and the late Pleistocene formation.

The Hawthorn formation consists chiefly of gray phosphatic sand, limestone, and lenses of green or gray fuller's earth. Known exposures of this formation in Sarasota County are confined to the western part. It is overlain by a thin bed of marine shell marl either of Pleistocene or Pliocene age.

In the northeastern part of the county, north of old Miakka, the Hawthorn formation is overlain unconformably by the Bone Valley formation. Natural exposures of this formation are rare and of slight extent. Matson (*8*) described the Bone Valley as "gray, brown, or mottled sand and phosphate conglomerate, in a sand matrix. The brown sands are locally cemented into a hard, ferruginous sandstone, and slight induration is common." He further reports, "The Bone Valley gravel consists of rounded pebbles of phosphate embedded in a matrix of sand or clay overlain by varying thicknesses of loose or semi-indurated sand. The maximum thickness of this formation is probably more than 50 feet, but only about one-third of this thickness should be assigned to the phosphate."

The Caloosahatchee marl formation consists predominantly of sands and shells. In many places a large part of the deposit is composed of shells, but in others shells are absent or scattered. Fresh, unweathered exposures of the formation are commonly white or light gray. Upon exposure they are subject to weathering and oxidizing and become yellow or cream colored (*3*). Only a few feet of the Caloosahatchee formation is exposed anywhere, because of the nearly level relief. In Sarasota County, the formation projects from the Myakka River eastward into De Soto County and south into Charlotte County.

The late Pleistocene deposits are marine and estuarine terraces less than 100 feet above sea level; included are the Wicomico, Penholoway, Talbot, and Pamlico formations. The principal component of the Wicomico formation is sand, which is commonly less than 50 feet thick. On the weathered surface, the exposure is generally drab in color; where less weathered, the formation has a yellowish or reddish tinge. The Penholoway formation consists chiefly of sand less than 20 feet thick. Little is known about the detailed composition of the Talbot formation. Presumably, it consists chiefly of fine sand, except in former estuaries, where clay or silt may prevail. The Pamlico is almost entirely sand, though it may include bodies of clay in places. The sand is chiefly quartz grains, and the layer is only 1 or 2 feet thick (*3*).

Soils covering the greater part of the county have developed chiefly from noncalcareous beds of sand overlying formations of limestone. The sand mantle varies in thickness. It is fairly thick over most areas, but in

some it is thin enough for the underlying limy strata to influence the properties of the soil. These thin areas occur in belts paralleling the Myakka River and in a strip of irregular width that extends in a northwest-southeast direction across the central part of the county.

The parent material from which the soils of Sarasota County developed consisted predominantly of materials removed from their original position to their present site, mainly by marine waters.

Climate

Climate produces major differences in soils, both directly and indirectly. Directly, climate affects the type of weathering and the alteration of plant material; the transfer, sorting, and accumulation of materials by water, wind, and gravity; and the percolation of water through the soil. Indirectly, climate plays an extremely important role in the complex interrelationships of biological and chemical activities, relief, and time (*12*).

Sarasota County has a humid, subtropical climate. Winters are short and mild, humidity is relatively high, and rainfall is abundant. These factors influence soil building. Chemical reactions are rapid because of high moisture and high temperatures. Rain has caused the leaching of soluble material from the soil and translocation of insoluble and colluvial materials to lower levels or layers. Many of the sandy soils are strongly acid; other soils have acid upper layers that are underlain by calcareous clayey material or marl.

There is no interruption to chemical action in winter, because the ground does not freeze. Since the depletion continues throughout the year, the soils are low in natural fertility.

Plant and animal life

Higher plants, micro-organisms, earthworms, and other forms of life that exist on and in the soil contribute to its morphology. Plant and animal life furnish organic matter for the soil and bring plant nutrients from lower layers to the surface. Micro-organisms are significant in soil development and affect growth of higher plants. One of their major functions is to change raw vegetable waste into soil organic matter. Dead leaves and stems from grasses and trees, and their decayed residue, accumulate on the surface and constantly replenish the supply of organic matter. The roots of plants make the soil more porous and also provide large quantities of vegetable matter (*12*).

Several types of vegetation in Sarasota County are influenced by soil characteristics. The most common and extensive cover is a pine forest having an abundant undergrowth of saw-palmetto, various grasses, and shrubs. Small islands of scrub oak on some of the higher, well-drained, droughty soils dot the area. On low hammocks, a dense heavy growth of cabbage-palm interspersed with water oak, live oak, and hardwoods is characteristic. Low, wet positions are dominated by a prairie type of cover composed of moisture-loving grasses, shrubs, and small aquatic plants.

Relief

Relief and runoff affect erosion, which in turn influences soil formation. Differences in relief may radically affect moisture and air conditions in the soil. The degree of soil development taking place within a given time, on a given parent material, and under the same type of vegetation seems to depend largely on the amount of water passing through the soil. Normal development of soils takes place on gentle slopes where drainage is good and runoff is not excessive. On steep slopes the development of soil may be slow because of rapid erosion, reduced percolation of water through the soil, and lack of water in the ground to stimulate the plants that aid soil formation (*12*).

In general, Sarasota County has a level or nearly level relief over wide expanses and few abrupt or marked differences in elevation. Changes from one level to another are very slight or gradual. Streams in the county have produced little dissection, and the adjoining slopes are short and of low gradient. Numerous shallow depressions that dot the terrain are nearly level. They are usually less than 3 feet below the general elevation of surrounding land. The lower elevations above sea level are along or near the gulf; the higher points are in the east and northeast.

Soils with nearly level relief have inadequate or poor drainage. Most of them are affected by a high water table or seasonal saturation. The level plains have a very poorly defined drainage system. Excess water flows slowly through broad sloughs or sluggish streams. Numerous intermittent ponds or depressions having no natural outlets are waterlogged or under water much of the time. The acreage of well-drained soils is small.

Time

Time is necessary for development of soils from parent material. The length of time required for the formation of a given kind of soil depends largely on other soil-building factors. Under favorable conditions of relief, drainage, climate, and other forces of soil genesis, soil material remaining in place for a sufficient time gradually takes on distinctive profile features that are nearly in equilibrium with the environment.

In Sarasota County, soils are mostly in a youthful stage, inasmuch as soil-forming processes have not acted on them long enough to create well-defined layers. Most of them lack development of the surface and subsoil layers; they are made up of layers of sand resting on beds of clayey materials, marl, or rock. These underlying layers are different from the overlying mantle in geologic origin and composition.

Classification of Soils

The highest category of soil classification is the order. There are three major divisions at this level: (1) zonal soils; (2) intrazonal soils; and (3) azonal soils (*11*). Zonal soils do not occur in Sarasota County.

The orders are subdivided into great soil groups. Five great soil groups occur in the county: Bog, Ground-Water Podzol, Humic Gley, Low-Humic Gley, and Regosol. These great soil groups are intrazonal and azonal soils in the Red-Yellow Podzolic region having a low, flat or nearly level topography. With the exception of some Regosols, the soils have either deficient or poor drainage. In general, the Humic Gley and Bog

TABLE 6.—*Soil series classified into higher categories and some factors that contributed to their morphology*

Great soil group and series	Parent material	Relief	Natural drainage
INTRAZONAL			
Bog:			
Pamlico	Remains of aquatic herbaceous plants accumulated over marine acid sands.	Flat, slight depressions	Very poor.
Terra Ceia	Remains of aquatic herbaceous plants deposited over sedimentary calcareous materials.	Flat, slight depressions	Very poor.
Ground-Water Podzol:			
Immokalee	Deep beds of marine acid sands	Nearly level to flat	Somewhat poor.
Leon	Deep beds of marine acid sands	Nearly level to flat	Somewhat poor.
Ona	Deep beds of marine acid sands	Nearly level to flat	Somewhat poor to poor.
Humic Gley:			
Delray	Moderately deep beds of marine sands over calcareous materials.	Level, slight depressions	Very poor.
Manatee	Thin beds of marine acid sands over clayey material that may contain marl.	Level, slight depressions	Very poor.
Rutlege	Moderately deep beds of marine acid sands	Level, slight depressions	Very poor.
Scranton	Deep beds of marine acid sands	Level to nearly level	Somewhat poor.
Low-Humic Gley:			
Bradenton	Thin beds of marine acid sands over clayey material interbedded with marl.	Flat to nearly level	Somewhat poor.
Broward	Thin beds of marine acid sands over limestone	Flat to nearly level	Somewhat poor.
Charlotte	Moderately deep beds of marine acid sands over alkaline material.	Level or slight depressions	Poor.
Felda	Thin beds of marine acid sands over alkaline clayey material.	Level or slight depressions	Poor.
Keri	Stratified beds of marine sands interbedded with a layer of marl.	Flat to nearly level	Somewhat poor.
Parkwood	Thin beds of marine sands over marl	Flat to nearly level	Somewhat poor to poor.
Plummer	Moderately deep beds of marine acid sands	Level, slight depressions	Poor.
Pompano	Moderately deep beds of marine acid sands over alkaline materials.	Level, slight depressions	Poor.
Sunniland	Thin beds of marine acid sands over clayey materials interbedded with marl.	Flat to nearly level	Somewhat poor.
AZONAL			
Regosol:			
Adamsville	Moderately deep beds of marine sands over alkaline material.	Level or nearly level	Somewhat poor.
Arzell	Moderately deep beds of marine sands	Nearly level, slight depressions	Poorly drained in wet seasons.
Blanton	Deep to moderately deep beds of marine acid sands	Level to gently undulating	Moderately well drained.
Lakeland	Deep beds of marine acid sands	Nearly level to undulating	Somewhat excessive.
Lakewood	Deep beds of marine acid sands	Nearly level to undulating	Somewhat excessive.
Pomello	Deep beds of marine acid sands	Flat to slightly sloping	Moderately well drained.
St. Lucie	Deep beds of marine acid sands	Nearly level to gently sloping	Excessive.

groups are dark and contain large quantities of organic matter, whereas the Low-Humic Gley and Ground-Water Podzol groups are lighter in color and contain much less organic matter. The Regosols have no well-developed profile characteristics, because their youth, the kind of parent material, or the degree of relief inhibits their development.

Each of the great soil groups includes several soil series. The members of any one series are soils that developed from similar parent material and have similar differentiating characteristics and arrangement of genetic horizons. The soils in one series differ from one another principally in texture of the surface layer and thickness of the layers.

The classification of the soil series in Sarasota County according to order and great soil group is shown in table 6.

Intrazonal soils

Intrazonal soils have more or less well-developed soil characteristics that reflect the dominating influence of some local factor of relief, parent material, or age over the normal effect of climate and vegetation. The intrazonal soils in the county are in the Bog, Ground-Water Podzol, Humic Gley, and Low-Humic Gley great soil groups.

BOG GROUP

Bog soils have a muck or peat surface soil underlain by peat; they have developed under a swamp or marsh type of vegetation, mostly in a humid or subhumid climate (*12*).

Terra Ceia muck and Pamlico peaty muck belong to this group. They are organic soils formed primarily from the remains of aquatic grasses, sedges, reeds, and other herbaceous plants. The depth of the organic materials ranges from about 10 to 45 inches or slightly more; the depth usually increases toward the central part of an area. These soils occupy flat, shallow depressions that are swampy much of the time. The organic matter occurs in thin stratified layers that are in different stages of decomposition. Some of the organic matter is thoroughly decayed and has changed into a smooth, colloidlike substance. Other plant remains form a felty, or fibrous, mass only partially decomposed. Small quantities of sand are mixed through this material. The vegetable matter is strongly acid. Terra Ceia muck is underlain by heavy-textured, calcareous mineral deposits or marl at shallow depths, whereas Pamlico peaty muck rests upon beds of acid sands.

Profile of Pamlico peaty muck and muck in NW¼ sec. 9, T. 38 S., R. 22 E.:

0 to 7 inches, brown, fibrous, felty, raw organic matter intermingled with partly decayed vegetable debris; strongly acid; numerous roots.
7 to 18 inches, black or very dark gray, smooth, thoroughly decomposed organic matter; contains thin laminations of brown, finely divided, partly decayed plant debris; strongly acid.
18 to 32 inches, very dark brown to very dark grayish-brown, felty, fibrous, partly decayed organic matter; contains smooth, mellow material in an advanced stage of decomposition; strongly acid.
32 to 48 inches, dark-gray (2.5Y 4/0), very friable fine sand, slightly compact in place; contains small streaks or veins of light-gray fine sand.

GROUND-WATER PODZOL GROUP

Ground-Water Podzols have developed from imperfectly drained sandy deposits in humid regions. They have a thin organic surface layer over a light-gray, sandy, leached layer that rests abruptly upon a black to dark grayish-brown B horizon. The B horizon is irregularly cemented with iron or organic compounds, or both (*12*). These soils formed under a coniferous forest.

Soils of the Leon, Immokalee, and Ona series are members of this great soil group. All developed from thick beds of unconsolidated acid marine sands. The relief is predominantly level or nearly level. All soils are somewhat poorly drained and have slow runoff and very slow internal drainage.

The soils of this great soil group have a conspicuous organic pan layer composed of mineral and organic material that differentiates them from other groups. This organic pan layer is more slowly permeable than overlying layers. For many months of the year, a water table remains near it. In the Leon soils, this well-defined horizon occurs at depths between 14 and 30 inches. In the Immokalee soil, it is at lower levels but is usually above 42 inches. Ona soils differ from Leon soils in having a fairly dark surface layer directly underlain by an incipient organic pan layer within 14 inches. Leon soils, on the other hand, have a light-gray or white sand layer intervening between the gray top layer and the pan. This layer is not present above the pan in Ona soils.

In this county the soils of the Leon series are of the fine sand type. A representative profile, as developed in SW¼ sec. 12, T. 37 S., R. 18 E., is as follows:

0 to 5 inches, very dark gray (2.5Y 3/0, moist), nearly loose fine sand; contains a small amount of light-gray fine sand; gradual, smooth boundary; layer contains many small and medium-sized roots; pH 5.1; salt-and-pepper coloration when dry.
5 to 9 inches, dark-gray (2.5Y 4/0, moist), loose fine sand with a moderate amount of light-gray fine sand that gives the material a salt-and-pepper appearance; the quantity of light-gray fine sand is greater than in the layer above; clear, irregular boundary; pH 5.1; moderate quantity of small and medium-sized roots.
9 to 14 inches, light-gray (2.5Y 7/0, moist), loose fine sand; short tongues of dark-gray fine sand project into the upper part of layer in places; a few medium-sized roots; clear, wavy boundary; pH 5.0.
14 to 22 inches, white (10YR 8/1, moist), loose fine sand; slightly compact in place; abrupt, wavy boundary; occasional medium-sized roots; pH 5.0.
22 to 24 inches, black (10YR 2/1, dry) fine sand strongly cemented by organic material; abrupt, smooth boundary; a few roots penetrate this layer; very slowly premeable; pH 4.8; massive.
24 to 26 inches, dark-brown to dark grayish-brown (10YR 4/3 to 4/2) fine sand; weakly cemented to very firm; interspersed with small lenses of partly decayed organic matter; abrupt, wavy boundary; an occasional root penetrates this material; pH 4.9.
26 to 38 inches, pale-yellow (5Y 8/3, moist) to light yellowish-brown (10YR 6/4), loose fine sand; a few, medium, faint to distinct, yellow and brown mottles; dark-brown to dark brownish-gray streaks along root channels; an occasional root in this layer; gradual, wavy boundary; pH 5.1.
38 to 60 inches, light-gray (2.5Y 7.2, wet) fine sand; slightly firm in place, loose when dry; a few, fine, faint, yellow and gray mottles in spots; pH 5.3.

HUMIC GLEY GROUP

Humic Gley soils are defined as a group of poorly to very poorly drained hydromorphic soils with dark-colored, organic-mineral horizons of moderate thickness underlain by mineral gley horizons. They occur naturally under either swamp forest or herbaceous marsh in humid and subhumid climates of greatly varying thermal efficiency. They range from medium acid to mildly alkaline in reaction (*11*).

In this group are Delray, Rutlege, Manatee, and Scranton soils. Each has thick, dark-colored upper layers underlain by light-colored material. The Delray, Rutlege, and Manatee soils have developed in shallow depressions of nearly level or level relief. They have very poor natural drainage and may be under several inches of water for a number of months each year. Most areas in this county have a wet, prairie type of vegetation. Locally, a growth of hardwood trees covers part or all of some areas.

Following is a profile of Delray fine sand in the NW¼ sec. 35, T. 37 S., R. 19 E.:

0 to 10 inches, black (2.5Y 2/0, moist) to very dark gray (2.5Y 3/0), very friable fine sand; contains a large amount of well-decomposed organic matter and numerous small roots; interspersed are thin seams and small amounts of light-gray fine sand that are conspicuous when the soil is dry; gradual, irregular boundary; acid.
10 to 32 inches, very dark gray to black (2.5Y 3/0 to 2/0, moist), very friable fine sand, slightly compact in place; moderate amount of organic matter; contains vertical small seams of dark-gray or gray fine sand along

fracture cracks or in old root channels; moderate number of medium and small roots; gradual, irregular boundary; acid.

32 to 40 inches, gray (2.5Y 5/0, moist), nearly loose fine sand; slightly compact in place; thin seams of dark-gray and light-gray fine sand extend from layer above; moderate number of fine roots; a few, medium, distinct, yellow and brown mottles have developed in sandy material occupying old root channels; clear, irregular boundary; slightly acid.

40 to 54 inches, light-gray (10YR 7/1, moist), very friable fine sand; moderately firm in place; narrow seams of white fine sand and occasional tongues of dark-gray or gray fine sand project from upper layers; small number of fine roots; slightly alkaline.

LOW-HUMIC GLEY GROUP

Low-Humic Gley soils are imperfectly to poorly drained. They have a very thin surface horizon that is moderately high in organic matter. It overlies mottled gray and brown, gleylike mineral horizons having a low degree of textural differentiation (*11*). On the basis of this definition, the Bradenton, Broward, Charlotte, Felda, Keri, Parkwood, Plummer, Pompano, and Sunniland soils can be classified in this great soil group in Sarasota County.

Charlotte, Plummer, and Pompano soils were derived from sandy marine sediments that have a depth greater than 42 inches. Shallow phases of the Plummer and Pompano soils are mapped where the sandy deposits are shallow and are underlain by clayey material at depths between 30 and 42 inches. Each of the soils in this great soil group is in shallow sloughs or slight saucerlike depressions and has level or nearly level relief. They all have poor drainage and during wet seasons may be flooded. Many areas have no natural outlets. A prairie type of vegetation predominates; it includes many kinds of grasses, sedges, and hydrophytic plants. Trees grow in some places.

The Keri, Broward, and Parkwood series form a related group of soils. They are somewhat similar, as they are all influenced by underlying marl or limestone formations.

Keri fine sand developed from moderately thin layers of sandy marine sediments. It is interbedded with marl at shallow depths. Its relief is nearly level to level. The soil is somewhat poorly drained; it has slow runoff and slow to moderate internal drainage. It is covered with a coniferous forest vegetation.

The Broward soil was derived from thin beds of marine sands laid down on limestone. The depth to limerock ranges from a few inches to about 36 inches. Relief is nearly level to level. Drainage is somewhat poor. Runoff is slow, and internal drainage is rapid. The surface layer, about 2 to 5 inches thick, has a salt-and-pepper coloration from a mixture of light-gray, dark-gray, and very dark gray fine sand. This layer is underlain by light-gray to white, loose fine sand that locally contains a few, medium, faint to distinct, yellow and brown mottles. Below is a very thin layer of gray or brown plastic clay loam or fine sandy clay loam splotched with yellow and light gray. This layer is residual material weathered from limestone. It may be lacking in places.

The Parkwood soils formed from thin beds of sand deposited over a thick stratum of marl. They differ from Keri soils, which have a thin layer of marly material between beds of sand. The Broward soil differs from the Parkwood soils in having a basal formation of limerock instead of marl. The Parkwood soils have somewhat poor to poor drainage. The upper layers of the Parkwood profile are less acid than the corresponding layers in Broward and Keri soils.

Bradenton and Sunniland soils developed from parent materials consisting of thin beds of sand overlying clayey materials that contain marl at various depths. Their sandy layers are somewhat similar in color, texture, consistence, and reaction. The texture of the underlying clayey material is also similar in these soils, but there are distinctive color differences. In the Bradenton soil, this underlying layer is a dark-gray to very dark gray, plastic fine sandy loam or fine sandy clay loam having light-gray, gray, and brown mottles. The corresponding layer in the Sunniland soil is lighter colored. It is a gray, plastic fine sandy clay loam with common, medium, distinct, light-gray and yellow mottles. Marly material usually occurs below this layer in many places. Both soils have somewhat poor drainage. Relief is level to nearly level.

Pompano fine sand is the most extensive of Low-Humic Gley soils developed under the environment of poor drainage. It has the following profile characteristics in an area in the NW¼ sec. 27, T. 37 S., R. 19 E.:

0 to 4 inches, dark-gray to very dark gray (10YR 4/1 to 3/1), nearly loose fine sand mixed with variable quantities of light-gray fine sand that locally produces a salt-and-pepper coloration; contains a moderate number of small roots; small content of organic matter; clear, wavy boundary; medium acid.

4 to 8 inches, gray (10YR 6/1), loose fine sand; a few small roots; clear, wavy boundary; medium acid.

8 to 28 inches, light-gray (10YR 7/1), loose fine sand with a few, small to medium, faint to distinct, yellow and brown stains; occasional small- to medium-sized roots; gradual, irregular boundary; slightly to medium acid.

28 to 40 inches, light-gray to white (10YR 7/1 to 8/1), nearly loose fine sand; slightly compact in place, when moist; clear wavy boundary; neutral.

40 to 58 inches, dark grayish-brown or gray (2.5Y 4/2 to 10YR 6/1), nearly loose fine sand; firm when dry.

Azonal soils

Azonal soils are without well-developed profile characteristics because of their youth or because parent material or relief have prevented development of definite soil-forming processes. The azonal soils in the county are in the Regosol great soil group.

REGOSOL GROUP

Regosols consist of deep unconsolidated mineral deposits in which few or no clearly expressed soil characteristics have developed. They are largely confined to recent sandy materials, and to loess and glacial drift of steeply sloping lands (*11*).

The Adamsville, Arzell, Blanton, Lakeland, Lakewood, Pomello, and St. Lucie soils are members of the Regosol great soil group.

The Adamsville soil formed from sandy sediments 30 inches or more thick over calcareous formations. This series occurs on nearly level or level relief and is somewhat poorly drained. A coniferous forest vegetation prevails.

The Adamsville soil has a dark-gray fine sand to depths of about 18 to 30 inches. Below this layer is brown or brownish-yellow fine sand containing light-gray and yellow mottles. The Adamsville is associated with Leon, Immokalee, Parkwood, and Sunniland soils. The lower part of the profile is characterized by a neutral or mildly alkaline reaction, which distinguishes the Adamsville from soils of the Leon and Immokalee series. Leon and Immokalee soils are strongly acid throughout and, in addition, have a well-developed pan layer not present in the Adamsville soil. Adamsville soil lacks the marl present in the subsoil of the Parkwood series and the heavy-textured or clayey material of the Sunniland series.

Blanton, Lakeland, Lakewood, and St. Lucie soils are a group of related soils derived from thick beds of acid sands. They occur on low ridges having a nearly level to gently sloping relief. They are well to excessively well drained, and all are strongly acid. The Blanton soil is not so well drained as the Lakeland, Lakewood, and St. Lucie soils. It has a very dark gray or dark-gray fine sand surface layer 4 to 6 inches thick. The subsurface is a light yellowish-brown to pale-brown fine sand that grades abruptly into gray or white fine sand. The Lakeland soil has a similar surface layer, but underlying layers are yellowish-brown to brownish-yellow fine sand. This soil is somewhat excessively drained. The St. Lucie is an excessively droughty soil and is light gray to white throughout. The Lakewood soil is at a stage of development intermediate between that of the St. Lucie and Lakeland soils. It has a light-gray to white topsoil over yellow layers of fine sand.

Arzell and Pomello soils were derived from thick beds of unconsolidated sands and are associated with Leon and Immokalee soils of the Ground-Water Podzol group and with the St. Lucie soil. Arzell soils are poorly drained, whereas the Pomello soil is somewhat excessively drained. In drainage and stage of development, the Pomello soil is intermediate between the St. Lucie and Immokalee soils. It resembles the St. Lucie soil in color but has better moisture relationships for plants and occurs in slightly lower positions. The Pomello soil is distinguished from Leon and Immokalee soils in that the characteristic organic hardpan, present in all, is at much lower depths, usually between 48 and 60 inches.

The profile of Arzell soils closely resembles that of the St. Lucie and Pomello series in color. Arzell soils, however, are separated from St. Lucie and Pomello on the basis of poor drainage. Arzell soils occur on nearly level or level relief in shallow depressions where they are subject to a seasonal saturation and may be flooded for several months during the year.

Following is a representative profile of Lakewood fine sand in the SE¼ sec. 10, T. 38 S., R. 18 E.:

0 to 2 inches, very dark gray (2.5Y 3/0), nearly loose fine sand; a moderate quantity of light-gray fine sand that causes a pepper-and-salt appearance; abrupt, wavy boundary; strongly acid.
2 to 10 inches, white (10YR 8/1), loose fine sand; moderate number of small roots; abrupt, wavy boundary; strongly acid.
10 to 18 inches, pale-yellow (2.5Y 8/4), loose fine sand with a few, fine, faint specks of white and yellow fine sand; moderate number of small- and medium-sized roots; diffuse, irregular boundary; strongly acid.
18 to 24 inches, yellow (10YR 8/6), loose fine sand interspersed with a few, slightly plastic medium-sized lumps of fine sand; moderate number of large and small roots; gradual, irregular boundary; strongly acid.
24 to 52 inches, pale-yellow (2.5Y 8/4), loose fine sand; a few small roots; gradual, irregular boundary; strongly acid.
52 inches +, pale-yellow (2.5Y 8/4), loose fine sand; common, medium, distinct, light-gray splotches; occasional small roots; strongly acid.

Soil Survey Methods and Definitions

The scientist who makes a soil survey examines soils in the field, classifies the soils according to the facts observed, and maps their boundaries on an aerial photograph or other map.

FIELD STUDY.—To determine the soil characteristics and qualities, the scientist bores or digs numerous holes and notes the arrangement and thickness of layers and many other physical factors that make the soil distinctive. Each boring shows several distinct layers, called soil *horizons,* which collectively make up the soil *profile.* Each layer is studied carefully to see how it differs from others in the profile and to learn the things about the soil that influence its capacity to support plant growth.

Color is usually related to the amount of organic matter. The darker the surface soil, as a rule, the more organic matter it contains. Streaks and spots of gray, yellow, and brown in the lower layers generally indicate poor drainage and poor aeration.

Texture, or the content of sand, silt, and clay in each layer, is determined by the way the soil feels when rubbed between the fingers. Samples are checked later by mechanical analyses in the laboratory. Texture determines how well the soil retains moisture, plant nutrients, and fertilizer, and whether it is easy or difficult to cultivate.

Structure, which is the way the individual soil particles are arranged in larger grains and the amount of pore (open) space between grains, indicates the ease or difficulty with which the soil is penetrated by plant roots and by water and air.

Consistence, or the tendency of the soil to crumble or to stick together, indicates whether it is difficult or easy to keep the soil open and porous under cultivation.

Other characteristics observed in the field study and considered in classifying the soil include the following: The nature of the underlying rocks or other parent material from which the soil has developed; the reaction, or how acid or alkaline the soil may be as measured by chemical tests; the depth of the soil over bedrock or to compact layers; the presence of gravel or stones that may interfere with cultivation; the steepness and pattern of the slopes; and the degree of erosion.

CLASSIFICATION.—On the basis of the characteristics observed by the survey team or determined by laboratory tests, soils are classified by phase, type, and series. The soil type is the basic classification unit. A soil type may consist of several phases. Types that resemble each other in most of their characteristics are grouped into soil series.

Soil type.—Soils similar in kind, thickness, and arrangement of soil layers are classified as one soil type.

Soil phase.—Because of differences other than those of kind, thickness, and arrangement of layers, some soil types are divided into two or more phases. Slope variations, frequency of rock outcrops, degree of erosion, depth of soil over the substratum, or natural drainage are examples of characteristics that suggest dividing a soil type into phases.

The soil phase (or the soil type if it has not been subdivided) is the unit shown on the soil map. It is the unit that has the narrowest range of characteristics. Use and management practices, therefore, can be specified more easily than for soil series or yet broader groups that contain more variation.

Soil series.—Two or more soil types that differ in surface texture but are otherwise similar in kind, thickness, and arrangement of soil layers, are normally designated as a soil series. In a given area, however, it frequently happens that a soil series is represented by only one soil type. Each series is named for a place near which the soil was first mapped. Thus, Bradenton, Ona, Manatee, and Immokalee are soil series names identified with places in southern Florida where they were first mapped.

Miscellaneous land types.—These land types are not classified into series but are identified by descriptive names such as Coastal beach, Made land, and Tidal marsh.

Soil complex.—Two or more soils intricately associated in small areas and mapped together are called a complex; for example, Pompano-Adamsville fine sands.

Engineering Properties of the Soils

Although soil surveys are made primarily for agricultural purposes, they can be used by engineers and others in planning roads, highways, dams, levees, canals, and ditches, or for other types of construction that require information about the soil.

Engineers of the Florida State Highway Department, the Bureau of Public Roads, United States Department of Commerce, and the Soil Conservation Service, United States Department of Agriculture, have collaborated with soil scientists of the Soil Conservation Service in writing this part of the soil survey report. The observations and knowledge of scientists and engineers familiar with the soils of Sarasota County were used, and field tests and laboratory analyses were made. Engineering tests on samples of 18 soil profiles were made in the laboratory of the Bureau of Public Roads.

The data in this section can be used as a preliminary guide in planning sites or locations, in eliminating tests of materials not suited to specific uses, and in locating soil materials suited to definite needs. It can help in improving location, design, and construction of low-hazard structures that normally are built on the basis of general experience in the area. *The data and tables will not take the place of sampling and testing soils to determine their in-place condition at the site of proposed engineering construction.*

In table 7, each mapping unit in Sarasota County is described briefly in terms familiar to the engineer. However, the component soils in the complex, Pompano-Adamsville fine sands, are described under the specific soils.

Table 8 gives classifications and estimates for some of the more important soil characteristics, as determined in the field and considering laboratory tests of similar soils and the experience of soil scientists making the survey. The estimated properties are based on the major soils described in the section, Descriptions of the Soils. This table also includes a classification of the soil materials according to the Unified system (*14*) and the American Association of State Highway Officials (A.A.S.H.O.) system (*1*). These classifications are based on interpretation of grain-size distribution obtained from field observations and from specific laboratory determinations on representative samples. (Test data from these samples are given in table 10).

Table 8 also records the permeability of the soils as estimated for undisturbed, in-place soil materials without compaction (moisture-density). The estimates are in terms of percolation rates through saturated, undisturbed core samples and are based on laboratory data for similar soils in adjacent areas.

Structure in this table refers to the physical arrangement of soil particles on noncompacted, in-place soils. The terminology is standard for agricultural soil classification.

The available moisture-holding capacity can be defined as the approximate amount of water a soil will hold against the pull of gravity under free drainage. It is approximately the amount of water required to wet an air-dried sample of the soil material to a depth of 1 foot without deeper percolation. These figures are not specific and are based on laboratory analyses of similar soils in many areas.

The reaction, or pH value, represents the relative concentration of hydrogen ion in the soil. A pH value of 7.0 means neutral in reaction. Values of pH less than 7.0 are acid, and values of more than 7.0 are alkaline. Extremes of acidity or alkalinity are important in their reaction on other structural materials and on the treatments that may be required to gain soil stability.

The shrink-swell potential is an indication of the volume change to be expected in a soil as its moisture content changes.

The suitability of the various layers of the profile for topsoil is also given in table 8.

Table 9 is based primarily on field experience with soil materials similar to those occurring in Sarasota County. For the highway engineer, it indicates some of the principal soil characteristics affecting the vertical alignment of highways. It also gives estimates of the suitability of the soil material for use in highway construction.

For the soil conservation engineer, table 9 indicates some of the major soil features that affect designs for dikes, drainageways, irrigation ditches, and excavated ponds.

Table 10 gives the results of laboratory tests performed by the Bureau of Public Roads.

TABLE 7.—*Characteristics of soils and land types in Sarasota County significant to engineering*

Map symbol	Soil	Slope	Natural drainage	Depth to seasonally high water table	Description of soil and site[1]
		Percent		*Feet*	
Aa	Adamsville fine sand	0–2	Somewhat poor	0–2	Deep beds of loose fine sand (SP; A–3); shallow phase is same material over unconsolidated clayey material (SM; A–2–4) at 30 to 42 inches; occur on broad, low interstream ridges.
Ab	Adamsville fine sand, shallow phase.	0–2	Somewhat poor	0–2	
Ac	Arzell fine sand	0–2	Poor	0–2	Deep beds of loose fine sand (SP; A–3) with almost no fine material or organic matter; shell phase has same material to depths of 36 inches, more or less, but is underlain by shelly material; occur in depressions and broad flat drainageways.
Ad	Arzell fine sand, shell phase	0–2	Poor	0–2	
Ba	Blanton fine sand, low phase	0–5	Moderately good to somewhat poor.	3–6	Deep beds of loose sand (SP; A–3); occurs as isolated, slightly elevated knolls of varying size.
Bb	Bradenton fine sand	0–5	Somewhat poor	0–5	Sand (SM; A–2–4) 12 to 30 inches thick over clayey and marly materials (SM; A–2–4); occupies low interridges.
Bc	Broward fine sand, shallow phase.	0–2	Somewhat poor	0–2	Thin beds of sand (SP; A–3) over residual limestone at depth of 18 inches, more or less; occurs generally on low interstream ridges.
Ca	Charlotte fine sand	0–2	Poor to very poor	Inundated	Deep beds of loose fine sand (SP; A–3); in some places there is clayey material (SM; A–2–4) or marl at 30 to 42 inches; occupies broad flat sloughs and depressions.
Cb	Coastal beach	0–2	Excessive	0–2	Wave deposits of white sand (SP; A–3) and shell fragments along beaches and bays of the gulf.
Cc	Coastal beach ridges	0–2	Good	0–2	
Da	Delray fine sand	0–2	Very poor	Inundated	Thick beds of fine sand, high in fine organic material (SM; A–2–4); underlying material (SP or SM; A–2 or A–3) is loose fine sand; shallow phase lies over plastic sandy clay (SC; A–2–4) at 30 to 42 inches; occupy low swampy areas.
Db	Delray fine sand, shallow phase.	0–2	Very poor	Inundated	
Dc	Delray mucky fine sand	0–2	Very poor	Inundated	
Dd	Delray mucky fine sand, shallow phase.	0–2	Very poor	Inundated	
Fa	Felda fine sand	0–2	Poor	Inundated	Loose fine sand (SP–SM; A–2–4 or A–3) 6 to 30 inches thick over heavier fine sandy loam (SC; A–2–4 or A–2–6); occupies broad flat sloughs and depressions.
Ia	Immokalee fine sand	0–2	Somewhat poor	0–2	Deep beds of loose fine sand (SP; A–3); organic pan contains small amount of fine organic particles at 30 to 42 inches below surface; occupies broad, low interstream ridges.
Ka	Keri fine sand	0–2	Somewhat poor	0–2	Deep beds of sand (SP A–3) at depths of 12 to 20 inches that contain a sandy marl layer (SM–SC; A–2–4) 6 inches thick, more or less; in places underlain by shelly limestone at depths of 42 to 60 inches; occupy low interstream ridges.
Kb	Keri fine sand, thick surface phase.	0–2	Somewhat poor	0–2	
La	Lakeland fine sand, deep phase.	0–5	Good to excessive	5+	Deep beds of loose dry sand (SP–SM; A–3); not affected by ground-water table; occurs on small isolated "islands" in elevated positions in the western part of the county.
Lb	Lakewood fine sand	0–5	Excessive	5+	Deep beds of loose, dry fine sand (SP; A–3); not affected by ground-water table; occurs on small isolated "islands" in elevated positions in the western part of the county.
Lc	Leon fine sand	0–2	Somewhat poor	0–2	Thick beds of sand (SP; A–3) containing a semihard organic layer (SP–SM; A–2–4) 3 to 6 inches thick at depths of 18 to 30 inches below surface; heavy substratum phase has clayey (SM; A–2–4) substratum at depths of 30 to 42 inches.
Le	Leon fine sand, heavy substratum phase.	0–2	Somewhat poor	0–2	
Ld	Leon fine sand, light colored surface phase.	0–2	Somewhat poor	0–2	

See footnote at end of table.

TABLE 7.—*Characteristics of soils and land types in Sarasota County significant to engineering*—Continued

Map symbol	Soil	Slope	Natural drainage	Depth to seasonally high water table	Description of soil and site[1]
		Percent		*Feet*	
Ma	Made land	0–2			Dredge sediment or dragline spoil; varies but is usually sandy and shelly; smoothed for urban or industrial development.
Mb	Manatee fine sandy loam	0–2	Poor	Inundated	Thin surface layer of loamy fine sand (SM; A–2–4) or fine sandy loam (SM; A–2–4); over sandy loam or sandy clay loam (SM; A–2–4) that is plastic when wet; occupy low marshy positions in depressions and sloughs; the overflow phases occur along major streams and are periodically subject to overflow by streams.
Mc	Manatee loamy fine sand	0–2	Poor to very poor	Inundated	
Md	Manatee soils, overflow phases.	0–2	Poor to very poor	Inundated	
Me	Mines, pits, and dumps				Excavations and refuse dumps.
Oa	Ona fine sand	0–2	Somewhat poor	0–2	Thick beds of loose fine sand (SP–SM; A–2–4 or A–3) with an 8- to 15-inch surface soil that contains considerable fine organic material; occupy low, flat interstream areas slightly higher than sloughs.
Ob	Ona fine sand, light colored surface phase.	0–2	Somewhat poor	0–2	
Pa	Pamlico peaty muck	0–1	Very poor	Inundated	Highly organic soil (Pt; A–5) 12 to 60 inches or more deep, derived from aquatic plants; the organic surface usually overlies loose fine sands (SP; A–3); occurs in depressions without good natural outlets.
Pb	Parkwood fine sand	0–2	Somewhat poor	0–2	Thin layers of fine sand (SP–SM; A–2–4) with high content of fine organic matter over marl (SM; A–2–4); occur as palm-covered fringes to sloughs and as isolated "islands" in wide, low glade areas.
Pc	Parkwood fine sand, deep phase.	0–2	Somewhat poor	0–2	
Pd	Plummer fine sand	0–2	Poor	0–2	Thick beds of fine sand (SP; A–3) occurring in depressions and wide drainageways; sandy loam or sandy clay loam (SM; A–2–4) occurs at 30 to 42 inches under the shallow phase; occupy broad sloughs, drainageways, and other depressions.
Pe	Plummer fine sand, shallow phase.	0–2	Poor	0–2	
Pf	Pomello fine sand	0–5	Moderate to somewhat excessive.	1–5	Thick beds of nearly white fine sand (SP; A–3) occupying slightly elevated positions on the interstream ridges; organic stained, semicemented layer below 30 inches.
Pg	Pompano fine sand	0–2	Poor	Inundated	Deep beds of fine sand (SP; A–3); shallow phase has same surface, 30 to 42 inches thick, overlying fine-textured stratum of sandy loam (SM; A–2–4); occur in depressions and along broad flat sloughs.
Ph	Pompano fine sand, shallow phase.	0–2	Poor	Inundated	
Pm	Pompano-Adamsville fine sands.	0–2	Poor to somewhat poor	Inundated	Complex of small, undifferentiated areas of Pompano and Adamsville soils.
Pk	Pompano fine sand, shallow phase-Adamsville fine sand.	0–2	Poor to somewhat poor	Inundated	
Ra	Rutlege fine sand	0–2	Very poor	Inundated	Surface soil is 10 to 30 inches of fine sand (SM; A–2–4) with high content of fine organic matter; underlain by thick layers of loose fine sand (SP; A–3); occupy depressions and other swampy areas.
Rb	Rutlege mucky fine sand	0–2	Very poor	Inundated	
Sc	St. Lucie fine sand	0–5	Excessive	5+	Thick beds of dry, loose, nearly white fine sand (SP; A–3); occupies small, low coastal ridges.
Sa	Sandy alluvial land	0–2	Variable	0–2	Stratified sand and clay materials deposited along streams; varies in texture, permeability, and organic matter.

TABLE 7.—*Characteristics of soils and land types in Sarasota County significant to engineering*—Continued

Map symbol	Soil	Slope	Natural drainage	Depth to seasonally high water table	Description of soil and site
		Percent		*Feet*	
Sb	Scranton fine sand	0–2	Somewhat poor	0–2	Thick beds of loose fine sand (SM; A–2–4); dark surface soil contains a considerable amount of fine organic matter; occupies low, flat interstream areas slightly higher than sloughs.
Sd	Sunniland fine sand	0–2	Somewhat poor	0–2	Fine sand (SP; A–3) 12 to 30 inches thick over plastic clayey material (SP; A–2–6); marly material (SC; A–2–6) frequently at depths between 30 and 60 inches; occur on broad, low interstream ridges.
Se	Sunniland fine sand, deep phase.	0–2	Somewhat poor to moderately good.	0–2	
Ta	Terra Ceia muck	0–1	Very poor	Inundated	Organic soils, 12 to 60 inches or more deep, derived from aquatic plants; the organic surface material (Pt; A–5) usually overlies marl or limestone; occurs in depressions without good natural outlets.
Tb	Tidal marsh	0–1	Very poor	Inundated	Sandy materials containing shell and organic material at or slightly above sea level; inundated at high tide; underlain by fine sands containing shell fragments
Tc	Tidal Swamp	0–1	Very poor	Inundated	

[1] Classifications in parentheses based on the Unified Soil Classification System (*14*) and The Classification of Soils and Soil-Aggregate Mixtures for Highway Construction Purposes, A.A.S.H.O. Designation: M 145-49 (*1*).

TABLE 8.—*Estimated physical and chemical properties*

Map symbol	Soil	Depth from ground surface of major horizons in typical profile	Classification		Permeability
			Unified	A.A.S.H.O.	
		Inches			*Inches per hour*
Aa, Ab	Adamsville fine sand	0–4	SP	A–3	10+
		4–36	SP	A–3	10+
Ac, Ad	Arzell fine sand	0–4	SP	A–3	10+
		4–42	SP	A–3	10+
Ba	Blanton fine sand, low phase	3–15	SP	A–3	10+
		15–42	SP	A–3	10+
Bb	Bradenton fine sand	0–9	SM	A–2–4	5–10
		9–20	SP	A–3	10+
		20–32	SM–SC	A–2–4	2.5–5
		32–60	SM–SC	A–2–4	0.8–2.5
Bc	Broward fine sand, shallow phase	0–4	SP	A–3	10+
		4–20	SP	A–3	10+
		20+			
Ca	Charlotte fine sand	0–3	SP	A–3	10+
		3–36+	SP	A–3	10+
Cb	Coastal beach	0–60+	SP	A–3	10+
Da	Delray fine sand	0–12	SM	A–4	0.8–2.5
		12–42+	SM–SC	A–2–4	0.5–10
Fa	Felda fine sand	0–4	SM	A–2–4	5–10
		4–15	SP–SM	A–3	10+
		15–42	SC	A–2–4	2.5–5
		42+	SC	A–6	2.5–5
Ia	Immokalee fine sand	0–4	SP	A–3	10+
		4–32	SP	A–3	10+
		32–38	SP	A–3	0.8–5
		38+	SP	A–3	5–10
Ka, Kb	Keri fine sand	0–24	SP	A–3	10+
		24–30	SM–SC	A–2–4	0.2–0.8
		30–42	SP	A–3	5–10
Lb	Lakewood fine sand	0–4	SP	A–3	10+
Lc, Ld, Le	Leon fine sand	0–4	SP	A–3	10+
		4–20	SP	A–3	10+
		20–26	SP–SM	A–2–4	2.5–5
		26–52+	SP	A–3	10+
Mb	Manatee fine sandy loam	0–12	SM	A–2–4	5–10
		12–40	SM	A–2–4	0.5–2.5
		40–52	SM–SC	A–2–4	0.05–0.2
Oa, Ob	Ona fine sand	0–9	SM	A–2–4	10+
		9–15	SP–SM	A–2–4	10+
		15–60+	SP–SM	A–3	5–10
Pa	Pamlico peaty muck	0–30	Pt	A–5	Wide variation locally
		30–42+	SP	A–3	Wide variation locally
Pb, Pc	Parkwood fine sand	0–12	SP–SM	A–2–4	2.5–.5
		12–23	SP–SM	A–2–4	2.5–.5
		23–42	SM	A–2	0.8
Pd, Pe	Plummer fine sand	0–4	SP	A–3	10+
		4–42	SP–SM	A–3	5–10
Pf	Pomello fine sand	0–36	SP	A–3	10+
		36–40	SP	A–3	10+
		40–60+	SP	A–3	10+
Pg	Pompano fine sand	0–32	SP	A–3	10+
		32–48	SC	A–2	2.5–5
		48–60+	SM	A–2	5–10
Ra	Rutlege fine sand	0–8	SM	A–2–4	5–10
		8–32	SM	A–2–4	5–10
		32–45	SP	A–3	5–10
Sc	St. Lucie fine sand	0–60+	SP	A–3	10+
Sb	Scranton fine sand	0–16	SM	A–2–4	10+
		16–42+	SP	A–3	10+
Sd, Se	Sunniland fine sand	0–9	SP	A–3	2.5–5
		9–24	SP	A–3	10+
		24–36	SC	A–2–6	5–10
		36–42	SC	A–2–6	5–10
Ta	Terra Ceia muck	0–30	Pt	A–5	Wide variation locally
		30–42	SM	A–2–4	5–10
Tb	Tidal marsh	0–60+	SP–SM	A–2–4	5–10
Tc	Tidal swamp	0–60+	SP–SM	A–2–4	5–10

[1] Rating indicates the degree of suitability for use on embankments, on cut slopes, and in ditches, to promote the growth of vegetation.

[2] Muck may be used to improve other topsoil materials.

of the soils (based on interpretations of soil survey data)

Structure	Available moisture-holding capacity	Reaction	Shrink-swell potential	Suitability for topsoil[1]
	Inches per foot	*pH*		
Single grain	0.7	5.5–6.5	Low	Fair.
Single grain	0.6	6.5–7.0	Low	Fair.
Single grain	0.4	6–7.5	Low	Poor.
Single grain	0.4	6–7.5	Low	Not suitable.
Single grain	0.65	5–5.5	Low	Fair.
Single grain	0.50	5–5.5	Low	Poor.
Crumb	0.9	5–6.5	Low	Good.
Single grain	0.7	6–6.5	Low	Fair.
Angular blocky	1.3	6–6.5	Moderate to high	Poor.
Angular blocky	1.0	8–8.5	Low to moderate	Poor.
Single grain	0.5	5.5–7	Low	Fair.
Single grain	0.5			Poor.
Rock				Not suitable.
Single grain	0.6	6.5–8	Low	Poor.
Single grain	0.5	7–8 5	Low	Poor.
Single grain			Low	Not suitable.
Crumb	1.5	5–7	Low	Good.
Single grain	0.8	5.5–7	Low	Fair.
Crumb	0.8	5.5–6.5	Low	Good.
Single grain	0.5	5.5–6.5	Low	Fair.
Angular blocky	1.2	6–7	Moderate to high	Not suitable.
Angular blocky	1.3	7–8.5	Low to moderate	Not suitable.
Single grain	0.5	4.5–5	Low	Fair.
Single grain	0.5	4.5–5	Low	Poor.
Massive	0.5	4.5–5	Low	Not suitable.
Single grain	0.5	4.5–5	Low	Not suitable.
Single grain	0.5	5.5–6.5	Low	Fair.
Massive	3.5	6–8.5	Low	Not suitable.
Single grain	0.5	6–8	Low	Poor.
Single grain	0.4	4.0–5	Low	Poor.
Single grain	0.5	4–5	Low	Fair.
Single grain	0.4	4–5	Low	Poor.
Massive	0.5	4–5	Low	Poor.
Single grain	0.4	4–5	Low	Poor.
Crumb	1.6	5.5–6.5	Moderate	Good.
Angular blocky	1.6	5.5–7	Moderately high	Fair.
Angular blocky	1.6	6–8.5	Moderately high	Poor.
Crumb	0.9	4.5–5.5	Low	Good.
Single grain	0.9	4.5–5.5	Low	Fair.
Single grain	0.5	4.5–5.5	Low	Poor.
Structureless	2.0+	4–5	High	Not suitable.[2]
Structureless	0.5	4–5	Low	Poor.
Single grain	0.8	5.5–7	Low	Good.
Single grain	0.7	5.5–8.5	Low	Fair.
Massive	1.2	7–8.5	Low	Not suitable.
Single grain	0.5	4–5.5	Low	Fair.
Single grain	0.4	4–5.5	Low	Poor.
Single grain	0.4	4.5–5.5	Low	Poor.
Massive	0.5	4.5–5.5	Low	Poor.
Single grain	0.4	4.5–5.5	Low	Poor.
Single grain	0.5	5.5–6.5	Low	Poor.
Angular blocky	1.2	6.5–7.5	Moderate	Poor.
Structureless		7–8.5	Low	Not suitable.
Single grain	0.7	4.5–5.5	Low	Good.
Single grain	0.6	4.5–5.5	Low	Fair.
Single grain	0.5	4.5–5.5	Low	Poor.
Single grain	0.3	4.5–6.0	Low	Poor.
Crumb	0.9	5–5.5	Low	Good.
Single grain	0.6	5–5.5	Low	Fair.
Single grain	0.7	4.5–5.5	Low	Fair.
Single grain	0.6	5–6	Low	Poor.
Angular blocky	1.2	6–7	Low	Not suitable.
Angular blocky	1.2	7–8.5	Low	Not suitable.
Structureless	2.0+	4.5–5.5	High	Not suitable.[2]
Structureless	0.5	7–8.5	Low	Poor.
Variable	Variable	Saline	Variable	Not suitable.
Variable	Variable	Saline	Variable	Not suitable.

TABLE 9.—*Estimated suitability of*

Soil	Features affecting vertical alignment of highways		Suitability of material for—		
	Materials	Drainage	Road subgrade[1]	Earthwork or grading when moisture content is—	
				Considerably higher than optimum[2]	Considerably lower than optimum[2]
Adamsville fine sand	Deep porous sand	High water table; rapid permeability.	Good	Fair	Good
Arzell fine sand	Deep porous sand	High water table; rapid permeability.	Good	Fair	Good
Blanton fine sand, low phase	Deep porous sand	Moderately deep water table; rapid permeability.	Good	Poor to fair	Good
Bradenton fine sand	Clayey subsoil; marl substratum.	High water table; restricted permeability.	Fair to poor	Fair	Good
Broward fine sand, shallow phase.	Porous sand surface; limerock near surface.	Limerock near surface; high water table.	Good	Good	Good
Charlotte fine sand	Deep porous sand	High water table; rapid permeability.	Good	Fair	Good
Coastal beach	Variable material	Near sea level	Good	Fair	Good
Delray fine sand	High content of organic matter in surface soil.	High water table; moderate permeability.	Fair	Poor	Fair
Felda fine sand	Shallow to clayey material	High water table; restricted permeability.	Fair	Poor	Fair
Immokalee fine sand	Deep porous sand	High water table; rapid permeability.	Good	Fair	Good
Keri fine sand	Marl stratum at shallow depth	High water table; restricted permeability in marl layer.	Fair	Fair	Good
Lakewood fine sand	Loose dry sand	Deep water table (knolls); rapid permeability.	Good	Good	Good
Leon fine sand	Deep porous sand; organic pan at shallow depth.	High water table; organic pan	Good	Fair	Good
Manatee fine sandy loam	High organic content in surface; light plastic clay subsoil.	High water table; low permeability.	Poor	Very poor	Fair
Ona fine sand	Deep porous sand	High water table; rapid permeability.	Good	Fair	Good
Pamlico peaty muck	Organic soil	High water table	Very poor[3]	Very poor[3]	Very poor[3]
Parkwood fine sand	Marl or limestone at shallow depths.	High water table; shallow to rock.	Good	Good	Good
Plummer fine sand	Deep porous sand	High water table; rapid permeability.	Good	Fair	Good
Pomello fine sand	Deep porous sand	Moderately high water table; rapid permeability.	Good	Good	Good
Pompano fine sand	Deep porous sand	High water table; rapid permeability.	Fair	Fair	Good
Rutlege fine sand	High content of organic matter in surface soil.	High water table; moderately high permeability.	Fair	Poor	Fair
St. Lucie fine sand	Deep porous sand	High dry ridges	Good	Good	Good
Scranton fine sand	Deep porous sand	High water table; rapid permeability.	Good	Fair	Good

See footnotes at end of table.

soil for roads and earth structures

Suitability of material for—	Features affecting—			
Embankment[1]	Dikes	Drainage	Irrigation	Excavated ponds
Good	Deep porous sand	High water table; rapid permeability.	Low available moisture-holding capacity; rapid permeability; level position.	Unstable in cuts; high water table.
Good	Deep porous sand	Low position; rapid permeability.	Very low available moisture-holding capacity.	Natural depressions subject to overflow.
Good	Deep porous sand	Relatively high position	Low available moisture-holding capacity; moderately deep to water table.	High position; unstable in cuts.
Good	Shallow to clayey substratum.	High water table; restricted permeability.	Moderately high available moisture-holding capacity; level position.	High water table; marl substrata.
Good	Limerock near surface	High water table; shallow to limestone.	Low available moisture-holding capacity; shallow to rock.	Shallow to rock.
Good	Deep porous sand	Low position; rapid permeability.	High water table; rapid permeability; level position.	Natural depressions; subject to overflow.
Good	Deep porous sand	Near sea level	Not suitable	Not suitable.
Good	Deep porous sand; high content of organic matter.	Low position; moderate permeability.	High available moisture-holding capacity; high water table; level position.	Natural depressions subject to overflow.
Good	Shallow to clayey subsoil	High water table; restricted permeability.	Clayey subsoil; restricted permeability; level position.	Clayey subsoil; natural depressions; subject to overflow.
Good	Deep porous sand	High water table; rapid permeability.	High water table; rapid permeability; level position.	Unstable in cuts; high water table.
Good	Marl near surface	High water table; shallow to marl.	Marl near surface	Shallow to marl.
Good			Low water table; low available moisture-holding capacity.	Not suitable.
Good	Deep porous sand; organic pan.	High water table; rapid permeability; organic pan.	Low available moisture-holding capacity; rapid permeability; level position.	Unstable in cuts; high water table.
Fair	Shallow to clayey subsoil; marl at shallow depth.	Low position; restricted permeability.	High available moisture-holding capacity; restricted permeability.	Natural depressions; plastic subsoil; marl substratum.
Good	Deep porous sand	High water table; rapid permeability.	Moderately high available moisture-holding capacity; rapid permeability; level position.	High water table; deep sandy soil.
Very poor[3]	Subsidence through oxidation.	Low position	High available moisture-holding capacity, deep peaty surface.	Natural depressions; deep organic soil; subject to overflow.
Good	Marl substratum	High water table; low permeability.	Marl substratum	Marl substratum.
Good	Deep porous sand	Low position; rapid permeability.	Low available moisture-holding capacity; level position.	Unstable in cuts; natural depressions; subject to overflow.
Good	Deep porous sand	Moderately high position; rapid permeability.	Very low available moisture-holding capacity.	Not suitable.
Good	Deep porous sand	Low position; rapid permeability.	Low available moisture-holding capacity; rapid permeability.	Unstable slopes; natural depressions; subject to overflow.
Good	Deep porous sand; high content of organic matter in surface soil.	Low position; moderately high permeability.	High available moisture-holding capacity; high water table.	Often in natural depressions subject to overflow.
Good			Very low available moisture-holding capacity.	Not suitable.
Good	Deep porous sand; moderate content of organic matter.	High water table; high permeability.	Moderately high available moisture-holding capacity; high water table.	High water table; deep sandy soil.

TABLE 9.—*Estimated suitability of*

Soil	Features affecting vertical alignment of highways		Suitability of material for—		
	Materials	Drainage	Road subgrade[1]	Earthwork or grading when moisture content is—	
				Considerably higher than optimum[2]	Considerably lower than optimum[2]
Sunniland fine sand	Porous sand surface; shallow to clayey subsoil.	High water table; shallow to clayey or marly material.	Fair	Poor	Good
Terra Ceia muck	Organic soil	High water table	Very poor[3]	Very poor[3]	Very poor[3]
Tidal marsh					
Tidal swamp					

[1] Rating is for soil materials at approximately the optimum moisture content for proper compaction, with provision for proper surface drainage and subdrainage.

[2] This item does not apply to earthwork for which the moisture content must be controlled for proper compaction.

[3] Muck and organic materials are normally excavated and wasted or used as topdressing on slopes to promote the growth of vegetation. Excavation may be impractical when water table is high, but organic materials may be excavated in any moisture condition.

soil for roads and earth structures—Continued

Suitability of material for—	Features affecting—			
Embankment[1]	Dikes	Drainage	Irrigation	Excavated ponds
Good	Porous sand surface; shallow to clayey subsoil.	High water table; moderately high permeability.	Good available moisture-holding capacity; high water table.	Clay and marl substrata; high water table.
Very poor[3]	Subsidence through oxidation.	Low position	High available moisture-holding capacity; deep peaty surface; high water table.	Natural depressions; deep organic soil; subject to overflow.
	Variable sand, shell, and muck.	Low position	Not suitable	Not suitable.
	Variable sand, shell, and muck.	Low position	Not suitable	Not suitable.

TABLE 10.—*Engineering test*

Soil name and location	Parent material	Bureau of Public Roads report number	Depth	Horizon or layer	Moisture-density	
					Maximum dry density	Optimum moisture
			Inches		*Lb. per cu. ft.*	*Percent*
Bradenton fine sand:						
SW¼ sec. 25, T. 36 S., R. 19 E.	Thin beds of sand over clayey material and marl.	89114	0–9	1	102	14
		89115	9–20	3	106	14
		89116	24–32	5	115	13
		89117	36–60	7	119	12
Bradenton fine sand (variation):						
NE¼ sec. 1, T. 37 S., R. 20 E.	Thin beds of sand over clayey material and marl.	89118	18–40	3	115	13
		89119	44–50	4	113	15
		89120	50–65	5	114	14
Broward fine sand, shallow phase:						
NW¼ sec. 30, T. 40 S., R. 20 E.	Sand over limestone	89129	0–4	1	104	14
		89130	4–12	2	106	13
		89131	12–20	3	112	11
Delray fine sand:						
NE¼ sec. 27, T. 37 S., R. 19 E.	Thick beds of fine sand	89152	0–12	1		
		89153	12–38	2	118	11
		89154	38–52	3	116	12
Delray fine sand, shallow phase:						
SE¼ sec. 30, T. 36 S., R. 19 E.	Thick beds of fine sand	89148	0–15	1	112	11
		89149	15–25	2	113	12
		89150	25–34	3	116	11
		89151	34–50	4	121	13
Felda fine sand:						
SW¼ sec. 13, T. 37 S., R. 19 E.	Thin beds of fine sand over clayey materials containing some marl.	89141	0–4	1	114	14
		89142	4–15	2	108	12
		89143	15–26	3	118	12
		89144	26–42	4	120	12
		89145	42–56	5	114	15
Felda fine sand (variation):						
SE¼ sec. 4, T. 38 S., R. 19 E.	Interbedded layers of clay and sand over sand beds.	89146	18–40	3	116	14
		89147	40–55	4	113	12
Keri fine sand:						
SW¼ sec. 24, T. 40 S., R. 19 E.	Stratified beds of marine sand and marl.	89126	7–15	3	105	14
		89127	15–22	4	111	11
		89128	22–31	5	104	19
Lakewood fine sand:						
NE¼ sec. 12, T. 39 S., R. 18 E.	Thick beds of loose acid sand	89123	1–12	2	101	15
		89124	18–25	4	105	14
		89125	50–65	6	105	14
Leon fine sand:						
SW¼ sec. 12, T. 37 S., R. 18 E.	Thick beds of acid unconsolidated sand.	89110	9–20	3	104	14
		89111	20–22	4	101	16
		89112	22–26	5	106	13
		89113	26–52	6	109	10
Manatee fine sandy clay (an inclusion in Manatee fine sandy loam on the soil map):						
NE¼ sec. 23, T. 36 S., R. 18 E.	Clay sediments over marly clay material.	89097	0–9	1	103	19
		89098	20–35	3	118	13
		89099	35–49	4	124	11
Manatee fine sandy loam:						
NW¼ sec. 11, T. 36 S., R. 18 E.	Sand over clay material underlain by marl.	89133	0–12	1	100	19
		89134	12–25	2	117	13
		89135	25–40	3	117	13
		89136	40–54	4	119	12
Ona fine sand:						
NW¼ sec. 2, T. 37 S., R. 18 E.	Marine-deposited sand	89104	0–9	1	107	13
		89105	9–15	2	103	16
		89106	15–22	3	108	11
		89107	22–34	4	112	10
		89108	34–56	5	113	10

See footnotes at end of table.

data[1] for soil samples

Mechanical analyses[2]								Liquid limit[3]	Plasticity index[3]	Classification	
Percentage passing sieve				Percentage smaller than—							
No. 10 (2.0 mm.)	No. 40 (0.42 mm.)	No. 60 (0.25 mm.)	No. 200 (0.074 mm.)	0.05 mm.	0.02 mm.	0.005 mm.	0.002 mm.			A.A.S.H.O.[4]	Unified[5]
100	94	71	16	10	4	3	2	NP	NP	A–2–4 (0)	SM
100	95	74	8	7	4	2	1	NP	NP	A–3 (0)	SP–SM
100	96	77	24	20	18	18	16	26	10	A–2–4 (0)	SC
100	92	74	22	18	13	12	11	20	4	A–2–4 (0)	SM–SC
100	98	89	24	19	14	13	12	24	4	A–2–4 (0)	SM–SC
100	93	85	35	29	24	21	16	24	7	A–2–4 (0)	SM–SC
100	97	89	24	17	11	10	9	20	2	A–2–4 (0)	SM
100	94	74	7	7	5	3	2	NP	NP	A–3 (0)	SP–SM
100	91	71	4	4	3	2	1	NP	NP	A–3 (0)	SP
100	89	70	4	4	3	3	3	NP	NP	A–3 (0)	SP
100	92	80	38	32	17	8	5	NP	NP	A–4 (1)	SM
100	96	81	18	15	11	10	9	NP	NP	A–2–4 (0)	SM
100	96	85	15	13	10	10	9	NP	NP	A–2–4 (0)	SM
100	89	56	10	8	6	4	4	NP	NP	A–3 (0)	SP–SM
100	90	60	8	8	7	5	3	NP	NP	A–3 (0)	SP–SM
100	89	61	10	9	8	7	6	NP	NP	A–3 (0)	SP–SM
100	91	65	19	17	15	14	12	23	8	A–2–4 (0)	SC
100	95	78	20	16	10	9	7	NP	NP	A–2–4 (0)	SM
100	93	72	8	7	5	3	2	NP	NP	A–3 (0)	SP–SM
100	95	80	23	21	20	15	13	25	10	A–2–4 (0)	SC
100	95	80	24	21	15	15	13	24	8	A–2–4 (0)	SC
100	96	85	41	40	34	32	30	38	22	A–6 (4)	SC
100	97	83	16	15	12	12	11	20	5	A–2–4 (0)	SM–SC
100	97	80	11	10	9	9	8	NP	NP	A–2–4 (0)	SP–SM
100	93	72	4	4	3	2	2	NP	NP	A–3 (0)	SP
100	91	71	5	4	3	2	2	NP	NP	A–3 (0)	SP–SM
100	93	79	32	32	29	23	19	28	8	A–2–4 (0)	SC
100	97	77	2	2	2	2	2	NP	NP	A–3 (0)	SP
100	96	75	3	3	3	2	2	NP	NP	A–3 (0)	SP
100	96	78	2	2	2	1	1	NP	NP	A–3 (0)	SP
100	96	76	5	5	5	3	1	NP	NP	A–3 (0)	SP–SM
100	96	75	12	9	6	6	5	NP	NP	A–2–4 (0)	SP–SM
100	97	76	9	8	6	4	3	NP	NP	A–3 (0)	SP–SM
100	97	78	6	5	4	3	2	NP	NP	A–3 (0)	SP–SM
100	91	68	28	27	22	19	16	30	7	A–2–4 (0)	SM–SC
100	91	68	24	22	20	19	17	28	13	A–2–6 (0)	SC
100	92	73	37	34	30	28	22	26	14	A–6 (1)	SC
100	88	65	22	16	11	9	7	NP	NP	A–2–4 (0)	SM
100	88	65	18	17	14	12	9	NP	NP	A–2–4 (0)	SM
100	88	64	18	17	15	13	11	NP	NP	A–2–4 (0)	SM
100	89	67	17	15	13	12	11	20	5	A–2–4 (0)	SM–SC
100	89	59	14	11	7	6	4	NP	NP	A–2–4 (0)	SM
100	93	68	11	9	7	6	4	NP	NP	A–2–4 (0)	SP–SM
100	93	68	9	7	6	5	4	NP	NP	A–3 (0)	SP–SM
100	93	71	7	6	5	4	3	NP	NP	A–3 (0)	SP–SM
100	93	69	7	6	5	5	4	NP	NP	A–3 (0)	SP–SM

TABLE 10.—*Engineering test*

Soil name and location	Parent material	Bureau of Public Roads report number	Depth	Horizon or layer	Moisture-density	
					Maximum dry density	Optimum moisture
Ona fine sand (variation):						
NW¼ sec. 2, T. 37 S., R. 18 E.	Marine-deposited sand	89109	0–9	1	102	15
Plummer fine sand:						
NE¼ sec. 17, T. 37 S., R. 19 E.	Marine-deposited sand	89102	4–38	2	106	12
		89103	38–52	3	114	10
Pompano fine sand, shallow phase:						
SW¼ sec. 10, T. 38 S., R. 19 E.	Fine sand over clayey materials.	89137	4–16	2	110	12
		89138	16–32	3	110	11
		89139	32–48	4	119	13
		89140	48–62	5	117	12
Rutlege fine sand:						
NE¼ sec. 29, T. 40 S., R. 19 E.	Unconsolidated fine sand	89100	6–32	2	107	13
		89101	32–45	3	106	13
Sunniland fine sand:[6]						
SE¼ sec. 14, T. 37 S., R. 18 E.	Marine-deposited sand over clayey materials containing marl.	89121	21–37	3	118	13
		89122	37–46	4	124	12

[1] Tests performed by Bureau of Public Roads according to standard procedures of the American Association of State Highway Officials (A.A.S.H.O.) (*1*).

[2] According to the American Association of State Highway Officials Designation T 88-54 (*1*). Results by this procedure frequently may differ somewhat from results that would have been obtained by the soil survey procedure of the Soil Conservation Service (SCS). In the A.A.S.H.O. procedure, the fine material is analyzed by the hydrometer method and the various grain-size fractions are calculated on the basis of all the material, including that coarser than 2 mm. in diameter. In the SCS soils survey procedure, the fine material is analyzed by the pipette method and the material coarser than 2 mm. in diameter is excluded from calculations of grain-size fractions. The mechanical analyses used in this table are not suitable for use in naming texture classes for soils.

[3] NP=Nonplastic.

[4] Based on Standard Specifications for Highway Materials and Methods of Sampling and Testing (Pt. 1, Ed. 7) (*1*).

[5] Based on the Unified Soil Classification System, Tech. Memo. No. 3-357, v. 1, Waterways Experiment Station, 1953 (*14*).

[6] Sunniland fine sand, 100 percent of sample No. 89122 passed a 1-in. sieve; 98 percent a ¾-in. sieve; 89 percent a ⅜-in. sieve; and 83 percent passed a No. 4 sieve (4.7 mm.).

data[1] for soil samples—Continued

Mechanical analysis[2]								Liquid limit[3]	Plasticity index[3]	Classification	
Percentage passing sieve				Percentage smaller than—						A.A.S.H.O.:	Unified:
No. 10 (2.0 mm.)	No. 40 (0.42 mm.)	No. 60 (0.25 mm.)	No. 200 (0.074 mm.)	0.05 mm.	0.02 mm.	0.005 mm.	0.002 mm.				
100	94	67	9	7	5	2	2	NP	NP	A–3 (0)	SP–SM
100	95	72	5	4	4	2	1	NP	NP	A–3 (0)	SP–SM
100	96	75	11	10	8	6	5	NP	NP	A–2–4 (0)	SP–SM
100	96	77	8	7	6	4	4	NP	NP	A–3 (0)	SP–SM
100	96	77	8	7	6	6	4	NP	NP	A–3 (0)	SP–SM
100	97	82	22	21	19	19	19	24	8	A–2–4 (0)	SC
100	88	71	14	13	11	9	7	NP	NP	A–2–4 (0)	SM
100	93	75	11	11	9	5	4	NP	NP	A–2–4 (0)	SP–SM
100	92	75	3	3	3	2	1	NP	NP	A–3 (0)	SP
100	93	78	26	22	18	18	16	29	14	A–2–6 (0)	SC
79	69	58	24	21	16	15	13	28	14	A–2–6 (0)	SC

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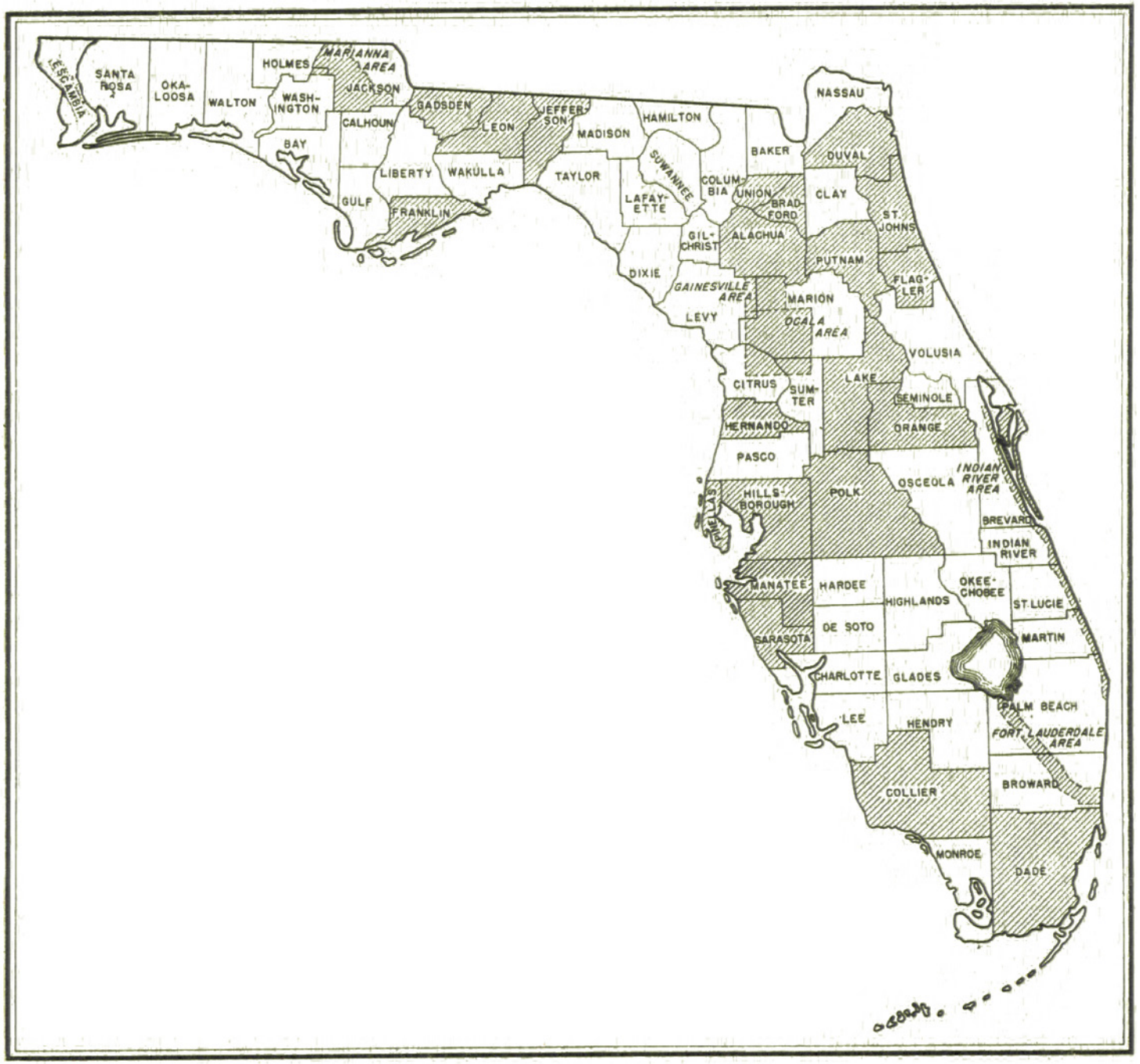

Areas surveyed in Florida shown by shading.

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