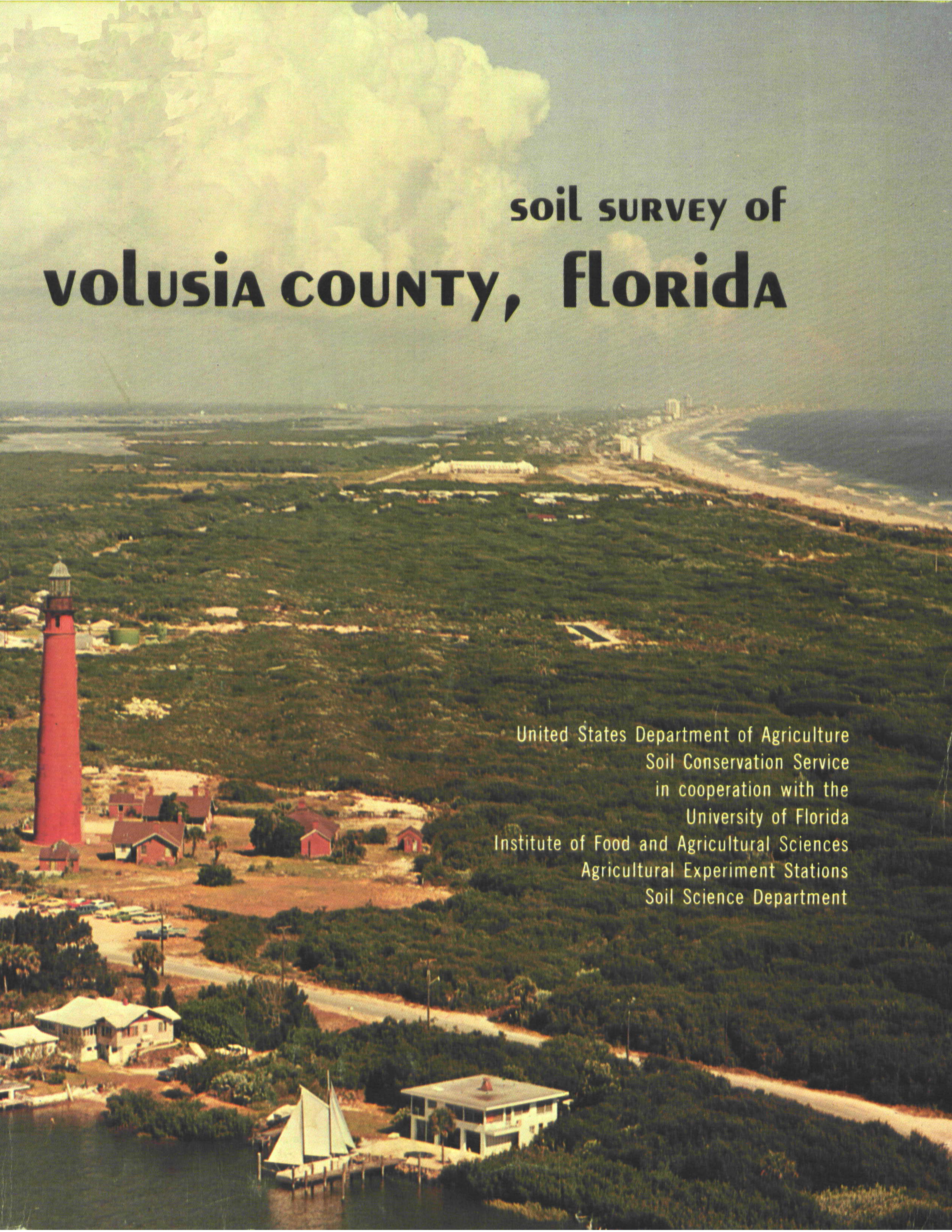
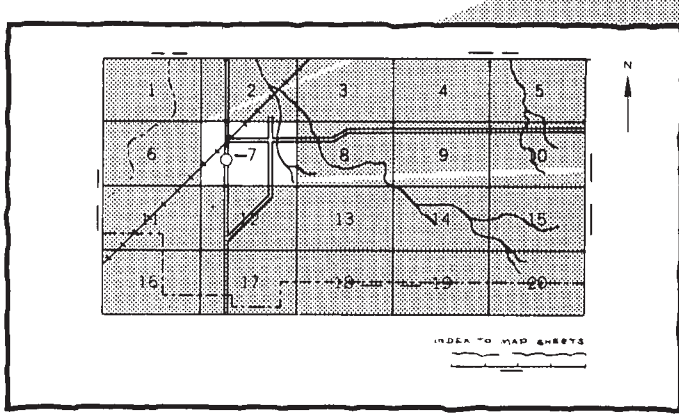


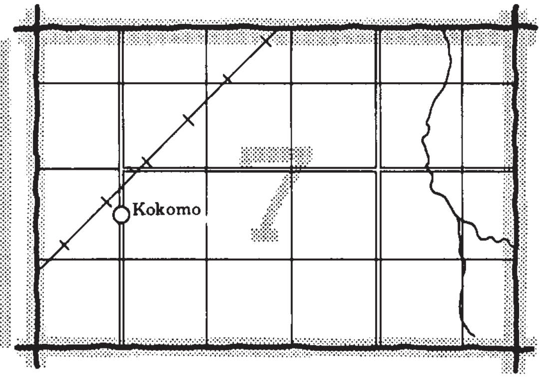
soil survey of volusia county, florida

United States Department of Agriculture
Soil Conservation Service
in cooperation with the
University of Florida
Institute of Food and Agricultural Sciences
Agricultural Experiment Stations
Soil Science Department

HOW TO USE

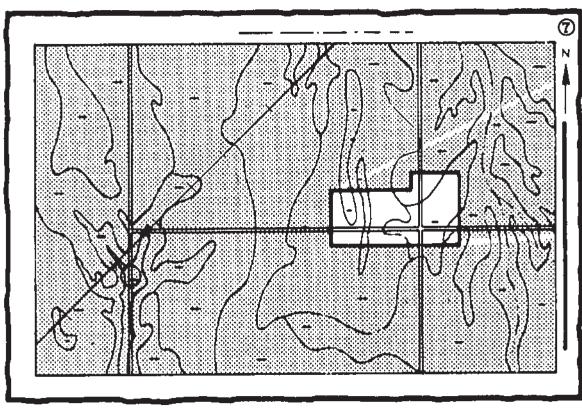
1. Locate your area of interest on the "Index to Map Sheets" (the last page of this publication).

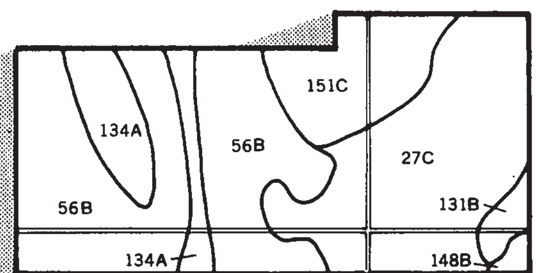




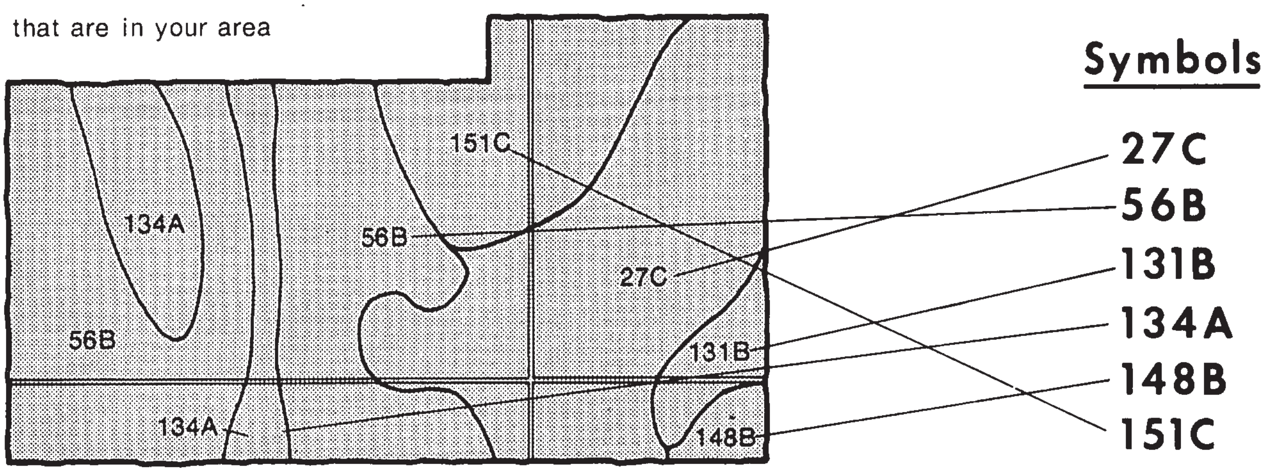
2. Note the number of the map sheet and turn to that sheet.

3. Locate your area of interest on the map sheet.



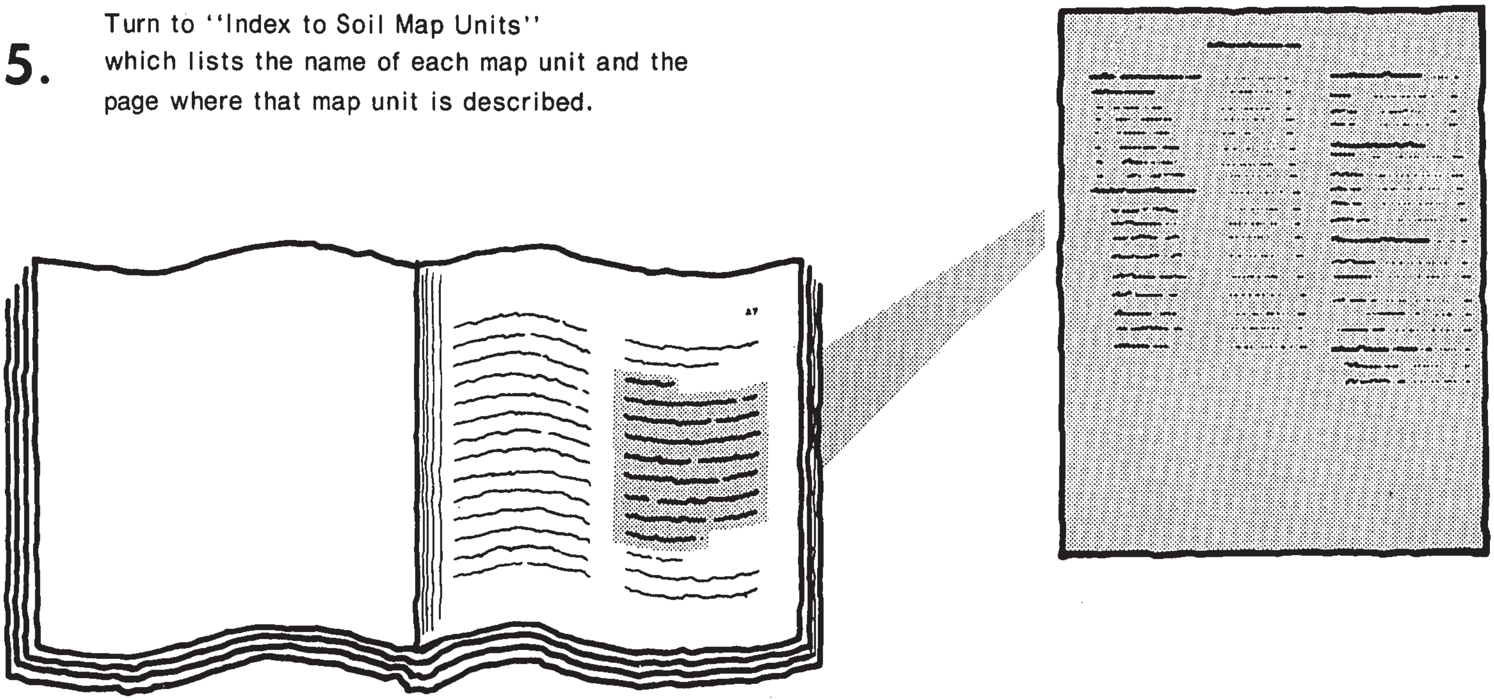


4. List the map unit symbols that are in your area

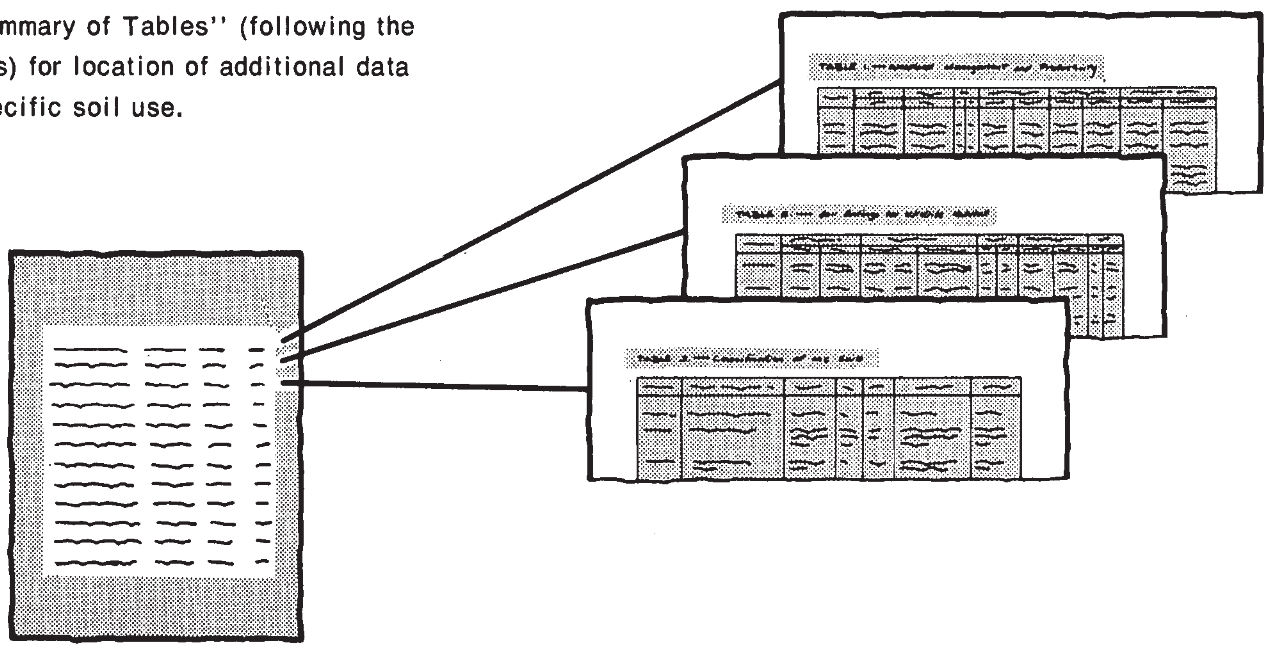


THIS SOIL SURVEY

5. Turn to "Index to Soil Map Units" which lists the name of each map unit and the page where that map unit is described.



6. See "Summary of Tables" (following the Contents) for location of additional data on a specific soil use.



7. Consult "Contents" for parts of the publication that will meet your specific needs. This survey contains useful information for farmers or ranchers, foresters or agronomists; for planners, community decision makers, engineers, developers, builders, or homebuyers; for conservationists, recreationists, teachers, or students; for specialists in wildlife management, waste disposal, or pollution control.

This is a publication of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and agencies of the States, usually the Agricultural Experiment Stations. In some surveys, other Federal and local agencies also contribute. The Soil Conservation Service has leadership for the Federal part of the National Cooperative Soil Survey. In line with Department of Agriculture policies, benefits of this program are available to all, regardless of race, color, national origin, sex, religion, marital status, or age.

Major fieldwork for this soil survey was completed in the period 1969-1977. Soil names and descriptions were approved in 1977. Unless otherwise indicated, statements in the publication refer to conditions in the survey area in 1977. This survey was made cooperatively by the Soil Conservation Service and the University of Florida Institute of Food and Agricultural Sciences, Agricultural Experiment Stations, and Soil Science Department and was financed in part by the Volusia County Board of Commissioners. It is part of the technical assistance furnished to the Volusia County Soil and Water Conservation District.

Soil maps in this survey may be copied without permission, but any enlargement of these maps can cause misunderstanding of the detail of mapping and result in erroneous interpretations. Enlarged maps do not show small areas of contrasting soils that could have been shown at a larger mapping scale.

Cover: The Palm Beach-Paola-Canaveral map unit between the Ponce Inlet Lighthouse and Daytona Beach. Photo courtesy of James Fenner Doane, Jr., Aerial Photography Services, Dunwoody, Georgia.

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Issued February 1980

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Foreword

The Soil Survey of Volusia County, Florida contains much information useful in any land-planning program. Of prime importance are the predictions of soil behavior for selected land uses. Also highlighted are limitations or hazards to land uses that are inherent in the soil, improvements needed to overcome these limitations, and the impact that selected land uses will have on the environment.

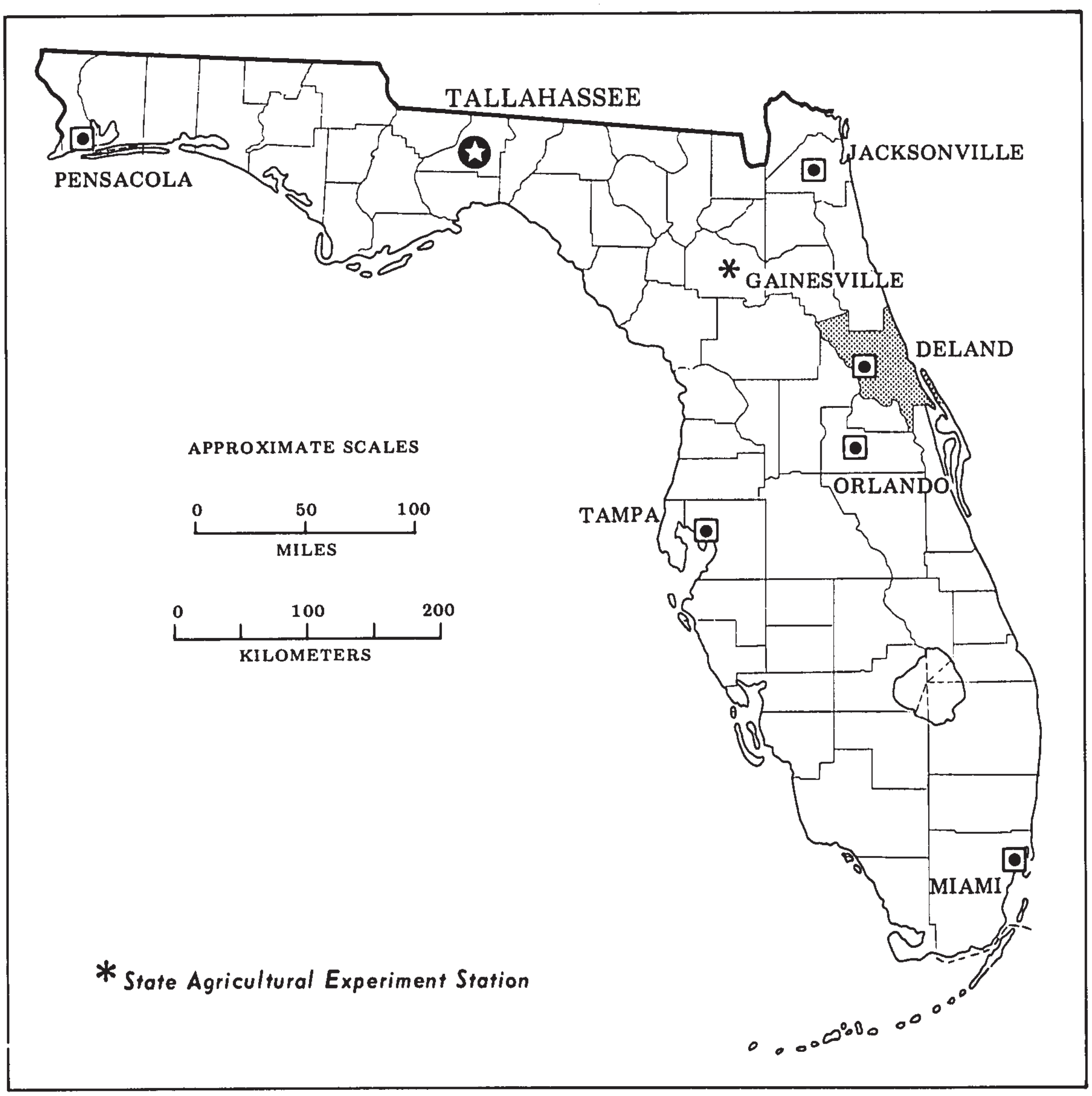
This soil survey has been prepared for many different users. Farmers, ranchers, foresters, and agronomists can use it to determine the potential of the soil and the management practices required for food and fiber production. Planners, community officials, engineers, developers, builders, and homebuyers can use it to plan land use, select sites for construction, develop soil resources, or identify any special practices that may be needed to insure proper performance. Conservationists, teachers, students, and specialists in recreation, wildlife management, waste disposal, and pollution control can use the soil survey to help them understand, protect, and enhance the environment.

Great differences in soil properties can occur even within short distances. Soils may be seasonally wet or subject to flooding. They may be shallow to bedrock. They may be too unstable to be used as a foundation for buildings or roads. Very clayey or wet soils are poorly suited to septic tank absorption fields. A high water table makes a soil poorly suited to basements or underground installations.

These and many other soil properties that affect land use are described in this soil survey. Broad areas of soils are shown on the general soil map; the location of each kind of soil is shown on detailed soil maps. Each kind of soil in the survey area is described, and much information is given about each soil for specific uses. Additional information or assistance in using this publication can be obtained from the local office of the Soil Conservation Service or the Cooperative Extension Service.

This soil survey can be useful in the conservation, development, and productive use of soil, water, and other resources.

William E. Austin
State Conservationist
Soil Conservation Service



Location of Volusia County in Florida.

soil survey of volusia county, florida

United States Department of Agriculture
Soil Conservation Service
in cooperation with

University of Florida Institute of Food and Agricultural Sciences
Agricultural Experiment Stations and Soil Science Department

By Robert Baldwin, Chester L. Bush,
Robert B. Hinton, Horace F. Huckle, Paul Nichols,
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Others participating in the field survey were
Frank L. Nelson and Everett C. A. Stuart, Soil Conservation Service

VOLUSIA COUNTY is about one-fourth the distance down the Florida peninsula from the Florida-Georgia State line. It is bounded on the north by Flagler and Putnam Counties, on the west by Marion and Lake Counties, on the south by Seminole, Orange, and Brevard Counties, and on the east by the Atlantic Ocean. The St. Johns River and several large lakes, such as Lake George, Lake Woodruff, Lake Monroe, Lake Harney, and Puzzle Lake, separate Volusia County from Marion, Lake, Seminole, and Orange Counties. The land area within Volusia County is 713,600 acres, or 1,115 square miles. DeLand, the county seat, is in the west-central part of the county. The largest city, Daytona Beach, is in the east-central part of the county near the ocean. Approximate distances by air from Daytona Beach to principal cities in the State are shown on the map on the facing page.

Most of the population is in several communities in the vicinity of Daytona Beach and DeLand. Many of these communities are settled by retirees. During winter the population increases. About 73 percent of the population lives in coastal areas and 26 percent in the western part of the county. Only about 1 percent is in the central part, where large tracts of land are owned by pulp and paper companies, investment corporations, and ranchers.

Aside from agriculture, tourism is the principal business. The county supports some small industry, but it is not highly industrialized.

General nature of the county

The following paragraphs describe environmental and cultural factors that affect the use and management of soils in Volusia County—the history and development, the climate, the natural resources, the farming, the transportation, the recreational facilities, and the geology, physiography, and drainage.

History and development

When Ponce de Leon discovered the east coast of Florida in 1513, the region, including Volusia County (*7*), was inhabited by the Timucuan Indians. After Spanish colonization, the Franciscans established missions in the vicinity of the Tomoka River as early as 1587. So successful were the friars at evangelizing the Indians that many of the Timucuans became known as the Mission Indians.

The Spaniards considered Florida to be of little importance except for establishment of military outposts and missions. When Cuba was taken by the English in 1763, the Spaniards gave Florida to England in exchange for the return of Cuba.

Unlike the Spanish, the English encouraged agriculture. Settlers cleared several thousand acres of land near New Smyrna Beach and raised sugar cane and indigo. After 1783, however, when the English ceded

Florida back to Spain, the agricultural land became reforested.

In 1821, the United States acquired Florida from Spain, and the land was again settled. Volusia County was established in 1854. About 30 families were living in the area. Enterprise was selected as the seat of the county government. At the start of the Civil War, the county had slightly more than 1,000 inhabitants. After the war, the county developed as different means of transportation became available. Until the railroads were built in the 1880's, the steamboat was important. Two steamboat lines regularly made trips up and down the St. Johns River. The chief riverport in the county was at Enterprise. After the coming of the railroad, Enterprise declined in importance. In 1880 the county seat was moved from Enterprise to DeLand.

In 1870, Mathias Day purchased 3,200 acres of the Atlantic coast for 1,200 dollars. This area, later known as Daytona Beach, became a hub of activity after 1900, as the automobile became a favorite mode of transportation. In 1903, the Florida East Coast Automobile Association was established to promote sports, chiefly automobile racing. At first, the races were held on the smooth, firm, sandy beach in the Daytona Beach-Ormond Beach area, but later they were moved to the Daytona International Speedway west of Daytona Beach.

Volusia County experienced sharp increases in population and economic growth after both world wars. The population is still increasing rapidly. In 1940, according to the U. S. Census, it was 53,710; in 1977, it was about 200,000. Within 20 years, the population is expected to be about a half million.

Climate

Volusia County has a subtropical maritime climate (*11, 12*). The average temperature is about 70 degrees F, and the average annual rainfall is about 50 inches. Rainfall is heaviest in summer. Winters are mild except for brief invasions of cold, dry air from across the continent. Snow, which is rare, melts when it hits the ground. Heavy fog is common early in the morning in winter, but it usually dissipates soon after sunrise. Dew is usually heavy because of the high humidity. Most of the time relative humidity is more than 50 percent at midday and increases to more than 80 percent at night. Prevailing winds are from the east, but often wind is from the southwest or northwest. Average windspeed is slightly more than 10 miles per hour in February, March, and April and slightly less than 10 miles per hour the rest of the year. The hurricane season is from June to mid-November. The chance of a hurricane occurring in any given year is about 1 in 30.

About 60 percent of the annual rainfall occurs between the first of June and the middle of October, the rainy season. The major part of this rainfall occurs as convective thundershowers late in the afternoon and in the evening. The showers are local, and as a result monthly rainfall totals recorded at nearby stations frequently show considerable variation, but over long periods the averages are not considerably different. Occasionally the showers produce as much as 2 or 3 inches of rain within 1 or 2 hours. Frequent showers can persist in an area for a week or longer, resulting in an abnormally high water table. In poorly drained areas, problems caused by excess water are to be expected. The record monthly precipitation was 24.82 inches in October, 1924; 12.85 inches of rain fell in 24 hours. Severe thunderstorms are accompanied by strong gusty winds. Occasionally they develop into hailstorms and tornadoes, but usually these do not cause much damage. In summer, rain lasting all day is uncommon unless it is associated with tropical disturbances.

Tropical disturbances, or tropical depressions, can produce very heavy rainfall in summer and in fall. These low pressure systems sometimes influence rainfall patterns for several days, even when the center of the storm poses no threat to the area. The more intense storm systems have hurricane-force winds and copious rains, which cause considerable damage and flooding in low-lying areas. Storm-driven waves may inundate low areas along bays and inlets, and erosion can be severe along beaches, especially in areas where the natural vegetation has been removed or badly disturbed.

After the rainy season ends, rainfall is fairly evenly distributed. It is approximately 2 to 3 inches per month. The rainfall is generally over a wide area, and it can occur at any time of day. Almost all of this rain is associated with frontal passages. Sometimes overcast, drizzly conditions last 2 or 3 days. Drought can occur at any time, even during the rainy season, but it is usually more severe in spring because of higher temperatures and increased plant growth.

In summer, the average day-to-day temperature is fairly uniform. The temperature reaches about 90 degrees F early in the afternoon. By morning it drops to about 70 degrees. Although temperatures as high as 102 degrees have been recorded, the temperature rarely reaches 95 degrees because of the cooling effects of sea breezes near the coast and of thundershowers farther inland. Probability of a thunderstorm occurring at a given location on any summer day is about 50 percent.

In winter, the average temperature is about 60 degrees. The maximum is near 70, and the minimum near 50. A greater day-to-day variation may be expected in winter than in summer. Temperatures in the high 80's and below freezing are to be expected. The extremes are associated with the passage of fronts. The more noticeable fronts are the cold waves. These cold waves seldom last more than 3 or 4 days. The lowest temperature recorded at Daytona Beach was 18 degrees, in January 1940, but lower temperatures have been recorded in other parts of the county. Significant differences in temperature occur at places not far apart, especially in areas where topographic differences are marked. On calm, clear nights, cold air collects in depressions, or cold pockets, where plants may be killed.

Some years, and occasionally several years in succession, winter passes without widespread frost damage, but in other years cold waves repeatedly invade throughout the winter bringing freezing temperatures. Heating degree days indicate the severity of a winter. Beginning in the fall, heating degree days accumulate by the amount that the average temperature each day is less than base temperature of 65 degrees. Normally, there are 902 heating degree days at Daytona Beach. Between 1935 and 1973, the maximum was 1377 heating degree days in the winter of 1939-40, and the minimum was 441 in the winter of 1971-72.

Both summer and winter temperatures are moderated by nearness to the Atlantic Ocean. Tables 1 and 2 show that temperatures are somewhat less extreme at Daytona Beach than at DeLand, which is inland in the western part of the county. Table 3 also shows that at DeLand the mean date of freezing temperatures is earlier in fall and later in spring than at Daytona Beach. In addition to the moderating influence of the ocean, temperature is influenced by the presence of other bodies of water and by the topographic position of an area. Microclimate is important in farming, because many of the common crops, such as citrus, ferns, and vegetables, are sensitive to the intensity, duration, and seasonal distribution of freezing temperatures.

Natural resources

Volusia County lies between the Atlantic Ocean on the east and the St. Johns River on the west. The St. Johns River, the "Nile of Florida," flows northward for nearly 200 miles. The water in the St. Johns River is brackish. It is polluted from many sources, including sewage effluent, storm sewer outfall, pesticides, and sediments from dredging and filling. Pollution problems have increased because of the decline in the rate of flow caused by diversion of water for irrigation and by flood control in the headwaters.

The waters of the St. Johns, Halifax, and Indian Rivers are used for navigation, recreation, and sport and commercial fishing. Other permanent streams of significant size in the county include the Tomoka River, Spruce Creek, Little Haw Creek, and Deep Creek.

Quantities of freshwater are among the county's most valuable assets (*6*). These are numerous lakes in the county. More than 120 are larger than 5 acres. Most occur in karst topography on the DeLand and Crescent City Ridges. Almost all are water table lakes that form where the level of the aquifer is above the surface of the land. For the most part, the lakes have water of high quality. Many are used for boating and fishing.

Large springs on the low slopes of the DeLand Ridge discharge water that has infiltrated the ridge. The largest is Blue Springs. Its average flow is 105 million gallons per day. Ponce de Leon Springs has an average flow of 20 million gallons per day. Temperature of the water from the springs is 73 to 74 degrees F. The high content of chloride make the springs poorly suited as public water supplies.

Most of the freshwater in the county is from rainfall, which averages about 50 inches per year. Much of the rainfall is retained on the land. Little runoff occurs on the rapidly permeable sandy soils of the karst DeLand and Crescent City Ridges and the sandy shoreline ridges.

Surface water is removed slowly from the broad marine terraces, or flatwoods, which do not have well-defined streams with incised channels. The water table is at or near the surface during the summer rainy season. Depressions where water stands for long periods are common. These inland wetlands are known as cypress domes, bay heads, and swamps; many contain organic soils or muck.

The Floridan Aquifer underlies all of Volusia County. This limestone and dolomitic limestone aquifer supplies about 95 percent of the water used in the county. The cities use about 60 percent. The rest is used mostly to irrigate crops. Recharge to the Floridan Aquifer occurs throughout the county, but the areas of greatest recharge are the deep sandy soils of the karst sand ridges in the western part of the county. Saltwater is moving into the aquifer in both the eastern part of the county along the coast and the western part along the St. Johns River. Saltwater intrusion occurs when the withdrawal of freshwater from the aquifer exceeds the recharge from freshwater percolating back into the aquifer. The sources of the saltwater are the ocean, the rivers, and the ancient seawater trapped below the freshwater aquifer. In the last few years, the coastal cities have had to move their well fields several miles inland. In the vicinity of Osteen, the salt content in some wells has become so high that the water cannot be used for irrigation.

Rocks and minerals other than quartz sand are rare. Some coquina rock and shells are mined in the eastern part of the county for use in construction.

Most of the soils are sandy and low in natural fertility, but the products of these soils are valuable. Many crops can be grown here that cannot be grown easily in most areas of the United States. The forests are valuable not only for lumber and paper production, but also as a habitat for many game animals and other wildlife. Many ornamental plants and plant products used for decoration are obtained from the numerous natural plant communities, which have diverse and sometimes unique species. The scenery, too, is a valuable resource. It attracts many visitors to the area.

Farming

The soils and climate of Volusia County are favorable for farming and agricultural industries. As early in 1767, colonists near New Smyrna Beach were producing sugar and indigo and cutting timber for sailing vessels. After the county government was established, settlers established homesteads and began farming along the St. Johns River and the Atlantic Coast.

The first cattle were brought to Florida by the early Spanish explorers. By the 1860's, the range cattle industry was well established. Today there are approximately 25,000 head of cattle on rangeland and pastures throughout the county. Most are beef cattle; only about 2,500 are dairy cattle.

Timber is commercially produced in large areas of the county, chiefly the flatwoods. In the early part of the 20th century, the turpentine industry flourished. Today, the principal forest products are lumber, poles, and pulpwood.

Vegetable production began in the 1870's near Osteen. Produce was shipped to market on the St. Johns River. Currently, most commercial vegetable production is in the flatwood areas near Samsula, Osteen, and Lake Ashby. The major crops are cabbage, cucumbers, and sweet peppers.

Citrus was introduced by the early Spaniards. Commercial groves were established in the 1880's, largely as a result of the development of improved varieties, some of which originated in Volusia County. Several varieties of fruit were developed by the horticulturist Lue Gim Gong, a Chinese immigrant who came to DeLand in 1886. About the same time, another DeLand resident, A.G. Hamlin, discovered the Hamlin orange in a grove at Highland Park, 5 miles west of DeLand and 2 miles from the grove of Lue Gim Gong.

The fern industry, begun in 1904 at Pierson, accounts for about half of the agricultural income in the county (fig. 1). Gross sales in 1976 were estimated at 20 million dollars, or double the 1974 figure. Leatherleaf ferns and asparagus or plumosus ferns are grown. They are cut by hand, and sprays are shipped throughout the world for floral arrangements. Ferns are very sensitive to climatic and soil conditions. They require hand labor, irrigation, and careful and frequent applications of pesticides and fertilizers. Only about 3,000 acres in the county is in ferns, but many ferneries are being expanded and new ones constructed. Although most ferneries are in the vicinity of Pierson, some are widely distributed over the DeLand and Crescent City Ridges.

Swine, horses, poultry, ornamental shrubs and flowers, and honey also are produced in the county, all on a small scale. The number of laying hens has increased significantly in recent years.

Transportation

Volusia County is served by good transportation facilities. Interstate Highways 4 and 95 are within a short distance of the major cities. Most other parts of the county are easily reached by well kept county, State, and Federal highways. Two railways extend north and south across the county, the Seaboard Coast Line in the west and the Florida East Coast Railway in the east. Scheduled airline service is available at the Daytona Beach Regional Airport. Other municipal or private airports are available for private or charter flights.

Recreation

Recreation is a major enterprise in Volusia County (*13*). Mild winters, sandy beaches, and a wide variety of tourist attractions bring many visitors to the county annually. One major attraction is the Daytona International Speedway, where automobile and motorcycle racing enthusiasts gather from all over the world. Many other types of recreation are available—from jaialai and dogracing to shuffleboard. During spring training, major league baseball is also available. Many sports activities, including golf and tennis, are available in most communities in the county. Cultural entertainment is offered by several organizations, schools, and museums.

Blue Spring, Hontoon, and Tomoka State parks and other areas have facilities for picnicking, camping, swimming, boating, canoeing, hiking, and relaxing. There are areas of archeological or historical interest, including Indian shell mounds and plantation sugar mill ruins.

Opportunities for fishing and hunting are plentiful. Marinas are numerous along the St. Johns River and the ocean. Many of the large tracts of land, especially in the central part of the county, are designated Wildlife Management areas, where hunting of deer and other game is permitted in season.

There are many opportunities for observing wildlife. The Lake Woodruff National Refuge is excellent for birdwatching. The bald eagle can be seen along Lake George and elsewhere. In winter, the manatee lives in the warm water of Blue Springs. Several other rare, unique, or endangered species inhabit the county.

Geology, physiography, and drainage

Volusia County is within the lower Atlantic Coastal Plain (*6*). The surface is covered with sandy marine sediments of Pleistocene to Recent age (*15*). The broad, nearly level marine terraces, relict shorelines, and karst ridges that characterize the landscape are of Pleistocene age. The areas adjacent to the Atlantic Ocean and the St. Johns River are of more recent geologic origin.

The geologic material can be divided into an upper sequence of unconsolidated or poorly consolidated clastic deposits and a lower sequence of carbonate rocks. The upper surface of the rock unit dips eastward toward the coast at about 3 feet per mile. At the coast, the depth to rock is about 100 feet. At the eastern edge of the DeLand Ridge, the depth to rock is about 65 feet. The thickness of the clastic deposits varies from 50 to

100 feet under the DeLand Ridge because of differences in local relief.

The carbonate rocks of the lower sequence are limestone and dolomite of middle and upper Eocene age. These rocks are also known as the Floridan Aquifer. Downward movement of slightly acid ground water has resulted in the formation of solution caverns that hold and transmit large quantities of water. About 95 percent of the county's freshwater supply for domestic and agricultural use comes from the Floridan Aquifer.

The clastic unit ranges in age from Miocene to Recent. The material is mostly sand, especially at the surface, but it contains discontinuous and interfingering lenses and beds of clay and shells. In places the shell beds are as much as 50 feet thick. In coastal areas where there is a saltwater intrusion into the Floridan Aquifer, these shell beds are the source of a limited amount of freshwater.

Most of the landscape in Volusia County formed during the Pleistocene Epoch. As ice sheets formed and melted, the level of the oceans fell and rose. During periods of maximum glaciation, shorelines were below the present sea level. During interglacial periods, the sea level was much higher than it is today. When the sea level remained stationary for a long period, waves and wind built dunes, forming a shoreline ridge, and the ocean floor was eroded, forming a nearly level marine terrace. This process was repeated several times. A series of relict shoreline ridges and terraces has been identified throughout the Coastal Plain. The terraces that include Volusia County are the Wicomico, Penholoway, Talbot, Pamlico, and Silver Bluff. Their relict shorelines are at 100, 70, 42, 25, and 8 feet respectively above sea level (*5*).

During Recent, or Holocene, times the Atlantic Ocean has formed a shoreline ridge or barrier chain separated from the mainland by the Atlantic Coastal Lagoons. In addition, there are recent alluvial deposits in the western part of the county along the St. Johns River.

The major features of Volusia County are shown on the map of Physiographic Regions (fig. 2) and a diagrammatic cross-section of the county (fig. 3) (*14*).

The Atlantic Beach Ridge extends along the eastern part of Volusia County. It is a barrier chain separated from the rest of the county by the Atlantic Coastal Lagoons. The Atlantic Beach Ridge consists of the Beach and a series of dunes, the present shoreline ridge. Here the geologic material consists of quartz sand mixed with varying amounts of shell fragments. After waves deposit sand on the beach, winds pile it into dunes. Often dunes are also eroded by wind and waves. After vegetation is established, the dunes are less susceptible to erosion. Eventually additional dunes are formed along the beach. This process may be repeated several times, resulting in the formation of a series of dune ridges progressively older at greater distances from the beach.

The Atlantic Coastal Lagoons consist of the Halifax River, the Indian River, Mosquito Lagoon, and adjacent areas that have halophytic vegetation. These areas are protected from the turbulence of the open ocean. As a result, plants can root in the shallow waters. After vegetation is established, the water is calmer around the plants. Silt and clay settle to the bottom, resulting in the buildup of land into tidal flats. Gradually plants grow outward from these flats, and more land is formed.

Extending from the Atlantic Coastal Lagoons to the Atlantic Coastal Ridge is an area that has been referred to as the Silver Bluff Terrace. It contains well preserved features that reflect a complex geologic history. Subsurface beds of shells are extensive, and in many places they are less than 6 feet beneath the surface. Based on differences in elevation, surface features, and soil characteristics, the area may be divided into two sections. The eastern section appears to be a former shoreline ridge and the western section a lagoon. They are much like the Atlantic Beach Ridge and the Atlantic Coastal Lagoons are today. The eastern section, where it has not been altered by human activity, consists mostly of a series of long, narrow, moderately well drained to well drained sand ridges separated by troughs that are poorly drained to very poorly drained. The ridges are approximately parallel to the present shoreline. Elevation of the eastern section is dominantly more than 10 feet above sea level. Elevation of the western section is less than 10 feet and in some places is 5 feet. Most soils of the western section have significant amounts of clay at or slightly below the surface and contain large amounts of calcium carbonate underlain by thick beds of shells. In some areas the calcium carbonate has hardened into limestone.

Unusual geologic formations are evident in the Silver Bluff Terrace. One is the Daytona Bone Bed, where skeletons of several animals, including the giant ground sloth, are found among the well preserved remains of woody and herbaceous plants. Another is the Anastasia Formation, a rock of cemented coquina shells that underlies some of the sand ridges, in places within a depth of 6 feet. In some places the Anastasia Formation is associated with the Atlantic Coastal Ridge just west of the Silver Bluff Terrace.

The Pamlico and Talbot Terraces are broad, nearly level, poorly drained areas characterized by numerous shallow depressions and poorly defined drainageways. Few streams have dissected the terraces.

The Atlantic Coastal Ridge and a range that includes Rima Ridge are relict shoreline ridges. The Atlantic Coastal Ridge extends the length of the county and rises about 10 to 15 feet above the Pamlico terrace to the west. The Rima Ridge extends along the eastern margin of the Talbot Terrace to the vicinity of Lake Ashby, where both the ridges and the terrace appear to end. The Rima Ridge rises about 5 to 10 feet above the

Talbot Terrace. It is older than the Atlantic Coastal Ridge and is therefore much more eroded.

The DeLand and Crescent City Ridges, karst ridges, are older marine terraces. The surface has been altered by erosion and the collapse of solution caverns in the underlying limestone. Of the approximately 120 lakes of more than 5 acres in the county, 90 percent are within these karst ridges. Local relief is greater than in any of the other physiographic regions. A few areas on the DeLand Ridge are slightly more than 100 feet above sea level. Others are less than 25 feet.

The rest of the county, in the St. Johns River Valley, consists mainly of nearly level terraces of various origins. In some places this region grades imperceptibly into other regions. The separation is made where drainage patterns become oriented toward the river.

The St. Johns River flows slowly northward along the western boundary of Volusia County. Where it enters the county, the elevation is only about 5 feet above sea level. Where it flows into Lake George, the elevation drops to about 1 foot. The St. Johns River receives slightly more than 60 percent of the runoff from the county. The rest flows in a more direct path to the Atlantic Ocean, mainly by way of the Tomoka River and Spruce Creek.

Surface drainage patterns, especially in the central part of the county, are in an early stage of development. Few streams have well defined channels. Runoff is slow in most of the county because of topographic features. The nearly level marine terraces, or flatwoods, make up a large part of the county. When the sandy soils become saturated, water accumulates in swales and depressions. The shoreline ridges commonly prevent the water from flowing directly to the ocean. Runoff is through a system of poorly defined drainageways and sloughs that are approximately parallel to the ocean. Near the St. Johns River and other major drainageways, the poorly defined drainageways merge into strands and creeks. The Pamlico Terrace is drained mostly by the Tomoka River and Spruce Creek, both of which cut through the Atlantic Coastal Ridge and the Silver Bluff Terrace before they empty into the Atlantic Coastal Lagoons. The southern part of the Pamlico Terrace is drained by Cow Creek. The Talbot Terrace is drained by Middle Haw and Little Haw Creeks to the north and by Deep Creek to the south.

The karst and shoreline ridges have little or no runoff because most of the rain percolates rapidly down through the sandy soil. Water that is not lost through evapotranspiration soon reaches the water table, where it recharges the aquifer, accumulates in lakes or depressions, or seeps outward from the base of the ridges. Ponce de Leon and Blue Springs are two large aquifer-fed springs at the western boundary of the DeLand Ridge. In some areas there are artesian wells, where water is confined under a head of pressure by an impervious layer, such as clay.

How this survey was made

Soil scientists made this survey to learn what kinds of soil are in the survey area, where they are, and how they can be used. The soil scientists went into the area knowing they likely would locate many soils they already knew something about and perhaps identify some they had never seen before. They observed the steepness, length, and shape of slopes; the size of streams and the general pattern of drainage; the kinds of native plants or crops; the kinds of rock; and many facts about the soils. They dug many holes to expose soil profiles. A profile is the sequence of natural layers, or horizons, in a soil; it extends from the surface down into the parent material, which has been changed very little by leaching or by the action of plant roots.

The soil scientists recorded the characteristics of the profiles they studied, and they compared those profiles with others in counties nearby and in places more distant. Thus, through correlation, they classified and named the soils according to nationwide, uniform procedures.

After a guide for classifying and naming the soils was worked out, the soil scientists drew the boundaries of the individual soils on aerial photographs. These photographs show woodlands, buildings, field borders, roads, and other details that help in drawing boundaries accurately. The soil map at the back of this publication was prepared from aerial photographs.

The areas shown on a soil map are called soil map units. Some map units are made up of one kind of soil, others are made up of two or more kinds of soil, and a few have little or no soil material at all. Map units are discussed in the sections "General soil map for broad land use planning" and "Soil maps for detailed planning."

While a soil survey is in progress, samples of soils are taken as needed for laboratory measurements and for engineering tests. The soils are field tested, and interpretations of their behavior are modified as necessary during the course of the survey. New interpretations are added to meet local needs, mainly through field observations of different kinds of soil in different uses under different levels of management. Also, data are assembled from other sources, such as test results, records, field experience, and information available from state and local specialists. For example, data on crop yields under defined practices are assembled from farm records and from field or plot experiments on the same kinds of soil.

But only part of a soil survey is done when the soils have been named, described, interpreted, and delineated on aerial photographs and when the laboratory data and other data have been assembled. The mass of detailed information then needs to be organized so that it is readily available to different groups of users, among them farmers, managers of rangeland and woodland, engineers, planners, developers and builders, homebuyers, and those seeking recreation.

General soil map for broad land use planning

The general soil map at the back of this publication shows, in color, map units that have a distinct pattern of soils and of relief and drainage. Each map unit is a unique natural landscape (*4*). Typically, a map unit consists of one or more major soils and some minor soils. It is named for the major soils. The soils making up one unit can occur in other units but in a different pattern.

The general soil map provides a broad perspective of the soils and landscapes in the survey area. It provides a basis for comparing the potential of large areas for general kinds of land use. Areas that are, for the most part, suited to certain kinds of farming or to other land uses can be identified on the map. Likewise, areas of soils having properties that are distinctly unfavorable for certain land uses can be located.

Because of its small scale, the map does not show the kind of soil at a specific site. Thus, it is not suitable for planning the management of a farm or field or for selecting a site for a road or building or other structure. The kinds of soil in any one map unit differ from place to place in slope, depth, stoniness, drainage, or other characteristics that affect their management.

The soils in the survey area vary widely in their potential for major land uses. Some of the major uses and limitations of the soils are briefly described in the descriptions of the general soil map units. To determine the potential of an individual soil for a particular use, refer to the map unit description under "Soil maps for detailed planning."

Soils of the sand ridges and coastal dunes

The five map units in this group are predominantly excessively drained to somewhat poorly drained, nearly level to moderately steep soils that are generally sandy to a depth of 80 inches or more. They are on barrier dunes, former shoreline ridges, and the karst DeLand and Crescent City Ridges. They make up approximately one-fourth of the acreage in the county.

1. Palm Beach-Paola-Canaveral

Long, narrow coastal dune ridges, predominantly of excessively drained to somewhat poorly drained, grayish and brownish, shelly and sandy soils; includes coastal beaches

The landscape of this map unit is one of beach ridges, beaches, and barrier dunes along the Atlantic Ocean. The unit makes up approximately 12,130 acres, or 1.7 percent of the county. It is about 56 percent Palm Beach soils, 15 percent Paola soils, 10 percent Canaveral soils, 12 percent Beaches, and 7 percent Quartzipsamments and Orsino and Daytona soils.

In the Palm Beach and Paola part of the unit, about half the acreage is used for housing and urban development. In the development areas, about 30 percent of the acreage is Urban land, where soils are largely covered with houses, streets, driveways, buildings, and parking lots.

The Palm Beach soils are excessively drained or well drained, the Paola soils excessively drained, and the Canaveral soils moderately well drained or somewhat poorly drained. All are quartz sand with generous amounts of multicolored shell fragments. The more recent dunes near the beach show little evidence of profile development. In several back dunes, however, disintegration of shells and translocation of iron and organic matter are evident.

Natural vegetation changes as distance from the beach increases. Each change represents a different stage of primary succession. The most recent dunes near the beach have pioneer species, such as sea-oats, railroad-vine, seashore panicum, and beach sunflower. These pioneer species protect the dunes from wind erosion. Once dunes are stabilized, other plant communities become established. First is a dense growth of sawpalmetto, which gives way to a thicket of scrub oak along with other plants, such as buckthorn and greenbrier. On the older dunes adjacent to the Atlantic coastal lagoons, there are coastal hammocks dominated by live oak, shore bay, and cabbage palm. Yaupon, southern redcedar, myrsine, marlberry, and eugenia are common in the understory. The coastal hammocks have a great assortment of plants, including epiphytes, or air plants, such as orchids and ferns.

Because of its attractive beaches, this map unit is popular for recreation. The Canaveral National Seashore, in the southern part of the unit, makes up about 13 percent of the unit. It is largely in its natural state. About 50 percent of the unit is highly urbanized, and much of the rest has undergone some development. Of the 51 miles of shoreline dunes, 32.7 miles had been disturbed by 1973, an increase of 21.2 miles since 1943.

Nearness to the beaches and the ocean, the factor that makes the area highly valued for urban development, also creates problems. The supply of fresh water is limited in some areas. Septic tank absorption fields can pollute the water because the sandy soils are rapidly permeable. Sewers are needed. The soils are droughty. Unless plants adapted to droughty conditions are used, lawns and gardens require intensive maintenance. Unless the surface is protected, wind piles sand into shifting dunes. Damage from salt spray can be anticipated. Much damage can be caused by winds of hurricane force.

2. Paola-Orsino

Broad, high ridges of excessively drained and moderately well drained, grayish sandy soils that have a yellowish sandy subsoil; interspersed with sinks, lakes, and wet depressions

This map unit is associated with karst ridges. The largest area is at the southern end of the DeLand Ridge in the vicinity of Deltona. Many landlocked lakes, sinks, and wet depressions are distributed throughout the unit. Many lakes are shallow and intermittent and generally have marshy vegetation.

This unit makes up about 37,100 acres, or 5.2 percent of the county. It is about 48 percent excessively drained Paola soils, which occur at the higher elevations, 14 percent moderately well drained Orsino soils, almost 14 percent Apopka soils, and 24 percent minor soils, such as Daytona, Astatula, Tavares, and Immokalee soils, and small bodies of water.

Natural vegetation on the more freely drained soils is a sand pine-scrub oak community, which serves as habitat for various kinds of wildlife. It is an open to closed canopy of sand pine and a sparse to dense understory of scrub oak—sand live oak, myrtle oak, and Chapman's oak—sawpalmetto, and staggerbush. Rosemary is a common shrub. Lichens are conspicuous on the otherwise bare ground. The sand pine-scrub community is a result of fires. If fire is excluded for a long time, a xeric hammock type of vegetation eventually replaces the sand pine-scrub oak community. Plant succession is slow, however, on these dry, infertile soils.

The soils in this unit are sandy and droughty and have low natural fertility. For the most part, they are in natural vegetation. They are poorly suited to vegetable or field crops. Permanent pasture and citrus groves are difficult to establish and maintain unless management is intensive.

Some parts of the unit have been developed for urban and residential use. Except in a few low-lying areas, a high water table is no problem. Because the sandy soils absorb water rapidly, runoff and erosion generally do not occur unless slopes are steep or large areas have been covered with housing and pavement. Lawns and gardens require liberal amounts of water and frequent applications of fertilizer. Unless paved, roads and streets are difficult to travel because of loose, dry sand.

3. Astatula-Tavares

Broad, undulating ridges of excessively drained and moderately well drained, brownish and grayish, sandy soils; interspersed with a few sinks, lakes, and depressions

This map unit makes up the greater part of the DeLand and Crescent City Ridges. The topography is generally similar to that in the Paola-Orsino unit; but local relief is generally not so great. In addition, the soils are not highly leached.

This unit makes up about 82,780 acres, or 11.6 percent of the county. It is about 45 percent Astatula soils, 20 percent Tavares soils, 8 percent Deland soils, 7 percent Apopka soils, and 20 percent soils such as Paola, Orsino, Daytona, Cassia, and Myakka soils and small bodies of water.

The Astatula soils are excessively drained. They generally occur where the landscape is rolling to undulating and local relief is the greatest. The Tavares soils are moderately well drained. They are in lower areas. The DeLand soils are well drained. They generally occur in nearly level areas. The Apopka soils are widely distributed along the western part of the DeLand Ridge near DeLand and on the Crescent City Ridge in the vicinity of Seville.

Natural vegetation is commonly an open forest of longleaf pine. The understory is turkey oak, bluejack oak, laurel oak, and live oak. Ground cover is mostly pineland threeawn, or wiregrass. Sawpalmetto, huckleberry, gopher apple, rabbit tobacco, pricklypear, tread-softly, and green-eyes are scattered but conspicuous. In areas that have been protected from fire long enough, plant succession has resulted in the establishment of xeric and mesic hammocks. These hammocks have a closed canopy mainly of laurel and live oak. The mesic hammock has greater diversity in the understory than the xeric. Southern magnolia and holly are indicators. A pine-palmetto community occupies the poorly drained areas. Bay heads or swamps occupy the very poorly drained areas.

The major soils of this unit are sandy. They become very dry after a few days without rain. During periods of heavy rainfall, inorganic nutrients are readily leached. Unless specially suited to these soils, plants require generous amounts of water and regular fertilization, measures that are not practical unless the plants have a high economic or esthetic value. Ferns, a high value crop, grow well on most soils of this unit, but high level management is needed. These soils are well suited to citrus, and most of the groves are in this part of the county. Improved pasture is common. The soils are moderately well suited to drought-resistant varieties of grasses.

Most of the older settlements in western Volusia County are in this unit, and most areas are satisfactory for urban development. Loose sand is a problem to traffic unless streets and lanes are paved. Because these sandy soils are droughty and have low natural fertility, landscaping should make maximum use of native vegetation and other suitable plants.

4. Daytona-Paola-Astatula

Mostly long, narrow sand ridges of moderately well drained, grayish sandy soils that have an organic-stained subsoil and excessively drained, grayish and brownish, *sandy soils; interspersed with areas of poorly drained and very poorly drained soils*

This map unit occurs in the eastern part of the county on the Atlantic Coastal Ridge and on another former shoreline ridge in the eastern bay shore part of the Silver Bluff Terrace, adjacent to the Atlantic Coastal Lagoons. These two shoreline ridges run almost parallel to the present shoreline. Soil characteristics are variable and frequently change within short distances. Long, narrow dunelike ridges of freely drained soils are commonly separated by narrow swales of poorly drained and very poorly drained soils.

This unit makes up about 6.5 percent of the county, or 46,390 acres. It is about 14 percent Daytona soils, 13 percent Paola soils, and 11 percent Astatula soils. Bulow and Cocoa soils make up about 8 percent. They are underlain by coquina rock of the Anastasia Formation and are on some of the narrow ridges. The moderately well drained Orsino and Tavares soils and the somewhat poorly drained Cassia soils make up about 24 percent. Poorly drained soils, such as Immokalee, Myakka, Smyrna, Basinger, and Riviera soils, make up about 20 percent, and very poorly drained soils the remaining 10 percent.

The vegetation in this unit, like the soils, is highly variable. Coastal hammocks occur on the bay shore ridge adjacent to the Halifax River and Indian River Lagoon. Other soils of that same shoreline ridge are covered with a dense thicket of scrub oak that is similar to the sand pine-scrub oak communities on the Atlantic Coastal Ridge but has little sand pine. The poorly drained soils support a slash pine-sawpalmetto community. The very poorly drained soils are marshes or hardwood swamps where red maple and Coastal Plain willow are abundant.

Citrus is grown on many of the better drained soils in this map unit, especially in the Oak Hill vicinity. There are a few areas of improved pasture. Sizeable areas where natural vegetation is largely intact are in the northern and southern parts of the unit. The southern part includes part of the Canaveral National Seashore.

The central part of the unit contains some urban and suburban areas. Even in areas that are not densely settled, the otherwise abandoned and undeveloped land contains scattered subdivisions, mobile home parks, commercial establishments, pits, canals, and other urban development.

Because of the wide range in soil properties in this unit detailed soil maps should be consulted before general planning is undertaken. Onsite investigation is needed for specific uses.

5. Daytona-Satellite-Cassia

Low sand ridges dominated by moderately well drained to somewhat poorly drained, grayish sandy soils, some having an organic-stained subsoil; interspersed with areas of poorly drained and very poorly drained soils

This map unit consists of separate areas of low sand ridges. The most conspicuous is a series of ridges, including Rima Ridge, along a former shoreline. Other low sand ridges in the vicinity of the DeLand and Crescent Ridges are also part of the unit.

This unit makes up about 11,420 acres, or 1.6 percent of the county. It is about 40 percent Daytona soils, 18 percent Satellite soils, 7 percent Cassia soils, and about 35 percent poorly drained to well drained minor soils.

Natural vegetation is mostly the sand pine-scrub oak type, but other plant communities are conspicuous because of the wide variations among the soils.

Most areas of this unit are forest and wildlife habitat. Some are improved pasture or range. A few are satellite communities of the larger urban areas nearby and contain some urban land.

Because of the wide range in soil properties in this unit, the various soils in the unit are suited to a variety of uses. Detailed soil maps should be consulted before general planning is undertaken.

Soils of the flatwoods

The three map units in this group are predominantly poorly drained, nearly level sandy soils that have a seasonally high water table. They are mainly on marine terraces, and they make up approximately half of the acreage in the county. Most of the soils in this group have a subsoil that is stained by organic matter or iron and is underlain by sandy or loamy material. Scattered swamps are throughout these areas.

6. Myakka-Smyrna-Immokalee

Nearly level, poorly drained soils that have a dark, organic-stained subsoil underlain by sandy material; interspersed with swamps and poorly defined drainageways

This map unit, the largest in the county, is in the broad flatwoods that cover a large part of the county. It makes up about 172,690 acres, or 24.2 percent of the county. It is about 33 percent Myakka soils, 17 percent Smyrna soils, 17 percent Immokalee soils, and 33 percent minor soils. Most of these minor soils are in swamps, depressions, poorly defined drainageways, and low areas adjacent to the swamps, and they are very poorly drained or poorly drained. Only about 4 percent of the acreage in the unit is somewhat poorly drained or moderately well drained.

The major soils and many of the minor soils have a spodic horizon, locally called a hardpan. A spodic horizon is a type of subsoil into which organic matter has been translocated and has accumulated. Even many of the soils in swamps in this unit have a spodic horizon, although the surface is covered with a shallow layer of muck. Almost all soils of this unit are sandy to a depth of 80 inches (2 meters) or more.

Natural vegetation consists of pine-palmetto communities. Most of the trees are slash pine, but longleaf and pond pine are common in some areas. The understory is a thick, scrubby growth of sawpalmetto and other shrubs, such as gallberry and fetterbush. Unless the area is entirely covered with sawpalmetto, the ground cover consists mostly of pineland threeawn, or wiregrass, and some bluestem (fig. 4). Dwarf huckleberry is common in many areas.

The pine-palmetto flatwoods are considered to be a fire subclimax. They have a history of frequent fires, caused either by lightning or by man. The flatwoods are often burned to destroy the palmetto foliage so that grasses can grow as feed for range cattle. Sawpalmetto is more scattered in the poorly defined drainageways. It is generally replaced by grasses, such as blue maidencane and pineland threeawn, and sometimes by shrubs, such as gallberry and waxmyrtle. Vegetation in the depressions is grassy, and the shrubby St.-Johnswort is a conspicuous component.

Most soils of this unit have a seasonal high water table (fig. 5). This creates problems because water stands at or near the surface during the rainy season. During the dry season, however, the water table recedes, and these sandy soils become droughty.

A large part of this unit is used as range and improved pasture, for production of pines, and as a habitat for wildlife. The soils are well suited to, or have good potential for, all of these uses. Vegetables, such as cabbages, sweet peppers, watermelons, and cucumbers, are grown in some areas. A system of ditches for drainage and irrigation is needed.

The major limitation to the use of these soils for urban development is the wetness or the seasonal high water table. This limitation can be overcome. Often, corrective measures are impractical because of expense and other restrictions.

7. Pomona-Wauchula

Nearly level, poorly drained soils that have a dark, organic-stained subsoil underlain by loamy material; interspersed with swamps and depressions

This map unit, the second largest in the county, covers a large part of the Pamlico and Talbot Terraces. It makes up about 127,160 acres, or 17.8 percent of the county. It is about 43 percent Pomona soils, 11 percent Wauchula soils, 12 percent closely related soils, such as EauGallie and Wabasso soils, 6 percent Malabar and Pineda soils, and 28 percent minor soils. Most of the minor soils occur in swamps, depressions, poorly defined drainageways, and low areas adjacent to the swamps, and they are very poorly drained or poorly drained. Only about 2 percent of the acreage is somewhat poorly drained or moderately well drained.

This unit is similar to the Myakka-Smyrna-Immokalee unit. Vegetation in both is the pine-palmetto type of flatwoods, often called "acid flatwoods" because the soils are acid. The major difference between this unit and the Myakka-Smyrna-Immokalee unit is that in this unit the major soils have a loamy subsoil below the spodic horizon. Use and management of soils in the two units are similar.

8. Pineda-Malabar-Wabasso

Nearly level, poorly drained soils that have a yellowish, iron-stained subsoil or a dark, organic-stained subsoil and are underlain by loamy material; interspersed with swamps and depressions

This map unit is mostly along the St. Johns River in the southern part of the county. Smaller areas are associated with the Pamlico Terrace, especially in the vicinity of Samsula and the Tomoka Farms Road. This unit makes up about 34,960 acres, or 4.9 percent of the county. It is about 23 percent Pineda soils, 23 percent Malabar soils, 14 percent Wabasso soils, 9 percent EauGallie soils, 7 percent Riviera soils, and 24 percent other minor soils. Almost half the acreage of the minor soils is in swamps, and the soils are very poorly drained or poorly drained.

This unit is closely associated with the Pomona-Wauchula unit. In natural areas, however, it is generally in slightly lower or wetter positions. Wabasso soils and other soils that have a spodic horizon are generally a few inches higher in elevation than the Pineda and Malabar soils, which have a yellowish, iron-stained subsoil. Like soils of the Pomona-Wauchula unit, the major soils of this unit have a loamy subsoil. In this unit, however, the subsoil generally has a higher concentration of bases, especially calcium, resulting in soils that are less acid in reaction. These areas are sometimes referred to as "sweet flatwoods."

Natural vegetation on this unit (fig. 6) tends to be more grassy and have fewer slash pines and sawpalmettos than the vegetation on the other two flatwoods units. The scattered clumps of sawpalmetto are more numerous on soils that have a spodic horizon. Cabbage palm and waxmyrtle are common. In spring, flowering herbaceous plants, such as butterworts, pitcher plants, and violets, are conspicuous.

In the lower areas of this unit the soils have a high water table that may rise a few inches above the surface during the rainy season. Because of wetness, the soils have severe limitations for urban development. Slash pine grows well if bedding or drainage can be installed to remove surface water. Most areas are range or improved pasture. Because these soils are less acid and have fewer sawpalmetto than other flatwoods areas, they are more easily adapted to the production of row crops. Excavating canals for irrigation and removing excess water, however, are still needed. A supply of fresh water for irrigation is also important during dry periods.

Soils of low-lying hammocks

This map unit makes up almost all of the lower, western part of the Silver Bluff Terrace, about 3.9 percent of the acreage in the county.

9. Tuscawilla-Chobee

Lowlands of poorly drained and very poorly drained soils that have a thin sandy surface layer over a loamy calcareous subsoil

This map unit makes up about 27,830 acres, or 3.9 percent of the county. It is about 50 percent Tuscawilla soils and 24 percent Chobee soils. The remaining 26 percent is minor soils, such as Wabasso, EauGallie, Myakka variant, Riviera, and Holopaw soils. Tuscawilla soils are poorly drained and typically have a microrelief of slightly elevated hammocks. In the lower areas, the very poorly drained Chobee soils form a braided drainage pattern. Most soils of this unit have a thin sandy surface layer and a loamy calcareous subsoil underlain by sand and shells.

Natural vegetation on this unit is mainly a hardwood or hydric hammock. As in the other hammocks in the county, there are large live oaks and laurel oaks. Cabbage palm is abundant. Deciduous hardwoods, such as red maple, sweetgum, and American hornbeam, are abundant. There are also many other hardwood trees, such as water oak, pumpkin ash, Florida elm, boxelder, Florida basswood, and water hickory. Southern magnolia is obvious in higher areas. Such shrubs as yaupon, little bluestem, palmetto, red buckeye, and hop tree are locally common. Jack-in-the-pulpit, green dragon, and other plants that are common farther north are also present. The very poorly drained part of this unit dominated by Chobee soils has mixed swamp vegetation, mostly red maple and Carolina ash and an abundance of baldcypress in the lowest spots. In addition to the highly diverse flora, the area has a rich fauna that includes the rare, large, and docile indigo snake.

Much of this unit remains in natural vegetation and is used as wildlife habitat. It is wet much of the time, and the clay in the shallow subsoil impedes the use of heavy equipment. Swarms of mosquitoes are a nuisance. If water control is feasible, a variety of ornamental vegetable plants can be grown. Citrus is grown in some areas, but bedding or other practices to alleviate wetness are needed.

Some parts of this unit are in urban areas, especially in the vicinity of Daytona Beach. Because of wetness, these areas were among the last to be developed, and several forested areas are still mostly undisturbed. Shells and marl, materials used in road construction, are abundant, and there are numerous pits, as is evident along Nova Road. Deep canals have been dug to remove surface water, but during periods of frequent and heavy rains, removing the water is not always successful. Low elevation and separation from the ocean by higher areas contribute to the difficulty in draining this unit. This area has a maximum elevation of about 10 feet, and much of it is less than 5 feet above mean sea level.

Soils of the St. Johns River flood plain

This map unit consists mostly of low areas along the St. Johns River that are subject to periodic flooding. Some of the low areas have standing water most of the time. Others are low-lying hammocks that are occasionally or never flooded. This unit makes up about 3.9 percent of the acreage in the county.

10. Bluff-Tequesta-Astor

Low-lying, predominantly poorly drained and very poorly drained soils that have a thick, dark surface layer or a thin layer of muck; interspersed with marshes, swamps, organic soils, and low hammocks

This map unit is on lowlands along the St. Johns River and its tributaries. It makes up about 27,830 acres, or 3.9 percent of the county. It is about 26 percent Bluff soils, 14 percent Tequesta soils, and 14 percent Astor soils. The lowest areas, the organic soils, make up about 10 percent of the unit. The more elevated areas, the EauGallie, Wabasso, and other soils that have a dark, organic-stained subsoil, make up about 5 percent. About 10 percent is Riviera soils, 4 percent is Paisley soils, 4 percent is Winder soils, 2 percent is Holopaw soils, and 7 percent is Fluvaquents. Other minor soils make up the remaining 4 percent of the unit.

Both Bluff and Astor soils are mineral soils that have a large amount of organic matter in the dark surface layer. Astor soils are deep and sandy. Bluff soils have a loamy surface layer and a loamy subsoil. Tequesta soils have a loamy subsoil and a surface layer of organic matter that is too thin for classification as an organic soil. Fluvaquents are stratified. The Terra Ceia muck and Gator muck are organic soils. Most of the other soils in the unit are variable in texture and in depth to a loamy subsoil.

Natural vegetation on this unit is as variable as the soils, and differences in vegetation do not necessarily correspond to soil boundaries. The vegetation is swamps, wet grasslands, and low hammocks. Wet grasslands, consisting of wet prairies and freshwater marshes, are dominant along the St. Johns River from Lake Woodruff southward. The wetter areas are marshes. Sawgrass is common where water is deepest. Sand cordgrass grows around the edges of the marsh. In some marshes, cattail and pickerelweed predominate. The largest part of the wetlands is wet prairie where the duration of flooding or standing water is less than in the marshes. Vegetation on the wet prairie consists of scattered bunches of sand cordgrass among shorter grasses and sedges. Scattered clumps of cabbage palm are generally on slightly elevated areas within the prairie. Low, or hydric, hammocks, consisting of an abundance of cabbage palm and live oak and often sweetgum and other hardwoods, are at the edges of many of the wet grasslands.

Along Deep Creek and northward to Lake Ashby, as well as in most areas of this unit of Lake Woodruff, hardwood vegetation is dominant. It is much like that in the Tuscawilla-Chobee unit, but it has less diversity. Many areas of hardwood swamps merge gradually and imperceptibly into hydric hammocks. Baldcypress, red maple, swamp tupelo, and Carolina ash are abundant in wetter areas; live oak and southern magnolia are conspicuous in higher areas. Cabbage palm, sweetgum, laurel oak, water oak, and American hornbeam are abundant. Loblolly pine is present in areas near Lake George.

The major soils of this unit are not suited to urban development because of wetness and periodic flooding. Wet prairies are used as range and, in some areas, as improved pasture. The forested areas serve as habitat for various kinds of wildlife, including the bald eagle.

Soils of the inland and coastal wetlands

The two map units in this group consist almost entirely of very poorly drained soils. The coastal wetlands are in the Atlantic Coastal Lagoons. The inland wetlands, dominated by organic soils, are the larger swamps and marshes that are widely distributed throughout much of the county. These map units make up about one-fifth of the acreage in the county.

11. Samsula-Terra Ceia-Tomoka

Swamps and marshes dominated by organic soils

The soils of this map unit occur in wetland swamps and marshes. The unit makes up about 113,460 acres, or 15.9 percent of the county. It is about 25 percent Samsula soils, 23 percent Terra Ceia soils, 12 percent Tomoka soils, 11 percent Hontoon soils, and 6 percent Gator soils. About 10 percent of the unit is Tequesta soils in swamps. These soils have a surface layer of muck that is too thin for the soils to be classified as organic. Soils in depressional areas make up about 5 percent of the unit, and the remaining 8 percent consists of poorly drained soils, such as Myakka, Smyrna, Pomona, EauGallie, Malabar, and Valkaria soils. Only the larger areas of swamps and marshes are in this unit; the smaller areas are widely distributed throughout the county and are included in other units.

The natural vegetation of these wetlands is freshwater marshes dominated by grasses and grasslike plants and swamps dominated by trees and other woody plants. The marshes are mostly covered with sand cordgrass where the water is more shallow and sawgrass where it is deeper. The larger areas of marsh are around Lake Woodruff and in the vicinity of Crescent Lake. Smaller marshes are in other areas, especially along the St. Johns River.

Hardwood swamps are extensive around Crescent Lake and at intervals along the St. Johns River. Some are in other areas where alkaline material has influenced the lower, nonorganic part of the soil. Trees that are common in hardwood swamps are red maple, baldcypress, swamp tupelo, Carolina ash, water hickory, water locust, and Coastal Plain willow. Buttonbush, stiffcornel dogwood, and royal fern are also conspicuous.

Cypress swamps are extensive in the central part of the county. The trees are dominantly pond cypress, baldcypress along streams, and some loblolly bay, swamp bay, and swamp tupelo. The ground cover is commonly marsh and Virginia chain ferns along with water-tolerant grasses. Many cypress swamps are bordered by an area covered with grasses, often maidencane, and scattered St.-Johnswort. Because cypress trees are likely to increase in size from the grassy margins towards the center of the swamp, these swamps often appear as domes and are commonly called cypress domes or cypress heads.

Bay swamps are dominated by broadleaf evergreen trees—loblolly bay, swamp bay, or sweet bay, or a combination of the three. Evergreen shrubs and greenbriers are also conspicuous. Bay swamps, or bays are more common in depressions in the DeLand Ridge, Crescent City Ridge, and the Rima Ridge range.

The soils in this unit have major limitations for urban development. Water stands on the surface permanently or for very long periods. Most areas are in positions that cannot be easily drained. Even if the soils are drained, they are subject to oxidation of the organic material, and they gradually subside or settle. A few small areas have a water control system and are used for vegetables or improved pasture. Most areas are in natural vegetation and are valuable for water storage and potential recharge. These areas are important as wildlife habitat. Large areas of this unit occur in the Lake Woodruff, Farmton, and Tomoka Wildlife Management Areas.

12. Hydraquents-Turnbull

Mangrove swamps and salt marshes subject to tidal flooding

This map unit encompasses Atlantic Coastal Lagoons. It makes up about 20,070 acres, or 2.8 percent of the county. It is about 53 percent Hydraquents and 32 percent Turnbull soils. Minor soils, mostly Canaveral variant soils, make up the remaining 15 percent.

Hydraquents and Turnbull soils are subject to storm-driven tides. Most areas are inundated twice daily at high tide. The soils formed through the deposition of fine sediments among the stems and roots of halophytic plants. They have low strength and cannot support heavy loads. The Canaveral variant soils consist of sand and shells that have been dredged from adjacent waters and heaped or spread on the Hydraquents or Turnbull soils. Most of the dredging was done to elevate areas for buildings or to deepen the Intercoastal Waterway.

Natural vegetation consists of mangrove swamps and saltwater marshes. Because these plants grow out into the water where suspended particles settle among them, they contribute to the slow development of soils and land within the lagoons. In many places in both mangrove swamps and salt marshes, individual species occur in almost pure stands. The presence or exclusion of a species depends on the salinity of the water and the depth and duration of tidal flooding.

Mangrove swamps of red, black, and white mangrove occur on Hydraquents on the islands and around the shoreline of the more open part of the lagoon. Salt marshes, predominantly of black needlerush and salt-tolerant grasses, are on Turnbull soils at the mouth of the Tomoka River, Spruce Creek, and Turnbull Creek (fig. 7).

The Hydraquents and Turnbull soils are not suitable for farming. They have major limitations for urban development because of salinity, flooding, and low soil strength. If left undisturbed, they are a valuable asset to the fishing industry, because these coastal wetlands provide food and protection for most fish and shellfish taken from the ocean. Near urban centers, however, areas of this unit have been converted to urban use. In 1943, about 363 acres of this unit was urban. By 1973, the total was 1,148 acres. Although these areas are attractive because they permit easy access to saltwater, developing them is risky or costly because of problems with adverse soil conditions. In addition, there is the ever-present threat of devastation by hurricane-generated winds and tides in these low-lying areas.

Soil maps for detailed planning

The map units shown on the detailed soil maps at the back of this publication represent the kinds of soils in the survey area. They are described in this section. The descriptions together with the soil maps can be useful in determining the potential of a soil and in managing it for food and fiber production; in planning land use and developing soil resources; and in enhancing, protecting, and preserving the environment. More information for each map unit, or soil, is given in the section "Use and management of the soils."

Preceding the name of each map unit is the symbol that identifies the soil on the detailed soil maps. Each soil description includes general facts about the soil and a brief description of the soil profile. In each description, the principal hazards and limitations are indicated, and the management concerns and practices needed are discussed.

The potential of a soil is in the capacity of that soil to produce, yield, or support the given structure or activity at a cost expressed in economic, social, or environmental units of value. The criteria used for rating soil potential include the relative difficulty or cost of overcoming soil limitations, the continuing limitations after measures in general use in overcoming the limitations are applied, and the suitability of the soil relative to other soils in Volusia County.

A five-class system of soil potential is used. The classes are defined as follows:

Very high potential. Soil limitations are minor or are relatively easy to overcome. Performance for the intended use is excellent. Soils rated with very high potential are the best in the county for the particular use.

High potential. Some soil limitations exist, but practices necessary to overcome the limitations are available at reasonable cost. Performance for the intended use is good.

Medium potential. Soil limitations exist and can be overcome with recommended practices; limitations, however, are mostly of a continuing nature and require practices that have to be maintained or that are more difficult or costly than average. Performance for the intended use ranges from fair to good.

Low potential. Serious soil limitations exist, and they are difficult to overcome. Practices necessary to overcome the limitations are relatively costly compared to those required for soils of higher potential. Necessary practices can involve environmental values and considerations. Performance for the intended use is poor or unreliable.

Very low potential. Very serious soil limitations exist, and they are most difficult to overcome. Initial cost of practices and cost of maintenance are very high compared to those of soils with high potential. Environmental values are usually depreciated. Performance for the intended use is inadequate or below acceptable standards.

The map units on the detailed soil maps represent an area on the landscape made up mostly of the soil or soils for which the unit is named. Most of the delineations shown on the detailed soil map are phases of soil series.

Soils that have a profile that is almost alike make up a *soil series*. Except for allowable differences in texture of the surface layer or of the underlying substratum, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement in the profile. A soil series commonly is named for a town or geographic feature near the place where a soil of that series was first observed and mapped. The Deland series, for example, was named for the town of DeLand in Volusia County.

Soils of one series can differ in texture of the surface layer or in the underlying substratum and in slope, erosion, stoniness, salinity, wetness, or other characteristics that affect their use. On the basis of such differences, a soil series is divided into phases. The name of a *soil phase* commonly indicates a feature that affects use or management. For example, Paola fine sand, 0 to 8 percent slopes, is one of several phases within the Paola series.

Some map units are made up of two or more dominant kinds of soil. Such map units are called soil complexes and soil associations.

A *soil complex* consists of areas of two or more soils that are so intricately mixed or so small in size that they cannot be shown separately on the soil map. Each area includes some of each of the two or more dominant soils, and the pattern and proportion are somewhat similar in all areas. Myakka-St. Johns complex is an example.

A *soil association* is made up of soils that are geographically associated and are shown as one unit on the map because it is not practical to separate them. A soil association has considerable regularity in geographic pattern and in the kinds of soil that are a part of it. The extent of the soils can differ appreciably from one delineation to another; nevertheless, interpretations can be made for use and management of the soils. Palm Beach-Paola association, 2 to 8 percent slopes, is an example.

Most map units include small, scattered areas of soils other than those that appear in the name of the map unit. Some of these soils have properties that differ substantially from those of the dominant soil or soils and thus could significantly affect use and management of the map unit. These soils are described in the description of each map unit. Some of the more unusual or strongly contrasting soils that are included are identified by a special symbol on the soil map.

Most mapped areas include places that have little or no soil material and support little or no vegetation. Such places are called *miscellaneous areas*; they are delineated on the soil map and given descriptive names. Beaches is an example. Some miscellaneous areas are too small to be delineated and are identified by a special symbol on the soil map.

Not all units in this survey have been mapped with the same degree of detail. Broadly defined units, identified by a superscript on the soil map legend, are likely to be larger and to vary more in composition than units mapped in greater detail. Composition has been controlled well enough, however, for the expected use of the soils.

The acreage and proportionate extent of each map unit are given in table 4, and additional information on properties, limitations, capabilities, and potentials for many soil uses is given for each kind of soil in other tables in this survey. (See "Summary of tables.") Many of the terms used in describing soils are defined in the Glossary.

Map unit descriptions

1—Apopka fine sand, 0 to 5 percent slopes. This nearly level to gently sloping, well drained soil is on intermediate to high sand hills. The acreage is moderate in extent. Individual areas are irregularly shaped and range from about 5 to 300 acres.

Typically, the surface layer is very dark grayish brown fine sand about 6 inches thick. The subsurface layer is fine sand to a depth of 62 inches. In sequence downward, 16 inches is grayish brown mottled with very pale brown, 28 inches is light yellowish brown mottled with brownish yellow, and 12 inches is white. The subsoil is brownish yellow sandy clay loam mottled with pale brown to more than 80 inches.

Included with this soil in mapping are small areas of Astatula, Electra, Orsino, and Tavares soils. Also included are soils in shallow depressions that are not so well drained as this Apopka soil. The included soils generally make up no more than 15 percent of any one mapped area.

The water table is below 72 inches. Permeability is rapid in the sandy layers and moderate in the sandy clay loam subsoil. Runoff is slow. The available water capacity is very low. Natural fertility and the organic matter content are low.

Natural vegetation is of the sandhills type—mainly longleaf pine-turkey oak. Where protected from fire, a forest chiefly of laurel oak and live oak has developed. Large areas have been cleared and used for citrus, ferns, or improved pasture. In the southern part of the DeLand ridge, the natural vegetation is a forest of sand live oak, sand pine, laurel oak, and turkey oak. The understory is pineland threeawn, common pricklypear, gopher apple, and scattered sawpalmetto.

This soil is moderately well suited to vegetable crops. Because it is droughty and low in natural fertility, frequent applications of water and fertilizer are needed to sustain yields. Where an irrigation system is economically practical, high value special crops such as ferns are suited. The loamy subsoil slows infiltration of water. As a result, waterlogging can occur in depressions if large volumes of water are applied to ferns.

This soil is moderately well suited to improved pasture of deep-rooting varieties of grass. Frequent applications of lime and fertilizer are needed. Overgrazing should be avoided during dry seasons.

This soil is well suited to citrus. Frequent applications of fertilizer are needed. In hilly areas, a cover crop should be grown to prevent erosion by wind and water. Irrigation is desirable in extended dry periods.

The potential productivity is moderately high for slash pine.

The potential is high for community development. Vehicle traction can be a problem on the sandy surface. Pavement is needed for most vehicular traffic. Often the loamy subsoil is excavated and spread on the sandy surface to make roadways more stable. Low natural fertility and very low available water capacity are limitations in maintaining lawns and ornamental plants. This is one of the best soils in the county for trench type sanitary landfill if the bottom of the cell is kept within the sandy clay loam subsoil. If the bottom of the cell is below the sandy clay loam subsoil, there is risk of polluting shallow groundwater by the leachate.

The capability subclass is IIIs.

2—Apopka fine sand, 5 to 12 percent slopes. This well drained, sloping to moderately steep soil occurs around sinks and depressions and on narrow side slopes of gently undulating sandhills. Individual areas are mostly less than 20 acres.

Typically, the surface layer is dark gray fine sand about 4 inches thick. The subsurface layer is fine sand about 40 inches thick. The upper 3 inches is light gray, the next 12 inches is white, and the lower 25 inches is very pale brown with continuous tongues 1/2 inch to 2 inches wide from the layer above. The tongues have a thin, discontinuous exterior layer that is dark brown or brown. The subsoil, which is between depths of 44 and 80 inches, is mainly light yellowish brown sandy clay loam.

Included with this soil in mapping are areas of Astatula and Paola soils, some areas where the texture is sand, and a few places where the subsoil is within a depth of 40 inches. Also included are small areas of soils that are similar to this Apopka soil but have slopes of more than 12 percent. The included areas make up about 15 percent of any one mapped area.

The water table is below 72 inches. The available water capacity is very low. Permeability is rapid in the sandy layers and moderate in the loamy subsoil. Natural fertility and the organic matter content are low.

Part of the acreage is in natural vegetation—a forest of sand live oak, sand pine, laurel oak, and turkey oak. The understory is pineland threeawn, common pricklypear, rosemary, lichens, fetterbush, scattered sawpalmetto, and gopher apple.

This soil is poorly suited to vegetable crops because of the slope, the droughtiness, and the rapid leaching of plant nutrients.

If well managed, the soil is moderately well suited to deep rooted improved pasture grasses. If adequately fertilized and limed, adapted native grasses grow well. Irrigation is needed during extended dry periods.

This soil is well suited to citrus. A close growing cover crop is needed to prevent soil blowing and water erosion. Irrigation during the dry season increases yields. Regular applications of fertilizer and lime are needed.

The potential productivity is moderately high for slash pine. Sand pine grows well. Controlled cutting of the less desirable oaks is needed.

The potential is high for community development. Vehicle traction can be a problem on the sandy surface. Pavement is needed for most vehicular traffic. Slope is the major soil limitation. Low natural fertility and very low available water capacity are limitations in maintaining lawns and ornamental plants. Regular applications of water and fertilizer are needed. Adding suitable topsoil material improves plant root development.

The capability subclass is IVs.

3—Arents. Arents are nearly level soils made up of heterogeneous overburden material that was removed from other soils and used in land leveling, as fill material, or as final cover for sanitary landfill. This material is a mixture of fine sand or sand and fragments of subsoil material from the associated Immokalee, Myakka, Smyrna, and St. Johns soils. Areas generally range from triangular to polygonal in shape and are 3 to 50 acres.

In most areas, the upper 20 to 72 inches is variable and discontinuous lenses, pockets, and streaks of black, gray, and grayish brown sand. It contains few to common black and dark reddish brown sandy fragments from the subsoil of the soils in the borrow areas. Below this is undisturbed soil. The undisturbed soil generally has the profile of a Myakka, Smyrna, St. Johns, or Immokalee soil. In some places, this underlying soil has been truncated and mixed with the overburden material.

In some areas below a depth of 2 or 3 feet there are large cells of garbage and refuse, which range in thickness from 2 to 20 feet. The garbage generally occurs as stratified layers within the sandy material that was used as daily cover. These areas of sanitary landfill are identified on the soil map by the words "sanitary landfill" in addition to the map symbol.

Included with these soils in mapping are a few areas in which the mixed material contains fragments of loamy soil material. Also included are small areas containing fragments of organic material or muck. In a few spots, the overburden material is as thin as 10 inches.

The water table fluctuates between 10 and 40 inches for 2 to 6 months in most years. In areas of sanitary landfill the water table is at variable depths for varying lengths of time. In the overburden material, the available water capacity and permeability are variable. Generally, however, the available water capacity is low and the permeability is rapid. Natural fertility and the organic matter content are generally low.

These soils are generally not suited to vegetable crops because of the wide range in soil properties. Some areas can be used for improved pasture.

Most areas of these soils will probably eventually be used for community development. They have high potential for this use. The areas of sanitary landfill, however, have very low potential for community development. Uneven settling and wetness in the lower areas are limitations for dwellings without basements and local roads and streets. If dwellings are constructed, special foundation design is needed to support the intended load. Even if special design is used, driveways may collapse and yards develop holes or an uneven surface because of differential settling. In wet areas, adequate water control is difficult. Septic tank absorption fields are impractical because of layout problems through the cells of unstable garbage and refuse.

No capability subclass is assigned to the unit.

4—Astatula fine sand, 0 to 8 percent slopes. This excessively drained, nearly level to sloping soil is on sandhills. Individual areas vary widely in shape and range from 5 to 600 acres.

Typically, the surface layer is gray fine sand about 2 inches thick. The underlying layers are fine sand about 93 inches thick. In sequence downward, 8 inches is brown, 16 inches is pale brown, and 69 inches is very pale brown.

Included with this soil in mapping are small areas of Apopka, Deland, Orsino, Paola, St. Lucie, and Tavares soils. Also included are small areas where slopes are more than 8 percent. In some areas the surface layer is darker colored than is described for the series. The included areas make up about 15 percent of any one mapped area.

The water table is always below 80 inches and is usually below 120 inches. The available water capacity is very low. Permeability is very rapid. Natural fertility and the organic matter content are very low. The response to fertilizer is moderate, but fertilizer is rapidly leached.

Part of the acreage is in natural vegetation of sand pine, turkey oak, sand live oak, laurel oak, and longleaf pine. The shrubby understory is fetterbush, rosemarybush, and a few scattered clumps of sawpalmetto. The common native grasses and forbs are pineland threeawn, pricklypear, gopher apple, creeping bluestem, and chalky bluestem.

This soil is poorly suited to vegetable crops because of very rapid permeability, very low fertility, and droughtiness. Under high level management, however, it can produce special crops such as watermelons and ferns. Large amounts of fertilizer and lime and frequent irrigation are needed.

This soil is well suited to citrus. A ground cover of close growing vegetation is needed to prevent wind and water erosion. Regular applications of fertilizer and lime are needed. Irrigation during the dry season increases yields.

This soil is poorly suited to improved pasture grasses and hay crops. If adequately fertilized and limed, pangolagrass and bahiagrass grow best. Irrigation is needed during dry periods.

Potential productivity is low for slash pine, even under a high level management. Sand pine grows best. Periodic cutting is needed to control the less desirable oaks.

This excessively drained, very rapidly permeable soil has high potential for community development. Many older communities are on this soil. Soil limiting factors are the high risk of corrosion to concrete and the hazard of pollution from onsite septic tank absorption fields to underground water sources because of the very rapid permeability. Lawns and ornamentals require regular applications of water and fertilizer because of the sandy texture, the very rapid permeability, the very low available water capacity, and the very low natural fertility. Adding good topsoil improves root development.

The capability subclass is VIs.

5—Astatula fine sand, 8 to 17 percent slopes. This excessively drained, sloping to moderately steep soil is around sinks and depressions and on the side slopes of high sand ridges. Individual areas are generally serpentine or oval in shape and less than 20 acres.

Typically, the surface layer is gray fine sand about 3 inches thick. The underlying layers are fine sand to a depth of 80 inches or more. The upper 7 inches is brown, the next 36 inches is light yellowish brown, and the lower 34 inches is very pale brown.

Included with this soil in mapping are small areas of Apopka and Paola soils and some areas where the surface layer is darker colored than is described for the series. Also included are small areas where slopes are more than 17 percent or less than 8 percent. The included areas make up about 15 percent of any one mapped area.

The water table is always below 80 inches and is usually below 120 inches. Permeability is very rapid. The available water capacity, natural fertility, and organic matter content are very low. Response to fertilizer is moderate, but fertilizer is rapidly leached.

Part of the acreage is in natural vegetation of sand pine, sand live oak, turkey oak, longleaf pine, and laurel oak. The shrubby understory is fetterbush, rosemarybush, and a few isolated clumps of sawpalmetto. The common native grasses and forbs are pineland threeawn, pricklypear, gopher apple, creeping bluestem, and chalky bluestem.

This soil is not suited to vegetable crops and is poorly suited to citrus because of very low fertility, very rapid permeability, droughtiness, and slope.

This soil is not suited to deep rooted improved pasture grasses. In some areas the understory has been cleared and pasture grasses planted, but forage production is so limited that maintaining the pasture is impractical.

The potential productivity is low for slash pine, even under high level management. Sand pine grows best.

The potential is high for community development. Limiting factors are the high risk of corrosion to concrete, the slope, and the hazard of pollution from onsite septic tank absorption fields to underground water sources because of the very rapid permeability. Lawns and ornamentals require regular applications of water and fertilizer because of the sandy texture, the very rapid permeability, the very low water capacity, and the low natural fertility. Adding good topsoil improves root development. Buildings should be designed to fit the natural terrain. For roads the slope can be reduced by cutting and filling. Slope affects the layout and construction of septic tank absorption fields. The absorption fields should be installed on the contour.

The capability subclass is VIIs.

6—Astatula-Urban land complex, 0 to 8 percent slopes. This map unit is made up of nearly level to sloping Astatula soils that have been used for urban development. In the natural state, these were deep sandy soils on sandhills and ridges. The water table is below 80 inches. Many areas have been disturbed by reworking and reshaping during the construction of foundations, utility lines, roads, and streets and the installation of other facilities associated with construction and development. About 40 to 70 percent of the unit is Astatula fine sand, and about 15 to 45 percent is Urban land. Urban land is covered with streets, parking lots, buildings, and other structures. The open areas of Astatula fine sand are lawns, gardens, vacant lots, or playgrounds. They generally are small and intermingled with areas of Urban land.

Typically, the surface layer of the Astatula soil is gray fine sand about 2 inches thick. The underlying layers are fine sand about 93 inches thick. The upper 8 inches is brown, the next 16 inches is pale brown, and the lower 69 inches is very pale brown.

Minor soils, similar to the Astatula soil, make up 5 to 30 percent of the unit. Of these, the Paola soils are the most extensive.

Natural vegetation was a forest of live oak, wild cherry, hickory, laurel oak, and turkey oak. Stands of sand and longleaf pine, pioneer species, occurred in places. Turf and ornamental plants require special care, including fertilization and irrigation.

No capability subclass is assigned to the unit.

7—Astor fine sand. This nearly level, very poorly drained soil occurs on flood plains and in sloughs and depressions bordering flood plains.

Typically, the surface layer is fine sand about 55 inches thick. The upper 4 inches is black, the next 35 inches is very dark gray, and the lower 16 inches is very dark grayish brown. Next is 10 inches of fine sand mixed in streaks and patches of very dark grayish brown, very dark gray, and light gray. Below this to a depth of 82 inches is light gray fine sand.

Included with this soil in mapping are small areas of Gator soils in associated fresh water marshes, Basinger and Pompano soils in narrow sloughs and drainageways, and Myakka, Riviera, and EauGallie soils at slightly higher elevations. The included soils make up about 15 to 30 percent of any one mapped area.

This soil is saturated to the surface for long periods during the summer rainy season. Areas bordering lakes and the St. Johns River and areas in depressions are frequently flooded. Runoff is very slow. The water table is at or near the surface for long periods in wet seasons. Permeability is rapid but is impeded by the high water table. The available water capacity and the organic matter content are high. Natural fertility is moderate.

Almost all the acreage is in natural vegetation of swamp hardwoods—mainly red maple, sweetgum, water oak, and laurel oak—and a few loblolly pine. In places are almost pure stands of cabbage palm. In slough areas, sand cordgrass and glasswort predominate.

If excess water can be removed, this soil is moderately well suited to vegetable crops. Because drainage outlets are generally unavailable, however, it is seldom used for vegetables.

This soil is not suited to citrus because of the wetness and the danger of frost damage.

If the excess water is removed, the soil is well suited to improved pasture.

Under high level management, the potential productivity is high for slash pine. Some water control is needed if the potential productivity is to be realized.

The potential is low for community development because of the flooding hazard, the excessive wetness, and the lack of suitable drainage outlets. If drainage is installed, development is possible. There is danger, however, that the drainage system will become obstructed or be incapable of carrying discharge from extremely heavy rains.

These areas are natural wetlands. The potential is very high for storing floodwater during periods of heavy rains.

The capability subclass is IIIw.

8—Basinger fine sand, depressional. This poorly drained, nearly level sandy soil is mainly in depressions and in a few poorly defined drainageways in the flatwoods and sandhills. The acreage is of moderate extent. Areas generally are circular or long and less than 100 acres. Slopes are smooth to concave. They are mostly less than one-half percent but range from 0 to 2 percent.

Typically, the surface layer is gray fine sand about 5 inches thick. The underlying layers are sand to a depth of more than 80 inches. The upper 15 inches is light gray generally streaked with gray or dark gray, the next 5 inches is dark brown with black fragments, and the lower layers are grayish brown, very pale brown, or light gray.

Included with this soil in mapping are small areas of Immokalee, Myakka, Smyrna, Placid, Pompano, and Valkaria soils. Also included are small areas of a soil that is similar to this Basinger soil, but the subsoil is loamy at a depth of more than 40 inches. The included areas make up about 20 percent of any one mapped area.

The water table is above the surface for several months in most years. The rest of the time it is within 30 inches except during very dry periods. The available water capacity is very low, and permeability is very rapid throughout. Natural fertility and the organic matter content are low.

Natural vegetation is dominantly St.-Johnswort, maidencane, and other water tolerant grasses, some pineland threeawn, and scattered pond pine.

This soil is not suited to vegetable crops and citrus. It is not suited to improved pasture because of the difficulty in establishing and maintaining an effective water control system.

Because of excessive wetness, the potential productivity is low for slash pine. Pond pine grows best.

The potential is low for community development because of the high water table and the lack of suitable drainage outlets. If a drainage system is installed, development is possible. There is danger, however, that the system will become obstructed or be incapable of carrying discharge from extremely heavy rains.

The capability subclass is VIIw.

9—Beaches. Beaches are narrow sandy strips along the Atlantic coast. Seawater regularly overwashes the larger part of the beaches at high tide, and these areas are barren. The fringes and other slightly higher areas are inundated only during equinoctial or storm-driven tides. These areas mostly have sparse vegetation that is fragile and easily destroyed.

Beaches are fine to coarse sand mixed with multicolored shells and shell fragments. The material is constantly reworked by wave action. In places, especially at Daytona Beach and New Smyrna Beach, white sand predominates, and Beaches are almost white.

In most places sand dunes border the Beaches on the west side. The major soils on the dunes are Palm Beach, Paola, and Canaveral soils. These soils are not subject to wave action except during storms. They commonly receive salt spray.

Beaches are used intensively for sunbathing, strolling, pleasure driving, picnics, and other recreation. In addition, they provide access to swimming, fishing, surfing, scuba diving, and boating. In many places the sand on the beaches is firm enough to support automobiles, bicycles, motorcycles, and dune buggies.

In the cities along the coast, the fringes of the Beaches and adjoining sand dunes have been altered by smoothing, shaping, and the building of sea walls to permit the construction of houses, roads, beach cottages, high rise condominiums, and apartments.

Because of the unique location of Beaches and their value for recreational activities, other uses are not practical.

No capability subclass is assigned to the unit.

10—Bluff sandy clay loam. This nearly level, very poorly drained, frequently flooded soil is on low terraces bordering the St. Johns River. Individual areas are typically large, some as large as 300 acres, and most border lakes or streams.

Typically, the surface layer is sandy clay loam about 14 inches thick. The upper 8 inches is black, and the lower 6 inches is dark gray. The subsoil is gray sandy clay loam that extends to 68 inches. Mottles in shades of brown and yellow commonly occur in the subsoil. Below this to a depth of 99 inches is gray massive clay.

Included with this soil in mapping are small areas of Chobee, Gator, and Holopaw soils. The included soils make up about 20 percent of any one mapped area.

This soil is saturated to the surface for long periods. It is commonly flooded during the latter part of the summer rainy season. The water table may drop several feet during long dry periods. The available water capacity is high. Permeability is slow. Natural fertility is high, and the organic matter content is moderate.

Natural vegetation is water tolerant plants, including sedges, pickerelweed, cattail, and some sawgrass. In places there are hammocks of cabbage palm, live oak, and cedar.

Large areas of this soil are used for range during dry seasons.

This soil is not suited to vegetable crops and citrus because of excessive wetness and the flood hazard.

If excess water is removed, this soil is moderately well suited to improved pasture. Flooding is a hazard.

Under high level management, this soil has high potential productivity for slash pine. Some water control is needed if the potential productivity is to be realized.

The potential is very low for community development. Limitations are flooding, excessive wetness, slow permeability, and high shrink-swell potential. Because all of these limitations are difficult to overcome, using this soil for community development is impractical.

The capability subclass is Vw.

11—Bulow sand, 0 to 5 percent slopes. This gently sloping soil is on low narrow sand ridges on the mainland. The ridges represent a former coastline and generally run parallel to the coast. Individual areas range from 40 to about 400 acres.

Typically, the surface layer is gray sand about 5 inches thick. The subsurface layer is white sand to a depth of about 20 inches and brownish yellow sand to about 45 inches. The subsoil is yellowish red sandy clay loam about 6 inches thick. Below this is a layer of coquina rock that ranges from 2 to 10 feet in thickness. Below the rock are layers of sand and shell.

Included with this soil in mapping are small areas of Paola and Astatula soils and small areas of the typical Cocoa soils. The included soils make up about 15 percent of any one mapped area.

Water and air move rapidly through this soil. The water table is below 72 inches. The available water capacity is very low. Natural fertility and the organic matter content are low.

Native vegetation is oak, hickory, and magnolia and some cabbage palm. In places there are stands of sand pine. Some areas of this soil are in native vegetation. Some have been used for urban development.

This soil is poorly suited to vegetables. It is moderately well suited to improved pasture. Regular additions of lime and fertilizer are needed.

This soil is well suited to citrus.

Under high level management, the soil has moderately high potential productivity for slash pine.

The potential is high for community development. In most places the coquina rock is rippable. In addition, the water table is below 6 feet, surface and internal drainage are good, and traffic supporting capacity is good. Turf and ornamental plants grow well, but most require irrigation during the dry season. In places the coquina rock is mined for road building material.

The capability subclass is IVs.

12—Canaveral sand, 0 to 5 percent slopes. This moderately well drained to somewhat poorly drained, nearly level to gently sloping soil is on low coastal sand dunes and in the bottoms of troughs between the dunes. Slopes are concave in the troughs and convex on the lower sides of the dunes.

Typically, the surface layer is about 9 inches of sand that is black in the upper 4 inches and dark grayish brown in the lower 5 inches. The underlying layers are a mixture of light gray sand and shell fragments. In places there are discontinuous layers of shells of varying thickness.

Included with this soil in mapping are small areas of similar soils that are poorly drained. In a few areas the subsoil is almost entirely beds of shells; in places the shell layers are weakly cemented by calcium carbonate. The included areas make up about 20 percent of any one mapped area.

The water table is between depths of 10 and 40 inches for periods of 2 to 4 months. In dry seasons, it is below 60 inches. In low areas bordering the Halifax and Indian Rivers, the height of the water table depends partly on tidal fluctuations. Permeability is very rapid above the saturated layers. The available water capacity is very low. Natural fertility and the organic matter content are low. Most areas receive salt spray from the Atlantic Ocean. If this soil is cleared of natural vegetation and left unprotected, wind erosion will be severe.

The natural vegetation is the sawpalmetto-scrub oak type. Leaving it undisturbed protects the soil from wind erosion.

Aerial salt spray, droughtiness, wind erosion, and low natural fertility limit the growth of turf and most introduced plants. The soil is poorly suited to vegetable crops and improved pasture.

Under high level management, this soil has moderate potential productivity for slash pine. Sand pine grows best.

The potential is only medium for community development, but this soil occurs in the part of the county that is highly valued for urban development because it is near the beaches and the ocean. Undisturbed areas are important to many kinds of coastal wildlife and as a greenbelt bordering the beaches.

If undisturbed, the natural vegetation forms a barrier against wind and storm-driven waves and serves as habitat for wildlife and as part of a greenbelt bordering the beaches.

The capability subclass is VIs.

13—Cassia fine sand. This is a nearly level to gently sloping, somewhat poorly drained sandy soil in slightly elevated positions in the flatwoods or in lower positions on the sandhills. It is of small extent and generally occurs as irregularly shaped areas of less than 100 acres. Slopes are smooth to gently undulating. The gradient is 0 to 2 percent.

Typically, the surface layer is gray fine sand about 3 inches thick. The subsurface layer is white fine sand about 25 inches thick. The subsoil is 4 inches of black fine sand over 4 inches of brown fine sand mottled with dark reddish brown. The sand grains are coated with organic matter. The substratum is fine sand to a depth of 80 inches or more. The upper 11 inches is brown, the next 7 inches is pale brown, and the lower 27 inches is light gray.

Included with this soil in mapping are small areas of Daytona, Immokalee, Myakka, Orsino, Satellite, and Smyrna soils. The included areas make up as much as 30 percent of some mapped areas.

The water table is between depths of 15 and 40 inches for about 6 months during most years. It recedes to below 40 inches in dry seasons. The available water capacity is low. Permeability is moderately rapid in the subsoil but very rapid in the other horizons. Natural fertility and the organic matter content are very low.

The natural vegetation is scattered slash pine, longleaf pine, or sand pine, dense scrubby oaks, a few sawpalmetto, and pineland threeawn. Most areas are still in natural vegetation. Some of the acreage has been planted to slash pine.

The Cassia soil is generally not suited to vegetable crops because of droughtiness.

This soil is poorly suited to citrus, but under favorable climatic conditions and high level management, citrus can be grown. Deep rooting, drought-resistant pasture grasses are moderately well suited.

The potential is medium for community development. Drainage or water control to lower the water table is needed. Onsite septic systems can be mounded to maintain adequate depth above the seasonal high water table.

The capability subclass is VIs.

14—Chobee fine sandy loam. This nearly level, very poorly drained soil is in low places in coastal hammocks, in drainageways, and on flood plains. It is of small extent but is locally important in Turnbull and Bulow Hammocks. Individual areas are irregular in shape and range from 3 to about 200 acres.

Typically, a black mat 1 inch thick of decomposing plant parts and roots is on the surface. The surface layer is black fine sandy loam about 6 inches thick. The subsoil is between depths of 6 and 54 inches. The upper 15 inches is very dark gray sandy clay loam, the next 11 inches is very dark gray heavy fine sandy loam, and the lower 22 inches is dark gray sandy clay loam. Mottles in shades of brown and gray occur in the lower part. The substratum is a mixture of sand and shell fragments.

Included with this soil in mapping are small areas of the Tequesta and Tuscawilla soils. Also included are small areas of similar soils that have a sandy clay subsoil and areas where discontinuous limestone is in the subsoil. The included areas make up about 25 percent of the unit.

This soil is covered with standing water for extended periods during the rainy season from June to November and after prolonged, heavy rain in winter. The water table seldom is below 10 inches even in prolonged dry spells. Internal drainage is slow because the water table is high. Permeability is moderate. The available water capacity, natural fertility, and organic matter content are high.

The natural vegetation is swamp hardwoods—cypress, sweetgum, and red maple—and cabbage palm. Most areas of this soil remain in natural vegetation.

If drainage outlets are available and the soil is adequately drained, this soil is moderately well suited to vegetable crops, improved pasture, and citrus. The loamy subsoil and the wetness restrict root development of the citrus trees, which results in smaller trees.

Removing the hardwoods and preparing the land for slash pine may not be economically feasible. Under high level management, however, the potential productivity is high for slash pine. Some water control is needed if the potential productivity is to be realized.

The potential is very low for community development. Limitations are the excessive wetness, the flooding, and the moderate shrink-swell potential of the subsoil. The low position on the landscape makes water control and protection from flooding difficult. Fill material is generally needed to elevate construction sites. Unless special care is taken, fill material spread around the natural vegetation may cause the trees to die.

The capability subclass is IIIw.

15—Cocoa sand, 0 to 5 percent slopes. This nearly level to gently sloping soil is on low, long, narrow sandy ridges that parallel the Atlantic Coast. Individual areas range from about 20 to more than 640 acres.

Typically, the surface layer is very dark gray sand about 6 inches thick. The subsurface layer is brown sand to a depth of 14 inches. The subsoil is about 12 inches of brown sand and 4 inches of reddish brown loamy sand. Coquina limestone occurs at a depth of about 30 inches, but the depth varies from 20 to 40 inches within short distances. Thickness of the coquina rock ranges from 2 to 10 feet.

Included with this soil in mapping are small areas of Astatula, Bulow, and Orsino soils. Also included are small areas of similar soils where the depth to coquina rock is less than 20 inches. The included areas make up about 15 percent of any one mapped area.

Runoff is slow. Infiltration is rapid. Water and air move through the soil rapidly. The available water capacity, organic matter content, and natural fertility are low. The water table is below 80 inches.

Natural vegetation is upland hardwood hammocks—live oak, laurel oak, magnolia, and cabbage palm.

The Cocoa soil is well suited to citrus. It is poorly suited to vegetable crops and improved pasture because of poor soil qualities and droughtiness. Under high level management, the potential productivity is moderately high for slash pine.

The potential is high for community development. Lawns and ornamental plants require good management, including supplemental irrigation, especially during dry periods. Because of the shallow depth to coquina limestone and the very rapid permeability in the limestone, pollution is a potential hazard from onsite sewage disposal systems to shallow ground water. Although the coquina rock is moderately hard, it can be removed without too much difficulty by heavy machinery.

The capability subclass is IVs.

16—Cocoa-Urban land complex, 0 to 5 percent slopes. This map unit is made up of long narrow sand ridges of nearly level to gently sloping Cocoa soils that have been used for urban development. In the natural state, these were well drained sandy soils about 40 inches thick over a layer of coquina rock. Depth to the water table is more than 80 inches. This naturally well drained soil has been mixed, reworked, and reshaped during the construction of roads, streets, utility lines, foundations, and other facilities associated with construction and development. About 40 to 70 percent of the unit is Cocoa sand, and about 15 to 45 percent is Urban land, or areas covered with streets, parking lots, buildings, and other structures. The open areas of Cocoa sand are lawns, vacant lots, and some undeveloped small tracts. A major part of this unit is along U.S. Highway 1.

Typically, the surface layer of Cocoa soil is very dark gray sand about 6 inches thick. The subsurface layer is brown sand to a depth of 14 inches. The upper part of the subsoil is brown sand about 12 inches thick, and the lower part is reddish brown loamy sand about 4 inches thick. Coquina limestone is generally at a depth of about 30 inches, but the depth varies from 20 to 40 inches within short distances. Thickness of the coquina rock ranges from 2 to 10 feet.

Minor soils make up 5 to 30 percent of the unit. They are soils that are similar to the Cocoa soil. Some are more than 60 inches deep over coquina rock, and some in small patches are not so well drained and have a seasonal high water table between depths of 40 and 60 inches. A few spots are Astatula and Paola soils.

Natural vegetation was a mixed hardwood forest of laurel oak, live oak, and magnolia and longleaf pine and cabbage palm. Supplemental irrigation is needed in the dry season for lawns and ornamental plants.

No capability subclass is assigned to the unit.

17—Daytona sand, 0 to 5 percent slopes. This moderately well drained, nearly level to gently sloping soil is on gently undulating sandhills or slightly elevated places in flatwoods. Slopes are convex to smooth. Areas are generally long and moderately wide or irregular in shape. They range from 4 to 300 acres.

Typically, the surface layer is gray sand about 5 inches thick. The subsurface layer is white sand about 31 inches thick. The subsoil is mainly yellowish brown sand about 11 inches thick. Below the subsoil to a depth of 80 inches or more is light brownish gray sand mottled in shades of brown.

Included with this soil in mapping are small areas of Cassia, Electra, Immokalee, Orsino, Satellite, and St. Lucie soils. In some low areas the water table may come to within 30 inches of the surface, and in some the upper layer of the subsoil is slightly thicker than is typical. Also included are a few areas where the surface layer is coarse sand, a few areas where it is fine sand, and a few small areas of similar soils where the subsoil is within a depth of 50 to 60 inches. The included areas generally make up no more than about 15 percent of any one mapped area.

Most areas are in natural vegetation of the sand pine-scrub oak type. Scattered turkey oak, slash pine, and longleaf pine are in places. There is commonly a brushy understory of rosemary, fetterbush, and sawpalmetto.

The water table is commonly at a depth of 40 to 50 inches for 1 to 4 months during the wet season, and it drops to 72 inches or more during the drier part of the year. The available water capacity is low. Permeability is very rapid in the surface layer and moderately rapid in the subsoil. Natural fertility and the organic matter content are low.

This soil is not suited to vegetable crops because of the low available water capacity, the rapid leaching of plant nutrients, and the low natural fertility. Under high level management, however, it can produce some special crops, such as ferns and watermelons. Irrigation and frequent applications of fertilizer are needed.

If adequately fertilized, this soil is moderately well suited to citrus. Irrigation is usually needed during the dry season.

This soil is poorly suited to improved pasture because of droughtiness and rapid leaching of plant nutrients. High level management and irrigation are needed to successfully establish and maintain improved pasture.

The potential productivity is low for slash pine. Sand pine grows best.

The potential is high for community development. The seasonal high water table at 40 inches is a hazard for dwellings with basements. Vehicle traction is poor on unpaved roads because of the sandy texture. Onsite waste disposal causes a moderate hazard of pollution to the groundwater. Establishing turf and ornamental plants is difficult. Frequent applications of fertilizer and irrigation water are needed. Adding topsoil of loamy material or material high in organic matter helps in establishing and maintaining the plants.

The capability subclass is VIs.

18—Daytona-Urban land complex, 0 to 5 percent slopes. This map unit is made up of nearly level to gently sloping Daytona soils that have been used for urban development. In the natural state these were deep, sandy soils on low sandy swells where the water table fluctuated between depths of 40 and 60 inches during the wet season. In almost all areas, however, drainage has been affected by roadside ditches and drainage ditches connected to arterial canals. For the most part, the soil has been disturbed by bulldozing or reworking and reshaping during the construction of drainage ditches, roads, streets, utility lines, and foundations and the installation of other facilities associated with construction and development. About 40 to 60 percent of the unit is Daytona sand, and about 15 to 45 percent is Urban land. The open areas of Daytona soils are lawns, vacant lots, and undeveloped areas. They are generally small and intermingled with areas of Urban land. The Urban land is areas covered with streets, parking lots, buildings, and other structures.

Typically, the surface layer of the Daytona soil is gray sand about 5 inches thick. The subsurface layer is white sand about 31 inches thick. The subsoil is sand about 11 inches thick. The upper 2 inches is dark brown, and the lower 9 inches is yellowish brown. Below this, to a depth of 80 inches or more, is light brownish gray sand mottled in shades of brown.

Natural vegetation was a xeric forest of the pine-scrub oak type, mainly sand pine, longleaf pine, scrub oak, and turkey oak. Sawpalmetto dominated the understory. These native plants thrive without irrigation or other special care, but cultivated and introduced ornamental plants and turf require continuous special care, including irrigation and regular fertilization.

About 10 to 20 percent of the unit is included small areas of Cassia, Electra, Satellite, and St. Lucie soils.

No capability subclass is assigned to the unit.

19—Deland fine sand, 0 to 5 percent slopes. This well drained, nearly level and gently sloping soil occurs on broad, moderately high sand ridges. The acreage is small in extent, but some individual areas are more than 100 acres. Areas are long to irregular in shape.

Typically, the surface layer is dark gray fine sand about 4 inches thick. The subsurface layer is fine sand to a depth of 55 inches. The upper 6 inches is light gray; the next 9 inches is light brownish gray; the next 17 inches is gray; and the lower 19 inches is light brownish gray. The subsoil extends to a depth of 130 inches or more. The upper 11 inches is dark brown fine sand; the next 6 inches is noncemented black fine sand; and the lower 36 inches is strongly cemented black fine sand.

Included with this soil in mapping are small areas of Apopka, Astatula, and Tavares soils. The included areas make up about 15 percent of some mapped areas.

The water table is below 72 inches, and there is a perched water table on the strongly cemented layers below 80 inches. The water table fluctuates between depths of about 75 and 90 inches during periods of high rainfall. The available water capacity is very low. Permeability is very rapid in the surface layer and moderate in the subsoil. Natural fertility and the organic matter content are very low.

The natural vegetation is mixed longleaf pine, sand pine, and turkey oak and an understory of sand live oak and sawpalmetto. Many areas are still in natural vegetation. Some have been planted to citrus, pasture, and pine trees.

This soil is poorly suited to vegetable crops because of poor soil qualities. Under high level management, however, a few special crops such as watermelons and ferns can be grown.

If the local climate is favorable, this soil is well suited to citrus trees. Growing a cover crop between the trees, applying lime and fertilizer, and irrigating during dry periods are good management practices.

If well managed, this soil is moderately well suited to deep rooted improved pasture grasses. Bahiagrass and other deep rooted grasses are suitable, but careful management is needed.

The potential is high for community development. On unpaved roads, vehicle traction can be a problem because of the sandy surface texture. This is one of the better soils in the county for trench sanitary landfill, even though the soil is sandy and seepage occurs to a depth of 67 inches, because the strongly cemented, nearly impermeable layer restricts downward movement of pollutants. The very low natural fertility and the droughtiness make establishing and maintaining turf and ornamental plants difficult.

The capability subclass is IVs.

20—EauGallie fine sand. This nearly level, poorly drained soil has a sandy surface layer over a loamy subsoil. It is in broad flatwoods. Slopes are 0 to 2 percent.

Typically, the surface layer is 9 inches thick. The upper 4 inches is black fine sand, and the lower 5 inches is very dark gray fine sand. The subsurface layer is gray fine sand about 12 inches thick. The subsoil begins at a depth of about 21 inches. The upper 6 inches is black fine sand, the next 8 inches is dark reddish brown fine sand, and the next 4 inches is dark brown fine sand. To a depth of 52 inches is brown fine sand, and to 61 inches is a layer of gray sandy loam. Below this to 65 inches is pale brown fine sand.

Included with this soil in mapping are small areas of Farmton, Wabasso, and Pinellas soils. In places, the boundaries between soils are gradual. These soils are similar in many properties. The included areas make up 20 to 25 percent of some mapped areas.

The water table fluctuates within 10 inches of the surface for periods of 1 to 4 months in most years and is within 40 inches for more than 6 months. The available water capacity is low. Runoff is slow. Permeability is rapid in the surface layer and moderately rapid in the subsoil. Natural fertility and the organic matter content are low, but response to fertilizer is moderate.

Most areas of this soil are forests of longleaf and slash pine and an understory of sawpalmetto, gallberry, and pineland threeawn. A few areas are improved pasture.

Under natural conditions this soil is poorly suited to vegetable crops because of a high water table and low natural fertility. If a good water control system and a high level of management are used, however, certain vegetable crops grow well.

This soil is not suited to citrus because of wetness and the hazard of frost.

This soil is well suited to improved pasture. Water control, good management, and fertilization are needed.

The potential productivity is moderately high for slash pine. Trees are usually planted on beds to improve surface drainage. A drainage system is needed to remove excess water during wet seasons.

The potential is low for community development. A water control system is needed to remove excess water during the wet season. In most areas in the central part of the county, drainage systems are expensive and difficult to install because drainage outlets are unavailable. Areas along the rivers and the coast and areas where there are natural drainage outlets can be developed after artificial drainage is provided.

The capability subclass is IIIw.

21—EauGallie fine sand, depressional. This nearly level, poorly drained soil occurs mainly in depressions and, in some places, in broad, poorly defined drainageways in the flatwoods. It is similar to EauGallie fine sand, but the upper part of the subsoil is generally more friable and less cemented. Areas of this soil are commonly lower on the landscape than areas of EauGallie fine sand.

Typically, the surface layer is black fine sand about 4 inches thick. The subsurface layer is 19 inches thick.

The upper 7 inches is light brownish gray fine sand, and the lower 12 inches is grayish brown fine sand. The upper part of the subsoil is 8 inches of black fine sand and 4 inches of very dark grayish brown fine sand. Between depths of 35 and 43 inches is grayish brown fine sand. Below this is 24 inches of dark gray sandy clay loam and 8 inches of gray sandy clay loam.

Included with this soil in mapping are small areas of Malabar and Pineda soils and depressional Wabasso, Wauchula, and Pomona soils. Also included are similar soils that are underlain by shell, which occur in coastal areas, on Turnbull Hammock, and near the St. Johns River. The included soils make up about 25 percent of any one mapped area.

The water table is within 10 inches of the surface for 3 to 6 months. The soil is ponded from 7 days to 1 month or longer after heavy rainfall. The ponded water is seldom deeper than 6 inches. The available water capacity is low. Permeability is rapid in the surface and subsurface layers and moderate to moderately rapid in the subsoil. Internal drainage is slow because the water table is high. Natural fertility and the organic matter content are low.

Most areas are in natural vegetation of pineland threeawn, maidencane, scattered pond pine, waxmyrtle, and scattered clumps of sawpalmetto and loblolly bay. A few areas are used as range when the water table is below the surface.

This soil is not suited to vegetable crops because of the wetness and the low natural fertility.

This soil is not suited to citrus because of the excessive wetness and the hazard of frost.

The potential productivity is moderate for slash pine. A system to remove excess surface water is needed for maximum growth. Trees should be planted on beds.

The potential is very low for community development. The major limitation is excessive wetness. The soil areas are lower on the landscape than surrounding soils, which makes drainage difficult. Artificial drainage systems are expensive; suitable drainage outlets generally are not available. In some areas along streams and near the coast, where there are more suitable drainage outlets, an adequate water control system can be installed. Such areas are more easily developed.

This soil is best left in its natural state and used as wetland wildlife habitat.

The capability subclass is VIIw.

22—Electra fine sand, 0 to 5 percent slopes. This somewhat poorly drained, nearly level soil occurs in slightly elevated places in flatwoods. Slopes are smooth.

Typically, the surface layer is dark gray fine sand about 2 inches thick. The subsurface layer is fine sand that is light gray in the upper 6 inches and white in the lower 27 inches. The subsoil is between depths of 35 and 78 inches. In sequence downward, it is 6 inches of dark reddish brown fine sand, 11 inches of dark brown to brown fine sand, 5 inches of very pale brown fine sand, 13 inches of light brownish gray sandy clay loam, and 8 inches of light brownish gray sandy loam. Below the subsoil to 92 inches is gray loamy fine sand.

Included with this soil in mapping are small areas of soils that have a black to dark reddish brown subsoil within a depth of 30 inches, or a loamy subsoil within 40 inches, or both. Also included are small areas of Cassia and Daytona soils and a few small areas where slopes are 5 to 8 percent. The included soils make up about 25 percent of any one mapped area.

The water table is at a depth of 20 to 40 inches for about 4 months during most years and recedes to below 40 inches during drier periods. The available water capacity is low. Permeability is rapid to a depth of about 35 inches, moderate between depths of 35 and 41 inches, rapid between 41 and 57 inches, moderately slow between 57 and 78 inches, and rapid below. Internal drainage is slow under natural conditions but rapid where artificial drainage has been provided. The organic matter content and natural fertility are very low. Response to fertilizers is slight.

A major part of the acreage is in natural vegetation—an open forest of slash and sand pine, dense scrub oak, and an understory of sawpalmetto, creeping bluestem, chalky bluestem, pineland threeawn, fetterbush, and gallberry.

This soil is poorly suited to vegetable crops because of very low organic matter content, very low natural fertility, and droughtiness.

The soil is not suited to citrus, mainly because of the frost hazard. The seasonal high water table is also a limitation.

The soil is poorly suited to improved pasture grasses. If fertilized and limed, bahiagrass grows best.

The potential productivity is moderate for slash pine.

In its natural state, this soil has medium potential for community development. The major limitation is wetness. Possible ways of overcoming the wetness are installing adequate drainage systems or filling the area with enough suitable sand material to reach the necessary elevation above the water table.

The capability subclass is VIs.

23—Farmton fine sand. This poorly drained, nearly level soil is in broad areas within the flatwoods. Slopes are smooth and are 0 to 2 percent.

Typically, the surface layer is very dark gray fine sand about 7 inches thick. The underlying layer is fine sand, sandy clay loam, and fine sandy loam to a depth of 60 inches. In sequence downward, it is 27 inches of light gray fine sand, 6 inches of black fine sand, 5 inches of dark reddish brown fine sand, and 6 inches of grayish brown sandy clay loam. The lower part is grayish brown fine sandy loam to 60 inches.

Included with this soil in mapping are small areas of EauGallie, Immokalee, Myakka, Pomona, Basinger, and

Wauchula soils. The included soils make up about 20 percent of any one mapped area.

The water table is within a depth of 10 inches for 1 to 3 months and within 40 inches for 6 months or more during most years. The available water capacity is low. Permeability is rapid to a depth of about 34 inches, moderate between 34 and 50 inches, and moderately rapid below. Internal drainage is slow under natural conditions but rapid where artificial drainage is provided. Natural fertility and the organic matter content are low. The response to fertilizer is moderate.

A large part of the acreage is in natural vegetation—an open forest of slash pine and an understory of saw-palmetto, runner oak, gallberry, fetterbush and waxmyrtle. Pineland threeawn and several varieties of bluestem are the most common native grasses.

Under natural conditions this soil is poorly suited to vegetable crops because of periodic wetness and poor soil quality. If water is controlled and soil-improving measures are applied, however, certain vegetable crops can be produced. The water control system should remove excess water in wet seasons and provide water through subsurface irrigation in dry seasons.

This soil is not suited to citrus because of the frost hazard and the excessive wetness.

If excess water is removed in wet seasons by a simple drainage system, improved pastures of pangolagrass, improved bahiagrasses, and white clover can be maintained on this soil. Regular application of fertilizer and lime is needed. Overgrazing should be prevented.

If well managed, this soil has moderately high potential productivity for slash pine. Bedding prevents damage to pine seedlings from excess surface water. During the process of bedding the soil, vegetation and debris are deposited below the bedding layer, which results in more available organic material for pine seedlings. A drainage system to remove excess surface water is needed if the potential productivity is to be realized.

In its natural state, the soil has low potential for community development. The major limitations are excessive wetness, lack of good drainage outlets, and a high risk of corrosion to uncoated steel and concrete. The seasonal high water table is at the soil surface. This soil is almost always saturated with water during the wet season so that it cannot store or transmit additional water. Runoff is very slow after heavy or prolonged rains because the areas are nearly level. An adequate water control system would be required to remove excess surface water and maintain the water table at the depth necessary for the selected use. Artificial drainage systems, however, are expensive and difficult to develop because natural drainage outlets are generally unavailable.

The capability subclass is IVw.

24—Fluvaquents. These are nearly level, poorly drained and frequently flooded soils that formed in stratified sandy, loamy, and clayey sediments on flood plains of rivers, creeks, and lakes. They vary widely in texture within short distances. They consist of stratified layers of sandy, loamy, and clayey material. In some places, there is a thin mucky surface layer. In some, there are layers of organic material in the soil. Most areas are narrow stream borders. Tracts range from a few acres to about 40 acres.

Included with these soils in mapping are small areas of Basinger, Samsula, Gator, Bluff, and Chobee soils. The included soils make up 15 to 30 percent of any one mapped area. All are associated with Fluvaquents.

Natural vegetation is predominantly swamp hardwoods—red maple, sweetgum, and cypress—and cabbage palm. In places, there are openings that support water-tolerant shrubs, grasses, and sedges.

These wet, frequently flooded soils are not suited to vegetable crops, citrus, or pasture.

The potential is very low for community development. The major limitations are flooding and wetness. The hazard of flooding is so difficult and costly to overcome that development is impractical.

The potential is high for some wetland wildlife and for nature areas.

The capability subclass is VIIw.

25—Gator muck. This very poorly drained, nearly level, well decomposed organic soil occurs in freshwater swamps and marshes and on flood plains of lakes, rivers, and creeks. Slopes are 0 to 1 percent.

Typically, the surface is black muck about 34 inches thick. Below this is 12 inches of very dark gray sandy clay loam and 6 inches of dark grayish brown stratified loamy fine sand, fine sandy loam, and fine sand. Below this is 6 inches of light gray fine sand.

Included with this soil in mapping are small areas of Holopaw, Pompano, Placid, Pomona, St. Johns, Tequesta, Terra Ceia, and Tomoka soils. The included soils make up about 20 percent of any one mapped area.

The water table is at or above the soil surface in spring, summer, and fall and is within 10 inches of the soil surface in winter. The available water capacity is high. Internal drainage is slow. It is impeded by the high water table. If artificial drainage is provided, however, it is rapid in the organic layer and moderate in the subsoil. Natural fertility is moderate. The response to fertilizer is good. The organic matter content is very high.

A large part of the acreage is in natural vegetation—swamp hardwoods with American elm, baldcypress, cabbage palm, red maple, sourwood, sweetgum and an understory of maidencane, sawgrass, giant cutgrass, smooth cordgrass, waxmyrtle, and other perennial grasses. A small acreage in marshes has a cover of sawgrass or smooth cordgrass and in places a moderate amount of chalky bluestem.

Under natural conditions this soil is not suited to vegetable crops because of excessive wetness. If adequate water control measures could be installed, it would be suited to most vegetable crops, but a major drainage system would be needed. The system should remove excess water when crops are on the land and keep the soil saturated at all other times to prevent excessive oxidation of the organic layers.

This soil is not suited to citrus. It has many soil limitations to citrus production.

Productive pastures of improved grasses or grass-clover mixtures could be grown if an adequate water control system could be installed.

This soil is not suited to and has very low potential productivity for slash pine. The major soil limitations are excessive wetness, rapid permeability, subsidence, and low strength of organic layers. These soil factors result in severe equipment limitations, seedling mortality, windthrow hazard, and plant competition. Hardwood trees and baldcypress grow naturally on this soil.

The potential for community development is very low. The major limitations are excessive wetness, excess humus, a high risk of corrosion to uncoated steel and concrete, and subsidence of organic layers.

This soil is always saturated with water during the wet season and cannot store or transmit additional water. Runoff is very slow because of nearly level slopes and limited natural drainage outlets. If drained, total subsidence of organic layers is about 24 inches. A system would be needed to remove excess surface water and maintain the water table at a depth required for selected uses. Artificial drainage systems are expensive and difficult to develop because of poor natural drainage outlets.

Many areas of this soil are adjacent to lakes. Altering natural vegetation could have a detrimental effect on the water quality. This soil is a good wetland wildlife habitat. Shallow water areas are easily developed.

The capability subclass is VIIw.

26—Holopaw sand. This nearly level, poorly drained soil has a seasonal high water table at or near the surface. It occurs in broad low flatwoods, especially in the slightly lower areas that are associated with lakes, and in areas bordering the flood plain of the St. Johns River. Individual areas vary in size; many range up to several hundred acres.

Typically, thick sandy surface layers overlie a subsoil of sandy clay loam. The surface layer is 11 inches thick. The top 5 inches is black, and the next 6 inches is dark gray. The subsurface layer is 44 inches thick. The upper part is grayish brown mottled in shades of yellow and brown, and it grades to gray in the lower part. The subsoil is gray sandy clay loam to a depth of 63 inches. Below this to 70 inches is layered gray sand, loamy sand, and sandy loam.

Included with this in mapping are small areas of the poorly drained Malabar, Pineda, Pomona, Riviera, and Farmton soils. These soils have many similar properties. They occur in small areas of less than 2 acres. Also included are a few small depressional areas. The included soils make up about 20 percent of any one mapped area.

Runoff is slow to very slow in nearly level areas. Ponding occurs in the included depressional areas. The water table is within 10 inches of the soil surface for 2 to 6 months in most years. Permeability is rapid in the surface layer and moderate in the subsoil, but under natural conditions the movement of air and water is impeded by the high water table. The available water capacity is low. Root development is restricted by the high water table.

Most areas of this soil are in water-tolerant native vegetation, a sparse forest of slash pine and cabbage palm and shrubby vegetation dominated by gallberry and waxmyrtle. Pineland threeawn is the major grass. Some areas associated with the flood plains are in a swamp hardwood forest dominated by sweetgum and red maple. A few areas are used for range.

Wetness is a limitation for most uses. Water control is difficult because the soil is low on the landscape and natural drainage outlets are unavailable.

Wetness is a severe limitation for vegetable crops. If water control is feasible, a number of vegetable crops can be grown.

This soil is not suited to citrus. Limitations are wetness and the hazard of frost because of the soil's low position on the landscape.

Under good management, this soil is moderately well suited to improved pasture. Good management includes controlling water, maintaining fertility, and controlling grazing.

The potential productivity is moderately high for woodland. Bedding prevents excess surface water from damaging pine seedlings. A good drainage system to remove excess surface water is needed if the potential productivity is to be realized.

The potential is low for community development. Excessive wetness is the principal limitation. The low position on the landscape and the resulting lack of natural drainage outlets make artificial drainage and water control difficult.

The capability subclass is IVw.

27—Hontoon mucky peat. This very poorly drained, nearly level organic soil occurs in freshwater swamps and marshes within the flatwoods. Slopes are smooth. The gradient is less than one percent.

Typically, the surface layer is dark reddish brown mucky peat about 5 inches thick. The underlying layer is well decomposed organic material to a depth of more than 52 inches and a mixture of sand and highly decomposed organic matter below. The upper 9 inches is black well decomposed organic material; the next 46 inches is dark reddish brown well decomposed organic material; and the lower 5 inches is black highly decomposed organic material that is about 72 percent sand.

Included with this soil in mapping are small areas of Myakka, St. Johns, Pomona, Pompano, Placid, and Samsula soils. These soils occur around the edges of mapped areas. They make up about 25 percent of any one mapped area.

During most years, the water table is at or above the soil surface for 6 to 9 months and within 10 inches of the surface for 6 months or more. The available water capacity is very high. Permeability is rapid throughout. Internal drainage, however, is slow; it is impeded by the high water table. If the soil is artificially drained, internal drainage is rapid. Natural fertility is moderate. Response to fertilizer is good. In the more acid areas intensive liming is needed for best yields.

A large part of the acreage is in natural vegetation of dense swamp hardwoods with loblolly bay, red maple, sweetgum, sourwood, and baldcypress and an understory of waxmyrtle, sawgrass, greenbrier, smooth cordgrass, and maidencane.

Under natural conditions this soil is not suited to vegetable crops because of excessive wetness. With good water control, however, the soil can produce most vegetable crops. The water control system should remove excess water while crops are on the land and keep the soil saturated at all other times to reduce oxidation and subsidence. In addition to applications of a complete fertilizer, large applications of lime are needed.

This soil is not suited to citrus.

If water is controlled, productive pastures of improved grasses or grass-clover mixtures suited to the area can be grown. The water control system should maintain the water table near the surface to prevent excessive oxidation of the organic layers.

The potential productivity is very low for slash pine because of excessive wetness, subsidence, and the low strength of the organic layers. These factors result in severe equipment limitations, high seedling mortality, a windthrow hazard, and severe plant competition.

In its natural state, the soil has very low potential for community development. The major soil limitations are excessive wetness, organic layers more than 52 inches deep, the high risk of corrosion to steel and concrete, and, if the soil is drained, considerable subsidence of the organic layers. The seasonal high water table is above the soil surface. This soil is always saturated with water during the wet season and cannot store or transmit additional water. Runoff is very slow because the areas are nearly level and natural drainage outlets are unavailable. The organic layers would have to be excavated or the structures built on fill material or pilings because of subsidence. A good water control system would be needed to remove excess surface water and maintain the ground water table at the depth necessary for the selected use. Artificial drainage systems are expensive and difficult to develop because of the limited natural drainage outlets.

Many areas of this soil are adjacent to streams and bodies of water. Altering the natural vegetation conditions would have an adverse effect on the water quality.

The capability subclass is IIIw.

28—Hydraquents. Hydraquents are silty, clayey, or loamy tidal deposits in mangrove islands or swamps. They are in tidal basins and estuaries along the Atlantic Coast. These mangrove islands are numerous. They occur in many sizes and shapes in the Indian and Halifax Rivers. In places along the lower course of the rivers, they are fingerlike projections extending from the banks. They are near sea level. Tidal water overwashes the outer edges of the mangrove clusters or islands at high tide. For the most part, the inner parts are slightly higher and are inundated only during storms and equinoctial tides.

Soils in the mangrove swamps typically vary within short distances. Because of this variability and the difficulty of detailed investigation, these soils are not classified below the great group level in soil taxonomy. Texture of the soil layers is clayey, silty, or loamy with few pockets or discontinuous strata of sandy material. In some places, the surface layer is mucky. The mineral soil layers are typically dark gray, greenish gray, or dark greenish gray. The soils have a high water content, so their strength is low and they can support little weight. They contain some sulfides. Soil reaction becomes extremely acid after prolonged exposure to air.

Included with these soils in mapping are a few places that have layers and accumulations of shells. Also included are a few areas along the Intracoastal Waterway that have piles of sand and shells as much as four feet thick. This material was dredged from the channel. The included areas make up about 15 percent of any one mapped area.

Both the red and the black mangrove are important species in the mangrove swamps. The red mangrove grows in the outer areas that are covered daily by saline water during high tides. It develops an extensive prop root system and produces seeds that germinate on the plant before dropping off to float away in the water and perhaps lodge in shallow water to form a new plant. The black mangrove grows at slightly higher elevations that are less affected by daily high tides. It produces many erect roots or pneumatophores above the soil surface. In places, the white mangrove grows as a secondary species along the inland border of the swamps. The mangroves are land builders. The prop roots of the red mangrove provide attachment surfaces for oysters and other sessile sea organisms, which causes an accumulation of shells on the surface. In addition, the thick prop root systems entrap all but the smallest floating organic debris. There is a slow accretion of shells, organic matter, and mineral particles. Sand crabs continually make burrows and mix the sediments.

Because of tidal flooding, low soil strength, and inaccessibility, Hydraquents are not suited to agriculture or community development. Drainage of these soils would probably cause the soils to become so acid that they would not support plant growth.

These are soils that support mangrove swamps, which are part river basin and part sea. They are a unique and biologically productive zone that is important to fish and wildlife. Many sport and commercial finfish as well as shellfish use the areas as nurseries and, in addition, are linked to food chains originating with mangrove detritus. Offshore birds use these soils as rookeries and feeding grounds. Mangrove swamps also serve as a protective barrier in estuaries against excessive wave action during tropical storms.

The capability subclass is VIIIw.

29—Immokalee sand. This nearly level, poorly drained sandy soil generally occurs in broad areas in the flatwoods, in low areas between sand ridges, or in slightly elevated areas between ponds and sloughs. The acreage is moderate in extent. Some areas are more than 1,000 acres. Slopes are smooth to slightly convex or concave and are 0 to 2 percent.

Typically, the surface layer is about 10 inches thick. The upper 5 inches is black sand, and the lower 5 inches is dark gray sand. The subsurface layer is sand streaked with very dark gray in old root channels. The upper 6 inches is gray, and the lower 18 inches is light gray. The subsoil is loamy sand or sand that is coated with organic matter. The upper 5 inches is dark reddish brown loamy sand, and the lower 5 inches is black sand. The underlying material is grayish brown sand to a depth of 80 inches or more.

Included with this soil in mapping are small areas of Basinger, Myakka, Placid, Daytona, St. Johns, Satellite, and Smyrna soils. The included soils generally make up less than 25 percent of any one mapped area.

The water table is within 10 inches of the surface for 1 to 2 months in most years and between 10 and 40 inches more than half the time. Occasionally in very wet seasons it rises above the surface for a few days. The available water capacity is low. Permeability is moderate or moderately rapid in the subsoil and rapid in the other horizons. Natural fertility and the organic matter content are low.

The natural vegetation is an open forest of slash pine and longleaf pine and an understory of sawpalmetto, runner oak, and pineland threeawn. Most areas are still in natural vegetation. Some are planted to improved pasture grasses.

Immokalee soils are moderately suited to vegetable crops. The periodic wetness, low fertility, and low organic matter content reduce choice of plants and result in a need for high level management. The water table must be carefully controlled. Availability of irrigation water and freedom from frost greatly affect the soil suitability and the choice of crops.

Generally this soil is not suited to citrus. The wetness and susceptibility to frost are the major limitations.

If excess water is removed, productive pastures of improved grasses can be maintained. Liberal amounts of fertilizer are needed. Clover can be grown with the grasses but must be irrigated to assure good growth.

The potential is low to medium for community development. The major limitation is the high water table. In places outfall ditches can be constructed to control surface water. Mounding can raise the sites for structures and onsite waste disposal fields. A maintenance program is needed to keep ditches open and functioning. Standing water in ditches increases the need for mosquito control.

The capability subclass is IVw.

30—Immokalee sand, depressional. This poorly drained, nearly level sandy soil occurs in shallow intermittent ponds and sloughs in the flatwoods. Individual areas are small, generally less than 25 acres.

Typically, the surface layer is black sand about 8 inches thick. The subsurface layer is mainly gray sand about 28 inches thick. The subsoil is loamy sand or sand coated with organic matter. It is 5 inches of friable black sand, 6 inches of friable dark reddish brown sand, and 3 inches of friable dark brown sand. Below this to a depth of 80 inches is brown sand.

The water table is within 10 inches of the surface for about 6 months in most years. Water stands above the surface for long periods after heavy rain. The available water capacity is low. Permeability is moderate or moderately rapid in the subsoil and rapid in the other layers. Natural fertility and the organic matter content are low.

Included with this soil in mapping are small areas of other soils, such as Basinger, Myakka, Placid, Pompano, and St. Johns soils. The included soils make up about 20 to 25 percent of many mapped areas.

The natural vegetation is St.-Johnswort, maidencane, sand cordgrass, and pickerelweed in the lowest spots. A few slash pine trees are in some high areas. These pines have become established during prolonged dry periods. Most areas are still in natural vegetation.

This soil is not suitable for vegetable crops or improved pasture because of the excessive wetness. Establishing an adequate drainage system is very difficult because suitable outlets are generally lacking.

This soil is not suited to citrus because of excessive wetness and the frost hazard.

The potential productivity is very low for slash pine. Pond pine will grow on this soil.

The potential is very low for community development. The major limitations are excessive wetness or standing water and the lack of drainage outlets.

In its native state, this soil provides watering places and some grazing for cattle. It is an important feeding ground for many kinds of wading birds and other wildlife.

The capability subclass is VIIw.

31—Malabar fine sand. This poorly drained, nearly level soil occurs in broad low flats. Slopes are smooth and are 0 to 2 percent.

Typically, the surface layer is black fine sand about 2 inches thick. The subsurface layer is fine sand about 13 inches thick. The upper 7 inches is light brownish gray, and the lower 6 inches is light gray. The subsoil is about 65 inches thick. In sequence downward, it is 9 inches of strong brown fine sand, 8 inches of mixed yellowish brown, light yellowish brown, and brownish yellow fine sand; 10 inches of gray fine sand; 11 inches of mottled gray fine sandy loam with pockets of sandy clay loam; and 27 inches of mottled gray sandy loam with pockets of fine sand.

Included with this soil in mapping are small areas of Basinger, Holopaw, Pineda, Pompano, Riviera, and Valkaria soils. Some pedons in depressions have a layer of humus or iron accumulation. In some areas about 6 inches of water stands on the soil surface for 7 days to 3 months in most years. In small areas the soil reaction is more acid than is described for the series. The included areas make up about 20 percent of any one mapped area.

In most years the water table is within a depth of 10 inches for 2 to 6 months and is within 40 inches for about 6 months. The water table may recede below 40 inches during extended dry periods. The available water capacity is low. Permeability is rapid to a depth of about 42 inches and moderate below. Internal drainage is slow; it is impeded by the high water table. If artificial drainage is provided, internal drainage is rapid. Natural fertility and the organic matter content are low. Response to fertilizer is good.

A moderate part of the acreage is in natural vegetation of mixed hardwoods and cabbage palm, water oak, slash pine, laurel oak, and southern redcedar. The understory is waxmyrtle, gallberry, sawpalmetto, and fetterbush. The common native grasses and shrubs are maidencane, chalky bluestem, pineland threeawn, broomsedge bluestem, St.-Johnswort, and lopsided indiangrass.

Under natural conditions this soil is poorly suited to vegetable crops because of periodic wetness, low fertility, and low available water capacity. If water is controlled and soil-improving measures are applied, it can be well suited to certain vegetable crops. The water control system should remove excess water in wet seasons and provide water through subsurface irrigation in dry seasons.

This soil is not suited to citrus because of the excessive wetness and the frost hazard.

The soil is moderately well suited to pasture and hay crops. Pangolagrass, improved bahiagrasses, and white clovers are well suited. Growth is good if excess water is removed in wet seasons. Regular applications of fertilizer and occasional liming are needed.

The potential productivity is moderately high for slash pine. Equipment limitations are moderate, and seedling mortality is severe. Bedding helps in establishing seedlings and in removing excess surface water. A system is needed to remove excess water during wet seasons if the potential productivity is to be realized.

The potential is low for community development. The major soil limitation is excessive wetness. The seasonal high water table is at or briefly above the soil surface. The soil is always saturated with water during the wet season and cannot store or transmit additional water. Runoff is very slow because the soil is nearly level. A water control system would be needed to remove excess surface water and maintain the ground water table at the depth necessary for the selected use. Artificial drainage systems are expensive and difficult to develop because natural drainage outlets are limited.

Altering natural vegetation and existing drainage patterns on this soil could have an adverse effect on the surrounding ecological community.

The capability subclass is IVw.

32—Myakka fine sand. This nearly level, poorly drained soil is in the flatwoods. The acreage is extensive. Individual areas range from a few acres to more than 750 acres.

Typically, this soil is sandy to a depth of more than 80 inches. The surface layer is 5 inches of black fine sand over 22 inches of gray fine sand. The subsoil extends to 90 inches or more. The upper 15 inches is black loamy fine sand coated with organic matter. The next 12 inches is dark reddish brown fine sand coated with organic matter. To a depth of 78 inches is yellowish brown fine sand that contains discontinuous layers of dark reddish brown material. Below this to 90 inches is dark reddish brown fine sand.

Included with this soil in mapping are small areas of Basinger and Immokalee soils, depressional Myakka soils, and Pomona and St. Johns soils. In some places, areas of the included soils are too small to be shown individually on the soil map. In others, they occur where the soil boundaries are gradual. The included areas make up 15 to 20 percent of any one mapped area.

Runoff is slow to very slow. The water table is within 12 inches of the surface from June to November and commonly within 40 inches of the surface the rest of the year except during extended droughts. Some areas are artificially drained by a system of ditches or, in a few places, by tile. Permeability is rapid in the surface layer and moderate in the subsoil. Infiltration is impeded by the seasonal high water table near the surface. The available water capacity is low. The organic matter content and natural fertility are low. If broad fields are left bare, wind erosion can occur.

The natural vegetation is the pine-palmetto type typical of the flatwoods. Slash and longleaf pine are the overstory, and sawpalmetto dominates the understory. Pineland threeawn is the predominant grass in the more open areas.

If water is controlled, this soil is moderately well suited to vegetable crops. A few areas are artificially drained and used for such crops as cabbage and cucumbers. Water control is needed to lower the water table for drainage and raise it in dry periods for subirrigation. Tracts of this soil that are near the coast or near incised streams or arterial canals are generally easier to drain than those in the central part of the county, where drainage outlets are generally unavailable. In addition to water control, lime and fertilizer are needed.

This Myakka soil is not suited to citrus because of the excessive wetness and the frost hazard.

If water can be controlled, this soil is well suited to improved pasture. In places a system of shallow surface ditches is the only control needed.

Much of the acreage is used for pulpwood production. Potential productivity is moderate for slash pine. Bedding helps in establishing seedlings and in removing excess surface water.

The potential is low to medium for community development. The seasonal high water table at or near the surface is a hazard for foundations, pavements, and septic tank absorption fields. In places outfall ditches can be constructed to control the surface water. Mounding is needed to raise the sites for structures and onsite waste disposal fields. A maintenance program is needed to keep ditches open and functioning. Standing water in the ditches increases the need for mosquito control. In periods of heavy or prolonged rain, ponding is likely to occur in broad areas, driveways, and low streets.

The capability subclass is IVw.

33—Myakka fine sand, depressional. This nearly level, poorly drained soil is in depressions in the flatwoods throughout the county. It is commonly ponded for 6 to 9 months in most years. Individual areas range from about 5 to 150 acres.

Typically, this soil is fine sand throughout. It has a very dark gray surface layer about 5 inches thick and a gray subsurface layer about 20 inches thick. The subsoil is black in the upper 3 inches, dark reddish brown in the next 7 inches, and dark brown in the lower part. The sand grains in the 10 inches of the subsoil are coated with organic matter. Below the subsoil to a depth of about 80 inches is brown fine sand.

Some mapped areas have inclusions of Basinger, Placid, Pompano, St. Johns, and Smyrna soils. The included soils make up about 15 percent of the unit.

Areas of Myakka fine sand, depressional, are generally 12 to 18 inches lower than the surrounding flatwoods. The water table is within 10 inches of the surface for 3 to 6 months during most years, and in rainy periods the surface is commonly covered with water 2 to 6 inches deep for 7 days to a month. In prolonged dry periods, the water table may drop to a depth of 2 to 3 feet. Permeability is rapid in the surface layer and substratum and moderately rapid in the subsoil. Downward movement of water is impeded by the high water table. The available water capacity is low. The organic matter content and natural fertility are low.

The natural vegetation is pineland threeawn, maidencane, scattered pine, myrtle, and scattered clumps of palmetto.

This soil is not suited to vegetable crops, citrus, or improved pasture. Standing water and wetness are limitations that are difficult to overcome because in most places suitable drainage outlets are not available. In addition, frost is a hazard for citrus.

The potential productivity is very low for slash pine. Seedling mortality is high. Growth is stunted. Standing water limits the use of equipment. Pond pine, however, can be grown.

The potential is very low for community development. The major limitations are excessive wetness or standing water and the lack of drainage outlets.

The potential is high for wetland wildlife. Shallow water areas are easily developed.

The capability subclass is VIIw.

34—Myakka-St. Johns complex. These nearly level, poorly drained Myakka and St. Johns soils are so intermingled on the landscape that they could not be shown separately at the scale of mapping selected. The map unit occurs as long or irregularly shaped tracts of 4 to 200 acres in low areas and in depressions in the flatwoods. The Myakka soil is in narrow depressions about 50 to 500 feet wide that are interspersed with the lower, long areas of St. Johns soil, which are 50 to 200 feet wide. Individual areas of each soil range from one-half acre to 8 acres.

The Myakka soil makes up about 60 percent of each mapped area. Typically the surface layer is black fine sand about 5 inches thick. The subsurface layer is light brownish gray fine sand about 22 inches thick. The upper 4 inches of the subsoil is friable black fine sand coated with organic matter, and the lower 12 inches is dark brown fine sand coated with organic matter. Below this to a depth of 78 inches is yellowish brown fine sand that contains discontinuous layers of dark reddish brown material.

The Myakka soil has a seasonal high water table that rises as much as 10 inches above the soil surface in wet periods, and the soil is continuously saturated within 10 inches of the surface in summer, fall, and winter. The organic matter content and natural fertility are low. The response to fertilizer is moderate. The available water capacity is low. Permeability is rapid except in the friable, dark colored subsoil, where it is moderate to moderately rapid.

The St. Johns soil makes up about 25 percent of each mapped area. Typically, the surface layer is about 10 inches thick. The upper 7 inches is black fine sand, and the lower 3 inches is very dark gray fine sand. The subsurface layer is mainly light gray fine sand about 16 inches thick. The subsoil is fine sand coated with colloidal organic matter. In sequence downward, 9 inches is black; the next 8 inches is dark reddish brown; and the lower 11 inches is dark brown and dark reddish brown. Below the subsoil is brown fine sand to a depth of 60 inches or more.

The St. Johns soil has a seasonal high water table that rises as much as 10 inches above the soil surface, and the soil is continuously saturated within 10 inches of the surface in summer, fall, and winter. Natural fertility is moderately low. The response to fertilizer is moderate. The available water capacity is low. Permeability is rapid except in the subsoil, where it is moderately rapid.

Included with this unit in mapping are small areas of Basinger, Pompano, Placid, Pomona, St. Johns, Samsula, and Valkaria soils. In a few places, the underlying material is loamy fine sand or loamy sand. In some areas, the soils have an organic surface layer 1 inch to 10 inches thick. In a few places, the subsoil is not so dark as the one described for the Myakka and St. Johns soils. The included areas make up about 30 percent of any one mapped area.

A large part of the acreage is a forest of baldcypress and scattered pond pine, sweetgum, loblolly pine, bay, and slash pine. The understory is mainly waxmyrtle, gallberry, St.-Johnswort, greenbrier, and clumps of sawpalmetto. The common grasses are maidencane, sawgrass, broomsedge bluestem, smooth cordgrass, and bluestem.

Under natural conditions this unit is poorly suited to vegetable crops. It is not suited to citrus, because it is almost always covered with standing water during the wet season. Suitable drainage outlets are generally not available. Frost is an additional hazard for citrus.

This unit is poorly suited to pasture of bahiagrass, bermudagrass, and white clover. If adequate outlets for artificial drainage systems are available, however, the unit can be used for improved pasture. Regular application of fertilizer and lime is needed.

Because the natural vegetation is mixed hardwoods, preparing this unit for slash pine production is not economically feasible. Under a high level of management, however, the potential productivity is moderate to moderately high for slash pine. Equipment limitations and seedling mortality are severe. Bedding is needed to elevate seedlings above the standing surface water. A drainage system to remove excess surface water is needed if the potential productivity is to be realized.

This unit has very low potential for community development. The major limitations are the excessive wetness, the high risk of corrosion to uncoated steel and concrete, and the very slow rate of water runoff. The seasonal high water table is above the soil surface. These soils are always saturated during the wet seasons and cannot store or transmit additional water. Runoff is very slow after heavy or prolonged rain, and ponding occurs in most areas. Artificial drainage systems are difficult to develop because natural drainage outlets are not available. Many areas are subject to flooding.

Altering the natural vegetation and the existing drainage patterns in this unit can adversely affect the aquatic ecosystems of wetlands that are commonly associated with these soils. The potential is high for wetland wildlife habitat. Shallow water areas are easily developed.

The capability subclass is VIIw.

35—Myakka-Urban land complex. This map unit consists of nearly level Myakka soils that have been used for urban development. About 40 to 70 percent of the unit is Myakka fine sand, and 15 to 45 percent is Urban land. About half the areas of Myakka soil have been disturbed by reworking and reshaping during the construction of foundations, utility lines, roads, and streets and the installation of other facilities associated with construction and development. The open areas of Myakka soil are mostly lawns, vacant lots, or playgrounds. They are generally small and intermingled with areas of Urban land. The Urban land is covered with houses, streets, driveways, buildings, parking lots, and other structures.

In undrained areas, the water table is within 10 inches of the soil surface for 1 to 4 months in most years. Drainage systems have been established in most areas, however, so the water table is only briefly within a depth of about 30 inches after heavy rainfall.

Typically, the Myakka soil is sandy to a depth of more than 80 inches. The surface layer is 27 inches thick. It is 5 inches of black fine sand and 22 inches of gray fine sand. The subsoil extends to 90 inches or more. The upper 15 inches is black loamy fine sand coated with organic matter. The next 12 inches is dark reddish brown fine sand coated with organic matter. To a depth of 78 inches is yellowish brown fine sand that contains discontinuous layers of dark reddish brown material. Below this to a depth of 90 inches is dark reddish brown fine sand.

Areas of soil that has been modified by grading and shaping are not so large in the older communities as in the newer ones. Excavating streets below the original land surface and spreading this material over adjacent land areas is common. Sandy material from drainage ditches is often used to fill low areas. Frequently, material is hauled in to fill low spots.

About 15 percent of the open areas is other soils, such as Immokalee sand, Daytona sand, St. Johns fine sand, Cassia fine sand, and Quartzipsamments, gently sloping. Also included are a few areas where the Urban land makes up 45 to 60 percent of the map unit.

No capability subclass is assigned to the unit.

36—Myakka Variant fine sand. This nearly level, poorly drained sandy soil is on swells in flatwoods and in slightly higher areas in hardwood hammocks near the coast. Slopes are mostly less than 1 percent but range from 0 to 2 percent.

In a typical profile, the surface layer is dark gray fine sand about 7 inches thick. The subsurface layer is light grayish brown fine sand about 21 inches thick. The subsoil between depths of 28 and 40 inches is black fine sand, and many of the sand grains are coated with organic matter. To a depth of 45 inches it is dark brown loose fine sand. Below this is brownish yellow and white stratified layers of mixed sand and shell fragments to 80 inches.

Included with this soil in mapping are small areas of Farmton, Wabasso, and Tuscawilla soils at the edges of mapped areas where boundaries are gradual. Also included are areas where the shelly substratum is within 40 inches, areas where a discontinuous loamy horizon is below the dark subsoil, and areas in depressions that are subject to ponding. The included areas make up 15 to 20 percent of any one mapped area.

Under natural conditions the water table fluctuates to within 10 inches of the surface during the rainy season from June to November. Many areas, however, are artificially drained by canals and ditches. Permeability is rapid in the surface layer and the substratum and moderate in the subsoil. The available water capacity is low. The organic matter content and natural fertility are low.

The natural vegetation is hammock forest that includes sweetbay, sweetgum, red maple, pignut hickory, live oak, and cabbage palm. The understory includes sawpalmetto, gallberry, waxmyrtle, and yaupon.

Under natural conditions, because the seasonal high water table is near the surface, this soil is poorly suited to vegetable crops or improved pasture. If an adequate drainage system is installed and maintained, it will produce most vegetable crops commonly grown, citrus, and improved pasture. For citrus the hazard of frost pockets is moderate to severe because temperature inversions can occur over low-lying areas.

The potential is low for community development. Where artificial drainage is feasible, some development is possible, but continuing limitations are likely. Many areas in the vicinity of the coastal cities are under urban development. Successfully developing and managing a drainage system is easier on a large tract than on individual lots or small parcels. Large tracts are more likely to have the differences in elevation needed for improved surface drainage. In addition, access to a drainage outlet, such as an incised drainageway or arterial canal, is more likely to be available.

The nearly level landscape and the good traffic supporting capacity are favorable characteristics for roads and structures. The low natural fertility, low available water capacity, and sandy texture are limitations for lawns and ornamental plants. Even if the water table is maintained below a depth of 40 inches, onsite sewage systems can pollute underground water, because permeability is rapid in the shelly and sandy substratum. In many areas the shelly substratum is thick enough to be mined for road material.

The capability subclass is IVw.

37—Orsino fine sand, 0 to 5 percent slopes. This moderately well drained, nearly level and gently sloping sandy soil occurs on low flat ridges and low side slopes of higher sandhills. The acreage is small. Individual areas are generally long or oval and range from about 5 to 200 acres. Slopes are smooth to convex.

Typically, the surface layer is gray fine sand about 6 inches thick. The subsurface layer is light gray fine sand about 24 inches thick. Tongues of material from the subsurface layer extend into the subsoil. The subsoil is mainly brownish yellow and yellow fine sand about 38 inches thick. The underlying material is very pale brown fine sand mottled with yellowish brown and light gray to a depth of 80 inches or more.

Included with this soil in mapping are small areas of Cassia, Paola, Daytona, and Tavares soils. The included soils generally make up no more than 20 percent of any one mapped area.

The water table is 40 to 60 inches below the soil surface in wet seasons. It recedes to below 60 inches in dry seasons. The available water capacity, the organic matter content, and the natural fertility are very low. Permeability is very rapid.

The natural vegetation is forest of sand pine and an understory of scattered sawpalmetto and rosemary. Some areas have been planted to citrus.

This soil is poorly suited to vegetable crops because of poor soil qualities. Under high level management, however, it can be developed to produce a few special crops, such as ferns.

If the local climate is favorable, this soil is moderately well suited to citrus. Tree roots extend into moist areas above the water table so that they are not so severely affected by drought as in other areas. Growing a cover crop between the trees, applying lime and fertilizer, and irrigating during dry periods are good management practices.

If well managed, this soil is moderately well suited to deep rooted improved pasture grasses. Bahiagrass and other deep rooting grasses are suitable, but careful management is needed.

The potential is medium for community development. The soil is well suited to buildings without basements and roads and streets. Because of the seasonal high water table at a depth of 40 to 60 inches, onsite waste disposal systems can pollute shallow ground water. Very low natural fertility and very low available water holding capacity are limiting factors for turf and ornamentals.

The capability subclass is IVs.

38—Paisley fine sand. This deep, poorly drained, slowly permeable soil formed in clayey marine sediments influenced by underlying calcareous materials. It occurs in low areas in flatwoods and on the outer edges of the

St. Johns River flood plain. Slopes are smooth or concave. The gradient is less than 1 percent.

Typically, the surface layer is dark gray fine sand about 9 inches thick. The subsurface layer is light brownish gray fine sand to a depth of 13 inches. The subsoil is about 50 inches thick. It is gray sandy clay mottled in shades of brown, yellow, and gray. It has nodules and coatings of white calcium carbonate that increase in amount with increasing depth. The substratum is gray loamy fine sand.

Included with this soil in mapping are small areas of Bluff, Riviera, and Tequesta soils, Typic Fluvaquents, and Wabasso and Winder soils. The included areas make up less than 10 percent of any one mapped area.

The water table is within a depth of 10 inches for 2 to 6 months during most years. In some areas water stands on the surface for a few days after heavy rain. Flooding from the St. Johns River is possible under abnormal conditions. The available water capacity is low in the surface layer and high in the subsoil. Permeability is rapid in the surface layer and slow in the subsoil. Natural fertility is moderate.

The natural vegetation is cabbage palm hammocks with scattered groves of live oak and an intermingling of slash pine and longleaf pine.

Under natural conditions, this soil is too wet for vegetable crops. Adequate drainage outlets are generally lacking and, in addition, the slowly permeable subsoil hampers the development of a water control system.

The soil is moderately well suited to adapted pasture grasses and grass-clover mixtures, but a water control system must be designed to remove standing water.

The potential productivity is very high for slash pine. Some surface water control is needed in establishing seedlings.

The potential is very low for community development because of wetness, flooding, and the slowly permeable subsoil. These limitations are extremely difficult and costly to overcome.

The soil has high potential for wetland wildlife. Shallow ponds are easily developed because of the high water table.

The capability subclass is VIw.

39—Palm Beach sand, 2 to 8 percent slopes. These are excessively drained sandy soils on primary dunes that border and are parallel to the Atlantic coast. Slopes are 2 to 8 percent.

Typically, the surface layer is about 6 inches thick. It is sand and about 15 to 30 percent very fine shell fragments. The upper 3 inches is gray, and the lower 3 inches is grayish brown. Between depths of 6 and 34 inches is light brownish gray sand mixed with multicolored shell. Below this to 80 inches is white sand and multicolored shell.

The mapped areas of this soil are 20 to 30 percent other kinds of soil, including Canaveral and Paola soils. Also included are a few places where the slope gradient is as steep as 15 percent. In places where the native plant cover has been removed, as much as 3 inches of fresh wind-deposited sand may be on the surface.

The water table is below 72 inches and is usually below 120 inches. The available water capacity, organic matter content, and natural fertility are very low. Permeability is very rapid.

This soil is not suited to cultivated crops, citrus production, or pasture. Most areas receive salt spray from the Atlantic. Most areas are in native vegetation of saw-palmetto, scrub oak, cacti, clumps of sea-oats, and scattered southern redcedar. In some urban areas the soil is protected by sea walls.

If only properties of the soil are considered, the potential is high for community development. The dunes, however, are a natural defense against storms and floods for the land areas behind the dune line, and they should not be disturbed.

The capability subclass is VIIs.

40—Palm Beach-Urban land-Paola complex, 0 to 8 percent slopes. This map unit consists of Palm Beach and Paola soils and areas of these soils that have been altered for buildings or covered with streets and buildings. About 20 to 40 percent of the unit is Palm Beach sand, about 15 to 45 percent is Urban land, and about 15 to 25 percent is Paola fine sand. About 25 to 45 percent of the Palm Beach and Paola soils has been reworked or reshaped by earthmoving machines. The open areas of the Palm Beach and Paola soils are mostly lawns, vacant lots, or playgrounds. They are generally small and intermixed with Urban land. The Urban land is covered with houses, streets, driveways, buildings, parking lots, and other structures.

The water table is more than 72 inches below the soil surface and is usually below 120 inches.

Typically, the surface layer of the Palm Beach soil is about 6 inches thick. It is sand that is about 15 to 30 percent very fine shell fragments. The upper 3 inches is gray, and the lower 3 inches is grayish brown. Between depths of 6 to 34 inches is light brownish gray sand mixed with multicolored shell. Below this to 80 inches is white sand and multicolored shell.

Typically, the surface layer of the Paola soil is a mixture of light gray fine sand and black organic matter about 6 inches thick. The subsurface layer is light gray and white fine sand about 20 inches thick. The subsoil is yellow fine sand about 38 inches thick. Tongues of subsurface material extend into the subsoil. They are a dark brown or yellowish brown exterior and a light gray interior. Below the subsoil is very pale brown fine sand to a depth of 80 inches or more.

The areas of soil that have been modified by grading and shaping are not so large in older communities as in the newer ones. Excavating streets below the original land surface and spreading this material over adjacent land areas is common. Soil material is frequently hauled in to fill low places.

About 15 percent of the land area that is not covered with urban facilities is other soils, such as Orsino, Daytona, and Canaveral soils and Quartzipsamments. Also included are a few small areas where the Urban land makes up as much as 60 percent of the map unit and some areas of the Paola soil that have sand texture.

No capability subclass is assigned to the unit.

41—Palm Beach-Paola association, 2 to 8 percent slopes. This map unit is made up of well drained to excessively drained sandy soils on sand dunes bordering the beaches along the Atlantic Ocean. The Palm Beach soils, about 55 percent of the unit, are on the primary dunes and the ocean side of the secondary dunes. The Paola soils, about 35 percent, are on the back dunes. The remaining 10 percent of the unit is included areas of Canaveral soils and similar soils in very narrow troughs that separate the dunes.

Typically, the surface layer of the Palm Beach soil is about 6 inches thick. It is sand that is about 15 to 30 percent very fine shell fragments. The upper 3 inches is gray, and the lower 3 inches is grayish brown. Between depths of 6 to 34 inches is light brownish gray sand mixed with multicolored shell fragments. Below this to 80 inches is white sand and multicolored shell fragments.

Typically, the surface layer of the Paola soil is a mixture of light gray fine sand and black organic matter about 6 inches thick. The subsurface layer is light gray and white fine sand about 20 inches thick. The subsoil is yellow fine sand about 38 inches thick. Tongues of subsurface material extend into the subsoil. They have a dark brown or yellowish brown exterior and a light gray interior. Below the subsoil is very pale brown fine sand to a depth of 80 inches or more.

This map unit receives salt spray from the Atlantic Ocean. The natural vegetation on the Palm Beach soil near the beach includes sea-oats, beach morningglory, and sandspur. Higher on the primary dune it is a thick growth dominated by sawpalmetto mixed with pricklypear, Spanish bayonet, and other salt-tolerant plants (fig. 8). The Paola soil supports a matted thicket of sand live oak, sawpalmetto, southern redcedar, and cactus.

Permeability is very rapid, and the available water capacity is very low. The organic matter content and natural fertility are low.

These soils are not suited to citrus, vegetables, or improved pasture. They are poorly suited to lawns and ornamentals. If the natural protective vegetation is disturbed, the sand particles are dislodged and blown.

If only the properties of the soils are considered, the potential is high for community development. The dunes, however, are a natural defense against storms and floods for the land areas behind the dune line, and they should not be disturbed.

The capability subclass is VIIs.

42—Paola fine sand, 0 to 8 percent slopes. This excessively drained, nearly level to sloping sandy soil occurs on high, broad sandhills. The acreage is moderate in extent. Some mapped areas are more than 500 acres.

Typically, the surface layer is a mixture of light gray fine sand and black organic matter about 6 inches thick. The subsurface layer is light gray and white fine sand about 20 inches thick. The subsoil is yellow fine sand about 38 inches thick. Tongues of subsurface material extend into the subsoil. They have a dark brown or yellowish brown exterior and a light gray interior. Below the subsoil is very pale brown fine sand to a depth of 80 inches or more.

Included with this soil in mapping are small areas of Astatula, Daytona, Orsino, St. Lucie, and Tavares soils. Also included are small areas of Paola soils that have a slope of more than 8 percent. The included areas generally make up less than 20 percent of any one mapped area.

The water table is below a depth of 72 inches. The available water capacity, the organic matter content, and the natural fertility are very low. Permeability is very rapid.

The natural vegetation is a sand pine-scrub oak forest and an understory of rosemary and scattered sawpalmetto. Most areas are still in native vegetation, but some have been used as building sites.

This soil is not suited to vegetable crops.

If the climate is favorable, the soil is moderately well suited to citrus. A plant cover is needed on the ground in the groves to protect the soil from wind erosion. Irrigation is needed for survival of young trees and for good yields of fruit from mature trees.

This soil is poorly suited to improved pasture. Under high level management, however, drought resistant grasses can be grown.

The potential productivity is low for slash pine. Sand pine grows best.

The potential is high for community development. The deep loose sand offers poor traction for vehicles. There is a slight risk of pollution to shallow groundwater from onsite waste disposal systems because of the very rapid permeability. Turf and ornamental plants are difficult to establish because of the very low natural fertility and the droughty soil conditions. Adding a more favorable topsoil is desirable. Frequent applications of fertilizer and irrigation water are needed. The native plants are much more hardy and easily maintained than most introduced plants, so leaving as much of the native vegetation as possible is desirable.

The capability subclass is VIs.

43—Paola fine sand, 8 to 17 percent slopes. This excessively drained, strongly sloping or moderately steep sandy soil occurs in small areas of side slopes of sand ridges, around sinks, and along streams that have high banks. Areas are generally oval, serpentine, or crescent-like in shape.

Typically, the surface layer is gray fine sand about 5 inches thick. The upper 6 inches of the subsurface layer is gray fine sand, and the lower 19 inches is light gray fine sand. The subsoil is yellow fine sand about 35 inches thick. Tongues of subsurface material extend into the subsoil. They have a brownish yellow exterior and a light gray interior. Below the subsoil is very pale brown fine sand to a depth of 80 inches or more.

Included with this soil in mapping are small areas of Astatula, Orsino, Daytona, and Tavares soils. Also included are small areas of Paola soils that have slopes of less than 8 percent or more than 17 percent. The included soils make up about 15 percent of any one mapped area.

The water table is below a depth of 72 inches. The available water capacity, the organic matter content, and the natural fertility are very low. Permeability is very rapid.

The natural vegetation is a sand pine-scrub oak forest and an understory of rosemary. Most areas are still wooded. A few have been cleared and are idle.

This soil has very limited use because of droughtiness and steep slopes. It is not suited to vegetable crops, improved pasture grasses, or citrus.

The potential productivity is low for slash pine. Sand pine grows best.

The potential is high for community development. There is a slight risk of pollution to shallow groundwater from onsite waste disposal systems because of the very rapid permeability. Special care is needed in establishing and maintaining turf and ornamental plants, such as additions of topsoil, frequent applications of fertilizer, and irrigation. Erosion is a problem if the steeper slopes are unprotected.

The capability subclass is VIIs.

44—Paola-Urban land complex, 0 to 8 percent slopes. This map unit consists of nearly level to sloping Paola soils that have been used for urban development. About 40 to 60 percent of the unit is Paola fine sand, and 15 to 45 percent is Urban land. About 25 to 45 percent of the areas of Paola soil has been reworked or reshaped by earthmoving machines. The open areas of Paola soil are mostly lawns, vacant lots, or playgrounds. They are generally small and intermingled with areas of Urban land. The Urban land is covered with houses, streets, driveways, buildings, parking lots, and other structures.

The water table is more than 72 inches below the soil surface.

Typically, the surface layer of the Paola soil is a mixture of light gray fine sand and black organic matter about 6 inches thick. The subsurface layer is light gray and white fine sand about 20 inches thick. The subsoil is yellow fine sand about 38 inches thick. Tongues of material from the subsurface layer extend into the subsoil. They have a dark brown or yellowish brown exterior and a light gray interior. Below the subsoil is very pale brown fine sand to a depth of 80 inches or more.

Areas of the soil that have been modified by grading and shaping are not so large in the older communities as in the newer ones. Excavating streets below the original land surface and spreading this material over adjacent land areas is common. Soil material from other locations is frequently hauled in to fill low places.

About 15 percent of the land area not covered with urban facilities is other soils, such as Orsino and Daytona soils and Quartzipsamments. A few small areas where the Urban land makes up as much as 60 percent of the map unit are also included.

No capability subclass is assigned to the unit.

45—Pineda fine sand. This nearly level, poorly drained soil occurs in the flatwoods on broad low flats, in poorly defined drainageways, and at the edges of sand ponds and swamps. The acreage is moderate in extent. Some areas are more than 500 acres. Slopes are smooth to slightly concave and 0 to 2 percent.

Typically, the surface layer is about 2 inches of black fine sand over 7 inches of dark gray fine sand. The subsurface layer is about 14 inches of fine sand that has yellowish and olive brown mottles or streaks. The upper part is grayish brown, and the lower part is light brownish gray. The subsoil consists of a sandy layer stained by iron oxides over a gray loamy layer. In sequence downward, it is 7 inches of brownish yellow fine sand, 4 inches of yellowish brown fine sand, and 22 inches of gray sandy clay loam that has yellowish mottles and few lenses of loamy fine sand. Below the subsoil is gray sandy loam and fine sandy loam.

Included with this soil in mapping are small areas of EauGallie, Malabar, Riviera, and Wabasso soils. The included soils generally make up less than 25 percent of any one mapped area.

The water table is within a depth of 10 inches for 1 to 6 months in most years. Some areas have standing water for 7 days to 6 months in some years. The available water capacity is low. Permeability is rapid in the sandy layers and moderately rapid in the loamy layers. Natural fertility is moderately low. The organic matter content is low.

The natural vegetation is an open forest of longleaf or slash pine and an understory of pineland threeawn and scattered clumps of sawpalmetto. Scattered cabbage palm is in places.

Under natural conditions, this soil is poorly suited to vegetable crops because of excessive wetness. Under good management that includes adequate water control, however, this soil can produce most of the vegetable crops and special crops grown in the area.

This soil is generally not suited to citrus because of the excessive wetness and the frost hazard.

This soil is well suited to improved pasture grasses and grass-clover mixtures. A drainage system that removes standing surface water quickly is essential.

The potential productivity is moderately high for slash pine. Some water control is needed in establishing pine seedlings.

The potential is low for community development. The major limitation is wetness. In places outfall ditches can be constructed to control surface water. Mounding can be used to raise the sites for structures (fig. 9) and onsite waste disposal fields. A maintenance program is needed to keep ditches open and functioning.

The capability subclass is IIIw.

46—Pinellas fine sand. This nearly level, poorly drained soil is in areas bordering low areas and depressions. Slopes are smooth.

Typically, the surface layer is black fine sand about 4 inches thick. The subsurface layer is about 25 inches thick. The upper 15 inches is light brownish gray fine sand, and the lower 10 inches is white fine sand with accumulations of carbonates as coatings on sand grains and in interspaces between sand grains. The subsoil is between depths of 29 to 45 inches. The upper 7 inches is gray sandy clay loam, and the lower 9 inches is gray fine sandy loam. Below the subsoil is gray fine sand.

Included with this soil in mapping are small areas of Riviera soils and depressional Wabasso and EauGallie soils. In places, the boundaries are gradual between the Pinellas soil and the depressional phases of the Wabasso and EauGallie soils. In some areas, the subsoil is loamy sand. The included soils make up about 25 to 30 percent of any one mapped area.

The water table is within a depth of 10 inches for 1 to 3 months during most years and between 10 and 40 inches for 2 to 6 months. In dry seasons, it recedes to depths below 40 inches. Runoff is slow. Permeability is rapid to moderately rapid in the surface layer and moderate to moderately rapid in the subsoil, but the downward movement of water is impeded by the seasonal high water table. The available water capacity is low. Natural fertility and the organic matter content are low, but a calcareous layer below the surface eliminates the need for liming.

Most areas are in natural vegetation of cabbage palm and sawpalmetto, scattered slash pine, gallberry, and pineland threeawn. In areas where water control is adequate, the soil is used for range and improved pasture.

Under natural conditions this soil is poorly suited to vegetable crops because of wetness. If water is controlled, however, it is moderately well suited. High level management is needed to remove excess water during the wet season and provide water through irrigation during the dryer periods.

Large areas of this soil are used for range and grazed woodland, but during wet seasons the high water is a problem. By removing excess water during wet seasons and providing irrigation during dry seasons, productive range and pasture of improved grasses can be maintained. Lime is not needed because of the calcareous subsoil.

This soil is not suited to citrus because of excessive wetness and the hazard of frost.

The potential productivity is moderate for slash pine.

In its natural state, this soil has low potential for community development. In coastal areas and areas where suitable drainage outlets are available, the potential is medium. An adequate water control system and a utility sewer system are needed. In some areas, where suitable drainage outlets are not available, developing and maintaining artificial drainage systems is not generally feasible.

The capability subclass is IIIw.

47—Pits. Pits are excavations from which soil and geologic material have been removed for use in road construction or for foundations. Most are abandoned, but excavation is continuing in a few places. Vegetation has become established in the older abandoned pits. It is mostly an assortment of weedy forbs, grasses, and shrubs. Pits, locally called borrow pits, occur in small to large mapped areas. Those that have been excavated below the normal water table and contain water for 9 months or more each year are mapped as water.

No capability subclass is assigned to the unit.

48—Placid fine sand, depressional. This very poorly drained, nearly level soil occurs in wet depressions. The acreage is small in extent. Areas are generally irregularly shaped and less than 100 acres. Slopes are smooth to concave and 0 to 2 percent.

Typically, the surface layer is black fine sand about 11 inches thick over about 4 inches of very dark gray fine sand that generally has a few gray streaks. The underlying material is fine sand that extends to 80 inches or more. The upper 28 inches is gray, the next 24 inches is grayish brown, and the lower part is light brownish gray.

Included with this soil in mapping are some small areas of soils that are similar to this Placid soil but have an organic-stained layer at a depth of about 40 inches and some areas of Basinger and Pompano soils. These included soils generally make up no more than 20 percent of any one mapped area. Also included are a few areas in the southeastern part of the county where the soil is slightly acid to neutral and has an admixture of shell in the lower part of the subsoil and a few areas where the texture is loamy fine sand or loamy sand.

The water table is within a depth of 12 inches for more than 6 months in most years. The soil is generally covered with standing water for as much as 6 months annually. The available water capacity is medium. Permeability is rapid, but downward movement of water is impeded by the seasonal high water table. The organic matter content is moderate.

The natural vegetation is generally wetland grasses, such as maidencane, but in some areas it is pond pine, bay, and cypress.

This soil has severe limitations for vegetable crops because of excessive wetness. It is not suited to these crops.

This soil is not suitable for citrus.

Unless excess water is removed, pastures of improved grasses or grass-clover mixtures cannot be produced. Installing a water control system is not feasible, however, because of the soil's low position on the landscape and the lack of accessible natural drainage outlets.

Under high level management, this soil has high potential productivity for slash pine because of the high organic matter content and the natural fertility of the thick surface layer. A drainage system that removes excessive surface water and provides proper water control is essential.

The potential is low for community development. The excessive wetness and thick sandy layers are the dominant features that severely restrict the use of this soil for development. Water is at or near the surface much of the time, and drainage systems that would adequately control the water are expensive and difficult to establish and maintain. Because of the soil's low position on the landscape, natural drainage outlets are generally unavailable.

The capability subclass is VIIw.

49—Pomona fine sand. This poorly drained, nearly level soil occurs in low, broad areas within the flatwoods. Slopes are smooth and are 0 to 2 percent.

Typically, the surface layer is fine sand about 13 inches thick. The upper 5 inches is black and the lower 8 inches is dark gray. The subsoil and underlying material are fine sand and fine sandy loam to a depth of 70 inches. In sequence downward, 5 inches is gray fine sand; 12 inches is black fine sand coated with organic matter; 3 inches is reddish brown fine sand; 12 inches is dark brown fine sand; 5 inches is light gray fine sand; 10 inches is gray sandy loam; and the lower 10 inches gray fine sand.

Included with this soil in mapping are small areas of Farmton, EauGallie, Immokalee, Myakka, Basinger, and Wauchula soils. In a few places the surface texture is sand. West of Holly Hill the texture of the subsoil is loamy fine sand or loamy sand in about 25 percent of the areas. The included areas make up about 20 percent of any one mapped area.

The water table is within a depth of 10 inches for 1 to 3 months and within 40 inches for about 6 months during most years. The available water capacity is medium. Permeability is rapid to about 18 inches, moderate from 18 to 33 inches, rapid from 33 to 50 inches, and moderately slow from 50 to 60 inches. Internal drainage is slow, but if artificial drainage is provided, it is generally good. Natural fertility and the organic matter content are low. Response to fertilizer is moderate.

A moderate part of the acreage is in natural vegetation—an open forest of slash pine and an understory of sawpalmetto, runner oak, gallberry, and fetterbush. Pineland threeawn is the most common native grass. Several varieties of bluestem are also present.

Under natural conditions this soil is poorly suited to vegetable crops because of periodic wetness, low fertility, and low available water. If water is controlled and soil-improving measures are applied, vegetable crops common to the area (fig. 10) can be produced. The water control system should remove excess water in wet seasons and provide water through subsurface irrigation in dry seasons.

The soil is not suited to citrus because of excessive wetness and the frost hazard.

If excess water is removed in wet seasons, productive pastures of pangolagrass, improved bahiagrass, and white clovers can be maintained. Regular applications of fertilizer and lime are needed. Overgrazing should be prevented.

Under high level management, this soil has moderately high potential for productivity for slash pine. Bedding of rows is needed to help pine seedlings survive. During the process of bedding, vegetation and debris are deposited below the bedding layer, which increases the amount of organic material available to the seedlings. A drainage system to remove excess surface water also is needed if the potential productivity is to be realized.

The potential is low for community development. The major soil limitations are the excessive wetness and the moderately slowly permeable subsoil. The seasonal high water table is within 10 inches of the soil surface. Runoff is very slow after heavy or prolonged rain because the soil is nearly level. Moderately slowly permeable layers in the subsoil impede downward water movement. A system would be needed to remove excess surface water and maintain the ground water table at the depth necessary for the selected use. Artificial drainage systems are expensive and difficult to develop because natural drainage outlets are poor.

The capability subclass is IVw.

50—Pomona fine sand, depressional. This poorly drained, nearly level soil occurs in depressions, in poorly defined sloughs, and on broad low flats within the flatwoods. Slopes are smooth to concave and 0 to 2 percent.

Typically, the surface layer is black fine sand about 7 inches thick. The subsurface layer is gray fine sand about 7 inches thick. The subsoil between depths of 14 and 25 inches is friable dark reddish brown fine sand and between depths of 25 and 33 inches is very dark grayish brown and dark brown fine sand. Below this is 16 inches of brown fine sand and then 4 inches of light gray fine sand. Between depths of 53 and 61 inches is gray fine sandy loam. Below this to 70 inches or more is light gray fine sandy loam with pockets of loamy fine sand and fine sand.

Included with this soil in mapping are small areas of Malabar, St. Johns, and Basinger soils and depressional phases of EauGallie, Immokalee, Myakka, Wabasso, and Wauchula soils. In a few places, the surface texture is sand. In some areas the material below the subsoil is loamy fine sand or loamy sand, and in a few areas the dark colored sandy subsoil is thinner than is typical. The included areas make up about 25 percent of any one mapped area.

The water table fluctuates from 6 inches above the soil surface to within a depth of 10 inches for 4 to 8 months during most years. After the driest season, usually late spring, the water table may briefly fall to a depth of 40 inches. The available water capacity is medium. Permeability is rapid except in the weakly cemented sandy loam subsoil where it is moderate. Internal drainage, however, is impeded by the high water table. Natural fertility and the organic matter content are low.

A large part of the acreage is in natural vegetation—an open forest of scattered slash pine, loblolly bay, sweetgum, and pond pine. The understory is gallberry, waxmyrtle, St.-Johnswort, fetterbush, and scattered saw-palmetto. The most common native grasses are pineland threeawn, blue maidencane, lopsided indiangrass, chalky bluestem, and creeping bluestem.

This soil is not suited to vegetable crops or improved pasture because it is always saturated with water during the wet season and has very slow surface runoff. These conditions are difficult to overcome because suitable drainage outlets are generally not available.

This soil is not suited to citrus because of excessive wetness and the frost hazard.

Under high level management, this soil has moderate potential productivity for slash pine. Equipment limitations and seedling mortality are severe. Bedding the rows is needed to elevate the pine seedlings above the surface water. In addition, a drainage system is needed to remove excess surface water.

The potential is very low for community development. The major limitations are the excessive wetness, the moderately permeable subsoil, and the high risk of corrosion to uncoated concrete and steel. The soil is always saturated during the wet season and cannot store or transmit additional water. Runoff is very slow, and ponding occurs after heavy or prolonged rain because of the soil's low position on the landscape. A water control system would be needed to remove excess surface water and maintain the ground water table at the depth needed for the selected use. Artificial drainage systems are expensive. Suitable drainage outlets are generally not available.

This soil has high potential for wetland wildlife. Shallow water areas are easily developed.

The capability subclass is VIIw.

51—Pomona-St. Johns complex. This map unit consists of nearly level, poorly drained Pomona and St. Johns soils that are covered with standing water for long periods. These soils occur in drainageways and broad depressions in flatwoods as irregular or long areas of 3 to 250 acres. They are so intermingled on the landscape that it was not feasible to show them separately at the scale of mapping selected. The St. Johns soil is mostly in slightly lower positions surrounded by the Pomona soil. Both have a dark colored subsoil that is less developed and more friable than in the map units of Pomona fine sand and St. Johns fine sand.

The Pomona soil makes up about 60 percent of each mapped area. Typically, the surface layer is fine sand about 13 inches thick. The upper 5 inches is black, and the lower 8 inches is dark gray. The subsurface layer is gray fine sand about 5 inches thick. The subsoil is fine sand and fine sandy loam about 32 inches thick. In sequence downward, 12 inches is very friable black fine sand coated with organic matter; 3 inches is dark reddish brown fine sand; 12 inches is dark brown fine sand; and 5 inches is light gray fine sand. Below the subsoil is gray fine sandy loam.

The Pomona soil has a seasonal high water table that rises as much as 10 inches above the soil surface in wet periods. The soil is almost always saturated within 10 inches of the soil surface in summer, fall, and winter. Natural fertility is low. The available water capacity is medium. Permeability is rapid except in the subsoil, where it is moderate.

The St. Johns soil makes up about 30 percent of each mapped area. Typically, the surface layer is fine sand about 10 inches thick. The upper 7 inches is black, and the lower 3 inches is very dark gray. The subsurface is gray fine sand about 17 inches thick. The subsoil is fine sand about 28 inches thick. The upper 9 inches is very friable and black; the next 8 inches is dark reddish brown; and the lower 11 inches is dark brown. Below the subsoil is brown fine sand.

The St. Johns soil has a seasonal water table that rises as much as 10 inches above the soil surface. This soil is always saturated within 10 inches of the soil surface in summer, fall, and winter. Natural fertility is moderately low. The available water capacity is medium in the surface layer and subsoil and very low to low in the subsurface layer and substratum. Permeability is rapid in the surface layer and moderately rapid in the subsoil.

Included with this unit in mapping are small areas of Scoggin, Basinger, EauGallie, Immokalee, Malabar, Pompano, Placid, and Samsula soils. In a few places, the texture below the subsoil is loamy fine sand or loamy sand. There are common spots where the surface layer is 1 to 8 inches of organic material. In a few places, the dark colored subsoil is lighter in color than is described. The included areas make up about 30 percent of some mapped areas.

A large part of the acreage is a hydric forest of baldcypress with scattered pond pine, sweetgum, loblolly bay, and slash pine. The understory is gallberry, greenbrier, St.-Johnswort, scattered clumps of sawpalmetto, and waxmyrtle. The common grasses are maidencane, sawgrass, broomsedge bluestem, smooth cordgrass, and chalky bluestem.

This map unit is not suited to vegetable crops or improved pasture because it is always saturated with water during the wet season and has very slow surface runoff. These conditions are difficult to overcome because suitable drainage outlets are generally not available.

This soil is not suited to citrus because of excessive wetness and the frost hazard.

Under high level management, this soil has moderate potential productivity for slash pine. Equipment limitations and seedling mortality are severe. Bedding of rows is needed to elevate the pine seedlings above the surface water. In addition, a drainage system to remove excess surface water is needed.

The potential is very low for community development. The major soil limitations are the excessive wetness, the high risk of corrosion to uncoated steel and concrete, and the extended periods when standing water is on the surface. The seasonal high water table is above the soil surface. The soils are always saturated during the wet season and cannot store or transmit additional water. Artificial drainage systems are costly and difficult to develop because natural drainage outlets are not available.

This map unit, which is temporarily covered with standing water during wet seasons, is important as a habitat for semiaquatic and some aquatic wildlife. It has high potential for development as wetland wildlife habitat.

The capability subclass is VIIw.

52—Pompano fine sand. This poorly drained, nearly level sandy soil occurs in poorly defined drainageways and low areas. Individual areas are long or egg-shaped and range from 3 to 50 acres.

Typically, the surface layer is dark gray fine sand about 7 inches thick. The underlying material is fine sand to a depth of 80 inches or more. The upper 26 inches is gray, and the lower 47 inches is light gray.

Included with this soil in mapping are small areas of Basinger, Immokalee, and Placid soils. Also included are a few areas of similar soils that are in depressional areas and are covered with standing water for 3 to 9 months in most years. The included soils make up about 25 percent of any one mapped area.

The water table is within a depth of 10 inches for 2 to 6 months in most years and within 30 inches for more than 6 months in most years. The available water capacity is very low. Permeability is rapid, but downward movement of water is impeded by the seasonal high water table. The soil is low in natural fertility and organic matter content.

The natural vegetation is generally wetland grasses and shrubs, such as sand cordgrass, maidencane, and St.-Johnswort.

This soil is not suited to vegetable crops unless the water table is controlled. Under high level management, it can be used for some vegetable crops, but a system that reliably controls the water table is essential.

This soil is not suited to citrus because of the high water table and the severe hazard of frost.

Under high level management, this soil is suited to improved pasture of grasses or grass and clover. Water control is needed.

The potential productivity is moderate for slash pine. Some water control is needed in establishing pine seedlings.

The potential is very low for community development. Wetness and the seasonal high water table, which is typically above the surface, are difficult to overcome because of the soil's low position on the landscape and the lack of suitable drainage outlets.

The capability subclass is IVw.

53—Pompano-Placid complex. This map unit consists of nearly level, poorly drained Pompano soils and very poorly drained Placid soils in depressions in the flatwoods. These soils are so intermingled on the landscape that they could not be shown separately at the scale of mapping selected. Areas are generally long or circular and 5 to 300 acres. The Pompano soil is slightly higher and surrounds the Placid soil, which is in depressions 50 to 200 feet in diameter.

Pompano fine sand makes up about 55 percent of each mapped area. Typically, the surface layer is dark gray fine sand about 7 inches thick. The underlying material is fine sand to a depth of 80 inches or more. The upper 26 inches is gray, and the lower 47 inches is light gray.

The Pompano soil has a water table less than 6 inches above the soil surface or is saturated within 10 inches of the surface in summer and fall. Frequently, this soil is covered with standing water during the wet seasons. It is low in natural fertility and organic matter content. Permeability is very rapid, and the available water capacity is very low throughout.

Placid fine sand generally makes up about 25 percent of the unit. Typically, the surface layer is 11 inches of black fine sand and 4 inches of very dark gray fine sand. The underlying material is fine sand that extends to 80 inches or more. The upper 28 inches is gray; the next 24 inches is grayish brown; and the lower part is light brownish gray.

The Placid soil has a water table less than 6 inches above the soil surface and is saturated within 10 inches of the surface in summer, fall, and winter. Frequently, it is covered with standing water during the wet seasons. It is moderate in natural fertility and organic matter content. Permeability is rapid, and the available water capacity is high to a depth of 20 inches and low below. Soil reaction ranges from extremely acid to strongly acid throughout.

Included with this unit in mapping are small areas of Holopaw, Malabar, Riviera, Samsula, and Tequesta soils. In a few places, the texture of the underlying material is loamy fine sand or loamy sand. The included areas make up about 20 percent of any one mapped area.

A large part of the acreage is in natural vegetation of swamp hardwoods—baldcypress, sweetgum, sourwood, and red maple—interspersed with slash pine and cabbage palm. The understory consists of waxmyrtle, fetterbush, and gallberry. The common native grasses are sawgrass, smooth cordgrass, maidencane, chalky bluestem, and broomsedge bluestem.

Under natural conditions this unit is poorly suited to vegetable crops because of excessive wetness. In addition, the Pompano soil is low in natural fertility, and it has very rapid permeability and very low available water capacity throughout. If water is controlled and soil-improving measures are applied, however, these soils can produce certain vegetable crops. The water control system should remove excess water in wet seasons and provide water through subsurface irrigation in dry seasons.

This unit is not suited to citrus because of excessive wetness and the frost hazard.

If excess water is removed, the unit is suited to improved pasture. Some suitable grasses are bahiagrass, bermudagrass, limpograss, pangolagrass, and white clover. Regular application of fertilizer and lime is needed.

Because the natural vegetation is mixed hardwoods, preparing this unit for slash pine production is not economically feasible. Under high level management, however, the potential productivity is moderate for slash pine. A system is needed to remove excess water during the wet season, and bedding is needed to elevate seedlings above the standing surface water.

In its natural state, this unit has very low potential for community development. The major soil limitations are the excessive wetness, the very rapid permeability, the high risk of corrosion to uncoated steel, and the moderate risk of corrosion to concrete. The seasonal high water table is at or above the soil surface. The soils are almost always saturated with water during the wet season and cannot store or transmit additional water. Runoff is very slow after heavy or prolonged rain because the soil is nearly level. An adequate water control system would be needed to remove excess surface water and maintain the groundwater table at the depth necessary for the selected use. Artificial drainage systems are expensive and difficult to develop because natural drainage outlets are limited.

Many areas of this unit are adjacent to bodies of water. Altering the natural vegetation and drainage conditions would adversely affect the quality of wildlife habitat.

These soils have high potential for a wetland wildlife habitat. Shallow water areas are easily developed.

The capability subclass is IVw.

54—Quartzipsamments, gently sloping. These are gently sloping, moderately well drained sandy soils that have been reworked and shaped by earthmoving equipment. Most areas are around former sloughs and shallow ponds that have been deepened to form lakes. Others are low areas that have been filled with sandy material.

These soils have been mixed during movement and reworking and have no definite horizonation. They do not have an orderly sequence of layers, but are a variable mixture of lenses, streaks, and pockets of sand, fine sand, loamy sand, or loamy fine sand within short distances. Individual areas are black, grayish, yellowish, brownish, or white, or a mixture of several of these colors. Seldom are two areas alike.

Reaction ranges from strongly acid to neutral throughout the soil. Filled areas range from about 2 to 5 feet in thickness. Some areas have a few limestone pebbles in the fill.

Included with this unit in mapping are similar soils that have the overburden but differ from Quartzipsamments in having buried soils with weakly cemented horizons and layers of sandy loam or sandy clay loam. Also included are similar soils that differ only in having fragments of sandy subsoil material or sandy loam and sandy clay loam subsoil material in the fill. The included areas make up about 20 percent of any one mapped area.

Drainage is variable, but the soil is dominantly moderately well drained. The water table is normally below a depth of 40 inches in most places. The available water capacity is very low. Permeability is very rapid. Natural fertility and the organic matter content are low.

The vegetation is various scattered weeds. The soils are poorly suited to most plants. Special treatment is needed for lawn grasses and ornamental plants. Smoothing and shaping have made these areas moderately well suited to use as building sites, roadways, recreational areas, and related uses.

The potential is high for community development. It is very high for dwellings without basements, small commercial buildings, and local roads and streets, even if no corrective measures are taken. If water is controlled, the potential is high for septic tank absorption fields. If the land is shaped and the surface stabilized, the potential is high for playgrounds. If water is controlled and the trench is sealed or lined with impervious material, the potential is medium for trench sanitary landfill. If water is controlled and the sides are shored, the potential is medium for shallow excavations. The potential is medium for shallow excavations. The potential is low for sewage lagoon areas, even if water is controlled and areas are sealed or lined with impervious material.

No capability subclass is assigned to the unit.

55—Riviera fine sand. This poorly drained, nearly level soil occurs in broad, low flats. Slopes are smooth and are 0 to 2 percent.

Typically, the surface layer is fine sand about 16 inches thick. The upper 4 inches is very dark gray, and the lower 12 inches is dark gray. The subsurface layer is light brownish gray fine sand about 9 inches thick. The subsoil is about 18 inches of gray sandy clay loam that has many medium and coarse distinct yellowish brown mottles. The upper 13 inches has vertical tonguing or intrusions from the subsurface layer. The underlying material to a depth of about 64 inches is light brownish gray loamy sand.

Included with this soil in mapping are small areas of Tuscawilla, Holopaw, Paisley, Pineda, Basinger, and Winder soils and some areas where the surface layer is sandy loam or loamy sand. Also included are some small areas where the surface layer is black and is 6 inches or more thick, others where the loamy layer is above a depth of 20 inches or below a depth of 40 inches, and a few areas of similar soils in depressions that are covered with standing water late in summer and in fall. The included areas make up about 25 percent of any one mapped area.

The water table is within a depth of 10 inches for about 2 to 6 months and is within 40 inches for about 6 months during most years. The available water capacity is low. Permeability is rapid to a depth of about 36 inches, moderately rapid to 42 inches, and rapid below. Internal drainage is slow. The seasonal high water table impedes the downward movement of water. Natural fertility and the organic matter content are low.

A moderate part of the acreage is in natural vegetation of mixed hardwoods and cabbage palm, water oak, laurel oak, southern magnolia, slash pine, and southern redcedar. The understory is waxmyrtle, gallberry, and fetterbush. The common native grasses are maidencane, smooth cordgrass, chalky bluestem, pineland threeawn, toothachegrass, and broomsedge bluestem.

Under natural conditions, this soil is poorly suited to vegetable crops because of periodic wetness, low fertility, rapid permeability, and low available water capacity. If water is controlled and soil improving measures are applied, certain vegetable crops can be grown.

This soil is not suited to citrus because of wetness and the frost hazard.

This soil is well suited to pasture. If excess water is removed during wet seasons, productive pastures of pangolagrass, improved bahiagrasses, and clovers can be maintained. Regular applications of fertilizer and occasional liming are needed. Overgrazing should be prevented.

If well managed, this soil has moderately high potential productivity for slash pine. Bedding of rows is needed to improve the surface drainage. A drainage system is needed to remove excess water in summer and fall if the potential productivity is to be achieved.

The potential is low for community development. The major soil limitations are the excessive wetness, the slowly permeable subsoil, the high risk of corrosion to uncoated steel, and the high risk of corrosion to concrete within a depth of 28 inches. The seasonal high water table is at or near the soil surface. The slowly permeable subsoil and the seasonal high water table retard downward movement of water. Runoff is very slow after heavy or prolonged rain because the soil is nearly level. A water control system would be needed to remove excess surface water and maintain the ground water table at the depth necessary for the selected use. Artificial drainage systems are expensive and difficult to develop because natural drainage outlets are limited.

The capability subclass is IIIw.

56—Samsula muck. This very poorly drained, nearly level organic soil occurs in broad low flats, small depressions, freshwater marshes, and swamps. The acreage is large. Some mapped areas are more than 1,000 acres. Individual areas are long to irregular in shape. Slopes are less than 2 percent.

Typically, the surface layer is about 9 inches of black muck underlain by 27 inches of dark reddish brown muck. Below this to a depth of 60 inches or more is sand. The upper 10 inches is dark grayish brown, and the lower 14 inches is light gray mottled with dark grayish brown and brown.

Included with this soil in mapping are other poorly drained or very poorly drained soils. Basinger, Myakka, St. Johns, Placid, and Pomona soils commonly occur around the edges of mapped areas, and the boundary is gradual between the surrounding soils and the Samsula soil. Hontoon soils occur near the center of many areas. The included soils commonly make up 25 percent of any one mapped area but range up to 50 in a few areas.

The water table is at or above the soil surface except during extended dry periods. The available water capacity is high. Permeability is rapid throughout. The organic matter content is high, and natural fertility is moderate.

The natural vegetation ranges from wetland grasses to dense swamps of cypress, various wetland hardwoods, or mixtures of these trees and longleaf pine. Most areas are still in natural vegetation.

In its natural state, this soil is not suitable for vegetable crops because of excessive wetness. If water is controlled, it can be used for vegetable crops. Water can be controlled through a system of dikes, canals, ditches, and pumps. Weirs and wickets are needed to keep water level at the proper depth for crops and to reduce the hazard of subsidence caused by oxidation of the organic matter.

This soil is not suited tc citrus.

Pastures of grass or grass-clover mixtures can be grown on this soil, but a system is needed to remove excess water and maintain the water table at shallow depths. Adequate applications of fertilizer and lime and controlled grazing also are needed.

This soil is not suited to slash pine. The excessive wetness is too difficult to control.

The potential is very low for community development. Wetness, standing water, subsidence after drainage, and low strength are limiting characteristics. The necessary removal of muck and water control are costly and difficult.

The capability subclass is IVw.

57—Satellite sand. This nearly level, somewhat poorly drained sandy soil formed in thick beds of sandy marine sediment. It is mainly on low and moderately high sandhills in the flatwoods. The acreage is small in extent. Few areas are more than 100 acres. The areas are generally long and follow the low sandhills. Slopes are smooth to slightly convex and are 0 to 2 percent.

Typically, the surface layer, after it has been rubbed, is very dark gray sand about 4 inches thick. Before rubbing it is a mixture of light gray sand grains and black organic matter that has a salt-and-pepper appearance. The underlying material is sand that has streaks and mottles of gray, dark gray, grayish brown, and reddish brown to a depth of 80 inches or more. The upper 47 inches is light gray sand, the next 14 inches is light brownish gray sand, and below a depth of 66 inches is gray sand.

Included with this soil in mapping are areas of Immokalee and Daytona soils. The included soils make up about 15 percent of any one mapped area.

The natural vegetation is an open stand of longleaf pine and an understory of sawpalmetto and pineland threeawn or a dense stand of various scrub oak or sand pine and an understory of sawpalmetto and scrub oak. Most areas are still in native vegetation, but a few have been planted to improved pasture grasses.

In most years, the water table is 10 to 40 inches below the surface for 2 to 6 months and within 60 inches for more than 9 months. The available water capacity, organic matter content, and natural fertility are very low. Permeability is very rapid.

This soil is not suited to vegetable crops because of the very rapid permeability and the very low organic matter content and natural fertility. Watermelons, however, can be grown.

The soil is poorly suited to citrus. Under high level management citrus can be grown if climatic conditions are favorable.

Deep rooted, drought-resistant pasture grasses are poorly suited but can be grown under high level management.

The potential productivity is moderate for slash pine.

The potential is medium for community development. This rapidly permeable soil is easily drained. Mounding may be needed for onsite sewage disposal systems. The very low natural fertility and the droughtiness are limitations in establishing turf and ornamental plants.

The capability subclass is VIs.

58—Satellite-Urban land complex. This map unit consists of nearly level Satellite soils that have been used for urban development. About 45 to 60 percent of the unit is Satellite sand, and 15 to 45 percent is Urban land. About 35 percent of the areas of Satellite soil have been disturbed by reworking and reshaping during the construction of foundations, utility lines, roads, and streets and the installation of other facilities associated with construction and development. The open areas of Satellite soil are mostly in lawns, vacant lots, or playgrounds. They are generally small and intermingled with areas of Urban land. The Urban land is covered with houses, streets, driveways, buildings, parking lots, and other structures.

In undrained areas, the water table is 10 to 40 inches below the soil surface for 2 to 6 months in most years. Drainage systems have been established in most areas, however, so the water table seldom rises above 40 inches.

Typically, the surface layer of the Satellite soil, after it has been rubbed, is very dark gray sand about 4 inches thick. Before rubbing it is a mixture of light gray sand grains and black organic matter that has a salt-and-pepper appearance. The underlying material is sand that has streaks and mottles of gray, dark gray, grayish brown, and reddish brown to a depth of 80 inches or more. The upper 47 inches is light gray sand, the next 14 inches is light brownish gray sand, and below a depth of 66 inches is gray sand.

Areas of soil modified by grading and shaping are not so large in the older communities as in the newer ones. Excavating streets below the original land surface and spreading this material over adjacent land areas is common. Soil material from other locations is frequently hauled in to fill low spots.

About 15 percent of the open areas is other soils, such as Immokalee sand, Daytona sand, Paola fine sand, and Quartzipsamments, gently sloping. Also included are a few areas where the Urban land makes up 45 to 60 percent of the map unit.

No capability subclass is assigned to the unit.

59—Scoggin sand. This very poorly drained soil is in swamps and in low places bordering swamps in the flatwoods. It is covered with standing water during the summer rainy season. It formed in loamy and sandy marine sediments. Slopes are nearly level to concave. The gradient is less than 1 percent.

Typically, the surface layer is dark reddish brown muck about 4 inches thick. Below the muck, the mineral surface layer is black sand about 7 inches thick. The subsurface layer is gray sand about 29 inches thick. The subsoil is dark gray sandy clay loam about 13 inches thick. The underlying material is gray sandy loam with discontinuous layers of finer and coarser material.

Included with this soil in mapping are small areas of Pomona, Riviera, Wabasso, and Wauchula soils and a few places where the mucky surface layer is as much as 10 inches thick. Also included are a few small depressional areas where the black or very dark gray part of the mineral surface layer is more than 10 inches thick and a few small areas where the mineral surface layer is fine sandy loam. The included areas make up 15 to 20 percent of any one mapped area.

The natural vegetation consists of a sparse forest of slash pine and swamp hardwoods and a ground cover of maidencane, pineland threeawn, gallberry, and clumps of sawpalmetto.

The water table is at or above the surface for as much as 6 months in most years. Ponding occurs during the summer rainy season. In the winter dry season, the water table may drop to 24 inches or more. Permeability is rapid in the surface layer and moderate in the subsoil. Internal drainage is slow; it is impeded by the high water table. The available water capacity is low. Natural fertility is moderately low, and the organic matter content is medium.

Most of this soil is in natural vegetation consisting of a sparse forest of slash pine and swamp hardwoods and a ground cover of maidencane, pineland threeawn, gallberry, and clumps of sawpalmetto. Some areas are cleared, artificially drained, and used for specialty crops.

In its natural state, this soil is not suited to vegetable crops or improved pasture because of excessive wetness. Establishing an adequate water control system is difficult because suitable outlets are generally not available. If water control can be established, however, the soil is moderately well suited to vegetable crops and well suited to improved pasture.

The potential productivity is moderately high for slash pine. Some water control is needed to realize this potential.

The potential is very low for community development because of the excessive wetness, the position of the soil on the landscape, and the general lack of drainage outlets. Even if water control is established, the water table cannot be maintained at low enough levels throughout the year to prevent continuing limitations.

Scoggin soils are important as water storage areas. They provide habitat for many kinds of wildlife, especially browse for deer and nesting areas and shelter for birds.

The capability subclass is IIIw.

60—Smyrna fine sand. This poorly drained, nearly level sandy soil occurs as broad areas in flatwoods, low-lying areas adjacent to depressions, and low areas within sandhills. The acreage is large in extent. Some mapped areas are more than 500 acres. Slopes are less than 2 percent.

Typically, the surface layer is black or very dark gray fine sand about 4 inches thick. The subsurface layer is fine sand about 13 inches thick that is gray in the upper 4 inches and light gray in the lower 9 inches. The subsoil is fine sand about 33 inches thick. The upper 2 inches is very dark gray, the next 5 inches is black, the next 3 inches is very dark grayish brown, and the lower 23 inches is brown. Below the subsoil, between depths of 50 to 72 inches, is gray fine sand that has brownish mottles, and next is 8 inches of white fine sand that has yellowish mottles.

Included with this soil in mapping are small areas of Basinger, Cassia, Immokalee, Myakka, Pomona, and St. Johns soils. The included soils generally make up less than 25 percent of any one mapped area.

The natural vegetation is an open forest of slash pine and an understory of sawpalmetto, running oak, and pineland threeawn. Most areas are still in native vegetation, but some have been planted to improved pasture grasses.

In most years, the water table is within a depth of 10 inches for 1 to 4 months and between 10 and 40 inches for more than 6 months. In rainy seasons, it rises to the surface for brief periods. Many areas, especially near the coast, are affected by artificial drainage. The available water capacity is low. Permeability is moderate or moderately rapid in the subsoil and rapid in the other layers.

If water is controlled, this soil is moderately well suited to vegetable crops. The water control system should lower the water table for drainage and raise it in dry periods for subsurface irrigation. In addition, applications of lime and fertilizer are needed.

This soil is not suited to citrus because of excessive wetness and the frost hazard.

This soil is well suited to improved pasture. If excess water is removed in wet seasons, highly productive pastures of improved grasses can be maintained. In places, a system of shallow surface ditches is all that is needed. Clover can be grown with the grasses but should be irrigated to assure good growth.

The potential productivity is moderately high for slash pine. Bedding helps in establishing seedlings and in removing excess surface water.

The potential is low to medium for community development. The seasonal high water table at or near the surface is a hazard for foundations, pavement, and septic tank absorption fields. If adequate drainage is available, the soil can be used for community development. For onsite waste disposal systems, special design, such as mounding, is generally needed. A maintenance program is needed to keep ditches open and functioning. Standing water in ditches increases the need for mosquito control.

The capability subclass is IVw.

61—St. Johns fine sand. This poorly drained, nearly level sandy soil occurs in low places in flatwoods, generally adjacent to swamps. The acreage is small in extent, although some areas are more than 100 acres. Slopes are mostly less than 1 percent but range to 2 percent.

Typically, the surface layer is about 10 inches thick. The upper 7 inches is black fine sand, and the lower 3 inches is very dark gray fine sand. The subsurface layer is about 16 inches thick. The upper 3 inches is gray fine sand, and the lower 13 inches is light gray fine sand. The subsoil is fine sand coated with colloidal organic matter. The upper 9 inches is black, the next 8 inches is dark reddish brown, and the lower 11 inches is dark brown and dark reddish brown. Below the subsoil is brown fine sand to a depth of 60 inches or more.

Included with this soil in mapping are areas of other soils, such as Basinger, Myakka, Placid, and Smyrna soils, and areas of similar soils in which the subsoil begins at a depth of more than 30 inches. These included soils make up about 10 to 30 percent of many mapped areas. Also included are a few areas of similar soils that have a loamy layer below 60 inches. These areas are associated with Pomona soils.

In most years, the water table is within a depth of 10 inches for 2 to 6 months and between 10 and 40 inches for more than 6 months. In rainy seasons, it rises to the surface for brief periods. Permeability is moderate in the weakly cemented organic subsoil and very rapid in the other layers. The available water capacity is medium. Natural fertility is low, and the organic matter content is medium.

The native vegetation is mostly pond pine, longleaf pine, or slash pine, loblolly bay, sawpalmetto, and gallberry. Most areas are still in native vegetation or have been cleared, bedded, and planted to pines. A few areas are planted to improved grasses or vegetables.

If water is controlled, this soil is well suited to vegetable crops. The water control system should both lower the water table for drainage and raise it in dry periods for subsurface irrigation. In addition, applications of lime and fertilizer are needed.

This soil is not suited to citrus because of the excessive wetness and the frost hazard.

This soil is well suited to improved pasture. If excess water is controlled in wet seaons, highly productive pastures of improved grasses can be maintained. Clover can be grown with the grasses but should be irrigated to assure good growth.

The potential productivity is moderately high for slash pine. Bedding helps in establishing seedlings and in removing excess surface water.

The potential is low to medium for community development. The surface water can be removed by a system of ditches if adequate drainage outlets are available, but lowering and maintaining the seasonal high water table, which is within a depth of 10 inches, is costly and difficult. For onsite waste disposal systems, special design, such as mounding, is generally needed. A maintenance program is needed to keep ditches open and functioning. Standing water in ditches increases the need for mosquito control.

The capability subclass is IIIw.

62—St. Lucie fine sand, 0 to 8 percent slopes. This excessively drained, nearly level to moderately sloping soil occurs on nearly level to dunelike ridges and isolated knolls.

Typically, the surface layer is gray fine sand about 3 inches thick. Below this to a depth of 80 inches or more is white fine sand. The soil contains almost no silt or clay. The sand grains are uncoated.

Included with this soil in mapping are small areas of Astatula and Paola soils. The included soils make up about 25 percent of any one mapped area.

The water table is always below a depth of 72 inches and is usually below 120 inches. The soil has very low available water capacity and rapid permeability throughout. Natural fertility and the organic matter content are very low.

A large part of the acreage is in natural vegetation—an open forest of sand pine and sand live oak. The understory is sawpalmetto, fetterbush, rosemary, and other perennial forbs, grasses, and shrubs.

This soil is not suited to vegetable crops, citrus, or improved pasture because of droughtiness and poor soil qualities.

The potential productivity is very low for slash pine. Sand pine grows best.

The potential is high for community development. The soil is excessively drained and very rapidly permeable, qualities that are favorable for community development. Because of the very rapid permeability, however, septic tank filter fields can pollute nearby water supplies. The potential is low for establishing lawns and ornamental plants because natural fertility and the response to fertilizers are both very low. A possible solution is adding suitable topsoil material that allows adequate plant root development. Regular irrigation is needed during the dry season.

The capability subclass is VIIs.

63—Tavares fine sand, 0 to 5 percent slopes. This moderately well drained, nearly level to gently sloping sandy soil occurs on higher positions on the low sand ridges and in intermediate positions on the higher sand ridges. The acreage is large in extent. Some mapped areas are more than 500 acres. Individual areas are long.

Typically, the surface layer is dark gray fine sand about 8 inches thick. The underlying material is fine sand to a depth of 80 inches or more. The upper 16 inches is pale brown fine sand that has yellowish and brownish splotches throughout. The next 24 inches is very pale brown mottled with yellow. Below this to 80 inches is white fine sand mottled with brown and yellow.

Included with this soil in mapping are small areas of Apopka, Astatula, Cassia, Daytona, Deland, and Paola soils and small areas of a soil that is similar to the Tavares soil but has a surface layer more than 10 inches thick. Also included are small areas of somewhat poorly drained soils that have a profile similar to that of the Tavares soil. The included areas generally make up no more than 25 percent of any one mapped area.

The native vegetation is a forest of longleaf pine, turkey oak, scattered sawpalmetto, and pineland threeawn.

The water table is between 40 and 60 inches during wet seasons. The available water capacity is very low, and permeability is very rapid. Natural fertility and the organic matter content are low.

This soil is poorly suited to vegetable crops. Deep rooted crops are favorably influenced by the water table. If well managed and irrigated during dry periods, special crops such as watermelons and ferns produce good yields.

If the local climate is favorable, this soil is well suited to citrus. Normally, the trees are not seriously affected by drought because the roots extend into the moist area just above the water table.

This soil is moderately well suited to improved pasture. If properly established and well managed, deep rooted grasses grow well.

The potential productivity is moderately high for slash pine.

The potential is high for community development. There is a hazard of pollution to shallow underground water from septic tank absorption fields because of the very rapid permeability. Establishing turf and ornamental plants is difficult. Turf can be established by adding sod. Regular applications of fertilizer and irrigation water are needed.

The capability subclass is IIIs.

64—Tequesta muck. This very poorly drained, nearly level soil occurs in freshwater swamps and marshes and on broad low flats adjacent to natural bodies of water. Slopes are concave to smooth. The gradient is less than 1 percent.

Typically, this soil has about 12 inches of friable black muck on the surface. The surface layer is very dark gray sand about 9 inches thick. The subsurface layer is light gray sand about 16 inches thick. The subsoil is about 10 inches thick. The upper 6 inches is mottled gray sandy clay loam, and the lower 4 inches is dark gray loamy sand. Below this is white sand and shell.

Included with this soil in mapping are small areas of Chobee, Holopaw, Pineda, Riviera, Tomoka, depressional Wabasso, and Winder soils. In some areas the organic layer is less than 6 inches thick. In others, the loamy layer is above a depth of 20 inches or below 40 inches. The included areas make up about 15 percent of any one mapped area.

The water table is within a depth of 10 inches for 6 to 9 months in most years. In wet seasons it may rise 12 inches or more above the surface. In extended dry seasons it may recede to within 20 inches for 1 to 3 months. The available water capacity is medium. Permeability is rapid except in the loamy subsoil, where it is moderate. Internal drainage is impeded by the high water table. Natural fertility and the organic matter content are moderate. Response to fertilizer is good.

Almost all the acreage is in natural vegetation of swamp hardwoods—red maple, baldcypress, sweetgum, sourwood, and American hornbeam—and cabbage palm. The shrubby understory consists of waxmyrtle, fetterbush, and gallberry. The common native grasses and forbs are maidencane, smooth cordgrass, chalky bluestem, broomsedge bluestem, and sawgrass. Some of the broad low flats are wet prairies associated with flood plains of lakes and streams. In such areas the vegetation is smooth cordgrass, sawgrass, chalky bluestem, and scattered waxmyrtle.

For most uses a water control system is needed to remove excess surface water and maintain the ground water table at the depth necessary for the selected use. Under natural conditions, this soil is not suited to vegetable crops because of excessive wetness. If water is controlled, it can be used for certain vegetable crops. Lime and fertilizer are needed.

This soil is not suited to citrus because of excessive wetness and the frost hazard.

If the water table is controlled, this soil is well suited to improved pasture grasses or grass-clover mixtures.

Where the natural vegetation is swamp hardwoods, it contains many desirable timber species, including cypress. With adequate water control and high level management, this soil has high potential productivity for slash pine.

The potential is very low for community development. The excessive wetness, the moderately permeable subsoil, the high risk of corrosion to uncoated steel, and the very slow rate of water runoff are limitations. In addition, the seasonal high water table is above the soil surface. This soil is always saturated during the wet season and cannot store or transmit additional water. Artificial drainage systems are costly and difficult to develop because natural drainage outlets are limited. Some areas of this soil are in flood-prone areas along lakes and streams.

This soil has high potential for a wetland wildlife habitat. Many areas are natural wetlands. Shallow water areas are easily developed.

The capability subclass is IIIw.

65—Terra Ceia muck. This very poorly drained soil formed in organic material. It occurs in swamps, freshwater marshes, and small depressions. Slopes are concave or smooth. The gradient is less than 1 percent.

Typically, the soil is black muck to a depth of about 64 inches or more.

Included with this soil in mapping are small areas of Chobee soils, Fluvaquents, and Placid, St. Johns, and Tomoka soils. These soils occur around the edges of mapped areas. The included soils make up about 20 percent of some mapped areas.

The water table is as much as 2 feet above the surface at times during the rainy season. It is at or above the surface for 6 to 9 months in most years and is seldom below a depth of 10 inches except during extended dry periods. Permeability is rapid throughout, but the internal drainage is impeded by the high water table. The available water capacity is high. Natural fertility is moderate, and the organic matter content is high.

Almost all areas of this soil are marshes or swamps. In the marshes, the natural vegetation is dominantly sawgrass or smooth cordgrass. In the swamps, it is a dense growth of swamp hardwoods—red maple, sweetgum, baldcypress, and loblolly bay.

In its natural state, this soil is not suitable for vegetable crops because of excessive wetness. Most areas have low potential for specialty crops because the drainage outlets needed in controlling the water table are unavailable. Where drainage and water control are established, however, this is an excellent soil for vegetable crops.

This soil is not suited to citrus because of excessive wetness and the hazards of frost and subsidence.

If a water control system is feasible, this soil is well suited to improved pasture.

The soil is not suited to slash pine. The excessive wetness is so difficult to control that this use is not practical.

The potential is very low for community development. Wetness, standing water, subsidence after drainage, and low strength are limiting characteristics. Removing muck and controlling water are costly and difficult.

Many areas of this soil border streams or lakes. Altering the natural vegetation and artificially draining this soil could have a detrimental effect on the quality of the adjacent bodies of water. This soil is a natural habitat for wetland wildlife.

The capability subclass is IIIw.

66—Tomoka muck. This very poorly drained soil formed in organic material. It occurs in swamps and freshwater marshes. Slopes are concave or smooth. The gradient is less than 1 percent.

Typically, the surface layer is black muck about 10 inches thick. Below this is dark reddish brown muck to a depth of about 34 inches. Below this is mineral material. The upper 5 inches is gray sand, the next 9 inches is gray sandy loam, and the lower part to 58 inches is very dark gray sandy clay loam.

Included with this soil in mapping are small areas of Hontoon and Samsula soils. The included soils make up about 15 percent of any one mapped area.

The water table is as much as 2 feet above the surface at times during the rainy seasons. It is at or above the surface for 6 to 9 months in most years and is seldom below a depth of 10 inches except during extended dry periods. Permeability is rapid to a depth of about 39 inches and moderate to moderately rapid below. Internal drainage, however, is impeded by the high water table. The available water capacity is high. Natural fertility is moderate, and the organic matter content is high.

The natural vegetation is swamp hardwoods—sweetgum, red maple, and baldcypress—or wetland marsh grasses—cordgrass, sawgrass, and associated marsh plants.

In its natural state, this soil is not suitable for vegetable crops or improved pasture because of excessive wetness. Water control or drainage is difficult and expensive. Where water control is established, however, this is an excellent soil for vegetable crops and improved pasture.

This soil is not suited to citrus because of excessive wetness and the hazards of frost and subsidence.

This soil is not suited to slash pine. The excessive wetness is so difficult to control that this use is not practical.

The potential is very low for community development. Wetness, standing water, subsidence after drainage, and low strength are limiting characteristics. Removing muck and controlling water are costly and difficult.

This soil is a natural habitat for wetland wildlife.

The capability subclass is IIIw.

67—Turnbull muck. This very poorly drained soil occurs in tidal marsh areas that are subject to periodic flooding by tidal water. Individual areas range up to several hundred acres.

Typically, a layer of very dark gray muck about 14 inches thick is on the surface. Below this is a layer of dark greenish gray clay about 36 inches thick. Between depths of 36 and 66 inches is dark greenish gray fine sand that contains layers of loamy fine sand and shells.

Included with this soil in mapping are areas of similar soils where the mucky surface layer is more than 14 inches thick. In a few places, there are layers on the surface of mixed sand and shells that were dredged from the Intracoastal Waterway. These layers are mostly less than two feet thick and are in narrow bands along the Intracoastal Waterway. Some pedons in the Indian River Lagoon area are sandy throughout and are intermingled with Turnbull muck in a complex pattern. The included areas make up as much as 30 percent of any one mapped area.

Fluctuating tides overwash the surface periodically. The soil is always waterlogged. Permeability is slow.

Native vegetation is a salt marsh of needlegrass rush, smooth cordgrass, bushy sea-oxeye, marshhay cordgrass, glasswort, bigleaf sumpweed, and seashore saltgrass.

This soil is not suited to vegetable crops or citrus.

This soil is not suited to improved pasture because of low soil strength. In many places it will not support the weight of animals.

This soil is not suited to slash pine or other trees because of tidal flooding and high salinity.

The potential is very low for community development because of tidal flooding, excessive wetness, and low strength. Overcoming these limitations is impractical.

This soil has unique importance for many kinds of wildlife. The native vegetation and fauna are important links in the food chain for many sport and commercial finfish and shellfish. The soil is important as habitat for many kinds of birds.

The capability subclass is VIIIw.

68—Turnbull Variant sand. This soil consists of mixed sandy and shelly material dredged from the Intracoastal Waterway and placed in narrow strips along the waterway. The underlying material is organic layers and layers of clayey and sandy estuarine deposits. Areas are mostly in tidal marshes associated with the Intracoastal Waterway.

Typically, the surface layer is a very pale brown mixture of sand and shells about 30 inches thick. The next layer is brown sand and shells about 12 inches thick. The underlying layer extends to 99 inches or more. In sequence downward, it is about 6 inches of black mucky clay, 4 inches of a brown mixture of sand and shells, 5 inches of black muck, 5 inches of dark greenish gray sandy clay, 10 inches of gray loamy sand, and 27 inches of very dark gray stratified sand, loamy sand, and clay.

Included with this soil in mapping are small areas where the sandy and shelly deposits are less than 40 inches thick. Also included are a few small areas where the sandy and shelly deposits contain discontinuous layers of muck, clay, and sandy clay. The included areas make up 15 to 25 percent of any one mapped area.

The water table is at a depth of about 40 inches, or at the base of the overburden. The available water capacity is very low, and permeability is very rapid throughout the sandy overburden. Natural fertility and the organic matter content are very low in the sandy overburden.

The amount of plant cover established depends on how fresh or how old the dredged material is. Common plants are pricklypear, southern redcedar, waxmyrtle, cabbage palm, and, where the overburden is thin, glasswort, pickerelweed, spartina, and juncus.

This soil is not suited to most agronomic and many ornamental plants because of the adverse soil conditions and the salt spray from the ocean.

The potential productivity is low for slash pine.

The potential is low for community development. Higher lying areas bordering the mainland and the peninsula are used as sites for structures, but storm-driven tides and salt spray are hazards. In addition, there is danger of uneven settlement and subsidence in the material below the sandy and shelly overburden. Low-lying areas on the islands are more prone to flooding by tidal overwash and are best used for wildlife, including resting and nesting places for shore birds.

The capability subclass is VIIs.

69—Tuscawilla fine sand. This nearly level, poorly drained soil is in broad hammocks near the coast. The acreage is extensive in Turnbull and Bulow hammocks. Undisturbed areas are characterized by microrelief of fairly closely spaced, low broad rises, or mounds, which are a few feet to more than 100 feet across, irregular in shape, and about 4 to 6 inches above the general level of the surrounding area. Slopes are 0 to 2 percent but mostly less than 1 percent.

Typically, the surface layer is dark gray fine sand about 3 inches thick. The subsurface layer is light brownish gray fine sand about 7 inches thick. The subsoil is 30 inches thick. In the upper 3 inches it is grayish brown fine sandy loam. To a depth of 32 inches it is gray sandy clay loam, and to 40 inches it is light gray fine sandy loam. Below the subsoil to 62 inches is light gray fine sand. To 68 inches is greenish gray fine sand. Below this to 80 inches is white shells and fine sand.

Included with this soil in mapping are a few small areas of the very poorly drained Chobee and Tequesta soils in the lower areas between the mounds, small areas where the surface layer is fine sandy loam, and small areas where the soil has a layer of limestone that is about 6 inches thick and 3 to 6 feet across and is below the subsoil. These included soils make up about 15 percent of any one mapped area. Also included are some areas of soils that are similar to this Tuscawilla soil but have a surface layer 7 to 9 inches thick and a few small areas of soils that are similar to the Tuscawilla soil but have a layer of muck 1 to 3 inches thick on the surface. These similar soils make up as much as 25 percent of any one mapped area. They occur mostly at the edges of areas and between the mounds.

The water table is within a depth of 10 inches for 2 to 6 months in most years. Permeability is rapid in the sandy layers and moderately slow in the loamy layers. The available water capacity is low. Natural fertility is medium, and the organic matter content is low.

Natural vegetation is lowland hardwood hammock. The overstory is laurel oak, live oak, sweetgum, and coastal pignut hickory; and the understory is cabbage palm, southern magnolia, southern redcedar, American hornbeam, waxmyrtle, and longleaf uniola. In some places, the vegetation in the lower areas between the mounds is dominantly cabbage palm, American hornbeam, and pumpkin ash.

Large areas of this soil are in natural vegetation. Many areas in the vicinity of Port Orange and Daytona have been drained and used for farmland and community development. Where outlets are available, draining this soil is not difficult. Constructing ditches or canals that extend well into the substratum of sand and shell, which is rapidly permeable, allows free movement of the ground water.

This soil is moderately well suited to vegetable crops and citrus. Water control is needed. In places, the discontinuous limestone substratum restricts the growth and development of citrus trees, so trees are smaller than normal.

If water is controlled, this soil is well suited to improved pasture. Grass-clover mixtures grow well.

This soil is poorly suited to pine production. The medium natural fertility and the neutral to slightly alkaline soil conditions favor the growth of broadleaf trees over pines.

The potential is medium for community development. Wetness is a limitation. Water control is needed. Onsite sewage disposal systems are not satisfactory because of the seasonal high water table, the moderately slow permeability in the loamy subsoil, and the discontinuous layers of limestone. Poor drainage conditions do not permit below-grade construction. The fertility is medium and the water holding capacity is enough that lawns and other plantings grow well. There are many desirable native trees, such as live oak and magnolia, that should be protected during construction. The substratum is a good source of shell.

The potential is high for natural parks and wilderness areas. Many areas support a unique growth of mesic hardwoods.

The capability subclass is IIIw.

70—Tuscawilla-Urban land complex. This map unit is made up of broad areas of the Tuscawilla soils that have been used for urban development. The areas are in coastal hammocks in the Daytona Beach urban area. About 40 to 60 percent of the unit is Tuscawilla fine sand, and 15 to 45 percent is Urban land. The open areas of Tuscawilla soil are lawns, vacant lots, and other open areas, and some contain native hardwoods. These open areas are generally small and intermingled with Urban land. The Urban land is covered with houses, streets, shopping centers, paved playgrounds, parking lots, and other structures.

In its natural state, the seasonal high water table fluctuated from a few inches above the surface to ten inches below the surface during the wet seasons. In most places, a system of ditches and canals has been installed to maintain the water table below the soil surface, and, in addition, some developed areas have been filled to elevate the construction sites.

Typically, the surface layer of the Tuscawilla soil is dark gray fine sand about 3 inches thick. The subsurface layer is light brownish gray fine sand about 7 inches thick. The subsoil is 30 inches thick. In the upper 3 inches it is grayish brown fine sandy loam. To a depth of 32 inches it is gray sandy clay loam, and to 40 inches it is light gray fine sandy loam. Below the subsoil to 62 inches is light gray fine sand, to 68 inches is greenish gray fine sand, and below this to 80 inches is white shells and fine sand.

About 15 percent of the open areas is other soils, such as Chobee, Riviera, and Winder soils. The very poorly drained Chobee soils are in depressions and drainageways. The Riviera and Winder soils occur as narrow, long areas along the outer edges of the hammocks adjacent to the flatwoods.

The soils in this unit have high natural fertility. In their natural state, they supported a luxuriant, indigenous hardwood forest of live oak, laurel oak, magnolia, ash, hickory, and in slight depressions, cypress, loblolly bay, red maple, and sweetgum. Cabbage palm was intermingled throughout the forest. Most of the native trees are highly desirable as shade and ornamental plants. As the remaining forested areas are cleared, the trees that can be left can be identified and care exerted to avoid disturbing the root system or placing fill material over the root system. Introduced plants and turf grow well with a minimum of care.

No capability subclass is assigned to the unit.

71—Urban land. In areas of Urban land, 85 percent or more of the surface is covered with streets, parking lots, buildings, and other structures. The few small areas that are not covered with buildings or pavement are lawns, vacant lots, or playgrounds. Individual areas are rectangular or polyhederal in shape and generally range from 5 to 150 acres.

Included with Urban land in mapping are small areas of Astatula, Paola, Tavares, Orsino, Daytona, Cocoa, Myakka, Immokalee, and other soils. The included soils make up about 15 percent of any one mapped area.

No capability subclass is assigned to the unit.

72—Valkaria fine sand. This nearly level, poorly drained, sandy soil is in broad, poorly defined drainageways and low areas bordering swamps. Slopes are smooth to concave. The gradient is 0 to 1 percent.

The surface layer is grayish fine sand about 10 inches thick. The upper 6 inches is very dark gray, and the lower 4 inches is dark grayish brown. The subsurface layer, to a depth of about 35 inches, is light brownish gray fine sand mottled in shades of yellow and brown. The subsoil is brownish yellow fine sand in the upper 13 inches and very pale brown fine sand in the lower 4 inches. Below the subsoil is gray and light gray fine sand.

Included with this soil in mapping are small areas of Basinger, Malabar, Pompano, and Myakka soils. The included soils make up about 15 percent of any one mapped area.

The water table is at or near the surface for as much as 6 months in most years. After prolonged rains, some areas have standing water that persists from a few days to as long as 3 months. In the dry season, the water table may drop below 40 inches. Permeability is very rapid throughout, but the high water table impedes the downward movement of water. The available water capacity, the organic matter content, and the natural fertility are low.

The natural vegetation is mostly St.-Johnswort, waxmyrtle, pineland threeawn, and scattered slash pine and clumps of cabbage palmetto.

Under natural conditions, this soil is poorly suited to vegetable crops because of wetness and poor soil qualities. If water is controlled, it is well suited to certain vegetable crops.

This soil is well suited to improved pasture. If excess surface water is removed, grasses and grass-clover mixtures grow well.

This soil is not suited to citrus because of excessive wetness and the frost hazard.

The potential productivity is moderate for slash pine. Seedlings should be planted on beds to provide adequate aeration for the roots.

The potential is low for community development. Wetness is the major limitation. Because of the soil's low position on the landscape and the lack of drainage outlets, water cannot be controlled well enough to make development practical. Wetness would be a continuing limitation except during extended dry periods.

The capability subclass is IVw.

73—Wabasso fine sand. This poorly drained, nearly level soil occurs in broad, low areas within the flatwoods. Slopes are smooth. The range is 0 to 2 percent.

Typically, the surface layer is black fine sand about 7 inches thick. The subsurface layer is fine sand about 17 inches thick. The upper part is gray, and the lower part is light gray. The subsoil is about 56 inches thick. In sequence downward, it is 6 inches of black loamy fine sand, 5 inches of dark reddish brown fine sand, 4 inches of dark brown fine sand, 12 inches of mottled gray, firm sandy clay loam, 21 inches of mottled greenish gray, friable sandy clay loam, and 8 inches of mottled greenish gray sandy clay loam with pockets of gray sandy loam.

Included with this soil in mapping are small areas of Basinger, EauGallie, Holopaw, Myakka, Pineda, Riviera, and Wauchula soils. Also included are places where the texture is sand instead of the fine sand. The included soils make up about 20 percent of any one mapped area.

The water table is within a depth of 10 inches for 1 to 4 months and within 40 inches for about 6 months in most years. It may recede to below 40 inches during extended dry periods. The available water capacity is low. Permeability is rapid to a depth of about 24 inches, moderate from about 24 to 35 inches, rapid from about 35 to 39 inches, and moderate from about 39 to 80 inches. Internal drainage is slow; it is impeded by the high water table. Natural fertility and the organic matter content are low.

A large part of the acreage is in natural vegetation—an open forest of slash pine and cabbage palmetto and an understory of sawpalmetto, gallberry, runner oak, dwarf huckleberry, and fetterbush. The most common native grasses are pineland threeawn, maidencane, lopsided indiangrass, broomsedge bluestem, hairy panicum, chalky bluestem, and creeping bluestem.

Under natural conditions this soil is poorly suited to vegetable crops because of periodic wetness, low fertility, and low available water capacity. If water is controlled and soil-improving measures are applied, the soil is moderately well suited to certain vegetable crops. The water control system should remove excess water in wet seasons and provide water through subsurface irrigation in dry seasons. Response to fertilizer is good.

This soil is not suited to citrus because of excessive wetness and the frost hazard.

This soil is well suited to improved pasture. If excess water is removed in wet seasons, pangolagrass, bahiagrasses, and clovers grow well. Regular application of fertilizer is needed.

The potential productivity is moderately high for slash pine. Equipment limitations and seedling mortality are moderate. Bedding of rows helps seedlings to survive by providing additional aeration for the roots. A system is needed to remove excess water in wet seasons if the potential productivity is to be realized.

The potential is low for community development. The major soil limitations are excessive wetness and the high risk of corrosion to uncoated steel. The seasonal high water table is at or near the soil surface. Runoff is very slow after heavy or prolonged rain because the soil is nearly level. An adequate water control system would be needed to remove excess surface water and maintain the ground water table at the depth necessary for the selected use. Artificial drainage systems are expensive and difficult to develop and existing drainage outlets are poor. In addition, altering natural vegetation and existing drainage patterns could adversely affect the surrounding ecological community.

The capability subclass is IIIw.

74—Wabasso fine sand, depressional. This poorly drained, nearly level soil occurs in depressions and in swales in the low flatwoods. Slopes are smooth to concave and 0 to 2 percent.

Typically, the surface layer is black fine sand about 7 inches thick, and it has a few gray mottles. The subsurface layer is gray fine sand about 17 inches thick. The subsoil is about 56 inches thick. In sequence downward, it is 6 inches of black, friable loamy fine sand, 5 inches of dark reddish brown, friable fine sand, 4 inches of dark brown, friable fine sand, 12 inches of mottled gray, firm sandy clay loam, 21 inches of mottled greenish gray, friable sandy clay loam, and 8 inches of mottled greenish gray sandy clay loam that has pockets of gray sandy loam.

Included with this soil in mapping are small areas of Basinger, Holopaw, Pineda, Riviera, Smyrna, and Wauchula soils and depressional phases of EauGallie, Myakka, and Wauchula soils. In some areas, the texture is sand instead of fine sand. In some, the lower part of the subsoil is loamy fine sand or loamy sand. The included areas make up about 25 percent of any one mapped area.

The water table fluctuates from 6 inches above the soil surface to about 10 inches below for 4 to 8 months during most years. After the driest season, usually late spring, the water table may briefly recede to a depth of 40 inches. The available water capacity is low. Permeability is rapid except in the weakly cemented and loamy layers, where it is moderate. Internal and surface drainage, however, are impeded by the high water table. Natural fertility and the organic matter content are low. Response to fertilizer is moderate.

A large part of the acreage is in natural vegetation—an open forest of scattered cabbage palm, slash pine, loblolly bay, sweetgum, and pond pine. Ground shrubs and forbs are gallberry, waxmyrtle, St.-Johnswort, fetterbush, and scattered sawpalmetto. The most common native grasses are pineland threeawn, blue maidencane, lopsided indiangrass, hairy panicum, chalky bluestem, and creeping bluestem.

This soil is not suited to vegetable crops, citrus, or improved pasture because it is always saturated during the wet season and has slow runoff. These conditions are difficult to overcome because suitable drainage outlets are generally not available. In addition, frost is a hazard to citrus.

The potential productivity is very low for slash pine. Pond pine grows best.

The potential is very low for community development. The major soil limitations are the excessive wetness, the moderate risk of corrosion to uncoated steel, and the high risk of corrosion to concrete. The soil is always saturated with water during the wet season and cannot store or transmit additional water. Runoff is very slow after heavy or prolonged rain because the soil is nearly level. An adequate water control system would be needed to remove surface water and maintain the ground water table at the depth necessary for the selected use. Artificial drainage systems are expensive. Suitable drainage outlets are generally not available.

Altering natural vegetation and existing drainage patterns would, in many places, adversely affect the associated wetland ecological systems. This soil is a good habitat for wetland wildlife. Shallow water areas are easily developed.

The capability subclass is VIIw.

75—Wauchula fine sand. This poorly drained, nearly level soil is in broad flatwoods. The acreage is small in extent. Most areas are less than 100 acres. Slopes are less than 2 percent.

Typically, the surface layer is about 7 inches thick. the upper 3 inches is black loamy fine sand, and the lower 4 inches is very dark gray fine sand. If the layer is mixed, by plowing, for example, the texture is fine sand. The subsurface layer is fine sand about 13 inches thick. The upper 6 inches is gray, and the lower 7 inches is light gray. It contains streaks of dark gray and very dark gray. The subsoil begins at about 20 inches and extends to a depth of 80 inches or more. The upper 5 inches is dark reddish brown loamy fine sand that has sand grains coated with organic matter; the next 4 inches is dark brown loamy fine sand that has black weakly cemented bodies; the next 5 inches is dark grayish brown fine sand; and the lower part is light gray, mottled sandy clay loam.

Included with this soil in mapping are small areas of Pineda, Pomona, Scoggins, and Wabasso soils. The included soils generally make up no more than 15 percent of any one mapped area.

The natural vegetation is a forest of longleaf pine, slash pine, sawpalmetto, and an understory of gallberry and pineland threeawn. Many areas have been cut over and replanted to slash pines. A few are improved pasture.

In most years, the water table is within 10 inches of the surface for 1 to 4 months and within 40 inches for about 6 months. During the driest seasons, it recedes to below 40 inches. The available water capacity is low. Permeability is rapid in the surface and subsurface layers and moderate in the subsoil. Natural fertility and the organic matter content are low.

Under natural conditions, this soil is poorly suited to vegetable crops because of periodic excessive wetness. If the water table is carefully controlled, the soil is moderately well suited to vegetable crops, but good management is needed.

This soil is not suited to citrus because of excessive wetness and the frost hazard.

If excess water is removed in wet seasons, this soil is well suited to improved pasture. Clover can be grown with the grasses, but irrigation is needed in dry seasons to assure good growth.

The potential productivity is moderately high for slash pine. Bedding of rows helps seedlings to survive by providing additional aeration for the roots. A surface drainage system is needed to remove excess water in wet seasons if the potential productivity is to be realized.

The potential is low for community development. The seasonal high water table at or near the surface is a limiting factor for most uses. Because of the soil's position on the landscape and the general lack of drainage outlets, wetness is difficult to control satisfactorily. In some areas that are near incised streams or arterial canals, however, the surface water can be easily removed by a system of shallow surface ditches.

The capability subclass is IIIw.

76—Wauchula fine sand, depressional. This poorly drained, nearly level soil occurs in depressions and swales in the low flatwoods. Slopes are smooth to concave and are 0 to 2 percent.

Typically, the surface layer is black fine sand in the upper 4 inches and dark gray fine sand in the lower 3 inches. The subsurface layer is gray fine sand about 14 inches thick and is streaked with shades of gray. The upper part of the subsoil, to a depth of 31 inches, is dark reddish brown loamy fine sand that has sand grains coated with organic matter. Below this is about 6 inches of brown fine sand that is mottled in shades of yellow and brown. A layer of gray sandy clay loam is between 37 inches and 49 inches. Below this to 60 inches or more is gray sandy loam mottled in shades of yellow.

Included with this soil in mapping are small areas of Basinger and Pomona soils and other Wauchula soils. The included soils make up as much as 20 percent of some mapped areas.

The water table is within 10 inches of the surface for 3 to 6 months during most years, and standing water is on the surface for periods of 7 days to 1 month after heavy rainfall. The standing water is seldom more than 6 inches deep. The available water capacity is low. Permeability is rapid in the surface and subsurface layers and moderately rapid to moderate in the subsoil. Natural fertility and the organic matter content are low.

The natural vegetation is pineland threeawn, maidencane, waxmyrtle, scattered pines, and occasional clumps of sawpalmetto.

This soil is not suited to vegetable crops, citrus, or improved pasture. It is always saturated during the wet season, and runoff is slow. These conditions are difficult to overcome because suitable drainage outlets are generally not available. In addition, frost is a hazard to citrus.

The potential productivity is very low for slash pine. Pond pine grows best.

The potential is very low for community development. The major soil limitations are the excessive wetness and the high risk of corrosion to uncoated steel and concrete. This soil is always saturated with water during the wet season and cannot store or transmit additional water. Runoff is very slow after heavy or prolonged rain because the soil is nearly level. An adequate water control system would be needed to remove surface water and maintain the ground water table at the depth necessary for the selected use. Artificial drainage systems are expensive. Suitable drainage outlets are generally not available.

Altering natural vegetation and existing drainage patterns would, in many places, adversely affect the associated wetland ecological systems. This soil is a good habitat for wetland wildlife. Shallow water areas are easily developed.

The capability subclass is VIIw.

77—Winder fine sand. This nearly level, poorly drained soil occurs in broad, low flats. Slopes are less than 2 percent.

Typically, the surface layer is fine sand 6 inches thick. The upper 3 inches is very dark gray, and the lower 3 inches is dark gray. The subsurface layer is gray fine sand 6 inches thick. The subsoil is 47 inches thick. The upper 8 inches is gray sandy clay loam that has gray fine sand intrusions about 1/2 inch to 2 inches in diameter. The next 8 inches is gray sandy clay loam mottled with yellowish brown. The lower 8 inches is light brownish gray fine sandy loam mottled with yellowish brown. Below this to a depth of 80 inches or more is light brownish gray fine sand mottled with yellowish brown and containing coarse lenses and balls of sandy clay loam.

Included with this soil in mapping are areas of Riviera, Paisley, and Chobee soils. Also included are a few small depressional areas. The included soils make up no more than 25 percent of most mapped areas.

Most areas are in hardwood forest—live oak, laurel oak, red maple, sweetgum, and American hornbeam—and cabbage palm and scattered pine. Some areas are used for pasture.

The water table is at a depth of less than 10 inches for 2 to 6 months during most years. The available water capacity is medium. Permeability is rapid in the surface layer and slow in the subsoil. Runoff is very slow. The organic matter content and natural fertility are low.

This soil is poorly suited to vegetable crops because of excessive wetness. If water is controlled, selected vegetable crops can be grown.

This soil is not suited to citrus because of wetness and the soil's low position in the landscape, which results in a higher probability of frost damage caused by temperature inversions.

If water is controlled, this soil is well suited to improved pasture. In some places, a simple system of surface ditches tied into canals is adequate for pasture production. Lime is not needed because the subsoil is mildly alkaline.

The potential is low for community development. Excessive wetness and slow permeability are major limitations. Wetness is costly and difficult to control because of the low landscape position and slow percolation. Slow permeability is a major limitation for septic tank absorption fields.

The capability subclass is IIIw.

Use and management of the soils

The soil survey is a detailed inventory and evaluation of the most basic resource of the survey area—the soil. It is useful in adjusting land use, including urbanization, to the limitations and potentials of natural resources and the environment. Also, it can help avoid soil-related failures in uses of the land.

While a soil survey is in progress, soil scientists, conservationists, engineers, and others keep extensive notes about the nature of the soils and about unique aspects of behavior of the soils. These notes include data on erosion, drought damage to specific crops, yield estimates, flooding, the functioning of septic tank disposal systems, and other factors affecting the productivity, potential, and limitations of the soils under various uses and management. In this way, field experience and measured data on soil properties and performance are used as a basis for predicting soil behavior.

Information in this section is useful in planning use and management of soils for crops and pasture, rangeland, and woodland; as sites for buildings, highways and other transportation systems, sanitary facilities, and parks and other recreation facilities; and for wildlife habitat. From the data presented, the potential of each soil for specified land uses can be determined, soil limitations to these land uses can be identified, and costly failures in houses and other structures, caused by unfavorable soil properties, can be avoided. A site where soil properties are favorable can be selected, or practices that will overcome the soil limitations can be planned.

Planners and others using the soil survey can evaluate the impact of specific land uses on the overall productivity of the survey area or other broad planning area and on the environment. Productivity and the environment are closely related to the nature of the soil. Plans should maintain or create a land-use pattern in harmony with the natural soil.

Contractors can find information that is useful in locating sources of sand and gravel, roadfill, and topsoil. Other information indicates the presence of bedrock, wetness, or very firm soil horizons that cause difficulty in excavation.

Health officials, highway officials, engineers, and many other specialists also can find useful information in this soil survey. The safe disposal of wastes, for example, is closely related to properties of the soil. Pavements, sidewalks, campsites, playgrounds, lawns, and trees and shrubs are influenced by the nature of the soil.

Crops and pasture

John D. Griffin, agronomist, Soil Conservation Service, helped prepare this section.

The major management concerns in the use of the soils for crops and pasture are described in this section. In addition, the crops or pasture plants best suited to the soil, including some not commonly grown in the survey area, are discussed; the system of land capability classification used by the Soil Conservation Service is explained; and the estimated yields of the main crops and hay and pasture plants are presented for each soil.

This section provides information about the overall agricultural potential of the survey area and about the management practices that are needed. The information is useful to equipment dealers, land improvement contractors, fertilizer companies, processing companies, planners, conservationists, and others. For each kind of soil, information about management is presented in the section "Soil maps for detailed planning." Planners of management systems for individual fields or farms should also consider the detailed information given in the description of each soil.

More than 36,000 acres in Volusia County was utilized for crops and pasture in 1975, according to Soil Conservation Service Now on the Land Records, Volusia County Extension Service Annual Report and Florida Crops and Reporting Service: Florida Agricultural Statistics. Of this total, 20,000 acres was used for pasture, 10,478 acres for fruit crops, 2,750 acres for vegetable crops, and 3,000 acres for specialty crops of ferns.

Pastures in the survey area produce forage for beef and dairy cattle. Beef cattle cow-calf operations are the main cattle enterprises. Bahiagrass and Coastal bermudagrass are the main pasture plants. Many farmers overseed rye on bahiagrass sod in fall for winter and spring forage.

Differences in the amount and kind of pasture yields are related closely to differences among soils. Management of pasture is based on the relationship of soils, pasture plants, lime, fertilizer, moisture, and grazing systems. Pasture in many parts of the county is greatly depleted by continuous excessive grazing. Yields can be increased under management that includes lime, fertilizer, and grass-legume mixtures.

If adequately drained, the poorly drained soils of the flatwoods are well suited to pasture. Subsurface irrigation increases both the length of time that the forage is available and the total forage produced. If irrigated and adequately limed and fertilized, these soils are well suited to white clover and other legumes.

If adequately limed and fertilized, the well drained and moderately well drained soils—Apopka, Deland, Astatula, and Tavares soils—are well suited to pasture of bahiagrass and Coastal bermudagrass.

Special crops grown commercially in the survey area are vegetables, citrus fruits, ornamental plants, and ferns. Cabbage, cucumbers, green peppers, and watermelons are grown in the central and southern parts of the county. Oranges are the most important citrus crop. Smaller acreages are in grapefruit and tangerines. The western part of the county produces about 3,000 acres of ferns. The ferns are grown under the shade of live oak trees or under artificial shade and are then shipped to florists for floral arrangements. About half the acreage is leatherleaf ferns and half is plumosus ferns.

Field crops suited to the soils and climate of the survey area include many that are not commonly grown. Only small acreages of field crops are presently grown.

Corn, soybeans, sugarcane, rice, and similar crops can be grown if economic conditions are favorable. Sugarcane and indigo were once major crops in the survey area.

As population increases, the demand for food will also increase. To increase food production, knowledge of soils and soil properties is essential. Some of the major soil properties to be considered are erosion by water and wind, wetness, fertility, and tilth.

Soil erosion is not so great a problem in Volusia County as it is in many areas in the southern United States. The soils are sandy and nearly level. Erosion from rapid runoff occurs only during periods of torrential rainfall in a few bare areas that have short, steep slopes.

Soil blowing is a major problem on the sandy soils and on the muck soils. In a few hours, soil blowing can damage both the soils and the tender truck crops and young citrus trees if winds are strong and the soils are bare of vegetation or surface mulch. Maintaining a plant cover or a surface mulch minimizes soil blowing on these soils. Windbreaks of adapted trees and shrubs, such as slash pine, sand pine, Japanese privet, and eucalyptus, are also effective in reducing wind erosion and crop damage. Stripcrops of small grain are also effective in reducing wind erosion and crop damage.

Water control is a major management need on land used for crops and pasture. About 75 percent of the soils in the county are poorly drained or very poorly drained. In most years they are too wet for crops commonly grown in the area. These sandy soils also have a low water holding capacity and are droughty during dry periods. For intensive row cropping, a combination of surface drainage and subsurface irrigation (fig. 11) is needed on most of the poorly drained soils. The design of both surface drainage and irrigation systems varies with the kind of soil and the crop grown. More information about water control and practices that prevent wind erosion is available at the local office of the Soil Conservation Service.

Soil fertility is naturally low in most of the sandy soils in the county. Dark surfaced mineral soils generally have more organic matter and more plant nutrients. Organic soils require special fertilizers because they are low in copper and other trace elements. Most soils in the county are very strongly acid. If they have never been limed, applications of ground limestone are needed for good growth of legumes and other crops. Nitrogen and available phosphorus and potash levels are naturally low in most of the mineral soils. More specific information about natural fertility is given for each soil under "Soil maps for detailed planning" and "Soil series and morphology." Natural soil fertility, however, changes as the soil is used. On all soils, additions of lime and fertilizer should be based on the results of soil tests, on the needs of the crop, and on the expected level of yields. The Cooperative Extension Service can help in determining the kinds and amounts of fertilizer and lime needed.

Tilth refers to the condition of the soil in relation to plant growth. It is an important factor in the germination of seeds and in the infiltration of water into the soil. Soils that have good tilth are granular, porous, and easily cultivated. Most soils used for crops in the survey area have a sandy surface layer and good tilth. Most have weak structure. Some are structureless. Structure can be improved by regular addition of organic matter, such as crop residue and manure. Soils that have a light colored surface also are low in organic matter. Adding organic matter increases their fertility and water holding capacity.

Volusia County has the potential for increased food production. Production could be increased in existing agricultural areas by proper management and modern technology. In addition, other areas could be converted to more intensive types of agriculture. About 175,000 acres of potentially good cropland is currently woodland and about 20 000 acres is pasture. Food production could be increased by growing crops not presently grown commercially. If water is adequately controlled, soils that are poorly drained and very poorly drained and that warm up early in spring are well suited to many vegetable crops and small fruits, such as blueberries and blackberries. Rice, sugarcane, corn, and similar crops are well suited to the organic soils. Organic soils oxidize and subside, however, when pore space is exposed to the air. Because of this, water must be maintained at the level required for the crops during the growing season and then raised during other parts of the year to minimize oxidation and subsidence.

Although the soils of Volusia County have the potential for increased food production, other factors must also be considered in choosing crops and selecting sites. Among these are the economic conditions; the risk of possible adverse weather conditions; the availability of suitable drainage outlets; saltwater intrusion into the aquifer and the availability of an adequate supply of freshwater for irrigation; environmental considerations such as possible pollution of nearby waters; and the desirability of using the land for other purposes.

Because Volusia County is almost surrounded by the saline Atlantic Ocean on the east and the brackish St. Johns River on the west, the supply of freshwater, although now generally abundant, is expected to become a limiting factor in the development of agricultural enterprises. Most of the freshwater supply for the county comes from local rainfall stored in the aquifer. Irrigation takes water from the aquifer, and surface water that drains directly into the streams and the ocean is not available to recharge the aquifer. On most soils of Volusia County, some form of water management is needed. Thus, agricultural interests compete with the urban demand for water as well as for the land itself.

The acreage in crops and pasture is gradually decreasing as more and more land is used for urban development. In 1967 there was an estimated 51,000 acres of urban and built-up land in the county; this figure has been increasing at the rate of about 1,000 acres per year. The information in this soil survey can help in making land use decisions that will influence the future role of farming in the county. Such use of the survey is described under "General soil map for broad land use planning."

Yields per acre

The average yields per acre that can be expected of the principal crops under a high level of management are shown in table 5. In any given year, yields may be higher or lower than those indicated in the table because of variations in rainfall and other climatic factors. Absence of an estimated yield indicates that the crop is not suited to or not commonly grown on the soil.

The estimated yields were based mainly on the experience and records of farmers, conservationists, and extension agents. Results of field trials and demonstrations and available yield data from nearby counties were also considered.

The yields were estimated assuming that the latest soil and crop management practices were used. Hay and pasture yields were estimated for the most productive varieties of grasses and legumes suited to the climate and the soil. A few farmers may be obtaining average yields higher than those shown in table 5.

The management needed to achieve the indicated yields of the various crops depends on the kind of soil and the crop. Such management provides drainage, erosion control, and protection from flooding; the proper planting and seeding rates; suitable high-yielding crop varieties; appropriate tillage practices, including time of tillage and seedbed preparation and tilling when soil moisture is favorable; control of weeds, plant diseases, and harmful insects; favorable soil reaction and optimum levels of nitrogen, phosphorus, potassium, and trace elements for each crop; effective use of crop residues, barnyard manure, and green-manure crops; harvesting crops with the smallest possible loss; and timeliness of all fieldwork.

For yields of irrigated crops, it is assumed that the irrigation system is adapted to the soils and to the crops grown; that good quality irrigation water is uniformly applied in proper amounts as needed; and that tillage is kept to a minimum.

The estimated yields reflect the productive capacity of the soils for each of the principal crops. Yields are likely to increase as new production technology is developed. The productivity of a given soil compared with that of other soils, however, is not likely to change.

Crops other than those shown in table 5 are grown in the survey area, but estimated yields are not included because the acreage of these crops is small. The local offices of the Soil Conservation Service and the Cooperative Extension Service can provide information about the management concerns and productivity of the soils for these crops.

Capability classes and subclasses

Capability classes and subclasses show, in a general way, the suitability of soils for most kinds of field crops. The soils are classed according to their limitations when they are used for field crops, the risk of damage when they are used, and the way they respond to treatment. The grouping does not take into account major and generally expensive landforming that would change slope, depth, or other characteristics of the soils; does not take into consideration possible but unlikely major reclamation projects; and does not apply to rice, cranberries, horticultural crops, or other crops that require special management. Capability classification is not a substitute for interpretations designed to show suitability and limitations of groups of soils for rangeland, for forest trees, or for engineering purposes.

In the capability system, all kinds of soil are grouped at two levels: capability class and subclass. These levels are defined in the following paragraphs. A survey area may not have soils of all classes.

Capability classes, the broadest groups, are designated by Roman numerals I through VIII. The numerals indicate progressively greater limitations and narrower choices for practical use. The classes are defined as follows:

Class I soils have few limitations that restrict their use.

Class II soils have moderate limitations that reduce the choice of plants or that require moderate conservation practices.

Class III soils have severe limitations that reduce the choice of plants, or that require special conservation practices, or both.

Class IV soils have very severe limitations that reduce the choice of plants, or that require very careful management, or both.

Class V soils are not likely to erode but have other limitations, impractical to remove, that limit their use.

Class VI soils have severe limitations that make them generally unsuitable for cultivation.

Class VII soils have very severe limitations that make them unsuitable for cultivation.

Class VIII soils and landforms have limitations that nearly preclude their use for commercial crop production.

Capability subclasses are soil groups within one class; they are designated by adding a small letter, *e, w, s,* or *c,* to the class numeral, for example, IIIe. The letter *e* shows that the main limitation is risk of erosion unless close-growing plant cover is maintained; *w* shows that water in or on the soil interferes with plant growth or cultivation (in some soils the wetness can be partly corrected by artificial drainage); *s* shows that the soil is limited mainly because it is shallow, droughty, or stony; and *c*, used in only some parts of the United States, shows that the chief limitation is climate that is too cold or too dry.

In class I there are no subclasses because the soils of this class have few limitations. Class V contains only the subclasses indicated by *w, s,* or *c* because the soils in class V are subject to little or no erosion, though they have other limitations that restrict their use to pasture, rangeland, woodland, wildlife habitat, or recreation.

The capability subclass is identified in the description of each map unit under "Soil maps for detailed planning."

Range and woodland grazing

Clifford W. Carter, range conservationist, Soil Conservation Service, helped prepare this section.

Native grasses are an important part of the overall, year-round supply of forage for livestock in Volusia County. This forage is readily available, it is economical, and it provides important roughage needed by cattle. About 150,000 acres throughout the county is used strictly as range, and another 22,000 acres is improved pasture.

The dominant native forage species that grow on a soil are generally the most productive and most suitable for livestock. They maintain themselves as long as the environment remains the same. The forage species are grouped into three categories according to their response to grazing—decreasers, increasers, and invaders.

The grasses most preferred by cows during the growing season are the ones that are grazed the closest. If these plants are continually grazed closely year after year, they decrease in amount or die out. They are called decreasers. Some decreasers in Florida are creeping bluestem and indiangrass in the flatwoods, maidencane in the freshwater marshes, and blue maidencane in depressional areas.

Plants that are less palatable replace the decreasers under close grazing. Because they increase in number in a pasture, they are called increasers . These plants are generally less productive than the decreasers. Examples of grasses in this group are broomsedge bluestem and hairy panicum in the flatwoods and species of paspalum and beaked panicum in the freshwater marshes.

Under continuous heavy grazing, even the increasers are affected. Eventually they are weakened and are replaced by invaders. Invaders are foreign to the plant community. For the most part they produce low amounts of forage or are totally undesirable. Examples are bottlebrush threeawn and common carpetgrass in the acid flatwoods, big carpetgrass in the freshwater marshes, and sand cordgrass in depressional areas.

Range condition is a measure of the current productivity of the range in relation to its potential. Four condition classes are used to measure range condition. *Excellent* condition indicates that the range is producing 76 to 100 percent of its potential; *good,* 51 to 75 percent; *fair,* 26 to 50 percent; and *poor,* 0 to 25 percent.

It is estimated that less than 10 percent of the range in Volusia County is in excellent condition. The real significance of range needs in Volusia County is made clear by the percentage of range that is in fair and poor condition—an estimated 70 percent.

Potential production refers to the amount of herbage that can be expected to grow well on a well managed soil used for range. Table 6 shows, for each soil, the potential for producing livestock forage. Yields are expressed in terms of pounds of air dry herbage per acre. Plant moisture content varies as the growing season progresses. It is not a measure of productivity. Herbage refers to total vegetation produced and does not reflect forage value or grazing potentials. Favorable years are those in which rainfall and temperature are favorable for plant growth.

The productivity of the soils is closely related to natural drainage. The wettest soils, such as those in marshes, produce the greatest amount of vegetation. The deep, droughty sandhills normally produce the least amount of herbage annually.

Management of the soils for range should be planned with the potential productivity in mind. Soils with the highest production potential generally should be given highest priority. Major management considerations involve livestock grazing. They are basic questions that must be considered if the forage production is to be improved or maintained. How long should the grass be grazed? In what season should it be used? How long and when should the range pastures be rested? What is the grazing pattern of livestock within a pasture that contains more than one type of range? What is the palatability of the dominant plants growing on the range? Manipulation of range pastures often involves mechanical brush control, controlled burning, and especially controlled livestock grazing. Predicting the effects of these practices is of utmost importance. Proper management of range results in maximum sustained production, conservation of the soil and water resources, and, generally, improved habitat for many wildlife species.

Woodland that has an understory of native grasses, legumes, forbs, shrubs, and other plants can be utilized by livestock or by grazing or browsing wildlife. The understory is an integral part of the forest plant community. The native plants can be grazed without significantly impairing other forest values. A well managed wooded area can produce enough understory vegetation to support optimum numbers of livestock, or wildlife, or both. In such forests, grazing is compatible with timber management if it is controlled or managed so that timber and forage resources are maintained or enhanced.

The quantity and quality of understory vegetation vary with the kind of soil, the age and kind of trees, the density of the canopy, and the depth and condition of the forest litter. The density of the forest canopy affects the amount of light that understory plants receive during the growing season.

The forage production in woodland varies according to: (1) the type of woodland; (2) the amount of shade cast by the canopy; (3) the accumulation of fallen needles, (4) the effects of the time and the intensity of grazing on the presence or absence of grass species; and (5) the number, size, and spacing of trees and the method of site preparation used for tree plantings.

Woodland management and productivity

Carl D. DeFazio, forester, Soil Conservation Service, and Bob Eikum, Volusia County forester, helped prepare this section.

Woodland in Volusia County makes up approximately 463,000 acres, or 65 percent of the land area. Most of the woodland is on Myakka, Pomona, and Smyrna soils, which are the typical soils in the flatwoods. The woodland is most heavily concentrated in the flatwoods, in the central part of the county. Part of the wooded acreage is under large corporate ownership. Part is under individual ownership.

Slash pine is the most important species in Volusia County, but sand pine is economically important in the sandhill regions, especially on the southern half of the DeLand Ridge, where the Paola, Orsino, and Apopka variant soils are extensive. A large part of the sandhill area supports longleaf pine and turkey and bluejack oaks. The oaks have little economic value, but they are valuable to wildlife and are very important to the esthetic value of the sandhills. In addition, cabbage palm, cypress, and many hardwood species are locally abundant throughout the county.

Timber management, for the most part, consists of clearcutting and then site preparation and planting. Sand pine and longleaf pine are reproduced mostly from seed trees rather than by planting.

Fire reduces the "rough" and exposes the mineral soil as a seedbed for natural reproduction. Fire also encourages grasses and forbs, which help to support various wildlife species, such as deer, turkey, and quail.

Markets are plentiful for the wood produced in Volusia County. Pulpwood mills near Palatka, Jacksonville, and Fernandina Beach are the major outlets. Several small mills saw cypress lumber, chiefly for the local market.

More detailed information on woodland and woodland management is available from the local offices of the Soil Conservation Service, the Florida Division of Forestry, and the Florida Cooperative Extension Service.

Table 7 contains information useful to woodland owners or forest managers planning use of soils for wood crops. Map unit symbols for soils suitable for wood crops are listed, and the ordination (woodland suitability) symbol for each soil is given. All soils bearing the same ordination symbol require the same general kinds of woodland management and have about the same potential productivity.

The first part of the *ordination symbol*, a number, indicates the potential productivity of the soils for important trees. The number 1 indicates very high productivity; 2, high; 3, moderately high; 4, moderate; and 5, low. The second part of the symbol, a letter, indicates the major kind of soil limitation. The letter *x* indicates stoniness or rockiness; *w*, excessive water in or on the soil; *t*, toxic substances in the soil; *d*, restricted root depth; *c*, clay in the upper part of the soil; *s*, sandy texture; *f*, high content of coarse fragments in the soil profile; and *r*, steep slopes. The letter *o* indicates insignificant limitations or restrictions. If a soil has more than one limitation, priority in placing the soil into a limitation class is in the following order: x, w, t, d, c, s, f, and r.

In table 7 the soils are also rated for a number of factors to be considered in management. *Slight, moderate,* and *severe* are used to indicate the degree of major soil limitations.

Ratings of the *erosion hazard* indicate the risk of loss of soil in well managed woodland. The risk is *slight* if the expected soil loss is small, *moderate* if some measures are needed to control erosion during logging and road construction, and *severe* if intensive management or special equipment and methods are needed to prevent excessive loss of soil.

Ratings of *equipment limitation* reflect the characteristics and conditions of the soil that restrict use of the equipment generally needed in woodland management or harvesting. A rating of *slight* indicates that use of equipment is not limited to a particular kind of equipment or time of year; *moderate* indicates a short seasonal limitation or a need for some modification in management or equipment; *severe* indicates a seasonal limitation, a need for special equipment or management, or a hazard in the use of equipment.

Seedling mortality ratings indicate the degree that the soil affects expected mortality of planted tree seedlings. Plant competition is not considered in the ratings. Seedlings from good planting stock that are properly planted during a period of sufficient rainfall are rated. A rating of *slight* indicates that the expected mortality of the planted seedlings is less than 25 percent; *moderate*, 25 to 50 percent; and *severe*, more than 50 percent.

Considered in the ratings of *windthrow hazard* are characteristics of the soil that affect the development of tree roots and the ability of the soil to hold trees firmly. A rating of *slight* indicates that trees in wooded areas are not expected to be blown down by commonly occurring winds; *moderate*, that some trees are blown down during periods of excessive soil wetness and strong winds; and *severe*, that many trees are blown down during periods of excessive soil wetness and moderate or strong winds.

The *potential productivity* of merchantable or *common trees* on a soil is expressed as a *site index*. This index is the average height, in feet, that dominant and codominant trees of a given species attain in a specified number of years. The index was calculated at age 50 for the species in this survey area. The site index applies to fully stocked, even-aged, unmanaged stands. Important trees are those that woodland managers generally favor in intermediate or improvement cuttings. They are selected on the basis of growth rate, quality, value, and marketability.

Trees to plant are those that are suitable for commercial wood production and that are suited to the soils.

Windbreaks and environmental plantings

Windbreaks are established to protect crops, livestock, buildings, and soil from wind damage. Windbreaks also help protect fruit trees, lawns, and gardens, and they furnish habitat for wildlife. Several rows provide the most protection.

Field windbreaks are narrow plantings made at right angles to the prevailing wind and at specific intervals across the field, the interval depending on erodibility of the soil. They protect cropland and crops from wind and provide food and cover for wildlife.

Environmental plantings help to beautify and screen houses and other buildings and to abate noise. The plants, mostly evergreen shrubs and trees, are closely spaced. A healthy planting stock of suitable species planted properly on a well prepared site and maintained in good condition can insure a high degree of plant survival.

Additional information about planning windbreaks and screens and the planting and care of trees can be obtained from local offices of the Soil Conservation Service or the Cooperative Extension Service or from a nursery.

Coastal dune management

John D. Griffin, agronomist, Soil Conservation Service, helped prepare this section.

In geological time, the coastal dune is a very recent formation. It is controlled by ocean waves and by wind. The resulting soil moisture, soil salinity, and salt spray have an adverse effect on most plants.

Dune stability depends on the anchoring vegetation. If the use of shallow wells lowers ground water below a critical level, the stabilizing plants die. The vegetation is fragile and vulnerable to trampling. Building groins along the beach arrests the littoral drift, eliminating the source of sand that supplements the dunes.

The beach can be used for swimming, picnicking, shell collecting, fishing, and sunbathing.

The primary dune cannot tolerate heavy use. It must not be trampled. Bridge crossings (fig. 12) are needed.

The trough between dunes is much more tolerant, and incidental development can occur. Lowering the ground water, however, sometimes kills the vegetation.

The inland dune is the second line of defense against the ocean. It is as vulnerable as the primary dune. It is intolerant of use and should not be developed.

The back dune is in a less critical location, and some use is permissible. Back dunes are the most suitable environment on the coastal dunes for man and development.

Behind the back dunes is the estuarine and bay shore environment, which is one of the most productive aquatic areas in the world. It is in this environment that the infantile stage of most of the important fish takes place and the valuable shell fish live.

Some of the more important plants on the coastal dunes are sea-oats, marshhay cordgrass, beach morningglory, bay bean, shoredune panicum, gopher apple, holly, and sand live oak.

Engineering

James W. Norris, area engineer, Soil Conservation Service, helped prepare this section.

This section provides information about the use of soils for building sites, sanitary facilities, construction material, and water management. Among those who can benefit from this information are engineers, landowners, community planners, town and city managers, land developers, builders, contractors, and farmers and ranchers.

The ratings in the engineering tables are based on test data and estimated data in the "Soil properties" section. The ratings were determined jointly by soil scientists and engineers of the Soil Conservation Service using known relationships between the soil properties and the behavior of soils in various engineering uses.

Among the soil properties and site conditions identified by a soil survey and used in determining the ratings in this section were grain-size distribution, liquid limit, plasticity index, soil reaction, depth to bedrock, hardness of bedrock that is within 5 or 6 feet of the surface, soil wetness, depth to a seasonal high water table, slope, likelihood of flooding, natural soil structure or aggregation, in-place soil density, and geologic origin of the soil material. Where pertinent, data about kinds of clay minerals, mineralogy of the sand and silt fractions, and the kind of absorbed cations were also considered.

On the basis of information assembled about soil properties, ranges of values can be estimated for erodibility, permeability, corrosivity, shrink-swell potential, available water capacity, shear strength, compressibility, slope stability, and other factors of expected soil behavior in engineering uses. As appropriate, these values can be applied to each major horizon of each soil or to the entire profile.

These factors of soil behavior affect construction and maintenance of roads, airport runways, pipelines, foundations for small buildings, ponds and small dams, irrigation projects, drainage systems, sewage and refuse disposal systems, and other engineering works. The ranges of values can be used to (1) select potential residential, commercial, industrial, and recreational uses; (2) make preliminary estimates pertinent to construction in a particular area; (3) evaluate alternative routes for roads, streets, highways, pipelines, and underground cables; (4) evaluate alternative sites for location of sanitary landfills, onsite sewage disposal systems, and other waste disposal facilities; (5) plan detailed onsite investigations of soils and geology; (6) find sources of gravel, sand, clay, and topsoil; (7) plan farm drainage systems, irrigation systems, ponds, terraces, and other structures for soil and water conservation; (8) relate performance of structures already built to the properties of the kinds of soil on which they are built so that performance of similar structures on the same or a similar soil in other locations can be predicted; and (9) predict the trafficability of soils for cross-country movement of vehicles and construction equipment.

Data presented in this section are useful for land-use planning and for choosing alternative practices or general designs that will overcome unfavorable soil properties and minimize soil-related failures. Limitations to the use of these data, however, should be well understood. First, the data are generally not presented for soil material below a depth of 5 or 6 feet. Also, because of the scale of the detailed map in this soil survey, small areas of soils that differ from the dominant soil may be included in mapping. Thus, these data do not eliminate the need for onsite investigations, testing, and analysis by personnel having expertise in the specific use contemplated.

The information is presented mainly in tables. Table 8 shows, for each kind of soil, the degree and kind of limitations for building site development; table 9, for sanitary facilities; and tables 11 and 12 for water management. Table 10 shows the suitability of each kind of soil as a source of construction materials.

The information in the tables, along with the soil map, the soil descriptions, and other data provided in this survey, can be used to make additional interpretations and to construct interpretive maps for specific uses of land.

Some of the terms used in this soil survey have a special meaning in soil science. Many of these terms are defined in the Glossary.

Building site development

The degree and kind of soil limitations that affect shallow excavations, dwellings with and without basements, small commercial buildings, and local roads and streets are indicated in table 8. A *slight* limitation indicates that soil properties generally are favorable for the specified use; any limitation is minor and easily overcome. A *moderate* limitation indicates that soil properties and site features are unfavorable for the specified use, but the limitations can be overcome or minimized by special planning and design. A *severe* limitation indicates that one or more soil properties or site features are so unfavorable or difficult to overcome that a major increase in construction effort, special design, or intensive maintenance is required. For some soils rated severe, such costly measures may not be feasible.

Shallow excavations are made for pipelines, sewerlines, communications and power transmission lines, basements, open ditches, and cemeteries. Such digging or trenching is influenced by soil wetness caused by a seasonal high water table; the texture and consistence of soils; the tendency of soils to cave in or slough; and the presence of very firm, dense soil layers, bedrock, or large stones. In addition, excavations are affected by slope of the soil and the probability of flooding. Ratings do not apply to soil horizons below a depth of 6 feet unless otherwise noted.

In the soil series descriptions, the consistence of each soil horizon is given, and the presence of very firm or extremely firm horizons, usually difficult to excavate, is indicated.

Dwellings and *small commercial buildings* referred to in table 8 are built on undisturbed soil and have foundation loads of a dwelling no more than three stories high. Separate ratings are made for small commercial buildings without basements and for dwellings with and without basements. For such structures, soils should be sufficiently stable that cracking or subsidence of the structure from settling or shear failure of the foundation does not occur. These ratings were determined from estimates of the shear strength, compressibility, and shrink-swell potential of the soil. Soil texture, plasticity and in-place density, soil wetness, and depth to a seasonal high water table were also considered. Soil wetness and depth to a seasonal high water table indicate potential difficulty in providing adequate drainage for basements, lawns, and gardens. Depth to bedrock, slope, and large stones in or on the soil are also important considerations in the choice of sites for these structures and were considered in determining the ratings. Susceptibility to flooding is a serious hazard.

Local roads and streets referred to in table 8 have an all-weather surface that can carry light to medium traffic all year. They consist of a subgrade of the underlying soil material; a base of gravel, crushed rock fragments, or soil material stabilized with lime or cement; and a flexible or rigid surface, commonly asphalt or concrete. The roads are graded with soil material at hand, and most cuts and fills are less than 6 feet deep.

The load supporting capacity and the stability of the soil as well as the quantity and workability of fill material available are important in design and construction of roads and streets. The classifications of the soil and the soil texture, density, and shrink-swell potential are indicators of the traffic supporting capacity used in making the ratings. Soil wetness, flooding, slope, depth to hard rock or very compact layers, and content of large stones affect stability and ease of excavation.

Lawns and landscaping require soils that are suitable for the establishment and maintenance of turf for lawns and ornamental trees and shrubs for landscaping. The best soils are firm after rains, are not dusty when dry, and absorb water readily and hold sufficient moisture for plant growth. The surface layer should be free of stones. If shaping is required, the soils should be thick enough over bedrock or hardpan to allow for necessary grading. In rating the soils, the availability of water for sprinkling is assumed.

Sanitary facilities

Favorable soil properties and site features are needed for proper functioning of septic tank absorption fields, sewage lagoons, and sanitary landfills. The nature of the soil is important in selecting sites for these facilities and in identifying limiting soil properties and site features to be considered in design and installation. Also, those soil properties that affect ease of excavation or installation of these facilities will be of interest to contractors and local officials. Table 9 shows the degree and kind of limitations of each soil for such uses and for use of the soil as daily cover for landfills. It is important to observe local ordinances and regulations.

If the degree of soil limitation is expressed as *slight*, soils are generally favorable for the specified use and limitations are minor and easily overcome; if *moderate*, soil properties or site features are unfavorable for the specified use, but limitations can be overcome by special planning and design; and if *severe*, soil properties or site features are so unfavorable or difficult to overcome that major soil reclamation, special designs, or intensive maintenance is required. Soil suitability is rated by the terms *good*, *fair*, or *poor*, which, respectively, mean about the same as the terms *slight*, *moderate*, and *severe*.

Septic tank absorption fields are subsurface systems of tile or perforated pipe that distribute effluent from a septic tank into the soil. Only the soil horizons between depths of 18 and 72 inches are evaluated for this use. The soil properties and site features considered are those that affect the absorption of the effluent and those that affect the construction of the system.

Properties and features that affect absorption of the effluent are permeability, depth to seasonal high water table, depth to bedrock, and susceptibility to flooding. Stones, boulders, and shallowness to bedrock interfere with installation. Excessive slope can cause lateral seepage and surfacing of the effluent. Also, soil erosion and soil slippage are hazards if absorption fields are installed on sloping soils.

In some soils, loose sand and gravel or fractured bedrock is less than 4 feet below the tile lines. In these soils the absorption field does not adequately filter the effluent, and ground water in the area may be contaminated.

On many of the soils that have moderate or severe limitations for use as septic tank absorption fields, a system to lower the seasonal water table can be installed or the size of the absorption field can be increased so that performance is satisfactory.

Sewage lagoons are shallow ponds constructed to hold sewage while aerobic bacteria decompose the solid and liquid wastes. Lagoons have a nearly level floor and cut slopes or embankments of compacted soil material. Aerobic lagoons generally are designed to hold sewage within a depth of 2 to 5 feet. Nearly impervious soil material for the lagoon floor and sides is required to minimize seepage and contamination of ground water. Soils that are very high in content of organic matter and those that have cobbles, stones, or boulders are not suitable. Unless the soil has very slow permeability, contamination of ground water is a hazard. In soils where the water table is seasonally high, seepage of ground water into the lagoon can seriously reduce the lagoon's capacity for liquid waste. Slope, depth to bedrock, and susceptibility to flooding also affect the suitability of sites for sewage lagoons or the cost of construction. Shear strength and permeability of compacted soil material affect the performance of embankments.

Sanitary landfill is a method of disposing of solid waste by placing refuse in successive layers either in excavated trenches or on the surface of the soil. The waste is spread, compacted, and covered daily with a thin layer of soil material. Landfill areas are subject to heavy vehicular traffic. Risk of polluting ground water and trafficability affect the suitability of a soil for this use. The best soils have a loamy or silty texture, have moderate to slow permeability, are deep to a seasonal water table, and are not subject to flooding. Clayey soils are likely to be sticky and difficult to spread. Sandy or gravelly soils generally have rapid permeability, which might allow noxious liquids to contaminate ground water. Soil wetness can be a limitation, because operating heavy equipment on a wet soil is difficult. Seepage into the refuse increases the risk of pollution of ground water.

Ease of excavation affects the suitability of a soil for the trench type of landfill. A suitable soil is deep to bedrock and free of large stones and boulders. If the seasonal water table is high, water will seep into trenches.

Unless otherwise stated, the limitations in table 9 apply only to the soil material within a depth of about 6 feet. If the trench is deeper, a limitation of slight or moderate may not be valid. Site investigation is needed before a site is selected.

Daily cover for landfill should be soil that is easy to excavate and spread over the compacted fill in wet and dry periods. Soils that are loamy or silty and free of stones or boulders are better than other soils. Clayey soils may be sticky and difficult to spread; sandy soils may be subject to soil blowing.

The soils selected for final cover of landfills should be suitable for growing plants. Of all the horizons, the A horizon in most soils has the best workability, more organic matter, and the best potential for growing plants. Thus, for either the area- or trench-type landfill, stockpiling material from the A horizon for use as the surface layer of the final cover is desirable.

Where it is necessary to bring in soil material for daily or final cover, thickness of suitable soil material available and depth to a seasonal high water table in soils surrounding the sites should be evaluated. Other factors to be evaluated are those that affect reclamation of the borrow areas. These factors include slope, erodibility, and potential for plant growth.

Construction materials

The suitability of each soil as a source of roadfill, sand, gravel, and topsoil is indicated in table 10 by ratings of good, fair, or poor. The texture, thickness, and organic-matter content of each soil horizon are important factors in rating soils for use as construction materials. Each soil is evaluated to the depth observed, generally about 6 feet.

Roadfill is soil material used in embankments for roads. Soils are evaluated as a source of roadfill for low embankments, which generally are less than 6 feet high and less exacting in design than high embankments. The ratings reflect the ease of excavating and working the material and the expected performance of the material where it has been compacted and adequately drained. The performance of soil after it is stabilized with lime or cement is not considered in the ratings, but information about some of the soil properties that influence such performance is given in the descriptions of the soil series.

The ratings apply to the soil material between the A horizon and a depth of 5 to 6 feet. It is assumed that soil horizons will be mixed during excavation and spreading. Many soils have horizons of contrasting suitability within their profile. The estimated engineering properties in table 15 provide specific information about the nature of each horizon. This information can help determine the suitability of each horizon for roadfill.

Soils rated *good* are coarse grained. They have low shrink-swell potential, low potential frost action, and few cobbles and stones. They are at least moderately well drained and have slopes of 15 percent or less. Soils rated *fair* have a plasticity index of less than 15 and have other limiting features, such as moderate shrink-swell potential, moderately steep slopes, wetness, or many stones. If the thickness of suitable material is less than 3 feet, the entire soil is rated *poor*.

Sand and *gravel* are used in great quantities in many kinds of construction. The ratings in table 10 provide guidance as to where to look for probable sources and are based on the probability that soils in a given area contain sizable quantities of sand or gravel. A soil rated *good* or *fair* has a layer of suitable material at least 3 feet thick, the top of which is within a depth of 6 feet. Coarse fragments of soft bedrock material, such as shale and siltstone, are not considered to be sand and gravel. Fine-grained soils are not suitable sources of sand and gravel.

The ratings do not take into account depth to the water table or other factors that affect excavation of the material. Descriptions of grain size, kinds of minerals, reaction, and stratification are given in the soil series descriptions and in table 15.

Topsoil is used in areas where vegetation is to be established and maintained. Suitability is affected mainly by the ease of working and spreading the soil material in preparing a seedbed and by the ability of the soil material to support plantlife. Also considered is the damage that can result at the area from which the topsoil is taken.

The ease of excavation is influenced by the thickness of suitable material, wetness, slope, and amount of stones. The ability of the soil to support plantlife is determined by texture, structure, and the amount of soluble salts or toxic substances. Organic matter in the A1 or Ap horizon greatly increases the absorption and retention of moisture and nutrients. Therefore, the soil material from these horizons should be carefully preserved for later use.

Soils rated *good* have at least 16 inches of friable loamy material at their surface. They are free of stones and cobbles, are low in content of gravel, and have gentle slopes. They are low in soluble salts that can limit or prevent plant growth. They are naturally fertile or respond well to fertilizer. They are not so wet that excavation is difficult during most of the year.

Soils rated *fair* are loose sandy soils or firm loamy or clayey soils in which the suitable material is only 8 to 16 inches thick or soils that have appreciable amounts of soluble salt.

Soils rated *poor* are very sandy soils and very firm clayey soils; soils with suitable layers less than 8 inches thick; soils having large amounts of soluble salt; steep soils; and poorly drained soils.

The surface horizon of most soils is generally preferred for topsoil because of its organic-matter content. This horizon is designated as A1 or Ap in the soil series descriptions. The absorption and retention of moisture and nutrients for plant growth are greatly increased by organic matter.

Water management

Many soil properties and site features that affect water management practices have been identified in this soil survey. In table 11, data on depth to the water table is given for some of the soils in the county. In table 12, the degree of soil limitation and soil and site features that affect use are indicated for each kind of soil. This information is significant in planning, installing, and maintaining water management systems.

The soil and site limitations in table 12 are expressed as slight, moderate, and severe. *Slight* means that the soil properties and site features are generally favorable for the specified use and that any limitation is minor and easily overcome. *Moderate* means that some soil properties or site features are unfavorable for the specified use but can be overcome or modified by special planning and design. *Severe* means that the soil properties and site features are so unfavorable and so difficult to correct or overcome that major soil reclamation, special design, or intensive maintenance is required.

Pond reservoir areas hold water behind a dam or embankment. Soils best suited to this use have a low seepage potential, which is determined by permeability and the depth to fractured or permeable bedrock or other permeable material.

Embankments, dikes, and levees require soil material that is resistant to seepage, erosion, and piping and has favorable stability, shrink-swell potential, shear strength, and compaction characteristics. Large stones and organic matter in a soil downgrade the suitability of a soil for use in embankments, dikes, and levees.

Aquifer-fed excavated ponds are bodies of water made by excavating a pit or dugout into a ground-water aquifer. Excluded are ponds that are fed by surface runoff and embankment ponds that impound water 3 feet or more above the original surface. Ratings in table 12 are for ponds that are properly designed, located, and constructed. Soil properties and site features that affect aquifer-fed ponds are depth to a permanent water table, permeability of the aquifer, quality of the water, and ease of excavation.

Drainage of soil is affected by such soil properties as permeability; texture; depth to bedrock, or other layers that affect the rate of water movement; depth to the water table; slope; stability of ditchbanks; susceptibility to flooding; salinity and alkalinity; and availability of outlets for drainage.

Irrigation is affected by such features as slope, susceptibility to flooding, hazards of water erosion and soil blowing, texture, presence of salts, depth of root zone, rate of water intake at the surface, permeability of the soil below the surface layer, available water capacity, need for drainage, and depth to the water table.

Terraces and diversions are embankments or a combination of channels and ridges constructed across a slope to intercept runoff. They allow water to soak into the soil or flow slowly to an outlet. Features that affect suitability of a soil for terraces are uniformity and steepness of slope; depth to bedrock, or other unfavorable material; large stones; permeability; ease of establishing vegetation; and resistance to water erosion, soil blowing, soil slipping, and piping.

Grassed waterways are constructed to channel runoff to outlets at a nonerosive velocity. Features that affect the use of soils for waterways are slope, permeability, erodibility, wetness, and suitability for permanent vegetation.

Recreation

Recreation is a major enterprise in Volusia County. The famous beaches, along with other scenic, cultural, and commercial attractions, draw thousands of tourists to the county each month. Because of the mild climate and the wide assortment of recreational facilities (fig. 13), thousands of people, including many retirees, have chosen Volusia County for permanent or winter residence. The rapid increase in population within the past few decades has brought an increase in the tempo of urban life and a corresponding need for more space for outdoor recreation.

In 1973, park and recreational facilities occupied about 22,842 acres in the county. Of this total, 1,026 acres was privately owned. Of the remaining 21,816 acres, approximately 16,227 acres was owned by the Federal government, 4,625 acres by the State, 240 acres by the county, and 724 acres by the city. As urbanization increases, more land for recreation will be needed, and a knowledge of soil properties can help a great deal in selecting such areas.

The soils of the survey area are rated in table 13 according to limitations that affect their suitability for recreation uses. The ratings are based on such restrictive soil features as flooding, wetness, slope, and texture of the surface layer. Not considered in these ratings, but important in evaluating a site, are location and accessibility of the area, size and shape of the area and its scenic quality, the ability of the soil to support vegetation, access to water, potential water impoundment sites available, and either access to public sewerlines or capacity of the soil to absorb septic tank effluent. Soils subject to flooding are limited, in varying degree, for recreation use by the duration and intensity of flooding and the season when flooding occurs. Onsite assessment of height, duration, intensity, and frequency of flooding is essential in planning recreation facilities.

The degree of the limitation of the soils is expressed as slight, moderate, or severe. *Slight* means that the soil properties are generally favorable and that the limitations are minor and easily overcome. *Moderate* means that the limitations can be overcome or alleviated by planning, design, or special maintenance. *Severe* means that soil properties are unfavorable and that limitations can be offset only by costly soil reclamation, special design, intensive maintenance, limited use, or by a combination of these measures.

The information in table 13 can be supplemented by information in other parts of this survey. Especially helpful are interpretations for septic tank absorption fields, given in table 9, and interpretations for dwellings without basements and for local roads and streets, given in table 8.

Camp areas require such site preparation as shaping and leveling for tent and parking areas, stabilizing roads and intensively used areas, and installing sanitary facilities and utility lines. Camp areas are subject to heavy foot traffic and some vehicular traffic. The best soils for this use have mild slopes and are not wet or subject to flooding during the period of use. The surface has few or no stones or boulders, absorbs rainfall readily but remains firm, and is not dusty when dry. Strong slopes and stones or boulders can greatly increase the cost of constructing camping sites.

Picnic areas are subject to heavy foot traffic. Most vehicular traffic is confined to access roads and parking areas. The best soils for use as picnic areas are firm when wet, are not dusty when dry, are not subject to flooding during the period of use, and do not have slopes or stones or boulders that will increase the cost of shaping sites or of building access roads and parking areas.

Playgrounds require soils that can withstand intensive foot traffic. The best soils are almost level and are not wet or subject to flooding during the season of use. The surface is free of stones or boulders, is firm after rains, and is not dusty when dry. If shaping is required to obtain a uniform grade, the depth of the soil over bedrock or hardpan should be enough to allow necessary grading.

Paths and trails for walking, horseback riding, bicycling, and other uses should require little or no cutting and filling. The best soils for this use are those that are not wet, are firm after rains, are not dusty when dry, and are not subject to flooding more than once during the annual period of use. They should have moderate slopes and have few or no stones or boulders on the surface.

Golf fairways are subject to heavy foot traffic and some light vehicular traffic. Cutting or filling may be required. The best soils for use as golf fairways are firm when wet, are not dusty when dry, and are not subject to prolonged flooding during the period of use. They should have a surface that is free of stones and boulders and have moderate slopes. Suitability of the soil for traps, tees, or greens was not considered in rating the soils. Irrigation is an assumed management practice.

Wildlife habitat

John F. Vance, Jr., biologist, Soil Conservation Service, and C.R. McCracken, biologist, Florida Game and Fresh Water Fish Commission, helped prepare this section.

Wildlife has been an important natural resource of Volusia County from the time of earliest settlement. Large areas of the county have been set aside as wildlife refuges or wildlife management areas. The larger areas are the Tomoka Wildlife Management Area, the Farmton Wildlife Management Area, and the Lake Woodruff National Wildlife Refuge, which together make up more than 150,000 acres. Several other areas are leased to hunting clubs. Much of the area that is used as range or forest serves also as wildlife habitat. In addition, the large areas of wetlands in the county are important wildlife habitat.

Soils directly affect the kind and amount of vegetation that is available to wildlife as food and cover, and they affect the construction of water impoundments. The kind and abundance of wildlife that populate an area depend largely on the amount and distribution of food, cover, and water. If any one of these elements is missing, is inadequate, or is inaccessible, wildlife either are scarce or do not inhabit the area.

If the soils have the potential, wildlife habitat can be created or improved by planting appropriate vegetation, by maintaining the existing plant cover, or by helping the natural establishment of desirable plants.

In table 14, the soils in the survey area are rated according to their potential to support the main kinds of wildlife habitat in the area. This information can be used in planning for parks, wildlife refuges, nature study areas, and other developments for wildlife; selecting areas that are suitable for wildlife; selecting soils that are suitable for creating, improving, or maintaining specific elements of wildlife habitat; and determining the intensity of management needed for each element of the habitat.

The potential of the soil is rated good, fair, poor, or very poor. A rating of *good* means that the element of wildlife habitat or the kind of habitat is easily created, improved, or maintained. Few or no limitations affect management, and satisfactory results can be expected if the soil is used for the designated purpose. A rating of *fair* means that the element of wildlife habitat or kind of habitat can be created, improved, or maintained in most places. Moderately intensive management is required for satisfactory results. A rating of *poor* means that limitations are severe for the designated element or kind of wildlife habitat. Habitat can be created, improved, or maintained in most places, but management is difficult and must be intensive. A rating of *very poor* means that restrictions for the element of wildlife habitat or kind of wildlife are very severe, and that unsatisfactory results can be expected. Wildlife habitat is impractical or even impossible to create, improve, or maintain on soils having such a rating.

The elements of wildlife habitat are briefly described in the following paragraphs.

Grain and seed crops are seed-producing annuals used by wildlife. The major soil properties that affect the growth of grain and seed crops are depth of the root zone, texture of the surface layer, available water capacity, wetness, slope, surface stoniness, and flood hazard.

Soil temperature and soil moisture are also considerations.

Grasses and legumes are domestic perennial grasses and herbaceous legumes that are planted for wildlife food and cover. Major soil properties that affect the growth of grasses and legumes are depth of the root zone, texture of the surface layer, available water capacity, wetness, surface stoniness, flood hazard, and slope. Soil temperature and soil moisture are also considerations.

Wild herbaceous plants are native or naturally established grasses and forbs, including weeds, that provide food and cover for wildlife. Major soil properties that affect the growth of these plants are depth of the root zone, texture of the surface layer, available water capacity, wetness, surface stoniness, and flood hazard. Soil temperature and soil moisture are also considerations.

Hardwood trees and the associated woody understory provide cover for wildlife and produce nuts or other fruit, buds, catkins, twigs, bark, or foliage that wildlife eat. Major soil properties that affect growth of hardwood trees and shrubs are depth of the root zone, available water capacity, and wetness.

Coniferous plants are cone-bearing trees, shrubs, or ground cover plants that furnish habitat or supply food in the form of browse, seeds, or fruitlike cones. Soil properties that have a major effect on the growth of coniferous plants are depth of the root zone, available water capacity, and wetness.

Wetland plants are annual and perennial wild herbaceous plants that grow on moist or wet sites, exclusive of submerged or floating aquatics. They produce food or cover for wildlife that use wetland as habitat. Major soil properties affecting wetland plants are texture of the surface layer, wetness, reaction, salinity, slope, and surface stoniness.

Shallow water areas are bodies of water that have an average depth of less than 5 feet and that are useful to wildlife. They can be naturally wet areas, or they can be created by dams or levees or by water-control structures in marshes or streams. Major soil properties affecting shallow water areas are depth to bedrock, wetness, surface stoniness, slope, and permeability. The availability of a dependable water supply is important if water areas are to be developed.

The kinds of wildlife habitat are briefly described in the following paragraphs.

Openland habitat consists of cropland, pasture, meadows, and areas that are overgrown with grasses, herbs, shrubs, and vines. These areas produce grain and seed crops, grasses and legumes, and wild herbaceous plants.

Woodland habitat consists of areas of hardwoods or conifers, or a mixture of both, and associated grasses, legumes, and wild herbaceous plants.

Wetland habitat consists of open, marshy or swampy, shallow water areas where water-tolerant plants grow.

Soil properties

Extensive data about soil properties are summarized on the following pages. The two main sources of these data are the many thousands of soil borings made during the course of the survey and the laboratory analyses of selected soil samples from typical profiles.

In making soil borings during field mapping, soil scientists can identify several important soil properties. They note the seasonal soil moisture condition or the presence of free water and its depth. For each horizon in the profile, they note the thickness and color of the soil material; the texture, or amount of clay, silt, sand, and gravel or other coarse fragments; the structure, or the natural pattern of cracks and pores in the undisturbed soil; and the consistence of the soil material in place under the existing soil moisture conditions. They record the depth of plant roots, determine the pH or reaction of the soil, and identify any free carbonates.

Samples of soil material are analyzed in the laboratory to verify the field estimates of soil properties and to determine all major properties of key soils, especially properties that cannot be estimated accurately by field observation. Laboratory analyses are not conducted for all soil series in the survey area, but laboratory data for many soil series not tested are available from nearby survey areas.

The available field and laboratory data are summarized in tables. The tables give the estimated range of engineering properties, the engineering classifications, and the physical and chemical properties of each major horizon of each soil in the survey area. They also present data about pertinent soil and water features, engineering test data, and data obtained from physical and chemical laboratory analyses of soils.

Engineering properties

Table 15 gives estimates of engineering properties and classifications for the major horizons of each soil in the survey area.

Most soils have, within the upper 5 or 6 feet, horizons of contrasting properties. Table 15 gives information for each of these contrasting horizons in a typical profile. *Depth* to the upper and lower boundaries of each horizon is indicated. More information about the range in depth and about other properties in each horizon is given for each soil series in the section "Soil series and morphology."

Texture is described in table 15 in the standard terms used by the U.S. Department of Agriculture. These terms are defined according to percentages of sand, silt, and clay in soil material that is less than 2 millimeters in diameter. "Loam," for example, is soil material that is 7 to 27 percent clay, 28 to 50 percent silt, and less than 52 percent sand. If a soil contains gravel or other particles coarser than sand, an appropriate modifier is added, for example, "gravelly loam." Other texture terms are defined in the Glossary.

The two systems commonly used in classifying soils for engineering use are the Unified Soil Classification System (Unified) (*2*) and the system adopted by the American Association of State Highway and Transportation Officials (AASHTO) (*1*).

The *Unified* system classifies soils according to properties that affect their use as construction material. Soils are classified according to grain-size distribution of the fraction less than 3 inches in diameter, plasticity index, liquid limit, and organic-matter content. Soils are grouped into 15 classes—eight classes of coarse-grained soils, identified as GW, GP, GM, GC, SW, SP, SM, and SC; six classes of fine-grained soils, identified as ML, CL, OL, MH, CH, and OH; and one class of highly organic soils, identified as Pt. Soils on the borderline between two classes have a dual classification symbol, for example, SM-SC.

The *AASHTO* system classifies soils according to those properties that affect their use in highway construction and maintenance. In this system a mineral soil is classified in one of seven basic groups ranging from A-1 through A-7 on the basis of grain-size distribution, liquid limit, and plasticity index. Soils in group A-1 are coarse grained and low in content of fines. At the other extreme, in group A-7, are fine-grained soils. Highly organic soils are classified in group A-8 on the basis of visual inspection.

When laboratory data are available, the A-1, A-2, and A-7 groups are further classified as follows: A-1-a, A-1-b, A-2-4, A-2-5, A-2-6, A-2-7, A-7-5, and A-7-6. As an additional refinement, the desirability of soils as subgrade material can be indicated by a group index number. These numbers range from 0 for the best subgrade material to 20 or higher for the poorest. The AASHTO classification for soils tested in the survey area, with group index numbers in parentheses, is given in table 21. The estimated classification, without group index numbers, is given in table 15. Also in table 15 the percentage, by weight, of rock fragments more than 3 inches in diameter is estimated for each major horizon. These estimates are determined mainly by observing volume percentage in the field and then converting that, by formula, to weight percentage.

Percentage of the soil material less than 3 inches in diameter that passes each of four sieves (U.S. standard) is estimated for each major horizon. The estimates are based on tests of soils that were sampled in the survey area and in nearby areas and on field estimates from many borings made during the survey.

Liquid limit and *plasticity index* indicate the effect of water on the strength and consistence of soil. These indexes are used in both the Unified and AASHTO soil classification systems. They are also used as indicators in making general predictions of soil behavior. Range in liquid limit and plasticity index is estimated on the basis of test data from the survey area or from nearby areas and on observations of the many soil borings made during the survey.

In some surveys, the estimates are rounded to the nearest 5 percent. Thus, if the ranges of gradation and Atterburg limits extend a marginal amount across classification boundaries (1 or 2 percent), the classification in the marginal zone is omitted.

Physical and chemical properties

Table 16 shows estimated values for several soil characteristics and features that affect behavior of soils in engineering uses. These estimates are given for each major horizon, at the depths indicated, in the typical pedon of each soil. The estimates are based on field observations and on test data for these and similar soils.

Moist bulk density is the weight of soil (oven dry) per unit volume. Volume is measured when the soil is at the field moisture capacity, that is, the moisture content at 1/3 bar moisture tension. Weight is determined after drying the soil at 105 decrees C. In table 16, the estimated moist bulk density of each major soil horizon is expressed in grams per cubic centimeter for soil material that is less than 2 millimeters in diameter.

Bulk density data are used to compute shrink-swell potential, available water capacity, total pore space, and other soil properties. The moist bulk density of a soil indicates the pore space available for water and roots. A bulk density of more than 1.6 can restrict water storage and root penetration. Moist bulk density is influenced by the texture, kind of clay, content of organic matter, and structure of the soil.

Clay is a mineral soil particle that is less than 0.002 millimeters in diameter. In table 16, the estimated clay content of each major soil horizon is given as a percent, by weight, of the soil material that is less than 2 millimeters in diameter.

The amount and kind of clay greatly affect the fertility and physical condition of the soil. They determine the ability of the soil to absorb cations and to retain moisture. They influence the soil's shrink-swell potential, permeability, and plasticity; the ease of soil dispersion; and other soil properties. The amount and kind of clay in a soil also affect tillage and earth-moving operations.

Permeability is estimated on the basis of known relationships among the soil characteristics observed in the field—particularly soil structure, porosity, and gradation or texture—that influence the downward movement of water in the soil. The estimates are for vertical water movement when the soil is saturated. Not considered in the estimates is lateral seepage or such transient soil features as plowpans and surface crusts. Permeability of the soil is an important factor to be considered in planning and designing drainage systems, in evaluating the potential of soils for septic tank systems and other waste disposal systems, and in many other aspects of land use and management.

Available water capacity is rated on the basis of soil characteristics that influence the ability of the soil to hold water and make it available to plants. Important characteristics are content of organic matter, soil texture, and soil structure. Shallow-rooted plants are not likely to use the available water from the deeper soil horizons. Available water capacity is an important factor in the choice of plants or crops to be grown and in the design of irrigation systems.

Soil reaction is expressed as a range in pH values. The range in pH of each major horizon is based on many field checks. For many soils, the values have been verified by laboratory analyses. Soil reaction is important in selecting the crops, ornamental plants, or other plants to be grown; in evaluating soil amendments for fertility and stabilization; and in evaluating the corrosivity of soils.

Salinity is expressed as the electrical conductivity of the saturation extract, in millimhos per centimeter at 77 degrees F. Estimates are based on field and laboratory measurements at representative sites of the nonirrigated soils. The salinity of individual irrigated fields is affected by the quality of the irrigation water and by the frequency of water application. Hence, the salinity of individual fields can differ greatly from the value given in table 16. Salinity affects the suitability of a soil for crop production, its stability when used as a construction material, and its potential to corrode metal and concrete.

Shrink-swell potential depends mainly on the amount and kind of clay in the soil. Laboratory measurements of the swelling of undisturbed clods were made for many soils. For others the swelling was estimated on the basis of the kind and amount of clay in the soil and on measurements of similar soils. The size of the load and the magnitude of the change in soil moisture content also influence the swelling of soils. Shrinking and swelling of some soils can cause damage to building foundations, basement walls, roads, and other structures unless special designs are used. A high shrink-swell potential indicates that special design and added expense may be required if the planned use of the soil will not tolerate large volume changes.

Erosion factors are used to predict the erodibility of a soil and its tolerance to erosion in relation to specific kinds of land use and treatment. The soil erodibility factor (K) is a measure of the susceptibility of the soil to erosion by water. Soils having the highest K values are the most erodible. K values range from 0.10 to 0.64. To estimate annual soil loss per acre, the K value of a soil is modified by factors representing plant cover, grade and length of slope, management practices, and climate. The soil-loss tolerance factor (T) is the maximum rate of soil erosion, whether from rainfall or soil blowing, that can occur without reducing crop production or environmental quality. The rate is expressed in tons of soil loss per acre per year.

Wind erodibility groups are made up of soils that have similar properties that affect their resistance to soil blowing if cultivated. The groups are used to predict the susceptibility of soil to blowing and the amount of soil lost as a result of blowing. Soils are grouped according to the following distinctions:

1. Sands, coarse sands, fine sands, and very fine sands. These soils are extremely erodible, so vegetation is difficult to establish. They are generally not suitable for crops.
2. Loamy sands, loamy fine sands, and loamy very fine sands. These soils are very highly erodible, but crops can be grown if intensive measures to control soil blowing are used.
3. Sandy loams, coarse sandy loams, fine sandy loams, and very fine sandy loams. These soils are highly erodible, but crops can be grown if intensive measures to control soil blowing are used.
4. Clays, silty clays, clay loams, and silty clay loams that are more than 35 percent clay. These soils are moderately erodible, but crops can be grown if measures to control soil blowing are used.
5. Loamy soils that are less than 18 percent clay, sandy clay loams, and sandy clays are slightly erodible, but crops can be grown if measures to control soil blowing are used.
6. Loamy soils that are 18 to 35 percent clay are very slightly erodible, and crops can easily be grown.

Organic matter is the plant and animal residue in the soil at various stages of decomposition. In table 16, the estimated content of organic matter of the plow layer is expressed as a percent, by weight, of the soil material that is less than 2 millimeters in diameter.

The content of organic matter of a soil can be maintained or increased by returning crop residue to the soil. Organic matter affects the available water capacity, infiltration rate, and tilth of the soil. It is a source of nitrogen and other nutrients for crops.

Soil and water features

Table 17 contains information helpful in planning land uses and engineering projects that are likely to be affected by soil and water features.

Hydrologic soil groups are used to estimate runoff from precipitation. Soils not protected by vegetation are placed in one of four groups on the basis of the intake of water after the soils have been wetted and have received precipitation from long-duration storms.

The four hydrologic soil groups are:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist chiefly of deep, well drained to excessively drained sands or gravels. These soils have a high rate of water transmission.

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils that have a layer that impedes the downward movement of water or soils that have moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clay soils that have a high shrink-swell potential, soils that have a permanent high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

Flooding is the temporary covering of soil with water from overflowing streams, with runoff from adjacent slopes, and by tides. Water standing for short periods after rains is not considered flooding, nor is water in swamps and marshes. Flooding is rated in general terms that describe the frequency and duration of flooding and the time of year when flooding is most likely. The ratings are based on evidence in the soil profile of the effects of flooding, namely thin strata of gravel, sand, silt, or, in places, clay deposited by floodwater; irregular decrease in organic-matter content with increasing depth; and absence of distinctive soil horizons that form in soils of the area that are not subject to flooding. The ratings are also based on local information about floodwater levels in the area and the extent of flooding; and on information that relates the position of each soil on the landscape to historic floods.

The generalized description of flood hazards is of value in land-use planning and provides a valid basis for land-use restrictions. The soil data are less specific, however, than those provided by detailed engineering surveys that delineate flood-prone areas at specific flood frequency levels.

High water table is the highest level of a saturated zone more than 6 inches thick for a continuous period of more than 2 weeks during most years. The depth to a seasonal high water table applies to undrained soils. Estimates are based mainly on the relationship between grayish colors or mottles in the soil and the depth to free water observed in many borings made during the course of the soil survey. Indicated in table 17 are the depth to the seasonal high water table; the kind of water table, that is, perched, or apparent; and the months of the year that the water table commonly is high. Only saturated zones above a depth of 5 or 6 feet are indicated. More information on depth to the water table in some of the soils in the county is given in table 11.

Information about the seasonal high water table helps in assessing the need for specially designed foundations, the need for specific kinds of drainage systems, and the need for footing drains to insure dry basements. Such information is also needed to decide whether or not construction of basements is feasible and to determine how septic tank absorption fields and other underground installations will function. Also, a seasonal high water table affects ease of excavation.

Depth to bedrock is shown for all soils that are underlain by bedrock at a depth of 5 to 6 feet or less. For many soils, the limited depth to bedrock is a part of the definition of the soil series. The depths shown are based on measurements made in many soil borings and on other observations during the mapping of the soils. The kind of bedrock and its hardness as related to ease of excavation is also shown. Rippable bedrock can be excavated with a single-tooth ripping attachment on a 200-horsepower tractor, but hard bedrock generally requires blasting.

Subsidence is the settlement of organic soils or of soils containing semifluid layers. Initial subsidence generally results from drainage. Total subsidence is initial subsidence plus the slow sinking that occurs over a period of several years as a result of the oxidation or compression of organic material.

Risk of corrosion pertains to potential soil-induced chemical action that dissolves or weakens uncoated steel or concrete. The rate of corrosion of uncoated steel is related to soil moisture, particle-size distribution, total acidity, and electrical conductivity of the soil material. The rate of corrosion of concrete is based mainly on the sulfate content, texture, and acidity of the soil. Protective measures for steel or more resistant concrete help to avoid or minimize damage resulting from the corrosion. Uncoated steel intersecting soil boundaries or soil horizons is more susceptible to corrosion than an installation that is entirely within one kind of soil or within one soil horizon.

Physical, chemical, and mineralogical analyses of selected soils

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Physical, chemical, and mineralogical properties of representative pedons sampled in Volusia County are listed in tables 18, 19, and 20. Analyses were conducted and coordinated by the Soil Characterization Laboratory, University of Florida. Detailed profile descriptions of the soils analyzed are given in alphabetical order under "Soil series and morphology." Laboratory data and profile information for other soils in Volusia County, as well as for other counties in Florida, are on file at the Soil Science Department, University of Florida.

Soils were sampled from pits at carefully selected locations that represent typifying pedons. Samples were air-dried, crushed, and sieved through a 2-millimeter screen. Most analytical methods used are outlined in Soil Survey Investigations Report No. 1 (*9*).

Particle size distribution was determined by using a modification of the Bouyoucos hydrometer procedure with sodium hexametaphosphate as the dispersant. Hydraulic conductivity, bulk density, and water content were determined on undisturbed core samples. Organic carbon was determined by a modification of the Walkley-Black wet combustion method. Extractable bases were obtained by leaching soils with ammonium acetate buffered at pH 7.0. Sodium and potassium in the extract were determined by flame photometry, and calcium and magnesium by atomic absorption spectroscopy. Extractable acidity was determined by the barium chloride-triethanolamine method at pH 8.2. Cation exchange capacity was calculated by summation of extractable bases and extractable acidity. Base saturation is the ratio of extractable bases to cation exchange capacity expressed in percent. The pH measurements were made with a glass electrode using a soil-water ratio of 1:1; a 0.01M calcium chloride in a 1:2 soil-solution ratio; and potassium chloride solution in a 1:1 soil-solution ratio.

Aluminum, carbon, and iron were extracted from suspected spodic horizons with 0.1M sodium pyrophosphate. Determination of aluminum and iron was by atomic absorption spectroscopy and of extracted carbon by the Walkley-Black wet combustion method. Mineralogy of the less than 2 micron clay fraction was ascertained by X-ray diffraction. Peak heights at angstrom 18, 14, 7.2, 4.83, and 4.31 positions representing montmorillonite and/or interstratified expandibles, vermiculite and/or 14 angstrom intergrades, kaolinite, gibbsite, and quartz, respectively, were measured, summed, and normalized to give percent soil minerals identified in the X-ray diffractograms. This is not an absolute quantity but a relative distribution of clay minerals in the clay fraction. The absolute percentage would require additional knowledge of particle size, crystallinity, unit structure substitution, and matrix problems.

The sandy nature of Volusia County soils is indicated in table 18. With the exception of the C1g horizon of Turnbull soils, sands are by far the major fraction in all horizons of all pedons. The Astatula, Deland, and Tavares pedons are less than 2 percent clay throughout their profiles to a depth of 2 meters. The Bulow and Paola pedons are less than 2 percent clay to a depth of more than 1 meter. Silt content of these soils is also generally less than 2 percent. The Bulow, Farmton, Gator, Malabar, Tuscawilla, Wabasso, and Wauchula pedons have textural increases of clay in the lower horizons, but the silt content generally remains very low except in the Turnbull, Tuscawilla, and Wauchula pedons that have horizons where total silt content is more than 10 percent. Only the Gator soils are slightly more than 10 percent silt in all horizons sampled. With the exception of the Bulow and Immokalee pedons the sand fraction of all soils sampled is dominated by fine sand. Droughtiness is a common characteristic of sandy soils, particularly those that are naturally moderately well drained, well drained, or excessively drained.

Hydraulic conductivity (table 18) measures the amount of water that is transmitted through the soil when it is saturated. Generally, the hydraulic conductivity of Volusia County soils is high. It decreases with increasing silt and clay content, as shown by the values for the argillic horizon of the Chobee variant, Malabar, Tuscawilla, Wabasso, and Wauchula soils. Soil structure also affects hydraulic conductivity. The values are lower in the spodic horizon of the Deland, Farmton, Immokalee, Myakka, Smyrna, Wabasso, and Wauchula soils.

Based on bulk densities and the moisture retained between 1/10 and 15 bar tension (table 18) most soils in Volusia County retain very low amounts of water that is available to plants in the upper 1 meter of soil. The amount of water available is usually highest in soils that have an argillic horizon, such as Farmton, Malabar, Tuscawilla, Wabasso, and Wauchula soils. The amount of available water is usually lower in Astatula, Bulow, Paola, and Tavares soils. Although the spodic horizon in the Deland, Immokalee, Myakka, Smyrna, Wabasso, and Wauchula soils has higher amounts of water available to plants (table 18), the low amount of available water in the A2 horizon of these soils frequently is a factor that restrains normal plant growth during extended periods of low rainfall.

Generally, low values for extractable bases, cation exchange capacities (sum cations), and base saturations (table 19) indicate low inherent soil fertility. Calcium and magnesium are the predominant bases. The highest amounts occur in Gator and Turnbull soils. Sodium is low in all but the Gator and Turnbull soils. The low amounts of potassium in all but the Turnbull soil further indicate the absence of appreciable quantities of weatherable minerals (not reported) in the soils of Volusia County. Cation exchange capacity is most frequently less than 5 meq/100g except in the surface, sapric, spodic, and argillic horizons. The increased reactivity of associated organic material enhances the cation exchange capacity of surface horizons, of soils having sapric horizons, and the spodic horizon in Daytona, Deland, Farmton, Immokalee, Myakka, Smyrna, Wabasso, and Wauchula soils. The higher cation exchange capacity values in the argillic horizon of the Bulow, Malabar, Turnbull, Tuscawilla, and Wabasso soils are the result of higher clay content and the presence of much more highly reactive montmorillonitic clays. In soils that have low values for cation exchange capacity, only small amounts of bases are needed to significantly alter both the base status and the soil reaction in the upper horizons. Fertile soils have a high cation exchange capacity and high base saturation. In soils that have low cation exchange capacity, frequent applications of fertilizer are needed for successful crop production.

Organic carbon is directly responsible for improving nutrient and water retention capacities. It is the primary source of cation exchange capacity in the surface horizons of Volusia County soils. The highest organic carbon content (table 19) occurred in the sapric horizon of the Gator soil, a Histosol, and the O1 horizon of the Turnbull soils. Generally, organic carbon content decreases with increasing soil depth in the mineral pedons except in those of Daytona, Deland, Farmton, Immokalee, Myakka, Smyrna, Wabasso, and Wauchula soils, which have a Bh horizon. The content of organic carbon in the better developed Bh horizon of these soils ranges from 1.17 percent in Daytona soils to 6.04 percent in Immokalee soils. Although the enhanced organic carbon content of a spodic horizon increases cation exchange capacity, the fertility status of this horizon is very low because of the low base status and the relatively larger amount of aluminum.

Soil reaction in 1:1 soil-water suspension seldom changes more than 2.0 pH units between horizons within the same profile. The Wabasso soil has the greatest range in pH; the pH is 4.3 in the A1 horizon and 7.5 in the B'23tg horizon. Daytona, Farmton, Immokalee, Myakka, Smyrna, and Wauchula soils are consistently strongly acid; there is little difference among horizons of the same pedon. Correlation is not always evident between percent base saturation and pH, probably because of low buffering capacity, as is shown in the Astatula, Myakka, Paola, and Tavares soils.

Sodium pyrophosphate-extractable iron (table 19) was 0.08 percent or less in selected horizons of Spodosols. The ratio of sodium pyrophosphate-extractable carbon and aluminum to clay in the Daytona, Deland, Farmton, Myakka, Smyrna, Wabasso, and Wauchula soils was large enough to meet certain chemical criteria for a spodic horizon. Furthermore, the sodium pyrophosphate extraction removed more than one-half the amount of aluminum and iron removed by dithionite-citrate extraction from the spodic horizon of these soils.

Sand fraction (more than 2 microns) mineralogy was siliceous with quartz being dominant in all mineral horizons of all soils. Very small amounts of heavy minerals, mostly ilmenite, occurred in most horizons. The greatest concentrations were in the fine sand (0.25 to 0.1 mm) and very fine sand (0.1 to 0.05 mm) fractions. Clay fraction (less than 2 microns) mineralogy is reported in table 20 for specific horizons of selected pedons. The clay mineralogical suite is composed of montmorillonite, a 14 angstrom intergrade mineral (vermiculite containing varying amounts of hydroxy A1 interlayer material), kaolinite, gibbsite, and quartz. Gibbsite was detectable only in Astatula, Gator, Paola, and Wauchula soils. Appreciable amounts occurred only in Astatula and Wauchula soils. Kaolinite occurred in all pedons but was noticeably absent in the surface horizon of Daytona, Farmton, Wabasso, and Wauchula soils, where only quartz was detected. Varying amounts of 14 angstrom intergrade occurred in all pedons except that of the Gator soil. Montmorillonite occurred in the Bulow, Deland, Gator, Immokalee, Malabar, Myakka, Paola, Turnbull, Tuscawilla, Wabasso, and Wauchula soils; but only Gator, Malabar, Turnbull, Tuscawilla, and Wabasso soils contained horizons dominated by montmorillonite. Quartz occurred in all pedons.

Kaolinite generally increased in the deeper horizons of soils having an argillic horizon, such as Farmton, Gator, Malabar, Turnbull, Tuscawilla, and Wauchula soils. Bulow and Wabasso soils were exceptions to this trend. Montmorillonite, least stable of the mineral components in the present environment, was not detectable in the sandy Astatula, Daytona, Smyrna, and Tavares soils and was detectable only in the surface horizon of the sandy Deland, Immokalee, and Paola soils. Clay mineralogy of Volusia County soils influences their use and management less frequently than the total clay content. Turnbull soils, however, contain enough montmorillonitic clays that their use for community development is severely limited.

Engineering test data

Table 21 contains engineering test data. Tests were made by the Soils Laboratory, Florida Department of Transportation, Bureau of Materials and Research, on some of the major soil series in the survey area. They were made to help evaluate the soils for engineering purposes. The classifications given are based on data obtained by mechanical analysis and by tests to determine liquid limit and plastic limit.

The mechanical analyses were made by combined sieve and hydrometer methods (*3*). In this method the various grain-sized fractions are calculated on the basis of all the material in the soil sample, including that coarser than 2 mm in diameter. The mechanical analyses used in this method should not be used in naming textural classes of soils.

Compaction (or moisture-density) data are important in earthwork. If soil material is compacted at a successively higher moisture content, assuming that the compactive effort remains constant, the density of the compactive material increases until the optimum moisture content is reached. After that, density decreases with increase in moisture content. The highest dry density obtained in the compactive test is termed maximum dry density. As a rule, maximum strength of earthwork is obtained if the soil is compacted to the maximum dry density.

Liquid limit and plasticity index indicate the effect of water on the strength and consistence of the soil material. As the moisture content of a clayey soil is increased from a dry state, the material changes from a semisolid to a plastic state. If the moisture content is further increased, the material changes from a plastic to a liquid state. The plastic limit is the moisture content at which the soil material changes from semisolid to plastic state;

and the liquid limit is the moisture content at which the soil material changes from a plastic to a liquid state. The plasticity index is the numerical difference between the liquid limit and the plastic limit. It indicates the range of moisture content within which a soil material is plastic. The data on liquid limit and plasticity index in this table are based on laboratory tests of soil samples.

Classification of the soils

The system of soil classification currently used was adopted by the National Cooperative Soil Survey in 1965. Readers interested in further details about the system should refer to "Soil taxonomy" (*10*).

The system of classification has six categories. Beginning with the broadest, these categories are the order, suborder, great group, subgroup, family, and series. In this system the classification is based on the different soil properties that can be observed in the field or those that can be inferred either from other properties that are observable in the field or from the combined data of soil science and other disciplines. The properties selected for the higher categories are the result of soil genesis or of factors that affect soil genesis. In table 22, the soils of the survey area are classified according to the system. Categories of the system are discussed in the following paragraphs.

ORDER. Ten soil orders are recognized as classes in the system. The properties used to differentiate among orders are those that reflect the kind and degree of dominant soil-forming processes that have taken place. Each order is identified by a word ending in *sol*. An example is Entisol.

SUBORDER. Each order is divided into suborders based primarily on properties that influence soil genesis and are important to plant growth or that are selected to reflect the most important variables within the orders. The last syllable in the name of a suborder indicates the order. An example is Aquent (*Aqu*, meaning water, plus *ent*, from Entisol).

GREAT GROUP. Each suborder is divided into great groups on the basis of close similarities in kind, arrangement, and degree of expression of pedogenic horizons; soil moisture and temperature regimes; and base status. Each great group is identified by the name of a suborder and a prefix that suggests something about the properties of the soil. An example is Psammaquents (*Psamm*, meaning sand texture, plus *aquent*, the suborder of Entisols that have an aquic moisture regime).

SUBGROUP. Each great group may be divided into three subgroups: the central (typic) concept of the great groups, which is not necessarily the most extensive subgroup; the intergrades, or transitional forms to other orders, suborders, or great groups; and the extragrades, which have some properties that are representative of the great groups but do not indicate transitions to any other known kind of soil. Each subgroup is identified by one or more adjectives preceding the name of the great group. The adjective *Typic* identifies the subgroup that is thought to typify the great group. An example is Typic Psammaquents.

FAMILY. Families are established within a subgroup on the basis of similar physical and chemical properties that affect management. Among the properties considered in horizons of major biological activity below plow depth are particle-size distribution, mineral content, temperature regime, thickness of the soil penetrable by roots, consistence, moisture equivalent, soil slope, and permanent cracks. A family name consists of the name of a subgroup and a series of adjectives. The adjectives are the class names for the soil properties used as family differentiae. An example is siliceous, hyperthermic Typic Psammaquents.

SERIES. The series consists of soils that formed in a particular kind of material and have horizons that, except for texture of the surface soil or of the underlying substratum, are similar in differentiating characteristics and in arrangement in the soil profile. Among these characteristics are color, texture, structure, reaction, consistence, and mineral and chemical composition.

Soil series and morphology

In this section, each soil series recognized in the survey area is described in detail. The descriptions are arranged in alphabetic order by series name.

Characteristics of the soil and the material in which it formed are discussed for each series. The soil is then compared to similar soils and to nearby soils of other series. Then a pedon, a small three-dimensional area of soil that is typical of the soil series in the survey area, is described. The detailed descriptions of each soil horizon follow standards in the Soil Survey Manual (*8*). Unless otherwise noted, colors described are for moist soil.

Following the pedon description is the range of important characteristics of the soil series in this survey area. Phases, or mapping units, of each soil series are described in the section "Soil maps for detailed planning."

Apopka series

The Apopka series is a member of the loamy, siliceous, hyperthermic family of Grossarenic Paleudults. It consists of nearly level to moderately steep, well drained, moderately permeable soils that formed in thick beds of sandy and loamy marine or eolian deposits of the lower Coastal Plain. These soils are on broad, high, gently undulating sandhills. Slopes are dominantly less than 5 percent, but a few short slopes have a gradient of up to 12 percent.

Apopka soils are geographically associated with Astatula, Daytona, Deland, Electra, and Tavares soils. Astatula soils occur in topographic positions similar to those of Apopka soils. Daytona, Deland, Electra, and Tavares soils generally occur in lower positions. Electra, Daytona, and Deland soils have a Bh horizon. Astatula, Daytona, Deland, and Tavares soils are sandy to a depth of 80 inches or more.

Typical pedon of Apopka fine sand, south of DeLand on Florida Highway 15A, 1.25 miles northwest of junction of 15A and I-4, 50 feet north of roadway; NW1/4NW1/4, sec. 1, T. 18 S., R. 30 E.

A1—0 to 6 inches; very dark grayish brown (10YR 3/2) fine sand; fine granular structure; friable; few fine and few medium roots; medium acid; clear wavy boundary.

A21—6 to 22 inches; grayish brown (10YR 5/2) fine sand; single grained; loose; many medium and few fine roots; few medium faint very pale brown (10YR 7/3) mottles; few uncoated light gray sand grains; strongly acid; gradual wavy boundary.

A22—22 to 50 inches; light yellowish brown (10YR 6/4) fine sand; single grained; loose; few medium roots; many medium faint brownish yellow (10YR 6/8) mottles; many uncoated sand grains; strongly acid; gradual wavy boundary.

A23—50 to 62 inches; white (10YR 8/2) fine sand; single grained; loose; most sand grains uncoated; very strongly acid; abrupt wavy boundary.

B2t—62 to 80 inches; brownish yellow (10YR 6/6) sandy clay loam; weak fine subangular blocky structure; firm; many medium faint very pale brown (10YR 7/4) mottles; sand grains coated with clay; very strongly acid.

Except in A horizons that have been limed, soil reaction ranges from medium acid to very strongly acid throughout.

The A1 horizon has hue of 10YR, value of 2 to 5, and chroma of 1. Thickness ranges from 2 to 7 inches. The A2 horizon is sand or fine sand. It has hue of 10YR, value of 7 or 8, and chroma of 1 or 2 or value of 6 to 8 and chroma of 3 to 8. Many pedons have few to medium bodies of clean or uncoated sand grains. Some pedons have a white or light gray A21 horizon. The A22 and A23 horizons have hue of 10YR, value of 6 to 8, and chroma of 3 to 8. Tongues of material from the A21 horizon extend through these horizons. The tongues range from few to many and from 1/2 inch to 2 inches in diameter. They have dark reddish brown, dark grayish brown, or dark brown discontinuous exteriors that turn gray on ignition.

The Bt horizon begins at a depth of more than 40 inches. It has hue of 10YR, value of 5 or 6, and chroma of 4 to 8; hue of 7.5YR, value of 5, and chroma of 6 or 8; or hue of 5YR or 2.5YR, value of 4 to 6, and chroma of 6 or 8. Many pedons have few to many mottles in shades of red, brown, yellow, or gray. Consistence is friable to firm. Texture is sandy loam or sandy clay loam. Thickness ranges from about 3 feet to more than 6 feet.

Astatula series

The Astatula series is a member of the hyperthermic, uncoated family of Typic Quartzipsamments. It consists of nearly level to steep, excessively drained soils that formed in thick beds of sandy marine, eolian, or fluvial sediments on the lower Coastal Plain. These soils are on broad, high, gently undulating sandhills. Slopes are dominantly from less than 8 percent to as much as 17 percent.

Astatula soils are geographically associated with Apopka, Cassia, Daytona, Myakka, Orsino, Paola, and Tavares soils. All but Paola soils occur in lower topographic positions than Astatula soils. Paola soils occur in positions similar to those of Astatula soils. Apopka soils have an argillic horizon. Cassia, Daytona, Myakka, and Orsino soils have an A2 horizon and a Bh horizon. Paola soils have an A2 horizon and a B&A horizon. Tavares soils are moderately well drained.

Typical pedon of Astatula fine sand, on a 2 percent slope, southeast of DeLand, about 0.75 mile south of I-4 and Florida Highway 430A overpass; NW1/4SW1/4 sec. 7, T. 18 S., R. 31 E.

A1—0 to 2 inches; gray (10YR 5/1) fine sand; single grained; loose; common fine roots; clear wavy boundary.

C1—2 to 10 inches; brown (10YR 5/3) fine sand; common coarse faint light brownish gray (10YR 6/2), few medium faint brownish yellow (10YR 6/6), and common fine faint very pale brown mottles; single grained; loose; common fine roots; strongly acid; gradual wavy boundary.

C2—10 to 26 inches; pale brown (10YR 6/3) fine sand; common coarse faint light brownish gray (10YR 6/2), common fine faint very pale brown, and few medium faint brownish yellow mottles; single grained; loose; common medium and few large roots; few coarse distinct streaks of gray fine sand; strongly acid; gradual wavy boundary.

C3—26 to 52 inches; very pale brown (10YR 7/4) fine sand; common coarse faint (10YR 7/2) mottles; single grained; loose; many medium and few large roots; strongly acid; diffuse wavy boundary.

C4—52 to 78 inches; very pale brown (10YR 7/4) fine sand; few coarse faint brownish yellow (10YR 6/6) mottles; single grained; loose; strongly acid; gradual wavy boundary.

C5—78 to 95 inches; very pale brown (10YR 8/3), fine sand; single grained; loose; common distinct discontinuous brownish yellow, 2 to 6 mm wide fine sand lamellae ranging up to 20 cm in length; sand grains are mostly thinly coated with iron oxides in lamellae; strongly acid.

Reaction ranges from very strongly acid to medium acid throughout the soil.

The A horizon has hue of 10YR or 2.5Y, value of 3 to 7, and chroma of 2 or less. Pedons in cultivated areas generally have an Ap horizon that has color value of 3 or less. Total thickness ranges from 2 to 7 inches.

Where present, the AC horizon has hue of 10YR or 2.5Y, value of 5, and chroma of 2 or less or value of 6 or 7 and chroma of 4 or less. This horizon is obscured in pedons that have been cultivated. Total thickness ranges from 0 to 4 inches. Texture is fine sand or sand.

The C horizon has hue of 10YR, value of 5, and chroma of 3 to 8, value of 6 and chroma of 3 or 4, or value of 7 and chroma of 3; hue of 7.5YR, value of 5 to 7, chroma of 6 to 8; or hue of 5YR, value of 5, and chroma of 6 to 8. In places this horizon has common to many, fine to coarse mottles or splotches of gray to white, but the mottles are the color of uncoated sand grains and do not indicate wetness. Texture of the C horizon is fine sand or sand.

Astor series

The Astor series is a member of the sandy, siliceous, hyperthermic family of Cumulic Haplaquolls. It consists of poorly drained soils that formed in sandy sediments along the St. Johns River. Most areas are subject to flooding by the river or by runoff from adjacent areas. Slopes are less than 1 percent.

Astor soils are geographically associated with Gator, Myakka, and Terra Ceia soils. Gator and Terra Ceia soils occur in positions similar to those of Astor soils. Gator soils formed in sapric material less than 51 inches thick over loamy sediments. Terra Ceia soils formed in sapric material more than 52 inches thick. Myakka soils occur in the adjacent flatwoods. They have a spodic horizon between depths of 20 and 30 inches.

Typical pedon of Astor fine sand, 100 yards south of Volusia Bar Camp Road on Hitchens Island, SE1/4SW1/4 sec. 12, T. 27 E., R. 15 S.

A11—0 to 4 inches; black (10YR 2/1) fine sand; weak fine crumb structure; very friable; many fine and medium roots; slightly acid; gradual wavy boundary.

A12—4 to 13 inches; very dark gray (10YR 3/1) fine sand with many discontinuous streaks of grayish brown (10YR 5/2); weak medium crumb structure; very friable; many fine and medium roots; slightly acid; gradual wavy boundary.

A13—13 to 39 inches; very dark gray (10YR 3/1) fine sand with few discontinuous horizontal streaks less than 1/2 inch thick of gray (10YR 5/1) and light brownish gray (10YR 6/2); weak medium crumb structure; very friable; common fine and medium roots; neutral; gradual wavy boundary.

A14—39 to 55 inches; very dark grayish brown (10YR 3/2) fine sand with a few discontinuous horizontal streaks and common medium faint mottles of light brownish gray (10YR 6/2) and light gray (10YR 7/2); single grained; few fine roots; mildly alkaline; gradual wavy boundary.

AC—55 to 65 inches; mixed in streaks and patches of very dark grayish brown (10YR 3/2), very dark gray (10YR 4/1), and light gray (10YR 7/1) fine sand with thin strata of loamy sand and sandy loam; single grained; loose; moderately alkaline; gradual wavy boundary.

C—65 to 82 inches; light gray (10YR 7/1) fine sand with common medium faint dark gray (10YR 4/1) and gray (10YR 5/1) mottles; single grained; loose; few thin strata of loamy sand less than 1/2 inch thick; moderately alkaline.

Reaction ranges from slightly acid to moderately alkaline.

The A horizon has hue of 10YR, value of 2 or 3, and chroma of 1 or 2 or the color is neutral and the value is 2 or 3. Mottles and streaks in shades of gray, yellow, and brown occur in places. Thickness of the A horizon is 24 to 60 inches.

The C horizon has hue of 10YR, value of 4 to 7, and chroma of 1 or 2 or the color is neutral and the value is 4 to 6. Mottles in shades of gray or brown are in many pedons. Texture is fine sand or sand with discontinuous strata of loamy sand.

Basinger series

The Basinger series is a member of the siliceous, hyperthermic family of Spodic Psammaquents. It consists of nearly level, poorly drained, very rapidly permeable soils that formed in thick beds of sandy marine sediments on the lower Coastal Plain. These soils are mainly in depressions and in a few places in poorly defined drainageways. Slopes are less than 2 percent.

Basinger soils are geographically associated with Immokalee, Myakka, Smyrna, Tavares, and Valkaria soils. Immokalee, Myakka, and Smyrna soils are poorly drained. They are in slightly higher areas than Basinger soils and have a Bh horizon. Tavares soils are moderately well drained and are on adjacent side slopes of sand ridges. Valkaria soils are in topographic positions similar to those of Basinger soils, but Valkaria soils have a Bir horizon instead of an A&Bh horizon.

Typical pedon of Basinger fine sand, in an area about 0.8 mile south of Florida Highway 44 on South Blue Lake Avenue in DeLand; SE1/4NE1/4 sec. 15, T. 17 S., R. 30 E.

A1—0 to 5 inches; gray (10YR 5/1) fine sand; single grained; loose; many fine roots and common medium roots; strongly acid; clear smooth boundary.

A2—5 to 20 inches; light gray (10YR 7/1) fine sand; single grained; loose; many fine roots decreasing with depth to common fine roots; gray (10YR 5/1, 6/1) vertical streaks mostly along root channels; strongly acid; abrupt wavy boundary.

A&Bh—20 to 25 inches; gray (10YR 5/1) and dark brown (10YR 3/3) fine sand; single grained; loose; many fine roots; common fine and medium black (10YR 2/1) fragments; common fine distinct grayish brown (10YR 5/2) streaks and mottles; many clean sand grains; strongly acid; clear wavy boundary.

C1—25 to 34 inches; grayish brown (10YR 5/2) fine sand; single grained; loose; few fine roots; few medium faint dark grayish brown mottles; strongly acid; clear wavy boundary.

C2—34 to 58 inches; very pale brown (10YR 7/3) fine sand; single grained; loose; common fine distinct grayish brown (10YR 5/2) streaks; strongly acid; gradual wavy boundary.

C3—58 to 90 inches; light gray (10YR 7/2) fine sand; single grained; loose; strongly acid.

Texture is either sand or fine sand in all horizons but the A1 horizon, which is fine sand in all areas. Reaction ranges from very strongly acid to mildly alkaline in all horizons.

The A1 horizon is 3 to 8 inches thick. It has hue of 10YR or 2.5Y, value of 2 to 6, and chroma of 1 or 2, or the color is neutral. The A2 horizon has hue of 10YR or 2.5Y, value of 5 to 7, and chroma of 2 or less; hue of 10YR, value of 6, and chroma of 3 or value of 7 and chroma of 3 or 4; or the color is neutral. In places very dark gray streaks occur along root channels. Thickness ranges from 3 to 18 inches.

The A&Bh horizon begins within a depth of 40 inches. The Bh part is stained with colloidal organic matter and has common to many uncoated sand grains. The color value for the Bh part is one unit less than that of the overlying A2 horizon. Commonly the hue is 10YR, value is 4 to 6, and chroma is 3 or less. Some pedons have hue of 10YR or 5YR, and value and chroma of 3 or 4. The A part has the color range of the A2 horizon.

The C horizon has hue of 10YR, value of 4 to 6, and chroma of 3 or less or value of 7 and chroma of 2 or less.

Bluff series

The Bluff series is a member of a fine-loamy, mixed, hyperthermic family of Typic Haplaquolls. It consists of nearly level, poorly drained soils that formed in loamy and clayey alluvial sediments associated with the drainage system of the St. Johns River.

Bluff soils are geographically associated with Fluvaquents, Gator, Paisley, and Terra Ceia soils. All but Paisley soils occur in positions similar to those of Bluff soils. Fluvaquents consist of stratified sandy and loamy sediments. Gator soils are organic material less than 51 inches thick over loamy material. Paisley soils, which occur at the outer edges of the flood plain, have a thin sandy A horizon less than 20 inches thick over an argillic horizon. Terra Ceia soils are organic material more than 51 inches thick.

Typical pedon of Bluff sandy clay loam, about 100 yards west of I-4 and 0.25 mile south of a borrow pit on the flood plain adjacent to Lake Monroe; sec. 10, T. 13 S., R. 30 E.

A11—0 to 2 inches; black (10YR 2/1) sandy clay loam; weak fine subangular blocky structure; friable; many fine and medium roots; slightly acid; clear smooth boundary.

A12—2 to 8 inches; black (10YR 2/1) sandy clay loam; coarse columnar structure, secondary structure moderate medium subangular blocky; firm; many fine and medium roots that follow ped faces; light gray (10YR 7/1) sand grains along ped faces; neutral; clear smooth boundary.

A13—8 to 14 inches; very dark gray (10YR 3/1) sandy clay loam with dark gray (10YR 4/1) coatings on ped faces; weak fine subangular blocky structure; firm; many vertical channels of white sand grains; few fine and medium roots; mildly alkaline; clear wavy boundary.

B21g—14 to 22 inches; gray (5Y 5/1) sandy clay loam; common medium distinct yellowish brown (10YR 5/8) and few fine faint gray mottles; weak, medium, subangular blocky structure; friable; few fine and medium roots; many medium and coarse calcite or gypsum crystals; mildly alkaline; clear wavy boundary.

B22g—22 to 50 inches; gray (5Y 5/1) sandy clay loam; common medium distinct reddish yellow (7.5YR 6/8), few fine distinct yellow (10YR 7/6), and few fine faint pale olive (5Y 6/4) mottles; weak medium subangular blocky structure; friable; many medium and coarse calcite or gypsum crystals; few fine and medium roots; mildly alkaline; clear smooth boundary.

B3g—50 to 68 inches; light gray (5Y 7/1) sandy clay loam; common medium prominent brownish yellow (10YR 6/8) and common medium distinct pale yellow (2.5Y 7/4) mottles; weak medium subangular blocky structure; friable; mildly alkaline; clear smooth boundary.

IIC1—68 to 86 inches; gray (5Y 5/1) clay; common medium distinct brownish yellow (10YR 6/6) and many medium distinct olive yellow (2.5Y 6/6) mottles; massive; slightly sticky and plastic; few lenses of light gray (10YR 7/1) sand; mildly alkaline; clear smooth boundary.

IIC2—86 to 99 inches; gray (N 5/0) clay; common medium distinct olive yellow (2.5Y 6/6) mottles; massive; sticky and plastic; mildly alkaline.

Solum thickness ranges from 40 to 60 inches or more. Reaction ranges from medium acid to neutral in the surface layer and from mildly to moderately alkaline in the subsoil.

The A horizon has hue of 10YR, value of 2 or 3, and chroma of 1. Texture is sandy clay loam or sandy clay.

The Bg horizon has hue of 10YR, value of 4 to 6, and chroma of 1 or less. Mottles in varying amounts occur in shades of yellow, brown, olive, and red. Texture is sandy clay loam or sandy clay. Accumulations of soft calcium carbonate and calcite or gypsum crystals are in places.

The IIC horizon has hue of 5Y, value of 6 or 7, and chroma of 1 or the color is neutral. Texture is clay or sandy clay with strata of varying thicknesses of coarser material. Layers of shells are in places.

Bulow series

The Bulow series is a member of the loamy, siliceous, hyperthermic family of Typic Hapludalfs. It consists of well drained, moderately deep sandy soils on low sand ridges underlain by a differentially weathered layer of coquina rock. Slopes range from 0 to 5 percent.

Bulow soils are geographically associated with Astatula, Cocoa, and Paola soils. The Astatula and Paola soils are in higher topographic positions than Bulow soils. Astatula soils are brown and sandy to a depth of more than 80 inches. Paola soils are sandy soils more than 80 inches deep and are acid throughout. The typical Cocoa soils occur in positions similar to those of Bulow soils. They have a brown A2 horizon and are less than 40 inches thick over coquina rock.

Typical profile of Bulow sand, about 2 miles south of Flagler County line, about 1.9 miles south on Old Dixie Highway from the intersection with I-95, then 0.2 mile west-southwest of Old Dixie Highway:

A1—0 to 5 inches; gray (10YR 6/1, rubbed) sand that has the appearance of salt and pepper; single grained; loose; many fine roots; very strongly acid.

A2—5 to 20 inches; white (10YR 8/2) sand; single grained; loose; common medium and fine roots; brownish yellow (10YR 5/6) stains along root channels; strongly acid; gradual wavy boundary.

B11—20 to 25 inches; reddish yellow (7.5YR 6/6) sand; single grained; loose; common medium roots; discontinuous streaks of very pale brown (10YR 7/4) and reddish yellow (7.5YR 6/8); strongly acid; gradual wavy boundary.

B12—25 to 45 inches; reddish yellow (7.5YR 6/8) sand; single grained; loose; common medium and large roots; discontinuous streaks of reddish yellow (7.5YR 7/6) along root channels; many uncoated sand grains; neutral; gradual wavy boundary.

B2t—45 to 50 inches; yellowish red (5YR 4/6) sandy clay loam; moderate medium subangular blocky structure; friable; common medium root casts; neutral; abrupt irregular boundary.

IIR—50 inches; coquina rock of varying hardness that is pitted with solution channels.

The thickness of the solum and depth to coquina rock range from 40 to 70 inches. Reaction ranges from very strongly acid to neutral in the A horizon and from slightly acid to neutral in the B1 horizon and the B2t horizon.

The A1 horizon has a salt-and-pepper appearance because of the many uncoated sand grains. It has hue of 10YR, value of 4 to 7, and chroma of 1. Thickness is 2 to 5 inches. The A2 horizon has hue of 10YR, value of 7 or 8, and chroma of 1 or 2. Texture of the A2 horizon is sand or coarse sand. Thickness is 15 to 30 inches.

Some pedons have an A3 horizon. Where present, it has hue of 10YR, value of 4 or 5, and chroma of 4 to 8 or hue of 7.5YR, value of 4, and chroma of 4. Texture is sand or coarse sand. Thickness ranges to 5 inches.

The B1 horizon has hue of 7.5YR, value of 4 to 6, and chroma of 6 to 8. Texture is sand or coarse sand. Thickness ranges from 15 to 34 inches. The B2t horizon has hue of 5YR, value of 4 to 6, and chroma of 4 to 8. Texture is sandy clay loam to sandy loam. Thickness ranges from 3 to 18 inches.

The coquina rock is differentially weathered. It ranges from soft porous limestone to beds of loose coquina shells. It is perforated with vertical solution passages. Soil horizonation follows the unevenly weathered rock; tongues extend into the solution passages. Thickness of the coquina rock ranges from 2 to 10 feet. Stratified beds of sand and shelly sand are below the coquina rock.

Canaveral series

The Canaveral series is a member of the mixed, hyperthermic family of Aquic Udipsamments. It consists of moderately well drained to somewhat poorly drained soils that formed in a mixture of eolian and marine sand in dune areas along the Atlantic Ocean. These soils are in nearly level areas between sand dunes and on the gently sloping lower sides of the dunes.

Canaveral soils are geographically associated with Palm Beach and Paola soils. The Palm Beach and Paola soils are on the middle and upper slopes of dunes. Palm Beach soils are well drained to excessively drained, and Paola soils are excessively drained. The Paola soils have an albic horizon underlain by a horizon having a color value more than one unit darker than that of the albic horizon.

Typical pedon of Canaveral sand, low on a dune, about 0.3 mile south of the Flagler County line and about 100 yards west of Florida Highway A1A; NE1/4NW1/4 sec. 32, T. 12, R. 32 E.

A11—0 to 4 inches; black (10YR 2/1) sand; weak fine granular structure; very friable; many fine and common medium and large roots; about 5 percent shell fragments by volume; mildly alkaline; gradual wavy boundary.

A12—4 to 9 inches; very dark grayish brown (10YR 3/2) sand; single grained; loose; common fine and few medium and large roots; about 15 percent by volume sand-size shell fragments; mildly alkaline; clear wavy boundary.

C1—9 to 22 inches; gray (10YR 6/1) sand; single grained; loose; common medium roots; about 50 percent by volume coarse shell fragments; mildly alkaline; clear wavy boundary.

C2—22 to 30 inches; light gray (10YR 7/1) sand mixed with multicolored shell fragments; single grained; loose; few medium roots; about 60 percent by volume shell fragments; few medium faint light brownish gray (10YR 7/1) streaks; moderately alkaline; clear wavy boundary.

C3—30 to 35 inches; light gray (10YR 7/1) sand with multicolored shell fragments; single grained; loose; about 50 percent by volume shell fragments; moderately alkaline; clear wavy boundary.

C4—35 to 80 inches; light gray (10YR 7/1) sand mixed with multicolored shell fragments; single grained; loose; about 60 percent by volume coarse, well-preserved shells; moderately alkaline.

Canaveral soils are mildly alkaline and moderately alkaline in the C horizon.

The A horizon has hue of 10YR, value of 2 or 4, and chroma of 3 or less. Where the value is 2 or 3, the thickness is less than 10 inches. Content of shell fragments ranges from 5 to 15 percent.

The C horizon has hue of 10YR, value of 5 to 7, and chroma of 1 to 4. It is a mixture of sand and shell fragments that in many places is stratified with some layers of almost pure shells and shell fragments. Content of shells and shell fragments ranges from 10 to 80 percent. In places there are thin discontinuous layers that are weakly cemented with calcium carbonate.

Cassia series

The Cassia series is a member of the sandy, siliceous, hyperthermic family of Typic Haplohumods. It consists of nearly level, somewhat poorly drained, moderately rapidly permeable soils that formed in thick beds of sandy marine sediments on the lower Coastal Plain. These soils are on low sandy swells that are slightly higher than the adjacent flatwoods. The water table is between depths of 15 and 40 inches during rainy seasons. Slope is 0 to 2 percent.

Cassia soils are geographically associated with Daytona, Myakka, Orsino, and Smyrna soils. Daytona and Orsino soils are moderately well drained soils on slightly higher sandhills. Orsino soils have a Bir horizon and occur in positions similar to those of Cassia soils. Myakka and Smyrna soils are in slightly lower positions in flatwoods and are poorly drained.

Typical pedon of Cassia fine sand about 4 miles west of the junction of I-4 and U.S. Highway 92, 0.2 mile north of U.S. Highway 92 on graded road, 30 feet west of road; SE1/4SE1/4 sec. 1, T. 16 S., R. 31 E.

A1—0 to 3 inches; gray (N 5/0, rubbed) fine sand; single grained; loose; many fine and common medium roots; unrubbed color is a mixture of white sand grains and black organic matter; strongly acid; gradual wavy boundary.

A2—3 to 28 inches; white (10YR 8/1) fine sand; single grained; loose; common fine and medium roots; few gray (10YR 6/1) streaks along old root channels; strongly acid; abrupt wavy boundary.

B21h—28 to 32 inches; black (5YR 2/1) fine sand; moderate medium granular structure; friable; noncemented; common fine and few medium roots; sand grains coated with colloidal organic matter; strongly acid; clear irregular boundary.

B22h—32 to 36 inches; dark brown (10YR 3/3) fine sand with common medium distinct dark reddish brown (5YR 2/2) mottles that are noncemented; single grained; loose; many uncoated sand grains; strongly acid; gradual wavy boundary.

B3—36 to 47 inches; brown (10YR 4/3) fine sand; single grained; loose; strongly acid; gradual wavy boundary.

C1—47 to 54 inches; pale brown (10YR 6/3) fine sand; single grained; loose; strongly acid; clear wavy boundary.

C2—54 to 80 inches; light gray (10YR 7/2) fine sand; single grained; loose; few distinct brown (10YR 5/3) streaks that decrease as depth increases; strongly acid.

Reaction ranges from medium acid to very strongly acid in all horizons. Texture is either sand or fine sand in all horizons but the A1 horizon, which is fine sand in all areas.

The A1 horizon is 2 to 5 inches thick. It has hue of 10YR or neutral color, value of 5 to 7, and chroma of 1 or less. The A2 horizon has hue of 10YR, value of 6 to 8, and chroma of 1 or less. Some pedons have mottles and streaks in shades of gray or brown.

The Bh horizon is 8 to 12 inches thick. It begins at a depth of less than 30 inches. It has hue of 10YR, value of 2, and chroma of 1 or 2 or hue of 5YR or 7.5YR, value of 3, and chroma of 3 or less.

The B3 horizon ranges from 2 to 7 inches in thickness. It has hue of 10YR, value of 4 or 5, and chroma of 3. In some pedons, it has many faint to distinct dark reddish brown weakly cemented fragments and mottles.

The C horizon has hue of 10YR, value of 5 to 7, and chroma of 2 or less. It has mottles in shades of gray, brown, and yellow.

Chobee series

The Chobee series is a member of the fine-loamy, mixed, hyperthermic family of Typic Argiaquolls. It consists of nearly level, very poorly drained soils formed in loamy marine sediments. These soils occur in hydric hammocks, in drainageways, and on flood plains.

Chobee soils are associated with Tuscawilla, Riviera, and Tequesta soils. All of these soils occur in similar topographic positions. Chobee soils are characterized by a mollic epipedon, whereas the Tuscawilla and Riviera soils have an ochric epipedon and the Tequesta soils an organic surface layer. In addition, the Tuscawilla soils are better drained.

Typical pedon of Chobee fine sandy loam, about 2 miles west of Florida East Coast Railway along Volco Road and 100 feet south of Volco Road:

Oa—1 inch to 0; black mat of decomposing plant parts and plant roots; strongly acid; abrupt smooth boundary.

A1—0 to 6 inches; black (10YR 2/1) fine sandy loam; moderate medium crumb structure; very friable; many medium and fine roots; slightly acid; abrupt smooth boundary.

B21t—6 to 21 inches; very dark gray (N 3/0) light sandy clay loam; weak coarse subangular blocky structure; slightly sticky and plastic; few patchy clay films; common fine and medium roots; neutral; gradual wavy boundary.

B22t—21 to 32 inches; very dark gray (N 3/0) fine sandy loam with few medium distinct mottles of gray (10YR 6/1); weak medium subangular blocky structure; slightly sticky and slightly plastic; mildly alkaline; gradual smooth boundary.

B23t—32 to 39 inches; dark gray (10YR 4/1) sandy clay loam; slightly sticky and plastic; mildly alkaline; gradual smooth boundary.

B24tca—39 to 54 inches; dark gray (10YR 4/1) sandy clay loam with few fine distinct yellowish brown mottles; slightly sticky and plastic; common coatings of calcium carbonate on ped faces and interiors; moderately alkaline; clear smooth boundary.

Cg—54 to 64 inches; gray (10YR 5/1) loamy sand; massive; few discontinuous layers or pockets of sandy clay loam less than 1/2 inch thick; moderately alkaline.

The solum is more than 40 inches thick. Reaction ranges from slightly acid to neutral in the A horizon, from slightly acid to moderately alkaline in the upper part of the Bt horizon, and from neutral to moderately alkaline in the lower part and in the Cg horizon.

The A horizon has hue of 10YR, value of 2 or 3, and chroma of 1 or the color is neutral and the value is 2 or 3. Thickness is 5 to 12 inches.

The B21t and B22t horizons have hue of 10YR, value of 2 to 5, and chroma of 1; neutral color and value of 2 to 5 with or without mottles; hue of 10YR, value of 2, and chroma of 2; or hue of 2.5Y, value of 3 to 5, and chroma of 2 with mottles. Where the A horizon is less than 7 inches thick, the value in the B21t horizon is 2 or 3. The B23t and B24tca horizons have hue of 10YR, value of 4 or 5, and chroma of 2; hue of 2.5Y, value of 4 or 5, and chroma of 2 with mottles; hue of 10YR, value of 3 to 6, and chroma of 1; or neutral color and value of 5 or 6 with or without mottles. Texture of the B2t horizon is sandy loam, fine sandy loam, or sandy clay loam. Clay content by weight of the control section ranges from 18 to 35 percent. Thickness of the Bt horizon is 6 to 36 inches. Thickness of the Btca horizon is 12 to 28 inches. Depth to carbonates is 12 to 40 inches.

The Cg horizon has hue of 10YR, value of 4 to 7, and chroma of 1; neutral color and value of 4 to 7; or hue of 2.5Y, value of 7, and chroma of 2. Some pedons have mottles of stronger chroma. Texture is loamy sand, loamy fine sand, or sandy loam. In some pedons, this horizon is a mixture of sand and shell fragments.

Cocoa series

The Cocoa series is a member of the sandy, siliceous, hyperthermic family of Psammentic Hapludalfs. It consists of nearly level and gently sloping, well drained sandy soils on low ridges near the Atlantic coast. Cocoa soils are underlain by coquina limestone at a depth of less than 40 inches. Slopes range from 0 to 5 percent.

Cocoa soils are geographically associated with Astatula, Bulow, Paola, and Tuscawilla soils. Astatula soils are in higher topographic positions than Cocoa soils and are sandy to a depth of more than 80 inches. Bulow soils are in positions similar to those of Cocoa soils, have a white A2 horizon, and have coquina rock at a depth of more than 40 inches. Paola soils are in higher positions, have a white A2 horizon, and are sandy to more than 80 inches. Tuscawilla soils are in lower positions, have an argillic horizon, and are poorly drained.

Typical pedon of Cocoa sand, 0 to 5 percent slopes, about 50 feet north of Edgewater canal, about 1 mile east of Mission Road and 0.4 mile west of Florida East Coast Railroad, city of Edgewater:

A1—0 to 6 inches; very dark gray (10YR 3/1) sand; weak fine granular structure; very friable; many fine roots; medium acid; abrupt smooth boundary.

A2—6 to 14 inches; brown (10YR 4/3) sand; weak fine granular structure; very friable; medium and common fine roots; medium acid; gradual smooth boundary.

B1—14 to 26 inches; strong brown (7.5YR 5/6) sand; single grained; loose; few fine roots; medium acid; gradual smooth boundary.

B2t—26 to 30 inches; reddish brown (5YR 4/4) loamy sand; weak medium subangular blocky structure;

few medium and fine roots; sand grains are bridged and coated with clay; slightly acid; abrupt smooth boundary.

IIR—30 to 33 inches; pale brown (10YR 6/3) soft partially weathered coquina rock with layers of loose coquina shells.

Thickness of the solum and depth to coquina rock range from 20 to 40 inches. The depth to rock varies considerably within short distances. Reaction ranges from medium acid to mildly alkaline in all horizons.

The A1 horizon has hue of 10YR, value of 3 to 5, and chroma of 1 to 4. Thickness is 3 to 8 inches. The A2 horizon has hue of 10YR or 7.5YR, value of 4 to 6, and chroma of 3 to 8. Texture of the A2 horizon is sand or fine sand. Thickness is 7 to 16 inches.

The B1 horizon has hue of 7.5YR or 5YR, value of 4 or 5, and chroma of 6 to 8. Texture is sand, fine sand, or loamy sand. Thickness is 6 to 14 inches.

The Bt horizon has hue of 7.5YR or 5YR, value of 4 or 5, and chroma of 4 to 8. Sand grains are coated and bridged with clay. Texture is loamy sand. Thickness is 4 to 10 inches.

The IIR horizon is coquina limestone that may contain layers of loose coquina shells.

Daytona series

The Daytona series is a member of the sandy, siliceous, hyperthermic family of Entic Haplohumods. These soils consist of nearly level to gently sloping, moderately well drained soils that formed in beds of marine sandy sediments on the lower Coastal Plain. They occur on broad, gently undulating sandhills or on narrow slopes adjacent to flatwoods. These soils are saturated below a depth of 40 inches late in summer and in fall. Slopes range from 0 to 5 percent.

Daytona soils are geographically associated with the Basinger, Cassia, Deland, Immokalee, Myakka, and Tavares soils. All but the Deland and Tavares soils occur in lower topographic positions than Daytona soils, in adjacent flatwood areas, and are not so well drained as Daytona soils. Deland soils occur in slightly higher positions, are well drained, and have a spodic horizon below a depth of 50 inches. The Tavares soils occur in similar topographic positions and do not have a spodic horizon.

Typical pedon of Daytona sand, 0 to 5 percent slopes, east of DeLand; about 1.5 miles north of Lake Winnemissett on paved road, 100 yards north on jeep trail from sharp curve in paved road; NE1/4NW1/4 sec. 12, T. 17 S., R. 30 E.

A1—0 to 5 inches; gray (10YR 5/1) sand; single grained; loose; many fine and large roots; extremely acid; clear wavy boundary.

A2—5 to 36 inches; white (10YR 8/1) sand; single grained; loose; common medium roots; few gray (10YR 5/1) streaks along root channels; very strongly acid; abrupt wavy boundary.

B2h—36 to 38 inches; black (10YR 2/1) sand; few large distinct dark reddish brown (5YR 3/3) and grayish brown (10YR 2/2) mottles; massive; friable; extremely acid; gradual irregular boundary.

B3&Bh—38 to 47 inches; yellowish brown (10YR 5/4) sand; few large distinct dark reddish brown (5YR 2/2) spodic fragments and common medium faint brown (10YR 5/3) mottles; single grained; few fine roots; extremely acid; gradual wavy boundary.

C—47 to 80 inches; light brownish gray (10YR 6/2) sand; few medium faint grayish brown (10YR 5/2), pale brown (10YR 6/3), and yellowish brown (10YR 5/4) mottles; single grained; loose; few medium roots within a depth of 65 inches; few tongues about 1 1/2 inches wide of yellowish brown material extending into upper part of this horizon from the horizon above; very strongly acid.

Solum thickness is 50 inches or more. Soil reaction ranges from extremely acid to medium acid throughout. Soil texture is sand, fine sand, or coarse sand in all horizons but the A1 horizon, which is sand in all areas.

The A1 horizon has hue of 10YR, value of 3 to 6, and chroma of 1 or 2, or the color is neutral and the value is 3 to 5. The A2 horizon has hue of 10YR, value of 7 or 8, and chroma of 1 or 2 with or without streaks of darker material. Total thickness of the A horizon ranges from 30 to 50 inches. Some pedons have a transitional layer 1/2 inch to 2 inches thick between the A2 horizon and the Bh horizon.

The B2h horizon has hue of 5YR, value of 2 or 3, and chroma of 2 to 4; hue of 10YR, value of 2, and chroma of 1 or 2; or hue of 7.5YR, value of 3, and chroma of 2. In some places, less than 25 percent of the entire vertical thickness is weakly cemented. In others, a subhorizon 1 inch or more thick is weakly cemented in less than 50 percent of each pedon. Mottles and discontinuous streaks in shades of brown, red, and gray are in places. Thickness of the Bh horizon is 1 to 4 inches. In places, tongues of material from the A2 horizon extend through the B2h horizon into the B3 horizon.

The B3 part of the B3&Bh horizon has hue of 10YR or 7.5YR, value of 4 or 5, and chroma of 3 to 6. The Bh part has the same color range as the B2h part. It occurs as bodies of soft nodules. Few to common brownish mottles are in places.

The C horizon has hue of 10YR, value of 5 to 8, and chroma of 2 or less. Few to common mottles in shades of brown may occur in the C horizon. Tongues may extend into the C horizon from the B3&Bh horizon.

Deland series

The Deland series is a member of the sandy, siliceous, hyperthermic family of Grossarenic Entic Haplohumods.

It consists of nearly level and gently sloping, well drained, sandy soils that formed in very thick beds of marine, eolian, or fluvial sediments on the lower Coastal Plain. These soils are on broad, gently undulating sandhills. Slopes range from 0 to 5 percent.

Deland soils are geographically associated with Astatula, Daytona, and Tavares soils. Astatula soils occur in higher positions on the landscape than Deland soils. Daytona and Tavares soils occur in slightly lower positions. Astatula and Tavares soils have no A2 horizon and Bh horizon. Daytona soils are moderately well drained. They have a Bh horizon within a depth of 30 to 50 inches.

Typical pedon of Deland fine sand, on Rima Ridge off Indian Lake Road, about 0.75 mile southeast of Scoggins Lake and 100 yards southeast of corner of Old Clark Field; SW1/4SW1/4 sec. 24, R. 31 E., T. 15 S.

A1—0 to 4 inches; dark gray (10YR 4/1, crushed and rubbed) fine sand; single grained; loose; common fine roots; medium acid; abrupt smooth boundary.

A21—4 to 10 inches; light gray (10YR 7/1) fine sand; single grained; loose; few fine and medium roots; medium acid; clear wavy boundary.

A22—10 to 19 inches; light brownish gray (10YR 6/2) fine sand; single grained; loose; few fine roots; splotches and streaks, mostly along root channels, of dark brown (7.5YR 4/4) and dark yellowish brown (10YR 3/4); medium acid; gradual wavy boundary.

A23—19 to 36 inches; gray (10YR 6/1) fine sand; few fine distinct dark yellowish brown (10YR 4/4) mottles; single grained; loose; common medium roots; few brownish yellow stains along old root channels; slightly acid; gradual wavy boundary.

A24—36 to 55 inches; light brownish gray (10YR 6/2) fine sand; few fine faint light gray bodies of uncoated sand grains; single grained; loose; common dead roots and root channels; streaks of yellow (10YR 7/6) along root channels; slightly acid; gradual wavy boundary.

B1h—55 to 67 inches; dark brown (10YR 3/3) fine sand; single grained; loose; few medium dead roots and root channels; few yellowish red (5YR 5/8) stains along old root channels; common uncoated sand grains; medium acid; gradual irregular boundary.

B21h—67 to 78 inches; black (10YR 2/1) fine sand; moderate medium subangular blocky structure; friable; remnant of an old stump with many dead roots; many sand grains coated with colloidal organic matter; strongly acid; gradual wavy boundary.

B22h—78 to 94 inches; black (10YR 2/1) fine sand; massive; noncemented; sand grains well coated with colloidal organic matter; very strongly acid; gradual irregular boundary.

B23h—94 to 130 inches; black (10YR 2/1) fine sand; massive; strongly cemented; sand grains well coated with colloidal organic matter; strongly acid.

Solum thickness is more than 80 inches. Reaction ranges from very strongly acid to slightly acid in the A horizon, very strongly acid to medium acid in the B1h horizon, and extremely acid to strongly acid in the B2h horizon. Texture is either fine sand or sand in all horizons but the A1 horizon, which is fine sand in all areas.

The A1 horizon has hue of 10YR, value of 3 to 5, and chroma of 1 or 2, or the color is neutral and the value is 2 to 4. Mottles or streaks of a darker or lighter color are present in some pedons. Thickness ranges from 2 to 5 inches.

The A2 horizon has hue of 10YR, value of 5 to 7, and chroma of 1 to 4. Few to common, fine to coarse bodies or discontinuous streaks of light gray or white commonly occur in the lower part of the A2 horizon. These bodies do not indicate wetness, however; they are the color of the sand grains. Few fine to coarse reddish yellow, brown, dark yellowish brown, or grayish brown mottles and dark concretions (oxides) may occur, mostly along old root channels. Total thickness of the A horizon ranges from 50 to 75 inches.

The B1h horizon has hue of 10YR, value of 3, and chroma of 2 to 4 or hue of 7.5YR, value of 4, and chroma of 2 to 4. Few to common uncoated sand grains are in this horizon.

The B2h horizon has hue of 10YR, value of 2, and chroma of 1; hue of 5YR, value of 2 or 3, and chroma of 1 to 4; or the color is neutral and the value is 2. Few to common uncoated sand grains are in the B21h horizon, but sand grains are well coated with colloidal organic matter in the lower part of the Bh horizon.

EauGallie series

The EauGallie series is a member of the sandy, siliceous, hyperthermic family of Alfic Haplaquods. It consists of nearly level, poorly drained soils in broad flatwoods areas. These soils formed in thick beds of sandy and loamy marine sediments. Slopes range from 0 to 2 percent.

EauGallie soils are geographically associated with Farmton, Malabar, Pineda, Pinellas, and Wabasso soils. All of these soils occur in similar topographic positions. Farmton soils have an A horizon more than 30 inches thick. Malabar and Pineda soils have a Bir horizon above the argillic horizon. Pinellas soils have an Aca horizon. Wabasso soils have an argillic horizon at a depth of less than 40 inches.

Typical pedon of EauGallie fine sand, about 4 miles northeast of Osteen; SE1/4NE1/4 sec. 33, T. 18 S., R. 32 E.

A11—0 to 4 inches; black (10YR 2/1) fine sand; weak fine granular structure; very friable; few coarse and many medium and fine roots; extremely acid; clear smooth boundary.

A12—4 to 9 inches; very dark gray (10YR 3/1) fine sand; single grained; loose; many medium and fine roots; extremely acid; abrupt smooth boundary.

A2—9 to 21 inches; gray (10YR 5/1) fine sand; single grained; loose; many medium and common fine roots; extremely acid; abrupt smooth boundary.

B21h—21 to 27 inches; black (5YR 2/1) fine sand; strong medium granular structure; noncemented; firm, few medium and fine roots; sand grains well coated with colloidal organic matter; very strongly acid; gradual wavy boundary.

B22h—27 to 35 inches; dark reddish brown (5YR 3/3) fine sand; weak fine granular structure; friable; few fine roots; common fine and medium distinct very dark brown (10YR 2/2) noncemented fragments; sand grains well coated with colloidal organic matter; very strongly acid; gradual wavy boundary.

B3—35 to 39 inches; dark brown (10YR 3/3) fine sand; single grained; loose; sand grains well coated with colloidal organic matter; strongly acid; gradual wavy boundary.

A'2—39 to 52 inches; brown (10YR 5/3) fine sand; single grained; loose; many uncoated sand grains; medium acid; clear wavy boundary.

B'tg—52 to 61 inches; gray (5Y 5/1) sandy loam; weak medium subangular structure; friable; sand grains bridged and coated with clay; mildly alkaline; gradual wavy boundary.

C—61 to 65 inches; pale brown (10YR 6/3) fine sand; single grained; loose; mildly alkaline.

Solum thickness ranges from 46 to 80 inches. Combined thickness of the A, Bh, and A'2 horizons is more than 30 inches.

When rubbed, the A1 horizon has hue of 10YR, value of 2 to 4, and chroma of 1. Undisturbed, it is a mixture of clean sand grains and organic matter that has a salt-and-pepper appearance. It is 4 to 9 inches thick. The A2 horizon has hue of 10YR, value of 5 to 8, and chroma of 1 or 2 or the color is neutral and the value is 5. Thickness ranges from 8 to 24 inches. Texture is fine sand or sand.

The Bh horizon has hue of 5YR or 10YR, value of 2, and chroma of 1 or 2 or value of 3 and chroma of 2 or 3, or it has hue of 7.5YR, value of 3, and chroma of 2. Sand grains are coated with colloidal organic matter. Thickness of the Bh horizon ranges from 9 to 16 inches. Texture is fine sand or sand.

The B3 horizon has hue of 10YR, value of 3 to 5, and chroma of 3 or 4. Thickness ranges from 6 to 14 inches. Texture is fine sand or sand.

The A'2 horizon has hue of 10YR or 2.5Y, value of 5 or 6, and chroma of 1 to 3. Thickness is 0 to 20 inches. Texture is fine sand or sand.

The B'tg horizon has hue of 10YR, 2.5Y, or 5Y; value of 4 to 6; and chroma of 2 or less. It is sandy loam or sandy clay loam. Lenses and pockets of sand, loamy sand, or sandy loam range from none to common in this horizon. Thickness of the B'tg horizon ranges from 6 to 18 inches.

The C horizon has hue of 10YR, value of 5 or 6, and chroma of 1 to 3. Texture is sand, loamy sand, or loamy fine sand. Mottles in shades of yellow or brown are in some pedons.

Electra series

The Electra series is a member of the sandy, siliceous, hyperthermic family of Arenic Ultic Haplohumods. It consists of nearly level, somewhat poorly drained soils that have a rapidly permeable A horizon over a moderately permeable Bh horizon and a moderately slowly permeable Bt horizon. These soils formed in beds of marine sandy and loamy materials. They occur on low ridges in the flatwoods. Slopes are 0 to 2 percent.

Electra soils are geographically associated with Apopka, Daytona, Immokalee, Myakka, and Pomona soils. The Apopka soils occur in higher positions on the landscape than the Electra soils, are better drained, and do not have the Bh horizon characteristic of the Electra soils. The Daytona soils are in slightly higher positions, are moderately well drained, and have no argillic horizon. The Immokalee, Myakka, and Pomona soils are in lower positions and are poorly drained. In addition, the Immokalee and Myakka soils do not have an argillic horizon.

Typical pedon of Electra fine sand, west of Daytona Beach, southwest of I-95 and 11th Street overpass, about 0.6 miles on 11th Street, about 0.25 mile on jeep trail to powerline, southeast along powerline about 0.4 mile, east along powerline about 0.1 mile, southeast on jeep trail about 0.7 mile; about 800 feet east; SE1/4NW1/4 sec. 16, R. 32 E., T. 15 S.

A1—0 to 2 inches; dark gray (10YR 4/1) fine sand; single grained; loose; many fine and few medium roots; very strongly acid; clear smooth boundary.

A21—2 to 8 inches; light gray (10YR 7/1) fine sand; single grained; loose; many fine and few medium roots; strongly acid; gradual smooth boundary.

A22—8 to 35 inches; white (10YR 8/1) fine sand; few coarse faint gray to light gray (5Y 6/1) mottles and streaks; single grained; loose; many medium and common large roots between depths of 18 and 24 inches, common above and few below; slightly acid; abrupt irregular boundary.

B2h—35 to 41 inches; dark reddish brown (5YR 2/2) fine sand; weak coarse subangular blocky structure; noncemented; friable; sand grains well coated with organic matter; common fine faint dark grayish brown (10YR 4/2) streaks; extremely acid; clear irregular boundary.

B3&Bh—41 to 52 inches; brown (7.5YR 4/4) fine sand; single grained; loose; common uncoated sand grains; common medium distinct dark reddish brown

(5YR 2/2) fragments; common coarse distinct yellowish brown (10YR 5/4) streaks; very strongly acid; clear irregular boundary.

A'2—52 to 57 inches; very pale brown (10YR 7/4) fine sand; common medium and coarse faint pale brown (10YR 6/3) mottles; single grained; loose; few fine roots; strongly acid; abrupt wavy boundary.

B'2tg—57 to 70 inches; light brownish gray (10YR 6/2) sandy clay loam; many fine and medium distinct strong brown (7.5YR 5/6) and common fine distinct yellowish red (5YR 4/8) mottles; weak coarse subangular blocky structure; friable; common fine roots; upper 1/2 inch to 1 inch is a fine sandy loam transitional layer; common fine pores; sand grains coated with clay; very strongly acid; clear wavy boundary.

B'3g—70 to 78 inches; light brownish gray (10YR 6/2) fine sandy loam with many lenses and pockets of loamy sand; common coarse faint brown (10YR 5/3) and few fine distinct yellowish red (5YR 4/8) mottles; massive; friable; few fine roots; very strongly acid; clear wavy boundary.

C'g—78 to 92 inches; gray to light gray (10YR 6/1) loamy fine sand; common coarse faint light brownish gray (10YR 6/2) mottles; single grained; friable; few fine decaying roots; few medium yellowish brown (10YR 5/8) vertical streaks; very strongly acid.

Solum thickness is 72 inches or more. Soil reaction ranges from extremely acid to slightly acid in the A2 horizon and from extremely acid to strongly acid in all the other horizons.

The A1 horizon has hue of 10YR, value of 4 to 6, and chroma of 1. Thickness is 2 to 6 inches. The A2 horizon has hue of 10YR, value of 5 to 8, and chroma of 1 or 2. Streaks of darker colors are few to common. Texture is sand or fine sand. A thin transitional layer 1/2 inch to 2 inches thick is between the A2 horizon and the Bh horizon in some pedons. Total thickness of the A horizon is 30 to 50 inches.

The Bh horizon has hue of 5YR, value of 2 or 3, and chroma of 1 to 3; hue of 7.5YR, value of 3, and chroma of 2; or hue of 10YR, value of 2, and chroma of 1 or 2. Texture is sand or fine sand. Thickness ranges from 4 to 16 inches. In many places there are few to common black to brown mottles or lighter colored streaks along root channels. Sand grains are coated with colloidal organic matter. Some pedons have a B3&Bh horizon. The B3 part has hue of 10YR, value of 3 or 4, and chroma of 3 or hue of 7.5YR, value of 4, and chroma of 2 to 4. The Bh part has the same color range as the Bh horizon. The B3&Bh horizon ranges from 0 to 11 inches in thickness. Texture is sand or fine sand.

The A'2 horizon has hue of 10YR, value of 5 to 7, and chroma of 2 to 4. Texture is sand or fine sand. Thickness ranges from 3 to 10 inches.

The total thickness of the horizons above the B'tg horizon is more than 40 inches.

The B'tg horizon has hue of 10YR, value of 5 or 6, and chroma of 1 or 2 or value of 7 and chroma of 3 or 4; or it has hue of 2.5Y, value of 6, and chroma of 2 or value of 7 and chroma of 4 and is mottled in shades of gray, brown, and yellow. Texture is fine sandy loam or sandy clay loam. Thickness ranges from 6 to 18 inches. Some pedons have lenses or streaks of sand, fine sand, or loamy fine sand. Some have a B'3g horizon that has hue of 10YR, value of 5 or 6, and chroma of 1 or 2 and has mottles of higher chroma. Texture is fine sandy loam or loamy fine sand. Lenses or pockets of fine sand to sandy clay loam are in some pedons. Thickness ranges from 0 to 10 inches.

The C'g horizon has hue of 10YR, value of 6 or 7, and chroma of 1 and is mottled and streaked in shades of gray and brown. Texture is sand, fine sand, or loamy fine sand.

Farmton series

The Farmton series is a member of the sandy, siliceous, hyperthermic family of Arenic Haplaquods. It consists of nearly level, poorly drained sandy soils. These soils formed in beds of marine sandy and loamy material. They occur in broad areas of the flatwoods. Slopes are less than 2 percent. Under natural conditions these soils are saturated within 10 inches of the surface late in summer and early in fall.

Farmton soils are geographically associated with Basinger, EauGallie, Immokalee, Myakka, and Pomona soils. All of these soils occur in similar topographic positions. Basinger, Immokalee, and Myakka soils do not have an argillic horizon. The EauGallie and Pomona soils have a spodic horizon above a depth of 30 inches.

Typical pedon of Farmton fine sand west of Daytona Beach, about 1 1/2 miles northwest of junction of I-95 and U.S. Highway 92, SW1/4NE1/4 sec. 21, T. 15 S., R. 32 E.

Ap—0 to 7 inches; very dark gray (10YR 3/1, rubbed) fine sand; weak fine granular structure; very friable; many fine and few medium roots; mixture of light gray sand grains and black organic matter gives salt-and-pepper appearance; very strongly acid; clear smooth boundary.

A21—7 to 12 inches; light gray (10YR 6/1) fine sand; single grained; loose; common fine and few medium roots; common medium vertical streaks of dark gray fine sand along root channels; very strongly acid; gradual wavy boundary.

A22—12 to 34 inches; light gray (10YR 7/2) fine sand; single grained; loose; few medium roots; common medium vertical streaks of dark gray fine sand along root channels; sand grains are uncoated; very strongly acid; abrupt wavy boundary.

B21h—34 to 40 inches; black (10YR 2/1) fine sand; weak fine granular structure; firm; noncemented; many medium roots; sand grains well coated with colloidal organic matter; very strongly acid; gradual wavy boundary.

B22h—40 to 45 inches; dark reddish brown (5YR 3/4) fine sand; weak fine granular structure; firm; noncemented; few medium roots; most sand grains coated with colloidal organic matter, but a few are uncoated; strongly acid; gradual wavy boundary.

B3—45 to 50 inches; brown (7.5YR 4/4) fine sand; single grained; loose; common uncoated sand grains; very strongly acid; clear wavy boundary.

B'21tg—50 to 56 inches; grayish brown (10YR 5/2) sandy clay loam; weak fine subangular blocky structure; friable; few fine roots; sand grains coated and bridged with clay; very strongly acid; gradual wavy boundary.

B'22tg—56 to 80 inches; grayish brown (10YR 5/2) fine sandy loam; moderate medium subangular blocky structure; very friable; few fine distinct reddish yellow (5YR 6/8) streaks along root channels; strongly acid.

Solum thickness is 60 inches or more. Soil reaction ranges from extremely acid to strongly acid throughout.

The A1 or Ap horizon has hue of 10YR, value of 2 to 4, and chroma of 1. Undisturbed, it is light gray fine sand grains mixed with black organic matter. The A2 horizon has hue of 10YR or 2.5Y, value of 5 to 8, and chroma of 1 or 2. This horizon has vertical streaks or mottles in shades of black or gray. The texture is fine sand or sand. There is a thin transitional layer between the A2 and Bh horizons in some pedons.

The Bh horizon has hue of 5YR, value of 2 or 3, and chroma of 1 to 4; hue of 7.5YR, value of 3, and chroma of 2; hue of 10YR, value of 2 or 3, and chroma of 1 to 3; or the color is neutral and the value is 2. Texture is sand or fine sand; the sand grains are coated with colloidal organic matter. Thickness is 8 to 18 inches.

The B3 horizon has hue of 7.5YR or 10YR, value of 3 to 5, and chroma of 3 or 4. Thickness ranges from 3 to 8 inches. Texture is sand or fine sand. Uncoated sand grains are common in this horizon.

An A'2 horizon is present in some pedons. It has hue of 10YR or 2.5Y, value 5 to 7, and chroma of 1 or 2. This horizon is 0 to 10 inches thick. Texture is sand or fine sand.

Depth to the B'2tg horizon is more than 40 inches and is commonly more than 50 inches. The B'2tg has hue of 10YR or 2.5Y, value of 4 to 6, and chroma of 1 or 2. This horizon is 6 to more than 30 inches thick. Texture is fine sandy loam, sandy loam, or sandy clay loam. Mottles are in shades of gray, brown, yellow, or red.

In some pedons a C horizon is present at a depth of less than 80 inches. It has hue of 10YR or 2.5Y, value of 6 or 7, and chroma of 2 or less. Texture is loamy sand or sand. Some pedons are stratified with sand, fine sand, loamy sand, and sandy loam.

Gator series

The Gator series is a member of the loamy, siliceous, euic hyperthermic family of Terric Medisaprists. It consists of nearly level, very poorly drained organic soils that formed in moderately thick beds of hydrophytic nonwoody plant remains underlain by loamy and sandy material. These soils occur in freshwater swamps and marshes and on flood plains of creeks, rivers, and lakes. Slopes are less than 1 percent.

Gator soils are geographically associated with Holopaw, Riviera, Tequesta, and Terra Ceia soils. The associated soils occur out of the flood plain in swamps and marshes. Holopaw, Riviera, and Tequesta soils are mineral soils. Tequesta soils have a histic epipedon. Terra Ceia soils do not have mineral horizons within the control section.

Typical pedon of Gator muck, about 4 miles west of DeLeon Springs in Lake Woodruff National Wildlife Refuge, about 1.5 miles east of Lake Woodruff and 0.5 mile southwest of Spring Garden Lake in cordgrass marsh:

Oa—0 to 34 inches; black (5YR 2/1) sapric material (muck); about 10 percent fiber, less than 5 percent rubbed; moderate medium granular structure; friable; many fine roots; slightly acid in 0.01M calcium chloride; gradual wavy boundary.

IIC1— 34 to 46 inches; very dark gray (10YR 3/1) sandy clay loam; massive; slightly sticky and plastic; slightly acid; gradual wavy boundary.

IIC2—46 to 52 inches; dark grayish brown (10YR 4/2) stratified loamy fine sand, fine sandy loam, and fine sand; massive; nonsticky, nonplastic; slightly acid; gradual wavy boundary.

IIIC3—52 to 58 inches; light gray (10YR 7/2) fine sand; single grained; loose; slightly acid.

Reaction in the Oa horizon is 4.5 to 6.0 or more in 0.01M calcium chloride or medium acid to moderately alkaline by Hellige-Truog method. Reaction in the IIC and IIIC horizons is slightly acid to moderately alkaline.

The Oa horizon has hue of 10YR, 5YR, or neutral color, and it has value of 2, and chroma of 2 or less; or it has hue of 5YR, value of 2 or 3, and chroma of 2 or less. Sodium pyrophosphate extract colors have hue of 10YR, value of 2 to 4, and chroma of 1 or 2 or value of 5 and chroma of 3. Total thickness of the Oa horizon is 16 to 40 inches.

The IIC horizon has hue of 10YR, value of 2 to 4, and chroma of 1. Texture is sandy clay loam, sandy loam, or fine sandy loam. The organic matter content of the IIC horizon is less than 20 percent. In places, the lower part of the IIC horizon is stratified loamy fine sand, fine sandy loam, and fine sand. The IIC1 horizon is 12 to 35 inches thick. The IIC2 horizon is 12 to 24 inches thick. In some pedons, there is 4 to 10 inches of loamy fine sand just below the Oa horizon. If present, this layer is underlain by a layer of sandy clay loam thick enough to qualify for a loamy family.

The IIIC horizon has hue of 10YR, value of 4 to 7, and chroma of 2 or less or hue of 2.5Y, value of 5 or 6, and chroma of 2 or less. Texture is fine sand or sand.

Holopaw series

The Holopaw series is a member of the loamy, siliceous, hyperthermic family of Grossarenic Ochraqualfs. It consists of poorly drained, nearly level soils on broad, low lying flats and depressions. These soils formed in thick sandy and loamy marine deposits.

Holopaw soils are geographically associated with Gator, Malabar, Pineda, Pomona, and Riviera soils. All of these soils occur in similar topographic positions. Gator soils also occur on flood plains. Gator soils are organic soils that have underlying mineral horizons. Malabar and Pineda soils have a Bir horizon. Pomona soils have a Bh horizon. In Riviera soils the Bt horizon is at a depth of less than 20 inches.

Typical pedon of Holopaw sand, about 1.55 miles north of the junction of Tomoka Farms Road and Taylor Road, east about 0.5 mile along photo north match line; NW1/4NW1/4 sec. 24, T. 16 S., R. 32 E.

A11—0 to 5 inches; black (10YR 2/1) sand; weak medium granular structure; very friable; common fine roots; medium acid; gradual wavy boundary.

A12—5 to 11 inches; dark gray (10YR 4/1) sand; many fine and medium distinct gray (10YR 5/1, 6/1) mottles and streaks; single grained; loose; few fine roots; medium acid; clear wavy boundary.

A21—11 to 46 inches; grayish brown (10YR 5/2) sand; few fine distinct yellowish brown (10YR 5/6) mottles; single grained; loose; few fine roots; slightly acid; gradual wavy boundary.

A22—46 to 55 inches; gray (10YR 6/1) sand; single grained; loose; slightly acid; gradual wavy boundary.

B2tg—55 to 63 inches; gray (10YR 6/1) sandy clay loam; few coarse faint gray (10YR 5/1) and few fine distinct dark yellowish brown (10YR 4/4) mottles; weak coarse subangular blocky structure; friable; sand grains coated and bridged with clay; upper 1/2 inch to 2 inches is a sandy loam transitional layer; neutral; gradual wavy boundary.

Cg—63 to 70 inches; gray (10YR 6/1) lenses and pockets of sand, loamy sand, and sandy loam; massive; friable; neutral.

The thickness of the solum ranges from 50 to 80 inches. Reaction ranges from strongly acid to neutral in the A horizon and from slightly acid to moderately alkaline in the Btg and C horizons.

The A1 horizon has hue of 10YR, value of 2 to 4, and chroma of 2 or less. Thickness is 6 to 12 inches. Where the value is less than 4, the thickness is less than 10 inches. The A2 horizon has hue of 10YR, value of 4 to 7, and chroma of 3 or less and is mottled in shades of yellow and brown.

The Btg horizon has hue of 10YR or 2.5Y, value of 5 to 7, and chroma of 2 or less and is mottled in shades of brown or yellow. It is sandy loam or sandy clay loam and has discontinuous strata of sand. Thickness is 7 to 18 inches.

The C horizon has hue of 10YR or neutral color, value of 5 to 7, and chroma of 2 or less. It is loamy sand or sand.

Hontoon series

The Hontoon series is a member of the dysic, hyperthermic family of Typic Medisaprists. It consists of nearly level, very poorly drained organic soils that are highly decomposed organic material to a depth of more than 52 inches. These soils formed in thick beds of hydrophytic nonwoody plant remains. They occur in freshwater swamps and marshes. Slopes are less than 1 percent. In most years these soils are completely saturated except during extended dry periods.

Hontoon soils are geographically associated with Placid, Samsula, and St. Johns soils. Placid and St. Johns soils occur in adjacent low lying areas. They are mineral soils. Samsula soils occur in topographic positions similar to those of Hontoon soils. They have mineral horizons below the organic material.

Typical pedon of Hontoon mucky peat, about 2 miles east of Pierson; SW1/4NW1/4 sec. 5, T. 15 S., R. 28 E.

Oe—0 to 5 inches; dark reddish brown (5YR 3/2) mucky peat; about 80 percent fiber, 60 percent rubbed; massive; friable; sodium pyrophosphate extract color is very pale brown (10YR 7/3); extremely acid; clear wavy boundary.

Oa1—5 to 14 inches; black (5YR 2/1, unrubbed and rubbed), well decomposed sapric material; about 20 percent fiber, 3 percent rubbed; weak medium subangular blocky structure; friable; sodium pyrophosphate extract color is brown (10YR 5/3); extremely acid; gradual wavy boundary.

Oa2—14 to 60 inches; dark reddish brown (5YR 2/2, unrubbed and rubbed) well decomposed sapric material; about 22 percent fiber unrubbed, 2 percent rubbed; weak coarse subangular blocky structure; friable; sodium pyrophosphate extract color is dark reddish brown (10YR 3/2); extremely acid; clear wavy boundary.

Oa3—60 to 65 inches; black (N 2/0) highly decomposed organic matter (sapric), about 72 percent sand; about 2 percent fiber unrubbed, none rubbed; massive; friable; sodium pyrophosphate extract color is dark grayish brown (10YR 4/2); very strongly acid.

Organic material extends to depths of more than 52 inches. Soil reaction is less than 4.5 in 0.01M calcium chloride and ranges from 4.5 to 5.5 by Hellige-Truog method. Mineral content of the Oa horizon ranges from about 5 to 30 percent within a depth of 16 to 51 inches and ranges to 75 percent below that depth. The mineral material is sand.

The Oe horizon has hue of 5YR, value of 3, and chroma of 2, or it has hue of 10YR or neutral color, value of 2, and chroma of 1 or less. It is 33 to more than 66 percent fiber, unrubbed, and an estimated 16 to 60 percent fiber, rubbed. Sodium pyrophosphate extract colors have hue of 10YR, value of 5, and chroma of 1, value of 6 and chroma of 1 or 2, value of 7 and chroma of 3, or value of 8 and chroma of 4. Thickness of the Oe horizon is 0 to 10 inches. Texture is mucky peat.

The Oa horizon has hue of 5YR, value of 2 or 3, and chroma of 3 or less or hue of 10YR, value of 2, and chroma of 1. Fiber content is less than 33 percent unrubbed. If the fiber content is less than 16 percent of the volume after rubbing, it is more than 33 percent unrubbed. Sodium pyrophosphate extract color has hue of 10YR, value of 2 to 4, and chroma of 4 or less, value of 5 and chroma of 2 to 6, value of 6 and chroma of 3 to 6, or value of 7 and chroma of 4 to 6. Where the Oa3 horizon is absent, the Oa2 horizon is underlain by a IIC horizon of black to light gray sand or loamy sand.

Immokalee series

The Immokalee series is a member of the sandy, siliceous, hyperthermic family of Arenic Haplaquods. It consists of nearly level, poorly drained, moderately permeable to moderately rapidly permeable soils that formed in thick beds of sandy marine sediments on the lower Coastal Plain. These soils are on broad, nearly level marine terraces, in low areas within sand ridges, and in slightly elevated areas between ponds and sloughs, and in depressions. They are saturated within 10 inches of the surface during rainy seasons. Depressions are seasonally ponded. Slopes are dominantly less than 2 percent.

Immokalee soils are geographically associated with Basinger, Daytona, Myakka, Pompano, Satellite, and Smyrna soils. Basinger and Pompano soils are in depressions and drainageways and do not have a Bh horizon. Myakka and Smyrna soils occur in positions similar to those of Immokalee soils but have a Bh horizon beginning at a depth of less than 30 inches. Daytona and Satellite soils are in slightly higher, convex positions and on slopes and have better drainage than Immokalee soils.

Typical pedon of Immokalee sand, 2.6 miles south of junction of Florida Highways 44 and 415, on 415 to Rasley Road, southeast 0.6 mile, 50 feet south:

A11—0 to 5 inches; black (10YR 2/1) sand; weak fine granular structure; loose; many fine and common medium roots; very strongly acid; gradual smooth boundary.

A12—5 to 10 inches; dark gray (10YR 4/1) sand; common medium gray (10YR 5/1) mottles; single grained; loose; many fine and common medium roots; very strongly acid; gradual smooth boundary.

A21—10 to 16 inches; gray (10YR 5/1) sand; single grained; loose; many fine and few medium roots; very strongly acid; gradual smooth boundary.

A22—16 to 34 inches; light gray (10YR 6/1) sand; single grained; loose; few fine and medium roots; common medium distinct very dark gray (10YR 3/1) vertical streaks along root channels; very strongly acid; abrupt wavy boundary.

B21h—34 to 39 inches; dark reddish brown (5YR 2/2) sand; common coarse distinct dark brown (10YR 3/3) mottles; weak coarse subangular blocky structure; firm; noncemented; many fine roots; common medium distinct dark grayish brown (10YR 4/2) streaks; sand grains coated with colloidal organic matter, many uncoated; very strongly acid; clear broken boundary.

B22h—39 to 43 inches; black (5YR 2/1) sand; weak, coarse subangular blocky structure; firm; noncemented; common fine roots; sand grains coated with colloidal organic matter; very strongly acid; clear irregular boundary.

C—43 to 85 inches; grayish brown (10YR 5/2) sand; common medium and fine gray (10YR 6/1) to light gray (10YR 7/1) mottles; single grained; loose; few fine roots; common medium distinct very dark gray (10YR 3/1) streaks increasing to many with increasing depth; very strongly acid.

The soil is sand or fine sand in all horizons but the A1 horizon to a depth of 80 inches or more; the A1 horizon is sand in all areas. Reaction ranges from strongly acid to very strongly acid in all horizons except where the soil has been limed or irrigated with alkaline water.

The A1 horizon is a mixture of light gray and black sand that has a salt-and-pepper appearance. When crushed, it has hue of 10YR or 2.5Y, value of 2, and chroma of 1 or less or value of 3 or 4 and chroma of 2 or less. Thickness ranges from 2 to 10 inches.

The A2 horizon has hue of 10YR or 2.5Y, value of 5 or more, and chroma of 2 or less. In many places, vertical streaks of material from the A1 horizon extend into the A2 horizon. A transitional A2&Bh horizon 1/2 inch to 2 inches thick occurs in many pedons. Total thickness of the A horizon is 30 to 50 inches.

The Bh horizon is noncemented. Most sand grains are coated with colloidal organic matter. This horizon is friable to firm. It has hue of 5YR, 7.5YR, or 10YR, value of 2, and chroma of 2 or less or hue of 5YR or 7.5YR, value of 3, and chroma of 2 to 4. In many places there are dark brown to black mottles and lighter colored streaks in the Bh horizon. Thickness ranges from 4 to 24 inches.

Some pedons have a B3 horizon that has hue of 7.5YR, value of 4, and chroma of 2 to 4 or hue of 10YR, value of 3, and chroma of 4 or value of 4 and chroma of 3 or 4. In places it contains noncemented fragments or mottles that have the color of the Bh horizon.

The C horizon has hue of 10YR, value of 4 to 7, and chroma of 3 or less. Mottles in shades of brown, yellow, or gray occur in some pedons.

Malabar series

The Malabar series is a member of the loamy, siliceous, hyperthermic family of Grossarenic Ochraqualfs. It consists of nearly level, poorly drained soils that formed in beds of marine sandy and loamy material influenced by underlying alkaline material. These soils occur in broad, low flats and in depressions along the lower Coastal Plain. Slope is less than 1 percent. Under natural conditions these soils are saturated to within 10 inches of the surface in summer and in fall.

Malabar soils are geographically associated with Basinger, EauGallie, Pineda, Pomona, Riviera, and Wabasso soils. All of these soils occur in similar topographic positions. Basinger soils have an A&Bh horizon and do not have an argillic horizon. EauGallie, Pomona, Riviera, and Wabasso soils do not have a Bh horizon or a Bir horizon. Pineda soils have an argillic horizon within a depth of 40 inches.

Typical pedon of Malabar fine sand, about 7 miles east of Osteen on Maytown road, south about 1 mile on graded road, 25 feet on west side of road; NW1/4NW1/4 sec. 20, T. 19 S., R. 33 E.

A1—0 to 2 inches; black (10YR 2/1) fine sand; weak fine granular structure; very friable; many fine and medium roots; common uncoated sand grains; very strongly acid; abrupt wavy boundary.

A21—2 to 9 inches; light brownish gray (10YR 6/2, rubbed) fine sand; single grained; loose; many very fine and common fine roots; very strongly acid; clear smooth boundary.

A22—9 to 15 inches; light gray (10YR 7/1) fine sand; common fine faint very pale brown (10YR 7/3), yellowish brown (10YR 5/6), and grayish brown (10YR 5/2) mottles; single grained; loose; few medium roots; strongly acid; gradual irregular boundary.

B2ir—15 to 24 inches; strong brown (7.5YR 5/8) fine sand; common coarse faint brownish yellow (10YR 6/8) mottles; single grained; loose; few medium roots; about 10 percent of the sand grains are uncoated; light gray vertical tongues from the A22 horizon extend through horizon; coatings around old root channels are strong brown (7.5YR 5/8) with dark brown (7.5YR 4/4, 3/2) broken faces; very strongly acid; gradual wavy boundary.

B3ir—24 to 32 inches; mixed yellowish brown (10YR 5/6), light yellowish brown (10YR 6/4), and brownish yellow (10YR 6/6) fine sand; few medium distinct very dark gray (10YR 3/1) mottles and few coarse faint light olive brown (5Y 5/6) mottles; single grained; loose; few medium roots; about 30 percent of the sand grains are uncoated; very strongly acid; gradual wavy boundary.

A'2—32 to 42 inches; gray (10YR 6/1) fine sand; common coarse faint gray (10YR 5/1) mottles; single grained; loose; many fine and medium roots; neutral; abrupt smooth boundary.

B'21tg—42 to 53 inches; gray (10YR 5/1) fine sandy loam with pockets of sandy clay loam; few medium faint greenish gray (5GY 5/1) mottles; moderate medium subangular blocky structure; friable; common medium roots and old root channels; streaks of olive brown (2.5Y 4/4) fine sand follow along old root channels; neutral; gradual smooth boundary.

B'22tg—53 to 80 inches; gray (10YR 5/1) fine sandy loam with pockets of fine sand; common medium faint greenish gray (5GY 5/1; 5Y 6/1) and few fine faint white (10YR 8/1) mottles; moderate medium subangular blocky structure; friable; common medium roots and root pores; neutral.

Solum thickness is 46 inches or more. Soil reaction ranges from medium acid to mildly alkaline in all horizons.

The A1 horizon has hue of 10YR, value ranging from 2 to 4, and chroma of 1 or 2 or hue of 2.5Y, value of 3 or 4, and chroma of 2. Where the value is 3 or less, this horizon is less than 8 inches thick. The A2 horizon has hue of 10YR, value of 5 or 6, and chroma of 2, value of 6 and chroma of 3, or value of 7 or 8 and chroma of 3 or 4; or it has hue of 2.5Y, value of 5 or 6, and chroma of 2. It has mottles in shades of yellow, brown, or gray. Few to common mottles and streaks of darker or lighter colors are in many places in the A2 horizon. Texture of the A2 horizon is sand or fine sand. Thickness of the A horizon ranges from 12 to 26 inches.

The Bir horizon has hue of 10YR, value of 6, and chroma of 3 or value of 5 to 7 and chroma of 4, 6, or 8; or it has hue of 7.5YR, value of 5, and chroma of 6 or 8. In places mottles of lighter or darker chroma are in this horizon. Texture of the Bir horizon is sand or fine sand. Thickness of the Bir horizon ranges from 14 to 26 inches.

The A'2 horizon has hue of 10YR, value of 5 to 7, and chroma of 1 or value of 6 or 7 and chroma of 2; or it has hue of 2.5Y, value of 6, and chroma of 2; or hue of 5Y, value of 7, and chroma of 1 or 2. Few to common mottles in shades of brown, yellow, or gray are in the A'2 horizon. Texture is sand or fine sand. Thickness of the A'2 is 4 to 12 inches.

Total thickness of all the horizons above the B'tg horizon is 40 inches or more.

The B'tg horizon has hue of 10YR, value of 4 to 7, and chroma of 1; or it has hue of 2.5Y and value of 6 or 7 or hue of 5Y, value of 5 or 7, and chroma of 1 or 2. It is mottled in shades of brown, gray, and yellow and contains few to common pockets or lenses of finer or coarser textured material. Texture of the B'tg horizon is sandy loam, fine sandy loam or sandy clay loam.

Some pedons have a C horizon in hue of 10YR, value of 5 to 7, and chroma of 1 or 2; hue of 2.5Y, value of 5 to 7, and chroma of 2; or hue of 5Y, value of 5, and chroma of 1. Texture is sand or fine sand with pockets of loamy sand or sandy loam. Shell fragments are present in some pedons. In many places the lower part of the C horizon is slightly compacted.

Myakka series

The Myakka series is a member of the sandy, siliceous, hyperthermic family of Aeric Haplaquods. It consists of poorly drained sandy soils that have a water table at or near the surface during the summer rainy season. Depressional areas are seasonally ponded. These soils are in flatwoods. Slopes range from 0 to 2 percent.

Myakka soils are geographically associated with the Basinger, Immokalee, Pomona, Smyrna, and St. Johns soils. The Basinger soils are in lower topographic positions than Myakka soils. They do not have a spodic horizon. Immokalee, Pomona, and Smyrna are in topographic positions similar to those of Myakka soils. Immokalee soils have a Bh horizon within a depth of 30 to 50 inches. Pomona soils have an argillic horizon below the spodic horizon. Smyrna soils have a Bh horizon within a depth of 20 inches. St. Johns soils are in slightly lower positions. They have an umbric epipedon.

Typical pedon of Myakka fine sand, 3 miles west of junction of State Routes 11 and 40, 0.5 mile north on tram road; NW1/4NE1/4 sec. 2, T. 14 S., R. 29 E.

A1—0 to 5 inches; black (10YR 2/1, crushed) fine sand; single grained; loose; matted with many fine and medium roots; very strongly acid; abrupt smooth boundary.

A2—5 to 27 inches; light brownish gray (10YR 6/2) fine sand; single grained; loose; common fine and medium roots; common fine faint vertical streaks of grayish brown and dark gray along root channels; very strongly acid; abrupt irregular boundary; tongues of material from this horizon that are as much as 18 inches long and 6 inches wide extend into the horizons below.

B21h—27 to 31 inches; black (10YR 2/1) loamy fine sand; moderate medium subangular blocky structure; noncemented; many fine and medium roots; sand grains coated with colloidal organic stains; contains clusters of uncoated sand grains; very strongly acid; gradual wavy boundary.

B22h—31 to 43 inches; dark brown (10YR 3/3) fine sand; common fine faint mottles of dark brown (7.5YR 4/4) and dark reddish brown (5YR 3/4); weak medium subangular blocky structure; noncemented; common to few fine roots; sand grains coated with colloidal organic matter; common discontinuous streaks and spots of dark reddish brown (5YR 2/2); strongly acid; gradual wavy boundary.

B3&Bh—43 to 78 inches; yellowish brown (10YR 5/4) fine sand; common medium faint mottles of brown (10YR 5/3) and dark yellowish brown (10YR 4/4); single grained; loose; few roots; discontinuous horizontally oriented dark reddish brown (5YR 2/2) layer that is as much as 6 inches thick; strongly acid; gradual wavy boundary.

B'2h—78 to 90 inches; dark reddish brown (5YR 2/2) fine sand; massive; noncemented, few fine roots; common discontinuous streaks and spots of dark yellowish brown (10YR 4/4); strongly acid.

The thickness of the solum is more than 40 inches. Reaction ranges from extremely acid to medium acid.

The A1 horizon has hue of 10YR, value of 2 to 4, and chroma of 1. It is 4 to 8 inches thick. The A2 horizon has hue of 10YR or neutral color, value of 5 to 8, and chroma of 2 or less. Texture is fine sand or sand. Total thickness of the A horizon ranges from 20 to 30 inches.

The Bh horizon has hue of 5YR, value of 2 or 3, and chroma of 1 to 3; hue of 7.5YR, value of 3, and chroma of 2; or hue of 10YR, value of 2, and chroma of 1 or 2 or value of 3 and chroma of 3. The Bh horizon is noncemented, but in some pedons it contains discontinuous strata or pockets that are weakly to moderately cemented. In some places, the Bh horizon occurs as a nearly horizontal horizon with an abrupt smooth upper boundary. In others, it is convoluted and has vertical to diagonal streaks or tongues of material from the A2 horizon. Texture is fine sand, loamy fine sand, or sand. Thickness is 8 to 20 inches.

The B3 part of the B3&Bh horizon has hue of 10YR, value of 3 to 5, and chroma of 2 to 4. The Bh part has the color range of the Bh horizon. Texture of the B3&Bh horizon is fine sand or sand. Thickness is 0 to 36 inches.

In some places, there is a sandy C horizon. Where present, it has hue of 10YR, value of 4 to 7, and chroma of 1 to 4.

The B'2h is not present in all places. In some places it is below 80 inches. It is similar to the Bh horizon in color and texture.

Myakka variant

The Myakka variant is a member of the sandy, siliceous, hyperthermic family of Aeric Haplaquods. It consists of nearly level, poorly drained soils that formed in beds of marine sandy material underlain by layered beds of sand and shell fragments. These soils occur in low broad swells in flatwoods near the coast and in slightly higher places in hydric hammocks. Under natural conditions the water table fluctuates to within 10 inches of the surface during the rainy season from June to November. Slope is dominantly less than 1 percent, but ranges from 0 to 2 percent.

Myakka variant soils are geographically associated with the Bradenton, Chobee, Farmton, Riviera, and Wabasso soils. All of these soils occur in similar topographic positions. Bradenton soils do not have a spodic horizon. They have an argillic horizon overlying discontinuous limestone. Chobee soils have a mollic epipedon. Wabasso soils have an argillic horizon below a depth of 30 inches, and Farmton soils have an argillic horizon below 40 inches.

Typical pedon of Myakka Variant fine sand, about 1.3 miles west of U.S. Highway 1 and north of State Route 40A, in a wooded area in front of the Turnbull Firehouse in Mission City; SE1/4 sec. 13, T. 17 S., R. 33 E.

A1—0 to 7 inches; dark gray (10YR 4/1) fine sand; single grained; loose; common fine and medium roots; strongly acid; clear smooth boundary.

A2—7 to 28 inches; light gray (10YR 6/1) fine sand; single grained; loose; common fine roots; strongly acid; abrupt smooth boundary.

B2h—28 to 40 inches; black (10YR 2/1) fine sand; weak medium subangular blocky structure; noncemented; many sand grains coated with organic matter; few fine and medium roots; very strongly acid; clear wavy boundary.

B3—40 to 45 inches; dark brown (10YR 4/3) fine sand; single grained; loose; neutral; gradual wavy boundary.

IIC1—45 to 47 inches; brownish yellow (10YR 6/8) fine sand and shell fragments; single grained; loose; neutral; clear wavy boundary.

IIC2—47 to 80 inches; white (10YR 7/2) fine to medium shell fragments, less than 15 percent sand by volume; single grained; loose; mildly alkaline.

Solum thickness ranges from 40 to 60 inches. Reaction ranges from very strongly acid to medium acid in the A horizon and the Bh horizon, from slightly acid to neutral in the B3 horizon, and from neutral to mildly alkaline in the IIC horizon.

The A1 horizon has hue of 10YR, value of 2 through 4, and chroma of 1 or less. It is 4 to 8 inches thick. The A2 horizon has hue of 10YR, value of 6 to 8, and chroma of 1 or 2. Texture is sand or fine sand. Total thickness of the A horizon ranges from 20 to 30 inches.

The Bh horizon has hue of 5YR, value of 2 or 3, and chroma of 1 to 3, or it has hue of 10YR, value of 2, and chroma of 1 or 2 or value of 3 and chroma of 3. The texture is sand or fine sand. Thickness ranges from 8 to 20 inches.

The B3 horizon has hue of 10YR, value of 4 or 5, and chroma of 3 or 4 or hue of 7.5YR, value of 4 or 5, and chroma of 4. Texture is sand or fine sand. Thickness ranges from 5 to 15 inches.

The IIC horizon has hue of 10YR, value of 6 to 8, and chroma of 1 or 2. Texture is a mixture of sand and shell fragments. In places the material is in layers, some predominantly of sand and some mostly of shell fragments.

Orsino series

The Orsino series is a member of the hyperthermic, uncoated family of Spodic Quartzipsamments. It consists of nearly level and gently sloping, moderately well drained sandy soils that formed in sandy marine or eolian deposits. These soils occur on low, flat ridges and in transitional areas between higher ridges and more poorly drained soils. The water table is 40 to 60 inches below the surface in wet seasons; it recedes to below 60 inches in dry seasons. Slopes range from 0 to 5 percent.

Orsino soils are geographically associated with Astatula, Cassia, Daytona, Paola, and Tavares soils. Astatula and Paola soils occur in higher topographic positions and are better drained than Orsino soils. Cassia soils occur in lower positions and are somewhat poorly drained. Daytona and Tavares soils occur in similar topographic positions. Daytona soils have a spodic Bh horizon. Tavares soils do not have a B horizon.

Typical pedon of Orsino fine sand, in an area about 3.5 miles east of DeLand, about 40 yards south of Florida Highway 44 and 10 yards west of Kepler Road; SE1/4NE1/4 sec. 14, T. 17 S., R. 30 E.

Ap—0 to 6 inches; gray (10YR 5/1, rubbed) fine sand; single grained; loose; many medium and large roots; strongly acid; gradual smooth boundary.

A2—6 to 30 inches; light gray (10YR 7/1) fine sand; single grained; loose; few large roots, common medium and fine roots; few fine distinct yellowish brown (10YR 5/4) streaks along roots; strongly acid; abrupt irregular boundary.

B2&Bh—30 to 55 inches; brownish yellow (10YR 7/6) fine sand; single grained; loose; few fine roots; discontinuous lenses 1/2 to 1 inch thick of very dark grayish brown (10YR 3/2), dark brown (10YR 3/3), and brown (10YR 4/3) in upper 5 inches of horizon; common tongues 1/2 inch to 2 inches in diameter of light gray (10YR 7/1) with a very dark grayish brown (10YR 3/2) exterior throughout the horizon; very strongly acid; gradual wavy boundary.

B3—55 to 68 inches; yellow (10YR 7/6) fine sand; single grained; loose; common medium distinct yellowish brown (10YR 5/6) and few medium distinct light gray (10YR 7/2) mottles; very strongly acid; gradual wavy boundary.

C—68 to 80 inches; very pale brown (10YR 7/4) fine sand; single grained; loose; very strongly acid.

Reaction ranges from strongly acid to medium acid. Texture is either fine sand or sand in all horizons but the A1 horizon, which is fine sand in all areas.

The A1 horizon, when rubbed, has hue of 10YR, value of 4 to 6, and chroma of 1 or 2. Unrubbed, it is a mixture of light gray sand grains and black organic matter that has a salt-and-pepper appearance. Thickness is 2 to 6 inches.

The A2 horizon has hue of 10YR or 2.5Y or neutral color, value of 6 to 8, and chroma of 2 or less. Thickness is 6 to 40 inches. In many pedons, tongues 1/2 inch to 2 inches in diameter of material from the A2 horizon extend into the horizon below.

The B2 part of the B2&Bh horizon has hue of 10YR or 7.5YR, value of 5 to 7, and chroma of 6 to 8. The Bh part, which occurs mainly where the B2&Bh horizon is in contact with the A2 horizon, is in the form of layers or lenses 1/2 inch to 2 inches thick. These layers or lenses have hue of 5YR, value of 3, and chroma of 2 to 4 or value of 4 and chroma of 3. The exterior of the tongues of A2 material that occur in this horizon has the same color range as these layers or lenses.

The C horizon has hue of 10YR, value of 6 to 8, and chroma of 3 or 4.

Paisley series

The Paisley series is a member of the fine montmorillonitic, hyperthermic family of Typic Albaqualfs. It consists of poorly drained, slowly permeable soils that formed in clayey sediments. These soils occur in low areas in flatwoods and on the outer edges of the flood plain of the St. Johns River. Slopes are less than 1 percent.

Paisley soils are associated with Bluff, Chobee, Tequesta, and Winder soils. Bluff and Chobee soils occur on the flood plain. They have a mollic epipedon. Tequesta and Winder soils occur in topographic positions similar to those of Paisley soils. Tequesta soils have a muck layer on the surface. In Winder soils, tongues of material from the A2 horizon extend into the Bt horizon.

Typical pedon of Paisley fine sand, about 2.0 miles east of Enterprise and 300 feet south of paved road; NW1/4NE1/4 sec. 8, T. 19 S., R. 31 E.

Ap—0 to 9 inches; dark gray (10YR 4/1) fine sand; weak fine granular structure; very friable; many fine roots in upper 4 inches, common fine roots below; slightly acid; abrupt wavy boundary.

A2—9 to 13 inches; light brownish gray (10YR 6/2) fine sand; few medium distinct dark gray (10YR 4/1) streaks along root channels; single grained; loose; common fine roots; mildly alkaline; abrupt wavy boundary.

B21tg—13 to 21 inches; gray (10YR 5/1) sandy clay; common medium distinct yellowish brown (10YR 5/6) and brown (7.5YR 4/4) mottles; moderate coarse subangular blocky structure; firm, very sticky and plastic; common fine roots; few medium pores; common distinct clay films on ped exteriors; moderately alkaline; clear wavy boundary.

B22tg—21 to 46 inches; gray (10YR 5/1) sandy clay; common fine faint dark gray streaks, many medium distinct yellowish brown (10YR 5/6) mottles, and many fine distinct light gray (10YR 7/2) and very pale brown (10YR 7/3) mottles; few fine and medium white calcium carbonate accumulations and few hard calcium carbonate nodules to 3 mm in diameter; moderate coarse subangular blocky structure; very firm, very sticky and plastic; few fine roots; few faint clay films on ped exteriors; moderately alkaline; gradual wavy boundary.

B3g—46 to 63 inches; gray (10YR 5/1) sandy clay containing few very pale brown (10YR 7/3) lenses of fine sandy loam and sandy clay loam; common fine faint dark gray streaks, common medium distinct yellowish brown (10YR 5/6) mottles, and common fine distinct light gray (10YR 7/2) and very pale brown (10YR 7/3) calcium carbonate accumulations and hard calcium carbonate nodules to 6 mm in diameter; weak coarse subangular blocky structure; very firm, very sticky and plastic; common fine decaying roots; moderately alkaline; clear wavy boundary.

C1g—63 to 70 inches; gray (10YR 5/1) sandy clay loam containing many medium distinct lenses and pockets of sandy clay and fine sandy loam; few medium distinct yellowish brown (10YR 5/6) mottles; massive; firm; moderately alkaline; clear wavy boundary.

C2g—70 to 80 inches; gray (10YR 5/1) loamy fine sand; massive; very friable; moderately alkaline.

Solum thickness is 40 to 72 inches. Soil reaction ranges from medium acid to moderately alkaline.

The A1 or Ap horizon has hue of 10YR, value of 3 to 5, and chroma of 1 or 2. Thickness is 2 to 10 inches. The A2 horizon has hue of 10YR, value of 5 or 6, and chroma of 1 or 2. Texture of the A horizon is sand, fine sand, or loamy fine sand.

The B2tg horizon has hue of 10YR, value of 5 to 7, and chroma of 1, or the color is neutral and the value is 5 or 6. Mottles in shades of brown, yellow, and gray are in places. Texture is sandy clay or clay. The B3g horizon has hue of 10YR, value of 5 to 7, and chroma of 1. Mottles in shades of yellow, brown, and gray are in places. Bodies or coatings of white calcium carbonatic material, or both, range from none to common in the B2tg and B3 horizons. Texture is sandy clay or clay.

The Cg horizon has hue of 10YR, value of 5 or 6, and chroma of 1. Mottles in shades of yellow, brown, and gray are in places. Nodules and coatings of white calcium carbonatic material range from common to many. Texture is sandy clay loam, sandy clay, sandy loam, or loamy fine sand; the horizon may be stratified with any combination of those textures.

Palm Beach series

The Palm Beach series is a member of the carbonatic, hyperthermic family of Typic Udipsamments. It consists of gently sloping and sloping, well drained to excessively drained soils. These soils formed in a mixture of sand and shell fragments. They are on sand dunes bordering the Atlantic Ocean. Slopes range from 2 to 8 percent.

Palm Beach soils are associated with Paola and Canaveral soils. Paola soils are on the back dunes. They have an A&B horizon. Canaveral soils are in nearly level positions between sand dunes and on the gently sloping lower slopes of dunes. They are moderately well drained to somewhat poorly drained.

Typical pedon of Palm Beach sand, about 1 mile south of the Flagler County Line and about 100 feet west of Florida Highway A1A; SE1/4SW1/4 sec. 32, T. 12 S., R. 32 E.

A11—0 to 3 inches; gray (10YR 6/1) sand and very fine shell fragments; single grained; loose; many fine, many medium, and few large roots; about 15 percent shell; moderately alkaline; calcareous; abrupt wavy boundary.

A12—3 to 6 inches; grayish brown (10YR 5/2) sand mixed with very fine shell fragments; single grained; loose; common fine, medium, and large roots; 20 to 30 percent shell; moderately alkaline; calcareous; gradual wavy boundary.

C1—6 to 25 inches; light brownish gray (10YR 6/2) sand mixed with multicolored shell fragments; single grained; loose; few medium roots; about 20 percent shell; moderately alkaline; calcareous; gradual wavy boundary.

C2—25 to 34 inches; light brownish gray (10YR 7/2) sand mixed with multicolored shell fragments; single grained; loose; few medium roots; about 25 percent shell; mildly alkaline; calcareous; gradual wavy boundary.

C3—34 to 45 inches; white (10YR 8/2) sand mixed with multicolored shell fragments; single grained; loose; about 35 percent shell; moderately alkaline; gradual wavy boundary.

C4—45 to 80 inches; white (10YR 8/2) sand mixed with multicolored shell fragments; single grained; loose; 40 to 50 percent shell; moderately alkaline; calcareous.

Palm Beach soils are moderately alkaline throughout. The shells are calcareous.

The A horizon has hue of 10YR, value of 3 to 5, and chroma of 1 to 3 or value of 6 and chroma of 1. The A horizon is 5 to 30 percent by volume shell fragments that are medium to coarse in texture. It is 2 to 8 inches thick.

The C horizon has hue of 10YR, value of 5 to 8, and chroma of 2 or 3. It is about 20 to 60 percent shell fragments. Stratified sand and shells or shell fragments are in places throughout the soil. Shell fragments range from sand size to about 1 cm.

Paola series

The Paola series is a member of the hyperthermic, uncoated family of Spodic Quartzipsamments. It consists of nearly level to moderately steep, excessively drained, very rapidly permeable soils that formed in thick beds of marine and eolian sand on the lower Coastal Plain. These soils are on broad, high sandhills. The water table is always below 72 inches and is usually below 120 inches. Slopes range from 2 to 17 percent.

Paola soils are geographically associated with Astatula, Canaveral, Daytona, Orsino, and Palm Beach soils. Astatula soils occur in positions similar to those of Paola soils but have no A2 horizon. Canaveral soils occur in nearly level positions between sand dunes. They are moderately well drained to somewhat poorly drained. Daytona soils are on lower side slopes and ridges. They have a Bh horizon. Orsino soils are on lower side slopes and ridges. They are moderately drained. Where Paola soils are associated with Palm Beach soils, the Palm Beach soils are on the primary dunes and on the ocean side of the secondary dunes, and the Paola soils on the back dunes.

Typical pedon of Paola fine sand, 0 to 8 percent slopes, east of DeLand, about 1/2 mile west of the intersection of I-4 and State Route 44, on north side of State Route 44, 50 feet north of pavement; SW1/4SW1/4 sec. 19, T. 17 S., R. 31 E.

A1—0 to 6 inches; gray (10YR 5/1) fine sand; single grained; loose; many fine roots; very strongly acid; clear wavy boundary.

A21—6 to 15 inches; light gray (10YR 7.1) fine sand; single grained; loose; common fine roots; very strongly acid; distinct wavy boundary.

A22—15 to 26 inches; white (10YR 8/1) fine sand; single grained; loose; few fine roots; common fine distinct gray (10YR 6/1) vertical streaks along old root channels; very strongly acid; abrupt irregular boundary.

B&A—26 to 64 inches; yellow (10YR 7/6) fine sand; few coarse distinct yellowish brown (10YR 5/8) mottles in the matrix; single grained; loose; common fine and few medium roots; common to medium prominent white (10YR 8/1) vertical tongues 2 to 8 cm wide that have an exterior 1 to 2 cm thick of mottled dark brown (10YR 4/3) and yellowish brown (10YR 5/8); yellowish brown (10YR 5/8) mottles decrease in number with increasing distance from the tongue; few white (10YR 8/1) splotches; few coarse distinct weakly cemented strong brown (7.5YR 5/8) concretions; very strongly acid; gradual wavy boundary.

C—64 to 85 inches; very pale brown (10YR 7/4) fine sand; single grained; loose; very strongly acid; few fine and medium roots.

Reaction is strongly acid or very strongly acid. Texture is either sand or fine sand in all horizons but the A1 horizon, which is fine sand in all areas. The content of silt and clay combined is less than 5 percent between depths of 10 and 40 inches.

The A1 horizon is 2 to 6 inches thick. It has hue of 10YR, value of 4 to 6, and chroma of 1 or 2. The A2 horizon has hue of 10YR or 2.5Y, value of 6 to 8, and chroma of 1 or 2. It is 6 to 40 inches thick.

The B part of the B&A horizon has hue of 7.5YR or 10YR, value of 5 to 7, and chroma of 3 to 8. Most pedons have tongues 1/2 inch to 2 inches in diameter filled with A2 material. A thin, discontinuous, very dark grayish brown or dark reddish brown layer is between the A horizon and the B horizon in some places. Dark reddish brown or very dark grayish brown spodic fragments are in some pedons. An AB horizon 4 to 6 inches thick occurs in many places. Thickness of the B&A horizon is 12 to 40 inches.

The C horizon extends to a depth of more than 80 inches. It has hue of 10YR, value of 5 to 8, and chroma of 3 or 4.

Pineda series

The Pineda series is a member of the loamy, siliceous, hyperthermic family of Arenic Glossaqualfs. It consists of poorly drained soils that formed in beds of sandy and loamy sediments influenced by underlying alkaline material. These soils are on broad low flats and in low areas bordering swamps and lakes. The water table is at or near the surface during the rainy season. Slopes are less than 2 percent.

Pineda soils are associated with EauGallie, Malabar, Pomona, Riviera, and Wabasso soils. EauGallie soils occur in the adjacent flatwoods in slightly higher areas than Pineda soils. They have a Bh horizon. Malabar soils occur in positions similar to those of Pineda soils. They have a Bt horizon below 40 inches. Pomona soils are in slightly higher positions in the adjacent flatwoods. They have a Bt horizon. Riviera soils are slightly lower or are in similar positions. They do not have a Bir horizon. Wabasso soils are in slightly higher positions in the flatwoods. They have a Bh horizon.

Typical pedon of Pineda fine sand, in an area about 9.5 miles east of DeLand to woods road, south about 2 miles; NW1/4NE1/4 sec. 27, T. 17 S., R. 31 E.

A11—0 to 2 inches; black (10YR 2/1) fine sand; moderate medium granular structure; very friable; many fine roots; very strongly acid; clear smooth boundary.

A12—2 to 9 inches; dark gray (10YR 4/1, rubbed) fine sand, unrubbed color is finely mottled very dark gray (10YR 3/1) and gray (10YR 5/1); single grained; loose; few fine roots; strongly acid; gradual wavy boundary.

A21—9 to 16 inches; grayish brown (10YR 5/2) fine sand with few medium distinct yellowish brown (10YR 5/4) mottles and few fine distinct yellowish brown (10YR 5/6) streaks along root channels; single grained; loose; few fine roots; neutral; clear wavy boundary.

A22—16 to 23 inches; light brownish gray (10YR 6/2) fine sand that has common coarse distinct light olive brown (2.5Y 5/4) mottles and common very coarse distinct mostly vertical streaks of yellowish brown (10YR 5/6), streaks contain common hard iron concretions 1/16 inch in diameter in upper part; single grained; loose; very few fine roots; moderately alkaline; clear irregular boundary.

B21ir—23 to 30 inches; brownish yellow (10YR 6/8) fine sand; single grained; loose; sand grains well coated with iron oxides; moderately alkaline; clear wavy boundary.

B22ir—30 to 40 inches; yellowish brown (10YR 5/4) fine sand; single grained; loose; lower 1/2 inch to 1 inch is a light brownish gray (10YR 6/2) transitional layer; few uncoated sand grains; mildly alkaline; abrupt wavy boundary.

B'21tg—40 to 42 inches; gray (5Y 5/1) sandy clay loam that has many coarse distinct yellowish brown (10YR 4/4) mottles and occasional light brownish gray (10YR 6/2) sandy lenses; weak coarse subangular blocky structure; friable; slightly sticky; many fine decaying roots; many fine pores; sand grains coated and bridged with clay; neutral; gradual wavy boundary.

B'22tg—42 to 56 inches; gray (5Y 5/1) sandy clay loam that has common medium distinct dark yellowish brown (10YR 4/4) mottles and few gray loamy sand lenses; weak coarse subangular blocky structure; friable; many fine decaying roots; sand grains coated with clay; slightly acid; gradual wavy boundary.

C1g—56 to 77 inches; gray (5Y 5/1) fine sandy loam containing few medium distinct dark yellowish brown (10YR 4/4) mottles and many lenses of loamy sand and sandy loam; massive; friable; slightly acid; gradual wavy boundary.

C2g—77 to 96 inches; gray (5Y 6/1) fine sandy loam containing few coarse distinct yellowish red (5Y 5/8) mottles; massive; friable; mildly alkaline.

Thickness of the solum is from 40 to 80 inches. Reaction ranges from very strongly acid to moderately alkaline in the A and Bir horizons and from neutral to moderately alkaline in the B'tg and C horizons.

The A1 horizon has hue of 10YR, value of 2 to 5, and chroma of 1 or 2. Thickness ranges from 6 to 14 inches. Where the color value is 3 or less, the thickness is less than 10 inches. The A2 horizon is sand or fine sand. It has hue of 10YR or 2.5Y, value of 5 to 8, and chroma of 1 to 3. Thickness is 0 to 14 inches.

The B2ir horizon is sand or fine sand. It has hue of 7.5YR or 10YR, value of 5 to 8, and chroma of 6 to 8. Some pedons have few to common streaks and mottles in shades of gray, brown, or yellow. Thickness is 6 to 20 inches.

Some pedons have a B3ir horizon. Where present, it has hue of 10YR, value of 6 to 8, and chroma of 3 or 4 or hue of 2.5Y, value of 7 or 8, and chroma of 4. Mottles in shades of brown or yellow are in places. Texture is sand or fine sand. Thickness is 0 to 6 inches.

Some pedons have an A'2 horizon below the Bir horizon. It has the same color range as the A2 horizon. Few to common mottles in shades of yellow or brown are in places. Texture is sand or fine sand.

The B'tg horizon begins within 40 inches of the surface. It has hue of 10YR, 2.5Y, 5Y, or neutral color; value of 4 to 6; and chroma of 2 or less. It has vertical tongues from the overlying horizon that are filled with sand, fine sand, or loamy fine sand. The B'2tg horizon is 6 to 24 inches thick. Texture is fine sandy loam or sandy clay loam with lenses and pockets of fine sand or sandy clay loam.

The Cg horizon has hue of 10YR, 2.5Y, or neutral color; value of 5 to 7; and chroma of 2 or less. Texture is sand, loamy sand, sandy loam, or sandy clay loam. In some pedons, it is sand mixed with shell fragments.

Pinellas series

The Pinellas series is a member of the loamy, mixed, hyperthermic family of Arenic Ochraqualfs. It consists of nearly level, poorly drained soils in areas bordering low areas and depressions in the flatwoods. It formed in sandy marine sediments over loamy material. Slopes are less than 2 percent.

Pinellas soils are geographically associated with EauGallie, Immokalee, Myakka, and Wabasso soils. All of these soils occur in similar topographic positions. The associated soils do not have an A22ca horizon. They all have a Bh horizon.

Typical pedon of Pinellas fine sand, 6 miles north of Osteen and 3 miles west of Florida Highway 415; SW1/4NE1/4 sec. 18, T. 18 S., R. 32 E.

A1—0 to 4 inches; very dark gray (10YR 3/1, rubbed) fine sand; weak fine granular structure; very friable; many fine and medium roots; the mixture of organic matter and light gray sand grains has a salt-and-pepper appearance; strongly acid; clear smooth boundary.

A21—4 to 19 inches; light brownish gray (10YR 6/2) fine sand; single grained; loose; many fine roots; medium acid; clear wavy boundary.

A22ca—19 to 29 inches; white (10YR 8/1) fine sand; single grained; loose; common fine roots; secondary carbonates occur in interstices between sand grains; sand grains are thinly coated with carbonates; few carbonate fragments 1 to 15 mm in size; moderately alkaline; calcareous; gradual wavy boundary.

B21tg—29 to 36 inches; gray (10YR 5/1) sandy clay loam; moderate medium granular structure; friable; slightly sticky; few fine roots; many medium distinct yellowish brown (10YR 5/8) mottles; sand grains are coated and bridged with clay; mildly alkaline; gradual wavy boundary.

B22tg—36 to 45 inches; gray (10YR 5/1) fine sandy loam; weak medium subangular blocky structure; friable; few lenses of uncoated sand grains; many coarse distinct yellowish brown (10YR 5/8) mottles; mildly alkaline; gradual wavy boundary.

Cg—45 to 60 inches; gray (N 5/0) fine sand; single grained; loose; mildly alkaline.

The thickness of the solum ranges from 40 to 60 inches. Reaction ranges from strongly acid to mildly alkaline in the A1 and A2 horizons, from neutral to mildly alkaline in the A2ca horizon, from neutral to moderately alkaline in the Btg horizon, and it is moderately alkaline in the C horizon.

The A1 horizon has hue of 10YR, value of 3 to 5, and chroma of 1 or 2. Thickness ranges from 2 to 6 inches.

The A2 horizon has hue of 10YR, value of 5 to 8, and chroma of 1 to 3. In the lower part of the A2 horizon there are accumulations of secondary carbonates, which occur as coatings on sand grains and in interstices. The calcium carbonate equivalent is more than 15 percent; the content is 5 percent higher than in the underlying horizon. Texture is sand or fine sand. Thickness is 10 to 26 inches.

The Btg horizon has hue of 10YR, value of 4 to 6, and chroma of 1 or 2. Few to many mottles of higher chroma are in places. Texture is sandy loam or sandy clay loam. Thickness is 5 to 18 inches.

The Cg horizon is sand. It has the same color range as the B2tg horizon. Some pedons have a IIC horizon that is a mixture of sand and shell fragments in varying proportions.

Placid series

The Placid series is a member of the sandy, siliceous, hyperthermic family of Typic Humaquepts. It consists of nearly level, very poorly drained, rapidly permeable soils that formed in thick beds of sandy marine sediments. These soils are in depressional areas. The water table is above the surface for more than 6 months in most years. Slope is less than 2 percent.

Placid soils are geographically associated with Daytona, Immokalee, Myakka, and St. Johns soils. The associated soils generally occur in topographic positions that are slightly higher than those of Placid soils. The Immokalee, Myakka, and St. Johns soils have a Bh horizon and are poorly drained. The Daytona soils are moderately well drained.

Typical pedon of Placid fine sand, in an area about 8 miles west of Daytona Beach on U.S. Highway 92 and Indian Lake Road; SE1/4SW1/4 sec. 6, T. 16 S., R. 31 E.

A11—0 to 11 inches; black (10YR 2/1) fine sand; moderate medium granular structure; very friable; many fine and few medium roots; few fine gray streaks; very strongly acid; gradual wavy boundary.

A12—11 to 15 inches; very dark gray (10YR 3/1) fine sand; weak fine granular structure; very friable; many fine and few medium roots; common fine distinct gray streaks; very strongly acid; clear wavy boundary.

C1—15 to 43 inches; gray (10YR 5/1) fine sand; single grained; loose; few fine roots; few fine and medium faint very dark gray and dark gray streaks; strongly acid; gradual wavy boundary.

C2—43 to 57 inches; grayish brown (10YR 5/2) fine sand; single grained; loose; common medium faint gray and dark gray mottles; strongly acid; gradual wavy boundary.

C3—57 to 75 inches; light brownish gray (10YR 6/2) fine sand; single grained; loose; few fine faint dark gray mottles; strongly acid.

Thickness of the regolith is 80 inches or more. Reaction ranges from extremely acid to strongly acid throughout the profile. Texture is either sand or fine sand in all horizons but the A1 horizon, which is fine sand in all areas.

The A horizon has a thickness of 10 to 24 inches. It has hue of 10YR, value of 2 or 3, and chroma of 1 or 2. The organic matter content ranges from about 1 to 12 percent. Few to common, dark gray, gray, or light gray streaks or pockets are in many pedons.

The C horizon has hue of 10YR or 5Y, value of 5 to 7, and chroma of 1 or 2 or hue of 2.5Y, value of 5, and chroma of 2; or the color is neutral and the value is 5 to 7. In places this horizon is mottled with colors of stronger chroma. In many places it has vertical streaks that have lower value than the matrix.

Pomona series

The Pomona series is a member of the sandy, siliceous, hyperthermic family of Ultic Haplaquods. It consists of nearly level, poorly drained soils that formed in beds of marine sandy and loamy material. These soils occur in broad areas of the flatwoods. Slope is less than 1 percent. Under natural conditions, the soils are saturated within 10 inches of the surface late in summer and early in fall.

Pomona soils are geographically associated with Farmton, Immokalee, Myakka, and Wauchula soils. All of these soils occur in similar topographic positions. Farmton soils have spodic horizons within a depth of 30 to 50 inches. Immokalee and Myakka soils do not have an argillic horizon. Wauchula soils have an argillic horizon below a depth of 40 inches.

Typical pedon of Pomona fine sand, about 6 miles west of Daytona Beach, about 1.5 miles west of the intersection of U.S. Highway 92 and I-95; SW1/4SW1/4 sec. 29, T. 15 S., R. 31 E.

A11—0 to 5 inches; black (10YR 2/1) fine sand; weak fine crumb structure; very friable; few coarse and many medium and fine roots; very strongly acid; clear wavy boundary.

A12—5 to 13 inches; dark gray (10YR 4/1) fine sand; single grained; loose; many medium and fine roots; strongly acid; gradual wavy boundary.

A21—13 to 18 inches; gray (10YR 5/1) fine sand; single grained; loose; many medium and fine roots; strongly acid; abrupt smooth boundary.

B21h—18 to 30 inches; black (5YR 2/1) fine sand; strong medium granular structure; firm; noncemented; few medium and common fine roots; sand grains well coated with colloidal organic matter; very strongly acid; gradual wavy boundary.

B22h—30 to 33 inches; dark reddish brown (5YR 3/2) fine sand; weak granular structure; firm; noncemented; many uncoated sand grains; very strongly acid; clear wavy boundary.

B3—33 to 45 inches; dark brown (10YR 3/3) fine sand; single grained; loose; strongly acid; gradual wavy boundary.

A'2—45 to 50 inches; light gray (10YR 6/1) fine sand; single grained; loose; strongly acid; gradual wavy boundary.

B'tg—50 to 60 inches; gray (10YR 5/1) fine sandy loam; weak coarse subangular blocky structure; friable; sand grains bridged and coated with clay; strongly acid; gradual wavy boundary.

C—60 to 70 inches; gray (10YR 5/1) fine sand; single grained; loose; strongly acid.

Solum thickness is 60 inches or more. Reaction ranges from extremely acid to strongly acid.

The A1 horizon has hue of 10YR, value of 2 to 4, and chroma of 1, or the color is neutral and the value is 2 to 4. Where undisturbed, the surface color is a mixture of clean sand grains and black organic matter. Thickness of the A1 horizon is 4 to 14 inches. Where the value is 3 or less, the thickness is less than 10 inches. The A2 horizon has hue of 10YR, value of 5 to 8, and chroma of 1 or 2; or the color is neutral and the value is 5 to 8. Texture of the A2 horizon is fine sand or sand. Total thickness of the A horizon is 15 to 29 inches.

Some pedons have a thin transitional layer 1/2 inch to 2 inches thick between the A2 and Bh horizons. Where present, it has hue of 10YR, value of 2 to 4, and chroma of 1 or 2; or the color is neutral and the value is 2, and it is mixed with hue of 10YR, value of 5 or 6, and chroma of 1.

The Bh horizon has hue of 5YR, value of 2, and chroma of 1 or 2 or value of 3 and chroma of 1 to 4; hue of 10YR, value of 2, and chroma of 1 or 2; or hue of 7.5YR, value of 3, and chroma of 2; or the color is neutral and the value is 2. Texture is fine sand or sand. The sand grains are coated with colloidal organic matter. Thickness ranges from 9 to 18 inches.

The B3 horizon has hue of 10YR, value of 3 or 4, and chroma of 3; it has hue of 7.5YR, value of 3, and chroma of 2 or value of 4 and chroma of 2 to 4. Texture is sand or fine sand. Thickness ranges from 3 to 12 inches. Fragments of bodies from the Bh horizon in this horizon range from none to common.

The A'2 horizon has hue of 10YR, value of 5 to 7, and chroma of 1 to 3 or value of 4 and chroma of 2. Texture is sand or fine sand. Thickness ranges from 2 to 24 inches.

Total thickness of all the horizons above the B'2tg is more than 40 inches.

The B'tg horizon has hue of 10YR or 5Y, value of 5 to 7, and chroma of 1; or the color is neutral and the value is 5 to 7. In some pedons, there are mottles in shades of brown, yellow, and gray throughout the horizon. Texture is sandy loam or sandy clay loam. The thickness ranges from 6 to 18 inches. In some pedons, the lower part of the B'tg horizon has lenses of coarse textured material.

The C horizon has hue of 10YR, value of 5 or 6, and chroma of 1 or 2. Some pedons have mottles in shades of yellow and brown. Texture is fine sand, loamy sand, or loamy fine sand.

Pompano series

The Pompano series is a member of the siliceous, hyperthermic family of Typic Psammaquents. It consists of nearly level, poorly drained sandy soils that formed in thick deposits of sandy marine sediments. These soils occur in poorly defined drainageways, low areas, and depressions. Slopes are less than 2 percent. The water table is at depths of less than 10 inches for 2 to 6 months during most years. Depressions are seasonally ponded.

Pompano soils are geographically associated with Basinger, Immokalee, Placid, and Satellite soils. Basinger soils occupy positions on the landscape that are similar to those of Pompano soils, but they have an A&Bh horizon. Immokalee soils occupy slightly higher positions and are adjacent to Pompano soils. They are poorly drained and have a Bh horizon. Placid soils are very poorly drained and have a dark A1 horizon more than 10 inches thick. Satellite soils are somewhat poorly drained. They are on side slopes and low ridges in the flatwoods.

Typical pedon of Pompano fine sand, about 300 yards north of a point about 3/8 mile east of Blue Lake Avenue, along power line; SE1/4SW1/4 sec. 14, T. 17 S., R. 30 E.

A1—0 to 7 inches; dark gray (10YR 4/1) fine sand; single grained; loose; many fine roots; strongly acid; gradual smooth boundary.

C1—7 to 33 inches; gray (10YR 6/1) fine sand; single grained; loose; few fine roots; few medium distinct dark gray (10YR 4/1) streaks along root channels; upper 1/2 inch to 2 inches is gray (10YR 5/1) transitional layer; many clean sand grains; strongly acid; gradual wavy boundary.

C2—33 to 80 inches; light gray (10YR 7/1) fine sand; single grained; loose; many clean sand grains; slightly acid.

Reaction ranges from very strongly acid to mildly alkaline in all horizons. Texture is either sand or fine sand in all horizons but the A1 horizon, which is fine sand in all areas.

The A horizon has hue of 10YR, value of 2 to 5, and chroma of 1 or 2, or the color is neutral and the value is 2 to 5. Thickness is 2 to 8 inches.

The C horizon has hue of 2.5Y, value of 5 to 7, and chroma of 2 or less; or it has hue of 10YR, value of 5 or 6, and chroma of 1 to 3, or value of 7 and chroma of 1 to 4, or value of 8 and chroma of 3 or 4. In some pedons, there are shell fragments at a depth of 40 inches or more.

Riviera series

The Riviera series is a member of the loamy, siliceous, hyperthermic family of Arenic Glossaqualfs. It consists of nearly level, poorly drained soils that formed in unconsolidated marine sands and clays influenced by underlying alkaline material. These soils occur in broad, low flats. Slope is less than 1 percent. Under natural conditions the soils are saturated within 10 inches of the surface in summer and in fall.

Riviera soils are geographically associated with Holopaw, Malabar, Pineda, Tequesta, Wabasso, and Wauchula soils. All of these soils occur in similar topographic positions. Holopaw and Malabar soils have a Bt horizon below a depth of 40 inches. Malabar and Pineda soils have a Bir horizon. Tequesta soils have a histic epipedon and are very poorly drained. Wabasso and Wauchula soils have a spodic horizon.

Typical pedon of Riviera fine sand, about 1.2 miles north of junction of Taylor Road and Tomoka Farms Road, west 0.5 mile, about 20 paces northeast of property line; SW1/4SW1/4 sec. 23, T. 16 S., R. 32 E.

A11—0 to 4 inches; very dark gray (10YR 3/1, rubbed) fine sand; weak fine granular structure; very friable; common fine and few medium roots; medium acid; gradual wavy boundary.

A12—4 to 16 inches; dark gray (10YR 4/1) fine sand; many medium faint gray (10YR 5/1) mottles; single grained; loose; few fine roots; common medium distinct gray and light gray (10YR 6/1) splotches; medium acid; clear wavy boundary.

A2—16 to 25 inches; light brownish gray (10YR 6/2) fine sand; single grained; loose; few fine roots; few faint gray (10YR 5/1) streaks; medium acid; abrupt wavy boundary.

B&A—25 to 38 inches; gray (10YR 5/1) sandy clay loam; many medium and coarse distinct yellowish brown (10YR 5/6) mottles; weak medium subangular blocky structure; friable; common tongues or intrusions 1/2 inch to 1 1/2 inches in diameter that are filled with light brownish gray (10YR 6/2) and light gray (10YR 7/2) sand; sand grains bridged and coated with clay; medium acid; gradual wavy boundary.

B2tg—38 to 43 inches; gray (10YR 5/1) sandy clay loam; many medium and coarse distinct yellowish brown (10YR 5/6) mottles; weak medium subangular structure; friable; few lenses of sandy loam; sand grains bridged and coated with clay; slightly acid; clear wavy boundary.

C—43 to 64 inches; light brownish gray (10YR 6/2) loamy sand; massive; friable; slightly acid.

Reaction ranges from medium acid to slightly acid in the A horizon, from slightly acid to moderately alkaline in the B&A horizon, from neutral to moderately alkaline in the B2tg horizon, and from slightly acid to moderately alkaline in the C horizon.

The A1 horizon has hue of 10YR, value of 2 to 4, and chroma of 1 or 2 or value of 5 and chroma of 1, or the color is neutral and the value is 3. Thickness of the A1 horizon is 4 to 16 inches. The part of the A1 horizon with value of 3 or less is less than 6 inches thick. The A2 horizon has hue of 10YR, value of 5 to 8, and chroma of 1 or 2 or hue of 2.5Y, value of 7, and chroma of 2. The A horizon contains few to many faint to distinct mottles in lighter or darker shades of gray and brown. Texture of the A horizon is either fine sand or sand except in the upper part of the A1 horizon, which is fine sand in all areas. Thickness of the A horizon ranges from 20 to 40 inches, but it is most commonly 20 to 34 inches.

The B&A horizon has hue of 10YR, value of 3 to 7, and chroma of 1 or 2; hue of 2.5Y, value of 5 or 6, and chroma of 2; hue of 5Y, value of 4 to 6, and chroma of 1 or 2; or the color is neutral and the value is 5 or 6. The A part consists of tongues or intrusions of fine sand or sand that extend vertically into the horizon from the A2 horizon. The B part is sandy loam or sandy clay loam. Thickness of the B&A horizon ranges from 6 to 25 inches.

The B2tg horizon has hue of 10YR, value of 3 to 7, and chroma of 1 or 2; hue of 2.5Y, value of 3 to 5, and chroma of 2; hue of 5Y, value of 3 to 6, and chroma of 1 or 2; or the color is neutral and the value is 5 or 6. The B2tg horizon is mottled in shades of brown, yellow, and gray. Texture is sandy loam, fine sandy loam, or sandy clay loam. Thickness of the B2tg horizon ranges from 4 to 12 inches. Some pedons have a B3g horizon that has hue of 10YR, value of 4 to 7, and chroma of 1 or 2. Texture is loamy sand or sandy loam. Thickness ranges from 0 to 12 inches.

The C horizon has hue of 10YR, value of 6 to 8, and chroma of 1 or 2, or the color is neutral and the value is 6 to 8. Texture is loamy sand or sand. Some pedons have a IIC horizon that contains a mixture of sand and shell fragments or a mixture of shell fragments and accumulations of soft calcium carbonate.

Samsula series

The Samsula series is a member of the sandy or sandy-skeletal, siliceous, dysic, hyperthermic family of Terric Medisaprists. It consists of very poorly drained, nearly level organic soils that formed in moderately thick beds of hydrophytic woody and nonwoody plant remains. These soils occur in broad, low flats, small depressions, freshwater marshes, and swamps. The water table is at or above the surface except during long dry periods. Slopes are less than 2 percent.

These soils are geographically associated with Hontoon, Placid, Pompano, St. Johns, Smyrna, and Valkaria soils. All of the associated soils occur in topographic positions similar to those of Samsula soils. All but Hontoon soils are sandy. Hontoon soils have organic layers more than 51 inches thick, whereas Samsula soils have organic layers ranging from 16 to 51 inches in thickness.

Typical pedon of Samsula muck, in an area about 2.5 miles northwest of junction of U.S. Highway 92 and I-95, west of Daytona Beach; SW1/4SW1/4 sec. 20, T. 15 S., R. 32 E.

Oa1—0 to 9 inches; black (5YR 2/1, rubbed and pressed) well decomposed muck; about 20 percent fiber, 5 percent rubbed; moderate medium granular structure; friable; many fine roots; few medium roots; about 10 percent mineral material; sodium pyrophosphate extract color is very dark grayish brown (10YR 3/2); extremely acid; gradual smooth boundary.

Oa2—9 to 36 inches; dark reddish brown (5YR 2/2, rubbed and pressed) well decomposed sapric material (muck); about 15 percent fiber, 5 percent rubbed; moderate medium granular structure; friable; common fine roots; about 20 percent mineral material; sodium pyrophosphate extract color is very dark grayish brown (10YR 3/2); extremely acid; abrupt wavy boundary.

IIAb—36 to 46 inches; dark grayish brown (10YR 4/2) sand; common coarse faint very dark gray (10YR 3/1) mottles; single grained; loose; extremely acid; clear wavy boundary.

IICb—46 to 60 inches; light gray (10YR 6/1) sand; common medium distinct brown (10YR 5/3) mottles; single grained; loose; extremely acid.

Reaction of the organic material is less than 4.5 in 0.01M calcium chloride. Thickness of the organic material ranges from 16 to 40 inches. Reaction of the mineral material is extremely acid to medium acid.

The Oa horizon has hue of 10YR, value of 2 or 3, and chroma of 1 or 2; hue of 5YR, value of 2 or 3, and chroma of 1 to 3; or the color is neutral and the value is 2. Fiber content in the organic part between 10 and 40 inches is generally less than 33 percent unrubbed. If the fiber content is less than 16 percent of the volume after rubbing, however, it is more than 33 percent unrubbed. The sodium pyrophosphate extract has hue of 10YR, value of 2 to 4, and chroma of 4 or less; value of 5 and chroma of 2 to 8; value of 6 and chroma of 3 to 8; or value of 7 and chroma of 4 to 8.

The IIAb horizon has hue of 10YR, value of 2 to 4, and chroma of 1 or 2; hue of 2.5Y, value of 3 or 4, and chroma of 2; or the color is neutral and the value is 2 to 4. Texture is sand, fine sand, or loamy sand. Thickness is 4 to 18 inches.

The IICb horizon has hue of 10YR or 2.5Y, value of 5 to 7, and chroma of 1 or 2; or the color is neutral and the value is 5 to 7. Texture is sand, fine sand, or loamy sand.

Satellite series

The Satellite series is a member of the hyperthermic, uncoated family of Aquic Quartzipsamments. It consists of somewhat poorly drained, very rapidly permeable soils that formed in thick beds of sandy marine sediments. These soils are on low and moderately high sandhills in the flatwoods. Slopes are less than 2 percent.

Satellite soils are associated with Daytona, Immokalee, and Myakka soils. All of the associated soils have a Bh horizon. Daytona soils are on adjacent side slopes and convex ridges. They are moderately well drained. Myakka and Immokalee soils are in lower positions on the landscape than Satellite soils. They are poorly drained.

Typical pedon of Satellite sand, southeast of DeLand, 2.6 miles south of junction of Florida Highways 44 and 415, on 415 to Rasley Road, southeast 1.15 miles on Rasley Road, 300 feet south of road; SW1/4SW1/4 sec. 6, T. 18 S., R. 32 E.

A1—0 to 4 inches; gray (10YR 5/1) sand; single grained; loose; many fine and common medium and large roots; very strongly acid; clear smooth boundary.

C1—4 to 24 inches; light gray (10YR 7/1) sand; single grained; loose; many fine and medium and few large roots; occasional large root channels filled with gray (10YR 5/1) sand; very strongly acid; gradual wavy boundary.

C2—24 to 51 inches; light gray (10YR 7/2) sand; few medium distinct reddish brown (5YR 4/3) and few large faint light brownish gray (10YR 6/2) mottles and streaks; single grained; loose; many fine and few medium roots; very strongly acid; gradual wavy boundary.

C3—51 to 66 inches; light brownish gray (10YR 6/2) sand; single grained; loose; common fine roots; common fine distinct very dark gray (10YR 3/2) streaks along root channels; very strongly acid; clear wavy boundary.

C4—66 to 80 inches; gray (10YR 5/1) sand; single grained; loose; very strongly acid.

Thickness of the regolith is 80 inches or more. Reaction is strongly or very strongly acid. Texture is sand, fine sand, or coarse sand except in the A1 horizon, which is sand in all areas.

The A horizon has a salt-and-pepper appearance. When rubbed, it has hue of 10YR, value of 3 to 5, and chroma of 1 or 2. Thickness is 2 to 8 inches.

The C horizon has hue of 10YR, value of 5 to 8, and chroma of 1 or 2 or value of 4 and chroma of 2; hue of 2.5Y, value of 4 to 7, and chroma of 2; or the color is neutral and the value is 5 to 7. Few to many, fine to coarse, faint or distinct streaks or mottles of a darker or lighter color occur in the C horizon.

Scoggin series

The Scoggin series is a member of the fine-loamy, siliceous, hyperthermic family of Typic Ochraquults. It consists of very poorly drained soils in swamps and low places bordering swamps. These soils are covered with standing water for as much as 6 months in most years. They formed in loamy and sandy marine sediments. Slope is less than 1 percent.

Scoggin soils are geographically associated with Pomona, Riviera, Tomoka, and Wauchula soils. All of these soils occur in similar topographic positions. Pomona and Wauchula soils have a spodic horizon. Riviera soils have higher base saturation in the argillic horizon than Scoggin soils. Tomoka soils are organic.

Typical pedon of Scoggin sand, about 4 miles northeast of junction of I-95 and Florida Highway 44 on I-95, about 1 mile southeast of highway; NE1/4SE1/4 sec. 34, T. 16 S., R. 31 E.

Oa—4 inches to 0; dark reddish brown (5YR 2/2) well decomposed organic matter (muck); weak fine granular structure; very friable; many fine roots; strongly acid; clear smooth boundary.

A1—0 to 7 inches; black (10YR 2/1) sand; weak fine granular structure; very friable; common fine and few medium and large roots; strongly acid; clear wavy boundary.

A21—7 to 17 inches; dark gray (10YR 4/1) sand; single grained; loose; few fine faint black streaks; few fine medium and large roots; strongly acid; gradual wavy boundary.

A22—17 to 25 inches; gray (10YR 5/1) sand; common medium distinct very dark gray (10YR 3/1) streaks and grayish brown (10YR 5/2) mottles; single grained; loose; few fine, medium, and large roots; strongly acid; gradual wavy boundary.

A23—25 to 36 inches; gray (10YR 6/1) sand; few medium distinct very dark gray (10YR 3/1) mottles; single grained; loose; few fine roots; strongly acid; clear wavy boundary.

B2tg—36 to 49 inches; dark gray (10YR 4/1) sandy clay loam; few coarse distinct yellowish brown (10YR 5/6) mottles; weak coarse subangular blocky structure; friable, slightly sticky; sand grains coated and bridged with clay; few fine roots; strongly acid; clear wavy boundary.

Cg—49 to 54 inches; gray (10YR 5/1) sandy loam; massive; friable; few coarse distinct lenses of loamy sand and dark gray sandy clay loam; strongly acid.

Solum thickness is 40 to 60 inches. Reaction is extremely acid to slightly acid in the A horizon and very strongly acid to strongly acid in the Oa horizon and the argillic horizon.

The Oa horizon has hue of 5YR, value of 2 or 3, and chroma of 2 to 4; hue of 10YR, value of 2, and chroma of 1; or the color is neutral and the value is 2. Thickness is 0 to 4 inches.

The A horizon is 20 to 40 inches thick. It is either sand or fine sand except in the A1 horizon, which is sand in all areas. The A1 horizon has hue of 10YR or neutral color, value of 2 to 4, and chroma of 1 or less. Thickness ranges from 5 to 14 inches. Where the value is 3.5 or less, the thickness is less than 10 inches. The A2 horizon has hue of 10YR or neutral color, value of 4 to 8, and chroma of 1 or 2. Fine mottles in shades of brown and gray are in places.

The Btg horizon has hue of 10YR or neutral color, value of 4 to 7, and chroma of 1 or less or hue of 2.5Y, value of 4 to 7, and chroma of 2. Few to many, fine to coarse, faint to distinct yellowish and brownish mottles are in places. Texture is fine sandy loam or sandy clay loam.

The Cg horizon has hue of 10YR, value of 4 to 7, and chroma of 1 or less or hue of 2.5Y, value of 5 to 7, and chroma of 2 or less. Texture ranges from fine sandy loam to fine sand with discontinuous strata of finer or coarser material.

Smyrna series

The Smyrna series is a member of the sandy, siliceous, hyperthermic family of Aeric Haplaquods. It consists of nearly level, poorly drained, moderately permeable or moderately rapidly permeable soils that formed in thick beds of sandy marine sediments. These soils are on broad, nearly level marine terraces in the flatwoods, in low areas between sandhills, and in slightly elevated areas between ponds and low areas. Slopes range from 0 to 2 percent.

Smyrna soils are geographically associated with Basinger, Cassia, Immokalee, Myakka, Pomona, and St. Johns soils. Basinger soils are in depressions and drainageways. They do not have a Bh horizon. Cassia soils are on low ridges in the flatwoods. They are somewhat poorly drained. The other associated soils occupy positions on the landscape similar to those of Smyrna soils. Immokalee soils have a Bh horizon below 30 inches. Myakka soils have a Bh horizon beginning between a depth of 20 and 30 inches. Pomona soils have a Bt horizon below the Bh horizon. St. Johns soils have a very dark gray to black A1 horizon more than 8 inches thick.

Typical pedon of Smyrna fine sand, in a field 1 mile west of Florida East Coast Railroad line, 75 yards north of Nova Road, in Port Orange:

A1—0 to 4 inches; black (10YR 2/1, rubbed) fine sand; weak medium granular structure; very friable; many fine, medium, and coarse roots; extremely acid; gradual wavy boundary.

A21—4 to 8 inches; gray (10YR 5/1) fine sand; single grained; loose; many fine roots; dark gray (10YR 4/1) streaks along root channels; extremely acid; gradual wavy boundary.

A22—8 to 17 inches; light gray (10YR 6/1) fine sand; single grained; loose; common medium roots; extremely acid; abrupt smooth boundary.

B21h—17 to 19 inches; very dark gray (10YR 3/1) fine sand; weak, medium granular structure; friable; many medium roots; extremely acid; gradual wavy boundary.

B22h—19 to 24 inches; black (10YR 2/1) fine sand; massive; noncemented; firm; sand grains coated with colloidal organic matter; extremely acid; gradual wavy boundary.

B23h—24 to 27 inches; very dark grayish brown (10YR 3/2) fine sand; weak medium subangular blocky structure; noncemented; firm; sand grains coated with colloidal organic matter; strongly acid; gradual wavy boundary.

C1—27 to 50 inches; brown (10YR 5/3) fine sand; few fine faint very dark grayish brown mottles; single grained; friable; few fine roots and root pores; strongly acid; gradual wavy boundary.

C2—50 to 72 inches; gray (10YR 6/1) fine sand; many medium and large distinct yellowish brown (10YR 5/4), brown (10YR 5/3), and light olive brown (2.5Y 5/4) mottles; single grained; loose; few medium roots; discontinuous streaks and patches of dark gray (10YR 4/1) fine sand; medium acid; gradual wavy boundary.

C3—72 to 80 inches; white (10YR 8/1) fine sand; common medium distinct yellow (10YR 7/8) and brownish yellow (10YR 6/6) mottles along root channels; single grained; loose; medium acid.

Texture is either sand or fine sand to a depth of 80 inches or more except in the A1 horizon, which is fine sand in all areas. Reaction is extremely acid to medium acid except where the soil has been limed or irrigated with alkaline water.

The A1 horizon is a mixture of organic matter and light gray sand that has a salt-and-pepper appearance. Thickness is from 4 to 8 inches. When rubbed, this horizon has hue of 10YR or neutral color, value of 2 to 4, and chroma of 1 or less.

The A2 horizon has hue of 10YR or neutral color, value of 5 to 8, and chroma of 2 or less. Few to common, faint to distinct streaks and mottles in shades of gray and brown are in many pedons. A transitional layer 1/2 inch to 2 inches thick occurs between the A2 and Bh horizon in many pedons.

The B2h horizon begins between depths of 8 and 19 inches. Thickness ranges from 6 to 20 inches. Sand grains in this horizon are coated with colloidal organic matter. This horizon has hue of 5YR, value of 2, and chroma of 1 or 2 or value of 3 and chroma of 2 to 4; hue of 7.5YR, value of 3, and chroma of 2; or hue of 10YR, value of 2 or 3, and chroma of 1 or 2. Light colored material from the A2 horizon often occurs in this horizon as vertical tongues or as streaks along old root channels.

Where present, the B3 horizon has hue of 10YR, value of 3 or 4, and chroma of 3. Thickness of the A and B horizons combined is less than 60 inches.

In some pedons there is a second sequum of A'2 and B'h horizons below a depth of 40 inches.

The C horizon has hue of 10YR, value of 4 or 5, and chroma of 1 to 3 or value of 6 to 8 and chroma of 1 to 4.

St. Johns series

The St. Johns series is a member of the sandy, siliceous, hyperthermic family of Typic Haplaquods. It consists of nearly level, poorly drained, moderately permeable soils that formed in thick beds of sandy marine sediments. These soils occur mostly in low places in the flatwoods. They are commonly adjacent to swamps. Some are in depressions. Slopes are less than 2 percent.

St. Johns soils are geographically associated with Immokalee, Myakka, Placid, and Smyrna soils. Immokalee, Myakka, and Smyrna soils occur in slightly higher positions on the landscape than St. Johns soils. They do not have an umbric epipedon. Placid soils occur in topographic positions similar to those of St. Johns soils. They do not have a Bh horizon.

Typical pedon of St. Johns fine sand, about 2 miles west of junction of Florida Highway 14 and U.S. Highway 92, 1/4 mile northwest of fire tower; SW1/4NW1/4 sec. 5, T. 16 S., R. 32 E.

A11—0 to 7 inches; black (10YR 2/1) fine sand; moderate medium granular structure; very friable; many fine roots, common medium and large roots; strongly acid; gradual smooth boundary.

A12—7 to 10 inches; very dark gray (10YR 3/1) fine sand; weak fine granular structure; very friable; common fine and few medium roots; strongly acid; clear wavy boundary.

A21—10 to 13 inches; gray (10YR 5/1) fine sand; single grained; loose; few fine roots; few medium distinct very dark gray (10YR 3/1) vertical streaks along root channels; strongly acid; gradual wavy boundary.

A22—13 to 26 inches; light gray (10YR 6/1) fine sand; single grained; loose; few fine roots; common fine distinct very dark gray (10YR 3/1) and few fine faint gray vertical streaks; strongly acid; abrupt wavy boundary.

B21h—26 to 35 inches; black (5YR 2/1) fine sand; moderate medium granular structure; noncemented; firm; common fine roots; sand grains coated with organic matter; strongly acid; clear wavy boundary.

B22h—35 to 43 inches; dark reddish brown (5YR 2/2) fine sand; moderate medium granular structure; noncemented; firm; common fine roots; sand grains coated with organic matter; strongly acid; clear wavy boundary.

B3&Bh—43 to 54 inches; dark brown (10YR 3/3) fine sand with common medium distinct dark reddish brown (5YR 2/2) spodic fragments; single grained; loose; many uncoated sand grains; strongly acid; clear wavy boundary.

C—54 to 60 inches; brown (10YR 4/3) fine sand; single grained; loose; strongly acid.

Texture is sand or fine sand to a depth of 80 inches or more. Reaction is strongly acid or very strongly acid.

The A1 horizon ranges from 10 to 20 inches in thickness. It has hue of 10YR, value of 2 or 3, and chroma of 1, or the color is neutral and the value is 2 or 3. The A2 horizon has hue of 10YR, value of 5 to 7, and chroma of 1. Few to common, faint to distinct vertical streaks of darker colors are present in many pedons. Thickness is 8 to 19 inches. A thin transitional layer is between the A2 and Bh horizons in many pedons.

The Bh horizon has hue of 10YR, 7.5YR, or 5YR, value of 2, and chroma of 1 or 2; or hue of 7.5YR or 5YR, value of 3, and chroma of 1 to 3. In many places there are few to common mottles in shades of black and brown. Tongues, pockets, and streaks of gray to light gray are associated with root channels in some pedons. Thickness ranges from 8 to 20 inches.

The B3 part of the B3&Bh horizon has hue of 10YR, value of 3 or 4, and chroma of 3 or value of 5 to 7 and chroma of 3 or 4; or it has hue of 7.5YR, value of 3, and chroma of 2 or value of 4 and chroma of 4. The Bh part consists of fragments and is scattered throughout the horizon. It has the color range of the Bh horizon. Thickness of the B3&Bh horizon ranges from 0 to 12 inches. Some pedons have a B3 horizon that is similar to the B3 part of the B3&Bh horizon. It lacks the spodic fragments.

The C horizon has hue of 10YR, value of 4 or 5, and chroma of 1 to 3, value of 6 and chroma of 2 or 3, or value of 7 and chroma of 3 or 4. Many pedons have mottles in shades of brown, yellow, or gray.

St. Lucie series

The St. Lucie series is a member of the hyperthermic, uncoated family of Typic Quartzipsamments. It consists of excessively drained, very rapidly permeable sandy soils that lack a diagnostic horizon. These soils formed in thick beds of marine or eolian sand. They are on nearly level to dunelike ridges and isolated knolls. Slope ranges from 0 to 8 percent.

St. Lucie soils are geographically associated with Astatula, Daytona, Paola, and Satellite soils. The Astatula and Paola soils occur in topographic positions similar to those of St. Lucie soils. The C horizon of the Astatula soils has brighter color than that of the St. Lucie soils or chroma of 3 or more. The Paola soils have a B&A horizon. The Daytona soils occur in lower positions, have a spodic horizon, and are moderately well drained. The Satellite soils are in lower positions and are somewhat poorly drained.

Typical pedon of St. Lucie fine sand, on a 2 percent slope, 0.8 mile east of U.S. Highway 17-92, on Highbank Road, which is the northern boundary of DeBary, 0.3 mile north of the road; NE1/4SW1/4 sec. 23, T. 18 S., R. 30 E.

A—0 to 3 inches; gray (10YR 5/1) fine sand; single grained; loose; common medium and large roots; strongly acid; clear smooth boundary.

C—3 to 80 inches; white (10YR 8/1) fine sand; few fine light gray (10YR 7/1) streaks; single grained; loose; common fine and medium roots that decrease to very few in the lower part of the horizon; sand grains are uncoated; strongly acid.

The sandy material extends to a depth of more than 80 inches. Soil reaction is extremely acid to neutral.

The A horizon is 1 to 4 inches thick. It has hue of 10YR, value of 5 to 7, and chroma of 1. Unrubbed, the A horizon is a mixture of light gray (10YR 6/1) or white (10YR 8/1) sand and black (10YR 2/1) organic matter.

The C horizon extends to 80 inches or more. It has hue of 10YR, value of 7 or 8, and chroma of 1 or 2. The content of silt and clay combined is less than 5 percent. Texture is fine sand or sand.

Tavares series

The Tavares series is a member of the hyperthermic, uncoated family of Typic Quartzipsamments. It consists of nearly level, moderately well drained, very rapidly permeable soils that formed in thick beds of marine or eolian deposits. These soils occur on moderately high areas of sand ridges. Slopes range from 0 to 5 percent.

Tavares soils are geographically associated with Apopka, Astatula, Cassia, Daytona, Deland, Immokalee, Myakka, Orsino, and Paola soils. Apopka soils occur in higher topographic positions than Tavares soils, are well drained, and have a Bt horizon. Astatula soils occur in higher positions and are excessively drained. Cassia soils are in slightly lower positions than Tavares soils, are somewhat poorly drained, and have a Bh horizon. Daytona soils occur in positions similar to those of Tavares soils, and they have a Bh horizon. Deland soils are in slightly higher positions, and they have a Bh horizon. Immokalee and Myakka soils occur in lower positions, are poorly drained, and have a Bh horizon. Orsino and Paola soils have an A2 horizon over a Bir horizon and, in addition, Paola soils are well drained. Orsino soils occur in positions similar to those of Tavares soils, and Paola soils are higher.

Typical pedon of Tavares fine sand, southeast of DeLand, 0.25 mile east of State Route 15A, on trail behind Meadow Gold Dairy; SW1/4SE1/4 sec. 34, T. 17 S., R. 29 E.

A1—0 to 8 inches; dark gray (10YR 4/1) fine sand; single grained; loose; many fine and medium roots; few discontinuous very pale brown streaks less than 1/2 inch wide; strongly acid; abrupt wavy boundary.

C1—8 to 24 inches; pale brown (10YR 6/3) fine sand; many fine faint brownish yellow (10YR 6/6) and many coarse faint very pale brown (10YR 8/3) mottles; single grained; loose; few medium roots; few streaks of charcoal along old root channels; medium acid; gradual wavy boundary.

C2—24 to 48 inches; very pale brown (10YR 7/3) fine sand; many medium faint yellow (10YR 7/6) mottles; single grained; loose; many medium and few fine roots; medium acid; diffuse wavy boundary.

C3—48 to 80 inches; white (10YR 8/2) fine sand; few medium faint very pale brown (10YR 7/3, 8/3) and yellow (10YR 7/6) mottles; single grained; loose; few medium roots; slightly acid.

Texture is either sand or fine sand to a depth of 80 inches or more except in the A1 horizon, which is fine sand in all areas. The content of silt and clay combined is 5 percent or less between 10 and 40 inches. Reaction is very strongly acid to slightly acid.

The A horizon has hue of 10YR, value of 3 to 5, and chroma of 1 or 2, or the color is neutral, the value is 3 or 4, and the chroma is 2. Thickness is 3 to 9 inches unless affected by cultivation.

The C1 and C2 horizon has hue of 10YR, value of 5 to 7, and chroma of 3 or 4. A few yellowish or brownish mottles are in places in the C horizon. In places, large white or gray splotches are present at a depth of less than 30 inches, but these are interpreted as the color of uncoated sand grains and are not evidence of wetness.

The C3 horizon has hue of 10YR, value of 6 to 8, and chroma of 1 to 4. Few to common mottles in shades of yellow and brown are present.

Tequesta series

The Tequesta series is a member of the loamy, siliceous, hyperthermic family of Arenic Glossaqualfs. It consists of nearly level, very poorly drained soils that formed in marine sandy and loamy material under conditions favorable for the accumulation of thin deposits of hydrophytic plant remains. These soils occur in broad low flats and freshwater swamps and marshes. Slopes are less than 1 percent.

Tequesta soils are geographically associated with EauGallie, Pineda, Riviera, Tomoka, and Wabasso soils. All of these soils are in similar topographic positions. EauGallie and Wabasso soils have a spodic horizon. Pineda soils have a Bir horizon. Riviera soils do not have a histic epipedon. Tomoka soils are organic.

Typical pedon of Tequesta muck, about 0.4 mile southwest of intersection of Maytown Road and I-95 overpass, on Maytown Road to flatwoods trail, north 1.1 miles on flatwoods trail, east 0.4 mile on flatwoods trail to fire lane, east 300 paces:

Oa—12 inches to 0; black (5YR 2/1, rubbed) sapric material (muck); weak medium granular structure; friable; many fine and medium roots; strongly acid; clear wavy boundary.

A1—0 to 9 inches; dark gray (10YR 4/1) sand; weak fine granular structure; loose; common medium and few fine roots; few pockets of black (N 2/0) sapric material; neutral; clear wavy boundary.

A2—9 to 25 inches; light gray (10YR 6/1) sand; single grained; loose; few large roots; common medium distinct streaks of dark gray (10YR 4/1) sand; neutral; abrupt irregular boundary.

B2tg—25 to 31 inches; gray (10YR 5/1) sandy clay loam; few medium faint dark grayish brown (10YR 4/2) mottles; weak fine subangular blocky structure; friable; slightly sticky and plastic; sand grains coated and bridged with clay; moderately alkaline; clear wavy boundary.

B3g—31 to 35 inches; dark gray (10YR 4/1) loamy sand; single grained; loose; moderately alkaline; abrupt wavy boundary.

IIC1—35 to 70 inches; white (10YR 8/1) mixed sand and shell; single grained; loose; few calcium carbonate nodules about 1 inch in diameter; moderately alkaline; calcareous.

Solum thickness is 30 inches or more. Reaction ranges from strongly acid to neutral in the Oa and A horizons and from slightly acid to moderately alkaline in the B and IIC horizons.

The Oa horizon has hue of 5YR, value of 2 or 3, and chroma of 1 to 4; hue of 10YR, value of 2, and chroma of 1; or neutral color and value of 2. Thickness of the Oa horizon ranges from 6 to 15 inches.

The A1 horizon has hue of 10YR, value of 2 to 4, and chroma of 1, or neutral color and value of 2 to 4. Thickness is 4 to 12 inches. The horizon is less than 7 inches thick where the value is 3 or less. The A2 horizon has hue of 10YR, value of 5 or 6, and chroma of 1 or 2, or neutral color and value of 4 to 6. In places few to common mottles and streaks in shades of gray and brown are in the A horizon. Texture of the A horizon is sand or fine sand.

Some pedons have a B&A horizon below the A2 horizon. It has the same color range as the B2tg horizon. The A part consists of few to common krotovina or tubular intrusions from the A2 horizon. Texture of the A part is sand or fine sand. Texture of the B part is sandy clay loam, sandy loam, or fine sandy loam.

The B2tg horizon has hue of 10YR or 5Y, value of 4 to 6, and chroma of 1 or 2; neutral color and value of 4 to 6; or hue of 2.5Y, value of 4 or 5, and chroma of 2. Few to common mottles in shades of gray, brown, or olive are in places. Texture of the B2tg horizon is sandy loam, fine sandy loam, or sandy clay loam. Total thickness ranges from 6 to 30 inches.

Some pedons have a B3g horizon. The color range is the same as that of the B2tg horizon. Texture is loamy sand, loamy fine sand, or sandy loam. Thickness is 0 to 20 inches.

The IIC horizon has hue of 10YR, value of 4 to 8, and chroma of 1 or 2, or the color is neutral and the value is 4 to 8. Texture is sand or loamy sand. Lenses and pockets of sandy loam or sandy clay loam may occur in some pedons. In many pedons, all or part of this horizon is a mixture of sand and shell. This horizon may have few to many calcium carbonate nodules.

Terra Ceia series

The Terra Ceia series is a member of the euic, hyperthermic family of Typic Medisaprists. It consists of nearly level, very poorly drained, well decomposed organic material to a depth of 52 inches or more. These soils formed in thick beds of hydrophytic nonwoody remains. They occur in freshwater marshes, grassy depressions, and broad freshwater swamps.

Terra Ceia soils are associated with Bluff, Chobee, Gator, Placid, and Tomoka soils. All of these soils occur in similar topographic positions. Bluff, Chobee, and Placid soils are mineral soils. In Gator and Tomoka soils, the mineral layers below the organic material are within a depth of 52 inches.

Typical pedon of Terra Ceia muck, about 2 miles southeast of Enterprise, in marsh area between Stone Island and the mainland; SW1/4NW1/4 sec. 8, T. 19 S., R. 31 E.

Oa1—0 to 15 inches; black (10YR 2/1, unrubbed and 5YR 2/1, rubbed) well decomposed organic matter (muck); about 45 percent fiber, 10 percent rubbed; weak medium granular structure; very friable; many fine roots; sodium pyrophosphate extract color is dark brown (10YR 3/3); about 10 percent mineral; strongly acid; gradual wavy boundary.

Oa2—15 to 44 inches; black (5YR 2/1, unrubbed and rubbed) well decomposed organic material (sapric); about 10 percent fiber, less than 2 percent rubbed; moderate medium granular structure; very friable; many fine roots; sodium pyrophosphate extract color is brown (10YR 5/3); about 10 percent mineral; strongly acid; gradual wavy boundary.

Oa3—44 to 64 inches; black (N 2/0) highly decomposed organic matter (sapric); less than 5 percent fiber, less than 2 percent rubbed; weak fine granular structure; very friable; sodium pyrophosphate extract color is very dark grayish brown (10YR 3/2); about 20 percent mineral; strongly acid.

Reaction is 4.5 or more in 0.01M calcium chloride. Thickness of the organic material is more than 52 inches. The Oa horizon has hue of 10YR or 5YR, value of 2, and chroma of 1, or the color is neutral and the value is 2.

In some pedons fibers from woody plants make up 5 to 30 percent, unrubbed, of the organic volume. Mineral content of the horizons between depths of 16 to 52 inches ranges from 5 to 40 percent. The underlying material is sandy, loamy, or clayey, or stratified sediments of these textures.

Tomoka series

The Tomoka series is a member of the loamy, siliceous, dysic, hyperthermic family of Terric Medisaprists. It consists of very poorly drained soils that formed in moderately thick beds of hydrophytic plant remains in swamps and marshes. Slopes are less than 2 percent.

Tomoka soils are geographically associated with the Hontoon, Myakka, Pomona, Samsula, Wabasso, and Wauchula soils. Hontoon and Samsula soils occur in topographic positions similar to those of Tomoka soils. Hontoon soils have organic layers more than 52 inches thick. Samsula soils have sandy layers below the organic material. Myakka, Pomona, Wabasso, and Wauchula soils occur in adjacent flatwoods. They have a spodic horizon.

Typical pedon of Tomoka muck, about 2.5 miles northeast of junction of Florida Highway 44 and I-95, about 100 feet south of I-95 right-of-way; NE1/4SW1/4 sec. 4, T. 17 S., R. 31 E.

Oa1—0 to 10 inches; black (10YR 2/1 rubbed and pressed) well decomposed organic material (muck); about 30 percent fiber, about 13 percent rubbed; moderate medium granular structure; friable; many fine roots; sodium pyrophosphate extract color is brown (10YR 4/3); extremely acid; gradual wavy boundary.

Oa2—10 to 34 inches; dark reddish brown (5YR 2/2 rubbed and pressed) well decomposed organic material (sapric); about 30 percent fiber, 8 percent rubbed; moderate medium granular structure; friable; few fine roots; sodium pyrophosphate extract color is dark brown (10YR 3/3); extremely acid; clear wavy boundary.

IIC1—34 to 39 inches; gray (10YR 5/1) sand; few medium distinct very dark gray (10YR 3/1) streaks; single grained; loose; strongly acid; clear wavy boundary.

IIIC2—39 to 48 inches; dark gray (10YR 4/1) sandy loam; few medium faint very dark gray and light gray mottles and streaks; friable; strongly acid by Hellige-Truog method; gradual wavy boundary.

IIIC3—48 to 60 inches; very dark gray (10YR 3/1) sandy clay loam; massive; friable; very strongly acid by Hellige-Truog method.

Soil reaction in the Oa horizon is less than 4.5 in 0.01M calcium chloride. Thickness of the Oa horizon ranges from 16 to 40 inches. This horizon has hue of 10YR, value of 2, and chroma of 1 or 2 or hue of 5YR, value of 2 or 3, and chroma of 1 to 3. Sodium pyrophosphate extract color has hue of 10YR, value of 2 to 4, and chroma of 1 to 4, value of 5 and chroma of 2 to 8, value of 6 and chroma of 3 to 8, or value of 7 and chroma of 4 to 8.

The IIC and IIIC horizons have hue of 10YR, value of 2 to 6, and chroma of 1 or 2 or hue of 2.5Y, value of 2 to 6, and chroma of 2. The IIC horizon is sand, fine sand, or loamy sand. Thickness is 0 to 6 inches. The IIIC horizon is sandy loam or sandy clay loam.

Turnbull series

The Turnbull series is a member of the clayey over sandy or sandy-skeletal, montmorillonitic, nonacid, hyperthermic family of Typic Hydraquents. It consists of very poorly drained soils that formed in clayey and sandy estuarine deposits. These soils are near sea level and are flooded periodically by tidal overwash. Slopes are less than 1 percent.

Turnbull soils are geographically associated with Beaches, Hydraquents, Turnbull variant soils, and the tidal waters of the Atlantic Ocean. Beaches are overwashed daily by tidal waters. They have no plant cover. Hydraquents are in mangrove islands or swamps in tidal basins and estuaries. They are more variable than the Turnbull soils. Turnbull variant soils occur in narrow strips bordering the Intracoastal Waterway. They have a surface layer of shell fragments and sand 40 inches or more thick.

Daytona, Myakka, and Wabasso soils are adjacent to the tidal marsh. All of these soils are mineral soils, have a Bh horizon, and are better drained than Turnbull soils.

Typical pedon of Turnbull muck, in a saltgrass tidal marsh, about 75 yards east of Bulow Creek and 50 feet northeast of road connecting Old Dixie Highway and John Anderson Highway:

Oa—14 inches to 0; very dark gray (10YR 3/1, rubbed) muck with estimated mineral content about 35 percent and clay content about 15 percent; about 33 percent fiber, 10 percent rubbed; massive; slightly sticky; many fine roots; many live roots; has odor; mildly alkaline in .01M calcium chloride when wet (air dry pH in .01M calcium chloride medium acid); gradual smooth boundary.

C1g—0 to 36 inches; dark greenish gray (5GY 4/1) clay; massive; sticky, clay squeezes easily between fingers; estimated *n* value 1.5; many fine and few medium roots; slightly acid; gradual wavy boundary.

C2g—36 to 66 inches; dark greenish gray (5GY 4/1) fine sand; single grained; loose; stratified loamy fine sand and fine shells; mildly alkaline.

Reaction ranges from slightly acid to mildly alkaline in the Oa horizon in .01M calcium chloride and from slightly acid to moderately alkaline in the Cg horizon in water in the natural state. Sulfur content ranges from a trace to less than 0.75 percent in all horizons. The electrical conductivity of the saturation extract in mmhos/cm is more than 16 in all horizons. The Oa horizon has hue of 10YR, neutral color, or hue of 5Y; value of 2 to 4; and chroma of 1 or less. Thickness is 6 to 14 inches.

The C1g horizon has hue of 5Y, 5GY, 5BG, or 5G; value of 4 to 6; and chroma of 1. Texture is clay; the range is about 60 to 85 percent clay. The clay flows easily between the fingers when squeezed. The *n* value is more than 1. Lenses of fine sand, loamy fine sand, or fine sandy loam are in places. Thickness is 20 to 36 inches.

The C2g horizon has hue of 5Y or 5GY, value of 4 to 6, and chroma of 1; hue of 10YR, value of 3 or 4, and chroma of 1 or 2; or the color is neutral and the value is 2 to 5. Texture may be loamy fine sand or fine sand, a variable mixture of loamy fine sand, fine sand and shell fragments, or stratified material of loamy fine sand or fine sand and shells with thin discontinuous strata of fine sandy loam, sandy loam, sandy clay loam, sandy clay, or clay.

Turnbull variant

The Turnbull variant is a member of the mixed, hyperthermic family of Aquic Udipsamments. It consists of manmade deposits of sand and shell fragments overlying organic layers and layers of clayey and sandy estuarine deposits. The sand and shells were dredged from the channel of the Intracoastal Waterway and from marinas and were deposited over Hydraquents and Turnbull soils. Thickness of the mixed sandy and shelly overburden averages about 4 feet but is more than 6 feet in places. Most areas receive ocean spray. Slopes range from 0 to 2 percent.

The Turnbull variant is geographically associated with Canaveral soils, Hydraquents, and Turnbull soils. Canaveral soils formed in marine- and wind-deposited sand more than 80 inches thick. Hydraquents are soils of the mangrove swamps. They are overwashed by tidal waters. Turnbull soils are in the tidal marsh. They have an organic surface layer.

Typical pedon of Turnbull variant sand, in Tomoka State Park, about 0.5 mile north of park headquarters in a filled-over area bordering the Halifax River:

C1—0 to 30 inches; very pale brown (10YR 7/3) mixture of sand and shells; shells make up 90 percent, by volume, of the soil mass; loose; single grained; few roots in upper 8 inches; moderately alkaline, calcareous; abrupt smooth boundary.

C2—30 to 42 inches; brown (10YR 5/3) sand and shells; shells make up 80 percent, by volume, of the soil mass; loose; single grained; moderately alkaline, calcareous; abrupt smooth boundary.

IIC3—42 to 48 inches; black (10YR 2/1) mucky clay; massive; sticky and flows easily between fingers when squeezed; estimated *n* value 1.5; moderately alkaline; abrupt smooth boundary.

IIIC4—48 to 52 inches; brown (10YR 5/3) mixture of sand and shells; loose; single grained; strongly alkaline; abrupt smooth boundary.

IVOa—52 to 57 inches; black (5YR 2/1) muck that is less than 10 percent fiber when rubbed; massive; mildly alkaline in .01M calcium chloride when wet; abrupt smooth boundary.

VC1—57 to 62 inches; dark greenish gray (5BG 4/1) sandy clay; sticky and flows easily between fingers when squeezed; estimated *n* value 1.5; strongly alkaline; gradual wavy boundary.

VIC2—62 to 72 inches; gray (10YR 5/1) loamy sand; single grained; loose; strongly alkaline; gradual wavy boundary.

VIC3—72 to 99 inches; very dark gray (10YR 3/1) stratified sand, loamy sand, and clay; massive; sandy material is single grained; clayey material is sticky and flows easily between fingers when squeezed; strong sulphur smell.

Reaction is moderately alkaline in the mineral horizons. In the organic horizons reaction is slightly acid to mildly alkaline in .01M calcium chloride. The C1 and C2 horizons are calcareous.

The C1 and C2 horizons have hue of 10YR, value of 4 to 7, and chroma of 3, value of 5 and chroma of 2, and value of 7 and chroma of 4. Texture is a mixture of sand and shells. The shell content is 40 to 90 percent by volume. The shells in many places are predominantly coquina. The C1 and C2 horizons combined are 40 to 80 inches thick or more. They contain strata of sandy and loamy material that have varying amounts of shells and fragments. These strata vary considerably over short distances in thickness, arrangement, and composition.

In some pedons, there is an Oa horizon just below the C2 horizon. An Oa horizon can occur at various depths between the clayey and sandy mineral layers. It has hue of 10YR or 5YR, value of 2 or 3, and chroma of 1, or the color is neutral and the value is 2 or 3. Texture is muck, mucky peat, or peat. Thickness of individual layers ranges from 0 to 14 inches.

The clayey horizons below the C1 and C2 horizons are clay, mucky clay, or sandy clay. The material flows easily between the fingers when squeezed; it has an *n* value of more than 1. The clayey horizons have hue of 10YR, value of 2 or 3, and chroma of 1; hue of 5Y, 5GY, 5BG, or 5G, value of 4 to 6, and chroma of 1; or the color is neutral and the value is 2 to 5. Strata or horizons of sandy and loamy material are between the clayey horizons; they may contain varying amounts of shells. They have hue of 10YR, value of 3 to 5, and chroma of 1 or 2 or value of 5 and chroma of 3. All vary considerably over short distances in thickness, arrangement, and composition.

Tuscawilla series

The Tuscawilla series is a member of the fine-loamy, mixed, hyperthermic family of Typic Ochraqualfs. It consists of poorly drained, moderately slowly permeable soils that formed in sandy and loamy marine sediments containing shells and shell fragments. These soils are in hammocks near the Atlantic Coast. Slopes range from 0 to 2 percent.

Tuscawilla soils are geographically associated with Chobee, Myakka variant, and Tequesta soils. All of these soils occur in similar topographic positions. Chobee soils have a mollic epipedon. They are more poorly drained than Tuscawilla soils. Myakka variant soils have a Bh horizon above the shelly substratum. Tequesta soils have a mucky surface layer and an A horizon more than 20 inches thick, and they are more poorly drained.

Typical pedon of Tuscawilla fine sand, about 0.25 mile south of Flagler County line, 0.5 mile north of Scenic Drive, about 150 yards south of Bulow Canal and 100 yards east of trail that goes from Scenic Drive to Bulow Canal; NW1/4 sec. 37, T. 31 S., R. 30 E.

A1—0 to 3 inches; dark gray (10YR 4/1, crushed and rubbed) fine sand; weak fine granular structure; very friable; many fine and few medium and large roots; medium acid; abrupt smooth boundary.

A2—3 to 10 inches; light brownish gray (10YR 6/2) fine sand; single grained; common medium faint grayish brown (10YR 5/2) and few medium distinct dark gray (10YR 4/1) mottles; loose; common medium and fine roots; slightly acid; gradual wavy boundary.

B21t—10 to 13 inches; very dark grayish brown (10YR 3/2) fine sandy loam; common medium distinct light brownish gray (10YR 6/2) mottles; moderate medium subangular blocky structure; firm; few medium and fine roots; pockets of loamy sand; neutral; abrupt wavy boundary.

B22tca—13 to 32 inches; light (10YR 7/2) sandy clay loam; common medium prominent strong brown (7.5YR 5/6) and common medium distinct gray (10YR 5/1) mottles; moderate medium subangular blocky structure; friable, but has tendency to be firm in places; few medium roots; discontinuous strata or pockets of sandy clay; old root channels are weakly cemented with accumulations of calcium carbonate; few nodules of calcium carbonate that are mostly less than 1.5 inches across; discontinuous layers of hard limestone that are mostly less than 2 inches thick and about 24 inches across; mildly alkaline; gradual wavy boundary.

B23tca—32 to 40 inches; light gray (10YR 7/2) fine sandy loam; common medium faint very pale brown (10YR 7/3) mottles in ped interiors and common coarse distinct yellowish brown (10YR 5/6) mottles on ped exteriors and in ped interiors; moderate medium subangular blocky structure; friable; moderately alkaline; diffuse wavy boundary.

IIC1—40 to 62 inches; light gray (10YR 7/1) fine sand; common medium faint gray (10YR 6/1) mottles; single grained; loose; moderately alkaline; gradual wavy boundary.

IIC2—62 to 68 inches; greenish gray (5G 5/1) fine sand; single grained; loose; a discontinuous thin stratum of sandy clay loam at top of horizon; mildly alkaline; abrupt wavy boundary.

IIIC3—68 to 80 inches; white (10YR 8/1) shells, shell fragments, and fine sand; loose; single grained; mildly alkaline.

Solum thickness is 30 to 50 inches. The A1 horizon has hue of 10YR, value of 2 to 4, and chroma of 1, or the color is neutral and the value is 2 to 4. Where the value is 3 or less, the thickness of the A1 horizon is less than 6 inches. If the soil is mixed to a depth of 7 inches, the moist color value is 4 or more. Reaction ranges from medium acid to neutral. Texture is fine sand. Thickness is 3 to 6 inches. The A2 horizon has hue of 10YR, value of 4 to 7, and chroma of 1, or the color is neutral and the value is 4 to 7. This horizon contains mottles in places. Where mottles are present, the chroma is 2. Mottles are in shades of gray, brown, or yellow. Texture of the A2 horizon is sand or fine sand. In some pedons, **nodules of calcium carbonate make up as much as 15 percent of the volume. The A2 horizon is 3 to 12 inches thick. Reaction ranges from medium acid to moderately alkaline.**

The B21t and the B22tca horizons have hue of 10YR, value of 3 to 7, and chroma of 1 with or without mottles; or hue of 10YR, value of 6 or 7, and chroma of 2; or the color is neutral and the value is 4 or 5. In places the Bt horizon has mottles or discontinuous streaks in shades of yellow, brown, or red. It is sandy clay loam, sandy loam, or fine sandy loam. It ranges from neutral to moderately alkaline. In most pedons, especially in the B22tca horizon, there are soft calcium carbonate accumulations and few to common calcium carbonate nodules. Discontinuous layers of hard limestone up to 6 inches thick and from 1 foot to 2 1/2 feet across occur in some pedons.

Some pedons have a B3 horizon, which has the same color range as the Bt horizon. It is loamy sand or loamy fine sand. It is mildly alkaline or moderately alkaline, and in places it contains few to many calcium carbonate nodules.

The IIC horizon has hue of 10YR, 5Y, 5GY, or 5G, or neutral color, value of 5 to 8, and chroma of 1 or less. Texture is sand, fine sand, or loamy fine sand. Reaction is mildly alkaline or moderately alkaline. Thickness is 0 to 40 inches.

The IIIC horizon consists of loose beds of sandy material, shells, and shell fragments that are stratified in varying proportions. Reaction is mildly alkaline or moderately alkaline.

Valkaria series

The Valkaria series is a member of the siliceous, hyperthermic family of Spodic Psammaquents. It consists of nearly level, poorly drained sandy soils that occur in broad, poorly defined sloughs, depressions, and low areas bordering swamps. These soils formed in sandy marine sediments.

Valkaria soils are geographically associated with Basinger, Malabar, and Pineda soils. All of these soils occur in similar topographic positions. Basinger soils have an A&Bh horizon. Malabar and Pineda soils have a Bir horizon.

Typical pedon of Valkaria fine sand, in the Farmton Wildlife Management Area, about 3.8 miles north of Maytown Road and 600 feet west of forest road (B-8); NW1/4SW1/4 sec. 1, T. 19 S., R. 33 E.

A11—0 to 6 inches; very dark gray (10YR 3/1) fine sand; weak medium granular structure; loose; many fine and few medium roots; medium acid; abrupt wavy boundary.

A12—6 to 10 inches; dark grayish brown (10YR 4/2) fine sand; single grained; loose; few medium and large roots; medium acid; gradual wavy boundary.

A21—10 to 32 inches; light brownish gray (10YR 6/2) fine sand; many medium very pale brown (10YR 7/4) mottles in lower part; single grained; loose; many medium and few large roots; mildly alkaline; gradual wavy boundary.

A22—32 to 35 inches; light brownish gray (10YR 6/2) fine sand; many medium faint brownish yellow (10YR 6/8) mottles; single grained; loose; mildly alkaline; gradual wavy boundary.

B2ir—35 to 48 inches; brownish yellow (10YR 6/6) fine sand; single grained; loose; sand grains coated with iron oxide; mildly alkaline; gradual wavy boundary.

B3ir—48 to 52 inches; very pale brown (10YR 7/3) fine sand; massive; friable; few coarse faint brownish yellow (10YR 6/6) mottles; massive; friable; mildly alkaline; gradual wavy boundary.

C1—52 to 65 inches; gray (10YR 6/1) fine sand; single grained; loose; mildly alkaline; gradual wavy boundary.

C2—65 to 75 inches; light gray (10YR 7/2) fine sand; single grained; mildly alkaline.

Texture is either sand or fine sand to a depth of 80 inches or more except in the A1 horizon, which is fine sand in all areas. Reaction is strongly acid to neutral in the A1 horizon and strongly acid to moderately alkaline in the A2, Bir, and C horizons.

The A1 horizon has hue of 10YR, value of 3 or 4, and chroma of 1 or 2, or the color is neutral and the value is 2 to 4. Thickness is 4 to 12 inches. Where the value is 3 or less, thickness is 4 to 6 inches. The A2 horizon has hue of 10YR, value of 5 to 7, and chroma of 1 or 2, or the color is neutral and the value is 5 to 7. In places this horizon has mottles and streaks in shades of gray, brown, or yellow.

The B2ir horizon has hue of 7.5YR, 10YR, or 2.5Y; value of 5 to 7; and chroma of 6 or 8 or value of 6 and chroma of 4. The B3ir has hue of 10YR, value of 6 or 7, and chroma of 3 or 4. Some pedons have mottles in shades of gray, yellow, or brown in the Bir horizon. Thickness is 12 to 30 inches.

The C horizon has hue of 10YR, value of 4 or 5, and chroma of 1 or value of 6 or 7 and chroma of 1 or 2, or the color is neutral and the value is 4 to 7. Layers of light colored shell fragments occur in places.

Wabasso series

The Wabasso series is a member of the sandy, siliceous, hyperthermic family of Alfic Haplaquods. It consists of nearly level, poorly drained soils formed in beds of marine sandy and loamy materials that were influenced by alkaline material. These soils occur in broad areas of the flatwoods and depressions. Slope is less than 2 percent. Under natural conditions the soils are saturated within 10 inches of the surface in summer and in fall. Depressions are seasonally ponded.

Wabasso soils are geographically associated with EauGallie, Farmton, Holopaw, Pineda, and Riviera soils. EauGallie and Farmton soils occur in the flatwoods in positions similar to those of Wabasso soils. They have a Bt horizon below a depth of 40 inches. Holopaw, Pineda, and Riviera soils are in slightly lower positions. Holopaw and Riviera soils do not have a spodic horizon. Pineda soils have a Bir horizon.

Typical pedon of Wabasso fine sand, about 7 miles east of Osteen on Maytown Road, south about 1.2 miles on graded road, southeast about 1.3 miles on graded road, southwest about 0.6 mile to bend in graded road, 50 feet on west side of road; SE1/4NW1/4 sec. 29, T. 19 S., R. 33 E.

A1—0 to 7 inches; black (10YR 2/1) fine sand; weak fine granular structure; very friable; many fine to large roots; extremely acid; many uncoated sand grains; gradual smooth boundary.

A21—7 to 12 inches; gray (10YR 5/1) fine sand; single grained; loose; many fine to large roots; very strongly acid; gradual smooth boundary.

A22—12 to 24 inches; light gray (10YR 6/1) fine sand; single grained; loose; few medium roots; discontinuous streaks of dark gray (10YR 4/1) sand along root channels; strongly acid; abrupt wavy boundary.

B21h—24 to 30 inches; black (5YR 2/1) loamy fine sand; massive; firm; noncemented; sand grains coated with colloidal organic matter; few dark reddish brown (5YR 3/2) streaks at bottom of horizon; slightly acid; gradual wavy boundary.

B22h—30 to 35 inches; dark reddish brown (5YR 3/2) fine sand; massive; firm; noncemented; sand grains coated with colloidal organic matter; few medium and fine roots; many black (5YR 2/1) streaks and coarse mottles that follow old root channels; slightly acid; gradual wavy boundary.

B3—35 to 39 inches; dark brown (10YR 4/3) fine sand; single grained; loose; many very dark grayish brown (10YR 3/2) streaks and splotches along old root channels; medium acid; gradual smooth boundary.

B'21tg—39 to 51 inches; gray (5Y 5/1) fine sandy loam; many medium distinct olive brown (2.5Y 5/4) mottles; moderate medium angular blocky structure; firm; common fine roots; tongues of dark brown sand from the B3 horizon extend about 5 inches into this horizon; common spots of white calcium carbonate accumulations; slightly acid; gradual smooth boundary.

B'22tg—51 to 72 inches; greenish gray (5GY 5/1) sandy clay loam with pockets of sandy loam; common medium faint gray (5Y 5/1) mottles; moderate medium subangular blocky structure; friable; few large roots; few shell fragments; neutral; gradual smooth boundary.

B'23tg—72 to 80 inches; greenish gray (5G 5/1) sandy clay loam with pockets of gray (5Y 6/1) sandy loam; few medium distinct brownish yellow (10YR 6/6) mottles; weak medium subangular blocky structure; mildly alkaline.

Solum thickness is 60 inches or more. Reaction ranges from extremely acid to slightly acid in the A horizon, from very strongly acid to neutral in the Bh and B3 horizons, and from medium acid to moderately alkaline in the B'tg and C horizons.

The A1 horizon has hue of 10YR, value of 2 to 4, and chroma of 1. Thickness is 3 to 8 inches. The A2 horizon has hue of 10YR, value of 5 to 7, and chroma of 1 or value of 6 or 7, and chroma of 2; or it has hue of 2.5Y, value of 6 or 7, and chroma of 2. Few to common mottles or streaks of darker color are in the A2 horizon. Texture of the A2 horizon is sand or fine sand. Total thickness of the A horizon is 12 to 29 inches.

The Bh horizon has hue of 10YR, value of 2 or 3, and chroma of 1 to 3; hue of 7.5YR, value of 3, and chroma of 2; or hue of 5YR, value of 2 or 3, and chroma of 1 to 4. Sand grains are coated with colloidal organic matter. Thickness of the Bh horizon is 6 to 12 inches. Texture is sand or fine sand.

Where present, the B3 horizon has hue of 10YR, value of 4, and chroma of 2 or 3; hue of 7.5YR, value of 4, and chroma of 2 to 4; or hue of 5YR, value of 4, and chroma of 3 or 4. In places this horizon has mottles of darker color. Texture is fine sand or sand. Thickness is 0 to 6 inches.

Some pedons have an A'2 horizon. It has hue of 10YR, value of 5 to 7, and chroma of 1 to 3; or hue of 2.5Y, value of 5 or 6, and chroma of 2. The A'2 horizon generally has mottles in shades of yellow or brown. Texture is fine sand or sand. Thickness is 0 to 12 inches.

Total thickness of all the horizons above the B21tg horizon is less than 40 inches.

The B'tg horizon has hue of 10YR, value of 5 to 7, and chroma of 1 to 4 or value of 5 or 6 and chroma of 6 or 8; hue of 2.5Y or 5Y, value of 5 or 6, and chroma of 1; hue of 2.5Y, value of 5, and chroma of 2; or hue of 5G and 5GY, value of 5, and chroma of 1. This horizon has few to common, faint to prominent mottles in shades of gray, brown, yellow, or red. It has light colored carbonatic accumulations in many places. Total thickness of the B'tg horizon is about 6 to 42 inches. Texture is fine sandy loam or sandy clay loam. Some pedons contain pockets of sandy loam, loamy sand, or sand.

Some pedons have a C horizon within a depth of 80 inches. It has hue of 10YR, value of 5 to 7, and chroma of 1 or hue of 5GY, 5G, and 5BG, value of 5 or 6, and chroma of 1. Texture is sand, fine sand, or loamy sand mixed with shell fragments.

Wauchula series

The Wauchula series is a member of the sandy, siliceous, hyperthermic family of Ultic Haplaquods. It consists of nearly level, poorly drained, moderately permeable soils that formed in sandy and loamy marine deposits. These soils occur in broad areas in the flatwoods and in depressions. Slopes are less than 2 percent.

Wauchula soils are geographically associated with Pineda, Pomona, and Scoggin soils. Pineda and Scoggin soils occur in lower topographic positions than Wauchula soils. Pineda soils have a Bir horizon above the Bt horizon, and Scoggin soils do not have a Bh horizon. Pomona soils occur in positions similar to those of Wauchula soils. They have a Bt horizon at a depth of more than 40 inches. Wabasso soils have a higher base saturation in the Bt horizon than Wauchula soils.

Typical pedon of Wauchula fine sand, about 9.5 miles east of DeLand to woods road, south about 1 mile; SW1/4NW1/4 sec. 23, T. 17 S., R. 31 E.

A11—0 to 3 inches; black (10YR 2/1) loamy fine sand; moderate fine granular structure; very friable; many fine and few medium roots; extremely acid; clear smooth boundary.

A12—3 to 7 inches; very dark gray (10YR 3/1, rubbed) fine sand; weak medium granular structure; very friable; common fine and medium roots; common coarse faint dark gray splotches; extremely acid; gradual wavy boundary.

A21—7 to 13 inches; gray (10YR 5/1) fine sand; many coarse faint dark gray mottles and streaks; single grained; loose; few fine and many medium roots; medium acid; gradual wavy boundary.

A22—13 to 20 inches; light gray (10YR 6/1) fine sand; single grained; loose; few fine and medium roots; many medium distinct very dark gray (10YR 3/1) vertical streaks and common coarse faint gray splotches; slightly acid; abrupt irregular boundary.

B21h—20 to 25 inches; dark reddish brown (5YR 2/2) loamy fine sand; moderate medium granular structure; firm; noncemented; common fine roots; sand grains well coated with colloidal organic matter; very strongly acid; clear irregular boundary.

B22h—25 to 29 inches; dark brown (7.5YR 3/2) loamy fine sand; moderate medium granular structure; very friable; less than 10 percent uncoated sand grains in matrix color; common fine roots; common coarse distinct black (5YR 2/1) weakly cemented bodies; strongly acid; gradual broken boundary.

B3—29 to 34 inches; dark grayish brown (10YR 4/2) fine sand; single grained; loose; few fine and medium roots; few fine and medium distinct black (10YR 2/1) streaks; few iron concretions 1 inch in diameter at upper boundary of horizon; strongly acid; abrupt wavy boundary.

B'21tg—34 to 49 inches; light gray (10YR 6/1) sandy clay loam; many coarse distinct yellowish brown (10YR 5/6) mottles; weak medium subangular blocky structure; friable; slightly sticky; many common and fine decaying roots; sand grains bridged and coated with clay; many fine pores; very strongly acid; gradual wavy boundary.

B'22tg—49 to 71 inches; light gray (10YR 6/1) sandy clay loam; many coarse distinct yellowish brown (10YR 5/6) and many coarse distinct red (2.5YR 4/8) mottles; weak coarse subangular blocky structure; friable; common fine decaying roots; few loamy fine sand lenses; common fine pores; very strongly acid; clear wavy boundary.

B'3—71 to 80 inches; light gray (5Y 7/1) sandy clay loam in vertical streaks 2 to 4 inches wide alternating with streaks of fine sandy loam that is mottled dark red (10R 3/6), red (10R 5/8), yellowish red (5YR 5/6), brownish yellow (10YR 6/6), and light gray (5Y 7/1); weak coarse subangular blocky structure; friable; common medium distinct streaks of loamy fine sand; very strongly acid.

Reaction is extremely acid to slightly acid in the A horizon, extremely acid to strongly acid in the Bh horizon, and strongly acid to very strongly acid in the B3, B'2t, and B'g horizons.

The A1 horizon has hue of 10YR, value of 1 to 4, and chroma of 1 or value of 4 and chroma of 2. Thickness is 4 to 9 inches. If the horizon is mixed, for example by plowing, the texture is fine sand.

The A2 horizon has hue of 10YR, value of 5 to 7, and chroma of 1 or 2, or the color is neutral and the value is 5 to 7. Some pedons have gray, yellow, red, or brown mottles. Thickness of the A2 horizon is 10 to 21 inches.

The Bh horizon has hue of 10YR, 7.5YR, or 5YR, value of 2 or 3, and chroma of 3 or less or hue of 5YR, value of 3, and chroma of 4. Consistence ranges from very friable to firm. Texture is fine sand, sand, or loamy fine sand. Thickness is 6 to 12 inches.

The B3 horizon has hue of 10YR, value of 4, and chroma of 2 to 4. In many pedons, few to common, fine to coarse bodies from the Bh horizon are present. Texture is fine sand or sand. In some pedons, there is no B3 horizon, and the Bh horizon rests directly on the B't horizon.

Some pedons have an A'2 horizon. It has hue of 10YR, value of 5, and chroma of 1, or value of 6 and chroma of 1 to 3, or value of 7 and chroma of 1 to 4. Texture is fine sand or sand. Thickness is 0 to 6 inches.

The B'tg horizon begins at a depth of less than 40 inches. It has hue of 10YR, value of 4 to 6, and chroma of 1 or 2; hue of 2.5Y, value of 4 to 6, and chroma of 2; or neutral color and value of 5 or 6. This horizon contains brown, yellow, gray, or red mottles. Texture is sandy loam, fine sandy loam, or sandy clay loam. Some pedons have lenses of sandy material.

The B'3 horizon has color and texture similar to that of the B'tg horizon.

Winder series

The Winder series is a member of the fine-loamy, siliceous, hyperthermic family of Typic Glossaqualfs. It consists of nearly level, poorly drained soils formed in unconsolidated marine sands and clays that are influenced by underlying alkaline material. These soils occur in broad, low flats. Slopes are less than 2 percent.

Winder soils are associated with Chobee, Malabar, Pinellas, Pineda, Tuscawilla, and Wabasso soils. All of these soils occur in low areas. Chobee soils have a mollic epipedon. Malabar soils have a Bir horizon and a Bt horizon below a depth of 40 inches. Pinellas and Pineda soils have a Bir horizon and a Bt horizon within a depth of 20 to 40 inches. Tuscawilla soils do not have a B&A horizon and have accumulations of calcium carbonate in the B horizon. Wabasso soils have a Bh horizon.

Typical pedon of Winder fine sand, about 4.5 miles east of Osteen and 1.5 miles south of Oak Hill road; SW1/4NE1/4 sec. 23, T. 19 S., R. 32 E.

A11—0 to 3 inches; very dark gray (10YR 3/1) fine sand; weak fine granular structure; very friable; many fine and common medium roots; medium acid; clear smooth boundary.

A12—3 to 6 inches; dark gray (10YR 4/1) fine sand; common fine faint gray and very dark gray mottles; very weak fine granular structure; very friable; many fine and medium roots and few large roots; medium acid; gradual smooth boundary.

A2—6 to 12 inches; gray (10YR 5/1) fine sand; many fine medium faint dark gray mottles that decrease with increasing depth; few light gray mottles in lower 3 inches; single grained; loose; common fine, many medium and few large roots; medium acid; abrupt wavy boundary.

B&A—12 to 19 inches; dark gray (10YR 4/1) sandy clay loam; many medium distinct yellowish brown (10YR 5/6) and dark yellowish brown (10YR 4/4) mottles and common fine distinct brownish yellow (10YR 6/8) mottles; moderate coarse angular and subangular blocky structure; friable; common fine pores; common intrusions of gray (10YR 6/1) fine sand 1/2 inch to 2 inches in diameter; few very dark gray (10YR 3/1) vertical streaks; discontinuous lenses of heavy sandy clay loam 1 to 3 inches thick in upper part of the horizon; medium acid; gradual wavy boundary.

B22tg—19 to 27 inches; gray (10YR 5/1) sandy clay loam; many fine and medium distinct yellowish brown (10YR 5/6) mottles; weak coarse angular and subangular blocky structure; friable; common fine and few medium roots; common fine and medium pores; common light gray (10YR 7/1) fine sand tongues or intrusions 1/2 inch to 2 inches in diameter and few very dark gray (10YR 3/1) tongues or intrusions 1/2 inch to 1 1/2 inches in diameter; slightly acid; gradual wavy boundary.

B23tg—27 to 35 inches; gray (10YR 5/1) sandy clay loam; common fine and medium distinct yellowish brown (10YR 5/6) mottles; weak coarse angular and subangular blocky structure; friable; few medium roots; neutral; gradual wavy boundary.

B24tg—35 to 53 inches; light brownish gray (10YR 6/2) fine sandy loam; common medium prominent yellowish brown (10YR 5/6) mottles; weak coarse subangular blocky structure; friable; few medium roots; few lenses of fine sand; neutral; gradual wavy boundary.

IICg—53 to 80 inches; light brownish gray (10YR 6/2) fine sand containing common coarse distinct lenses and balls of sandy clay loam and common fine and medium distinct yellowish brown (10YR 5/6) mottles; massive; loose to friable; neutral.

Solum thickness ranges from 22 to 54 inches. Reaction ranges from medium acid to moderately alkaline.

The A1 horizon has hue of 10YR, value of 2 to 4, and chroma of 1, or the color is neutral and the value is 2 to 4. Thickness is 3 to 8 inches. Where the value is less than 3, thickness is less than 6 inches. The A2 horizon has hue of 10YR, value of 4 to 7, and chroma of 1 or 2; neutral color and value of 4 to 7; or hue of 2.5Y, value of 5 to 7, and chroma of 2. Common fine mottles occur in shades of yellow and brown. Texture is fine sand or sand. Total thickness of the A horizon is 12 to 20 inches.

The B&A horizon has hue of 10YR, 2.5Y, 5Y, or neutral color; value of 4 to 7; and chroma of 0 to 2. There are few to many, fine to coarse, faint to prominent mottles in shades of gray, yellow, and brown. Texture of the B part ranges from sandy loam to sandy clay loam. The average clay content is 18 to 25 percent but ranges to 35 percent. Texture of the A part is fine sand or sand that extends vertically into the horizon from the A2 horizon. Thickness of the B&A horizon is 2 to 7 inches.

The color and texture of the B2tg horizon is similar to that of the B part in the B&A horizon. Thickness is 12 to 34 inches.

The IICg horizon is stratified and mixed fine sand to sandy clay loam. Reaction ranges from slightly acid to moderately alkaline. In some pedons, this horizon is calcareous.

Formation of the soils

In this section the factors of soil formation are discussed and related to the soils in the survey area. In addition, the processes of soil formation are described.

The kind of soil that develops in a given area depends on five major factors. These factors are (1) the *climate* under which the soil material has accumulated and has existed since accumulation; (2) the physical and mineral composition of the *parent material*; (3) the *organisms*, or plant and animal life on and in the soil; (4) the *relief*, or lay of the land; and (5) the length of *time* that these four factors have been acting. The five factors of soil formation are interdependent; each modifies the effects of the others. As soil forms, it is influenced by the five factors, but in some places the major differences among soils appear to be the result of only one factor. A variation in one or more of the factors results in the formation of a different soil.

Climate

The climate of Volusia County is described in part by the term "hyperthermic," which appears in the classification of each soil series. If a soil is in the hyperthermic temperature regime, the average temperature of the soil at a depth of 20 inches (50 cm) is 72 degrees F (22 degrees C) or more. The soils in Volusia County are never frozen. As a result, biological activity and chemical reactions involved in the processes of soil formation proceed throughout the year. These processes are also accelerated by the adequate supply of moisture that is available. The average annual rainfall is about 50 inches. Under a warm and moist climate such as this, organic matter decomposes rapidly, and chemical reaction in the soil is faster than in cooler and dryer areas. Heavy rainfall readily leaches the soils of most plant nutrients and produces strongly acid soil conditions, especially in freely drained sandy soils. Fine particles of clay and sometimes organic matter are also carried down, or translocated, and eventually form a subsoil.

The climate is fairly uniform throughout the county. Therefore, it has not been a major factor contributing to the differences among the soils of the county. The differences are chiefly the result of other factors of soil formation.

Parent material

The parent material in Volusia County is almost entirely deposits of marine origin. These deposits are apparently much like the deposits that are accumulating at the present time. Almost all the material is quartz sand that has variable amounts of clay and shell fragments. Clay is more abundant in soils formed in the sediments of marine terraces and lagoons. It is virtually absent in shoreline ridges, where most deposits are eolian sands.

Some alluvial deposits are associated with the major streams and lakes. The largest such area is along the St. Johns River. Because the parent material was derived from diverse sources and deposited under many conditions, the soils formed in alluvial deposits are highly variable. Some, such as Bluff soils, are fine textured. Others are sandy or loamy. Fluvaquents are highly variable and stratified.

The organic soils, or Histosols, which are common throughout the county, formed in the partially decayed remains of wetland vegetation.

Living organisms

Plants, animals, and micro-organisms, such as bacteria and fungi, are important in the formation of soils. Plants generally supply organic matter, which decomposes, gives a dark color to the soil surface, and supplies the soil with plant nutrients. Trees and other plants take nutrients from the soil and store them in their roots, stems, leaves, and other parts. When these plants or plant parts decay, the nutrients are returned to the soil and can be used again. Bacteria and fungi decompose the vegetation and return the nutrients to the soil. In addition, many metabolic processes of the bacteria and fungi release organic acids and other materials that affect the process of soil formations. Earthworms, ants, and other animals mix the soil and influence porosity and other soil properties.

The native vegetation has had a major influence on soil genesis. Unless drastically disturbed by man, the soil and the natural vegetation show a close relationship; this relationship is readily apparent in Volusia County. Various swamp and marsh communities occupy the very poorly drained soils. Xerophytic communities of pines and oaks are on sand ridges, and pine-palmetto communities dominate the poorly drained soils of the flatwoods. This relationship is described more fully in the map unit descriptions under the heading "General soil map for broad land use planning." The close relationship between the soil and the native plant community is sometimes complicated by the presence of plant communities in various stages of succession. Plant succession has been interrupted by factors other than soil, such as clearing, logging, burning, and other types of human activity.

In many areas in recent times, man has become a major factor in soil genesis. Man's tillage and management practices have altered soil structure, porosity, and other physical properties. The addition of lime, fertilizers, and other chemicals has altered chemical properties. Intensive use has sometimes caused removal of soil horizons through erosion. This process is often accompanied by increased deposition on flood plains and in depressions. In many places man has created new soils that lack the normal diagnostic horizons attributed to natural soil forming processes. Such soils are called Arents. Other areas, called Urban land, have been thoroughly covered or altered during construction of buildings, streets, or other structures. In some places soils have been altered only to support activities on the surface. Little attention has been paid to the physical, chemical, and mineralogical properties of the underlying layers. Such neglect has often resulted in later problems that have been costly and difficult to remedy.

Relief

Relief, or lay of the land, affects soil formation because it influences microclimate and water relationships. Soil temperature is influenced by altitude and by the orientation of slopes toward or away from the sun. Relief controls drainage, runoff, erosion, soil fertility, and vegetation. Soil formation is retarded on steeper slopes because soil material and organic matter tend to gravitate downslope.

Even though the terrain of Volusia County is nearly level, relief has a significant effect on the soils. Because the parent material of most of the soils was sandy marine deposits, the soils are sandy. Because sandy soils have low water holding capacity and easily become droughty, most of the water available to plants comes from the water table. As a result, the depth to the water table becomes extremely important in determining the type of vegetation that grows in a particular area.

In addition, the depth to the water table affects internal drainage. On sand ridges where the water table is deep, soluble plant nutrients and colloidal clays and organic matter are carried rapidly down through the sandy soil. The soils in such areas are highly leached.

In flatwood areas the water table is frequently at or near the surface, and it rarely drops below 5 feet. Organic matter is translocated down a short distance and forms a humus-rich spodic horizon, or Bh horizon. This horizon is locally referred to as a hardpan.

In low areas or depressions where the water table is normally above the surface, muck accumulates under the marsh or swamp vegetation. As plants and plant parts die, they accumulate in the water where oxygen is excluded, and decay is only partial and slow. The amount of muck that accumulates depends largely on the depth and duration of standing water. In some wet areas, the organic matter, instead of forming a surface layer of muck, has accumulated within the mineral soil to form a thick black topsoil.

Time

The parent material of soils of Volusia County is young in terms of geologic time. It is of Pleistocene or Holocene (Recent) age. The Pleistocene material was deposited during the interglacial stages when ice sheets melted and the sea level was high. When sea level remained fairly stationary over a long period, a nearly level marine terrace and shoreline ridge formed. A series of marine terraces is evident in Volusia County. The oldest is the highest, and it has been most altered by weathering and geologic forces. Excluding the recent alluvial deposits, the soils are progressively older from the Atlantic coast to the DeLand Ridge. It is in coastal areas, however, that time as a factor in soil formation is most conspicuous, as is evident in the abundance of shells and shell fragments in the substrate.

Relatively little geologic time has elapsed since the material in which the soils in Volusia County formed was laid down or emerged from the sea. The age of a soil refers to the degree of maturity of that soil. It does not refer to chronological or geological time. Because soils are influenced by the other four factors of soil formation, they mature at different rates. Soils that are classified as Entisols (from rec*ent*) may be on a landscape that is actually older than that of Ultisols (from *ult*imate) elsewhere. Examples of this situation are common throughout Volusia County.

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Glossary

Aeration, soil. The exchange of air in soil with air from the atmosphere. The air in a well aerated soil is similar to that in the atmosphere; the air in a poorly aerated soil is considerably higher in carbon dioxide and lower in oxygen.

Aggregate, soil. Many fine particles held in a single mass or cluster. Natural soil aggregates, such as granules, blocks, or prisms, are called peds. Clods are aggregates produced by tillage or logging.

Alluvium. Material, such as sand, silt, or clay, deposited on land by streams.

Association, soil. A group of soils geographically associated in a characteristic repeating pattern and defined and delineated as a single mapping unit.

Available water capacity (available moisture capacity). The capacity of soils to hold water available for use by most plants. It is commonly defined as the difference between the amount of soil water at field moisture capacity and the amount at wilting point. It is commonly expressed as inches of water per inch of soil. The capacity, in inches, in a 60-inch profile or to a limiting layer is expressed as—

	Inches
Very low	0 to 3
Low	3 to 6
Moderate	6 to 9
High	More than 9

Base saturation. The degree to which material having base exchange properties is saturated with exchangeable bases (sum of Ca, Mg, Na, K), expressed as a percentage of the exchange capacity.

Bedrock. The solid rock that underlies the soil and other unconsolidated material or that is exposed at the surface.

Boulders. Rock fragments larger than 2 feet (60 centimeters) in diameter.

Calcareous soil. A soil containing enough calcium carbonate (commonly with magnesium carbonate) to effervesce (fizz) visibly when treated with cold, dilute hydrochloric acid. A soil having measurable amounts of calcium carbonate or magnesium carbonate.

Cation. An ion carrying a positive charge of electricity. The common soil cations are calcium, potassium, magnesium, sodium, and hydrogen.

Cation-exchange capacity. The total amount of exchangeable cations that can be held by the soil, expressed in terms of milliequivalents per 100 grams of soil at neutrality (pH 7.0) or at some other stated pH value. The term, as applied to soils, is synonymous with base-exchange capacity, but is more precise in meaning.

Clay. As a soil separate, the mineral soil particles less than 0.002 millimeter in diameter. As a soil textural class, soil material that is 40 percent or more clay, less than 45 percent sand, and less than 40 percent silt.

Clay film. A thin coating of oriented clay on the surface of a soil aggregate or lining pores or root channels. Synonyms: clay coat, clay skin.

Climax vegetation. The stabilized plant community on a particular site. The plant cover reproduces itself and does not change so long as the environment remains the same.

Coarse fragments. Mineral or rock particles up to 3 inches (2 millimeters to 7.5 centimeters) in diameter.

Coarse textured (light textured) soil. Sand or loamy sand.

Community, plant. All plants living together in a particular habitat. A distinct kind of plant community develops in habitats where soil conditions and other environmental factors are similar.

Complex, soil. A mapping unit of two or more kinds of soil occurring in such an intricate pattern that they cannot be shown separately on a soil map at the selected scale of mapping and publication.

Concretions. Grains, pellets, or nodules of various sizes, shapes, and colors consisting of concentrated compounds or cemented soil grains. The composition of most concretions is unlike that of the surrounding soil. Calcium carbonate and iron oxide are common compounds in concretions.

Consistence, soil. The feel of the soil and the ease with which a lump can be crushed by the fingers. Terms commonly used to describe consistence are—

Loose.—Noncoherent when dry or moist; does not hold together in a mass.

Friable.—When moist, crushes easily under gentle pressure between thumb and forefinger and can be pressed together into a lump.

Firm.—When moist, crushes under moderate pressure between thumb and forefinger, but resistance is distinctly noticeable.

Plastic.—When wet, readily deformed by moderate pressure but can be pressed into a lump; will form a "wire" when rolled between thumb and forefinger.

Sticky.—When wet, adheres to other material and tends to stretch somewhat and pull apart rather than to pull free from other material.

Hard.—When dry, moderately resistant to pressure; can be broken with difficulty between thumb and forefinger.

Soft.—When dry, breaks into powder or individual grains under very slight pressure.

Cemented.—Hard; little affected by moistening.

Contour stripcropping (or contour farming). Growing crops in strips that follow the contour. Strips of grass or close-growing crops are alternated with strips of clean-tilled crops or summer fallow.

Control section. The part of the soil on which classification is based. The thickness varies among different kinds of soil, but for many it is 40 or 80 inches (1 or 2 meters).

Corrosive. High risk of corrosion to uncoated steel or deterioration of concrete.

Cover crop. A close-growing crop grown primarily to improve and protect the soil between periods of regular crop production, or a crop grown between trees and vines in orchards and vineyards.

Cutbanks cave. Unstable walls of cuts made by earthmoving equipment. The soil sloughs easily.

Decreasers. The most heavily grazed climax range plants. Because they are the most palatable, they are the first to be destroyed by overgrazing.

Deferred grazing. A delay in grazing until range plants have reached a specified stage of growth. Grazing is deferred in order to increase the vigor of forage and to allow desirable plants to produce seed. Contrasts with continuous grazing and rotation grazing.

Depth to rock. Bedrock at a depth that adversely affects the specified use.

Diversion (or diversion terrace). A ridge of earth, generally a terrace, built to protect downslope areas by diverting runoff from its natural course.

Drainage class (natural). Refers to the frequency and duration of periods of saturation or partial saturation during soil formation, as opposed to altered drainage, which is commonly the result of artificial drainage or irrigation but may be caused by the sudden deepening of channels or the blocking of drainage outlets. Seven classes of natural soil drainage are recognized:

Excessively drained.—Water is removed from the soil very rapidly. Excessively drained soils are commonly very coarse textured, rocky, or shallow. Some are steep. All are free of the mottling related to wetness.

Somewhat excessively drained.—Water is removed from the soil rapidly. Many somewhat excessively drained soils are sandy and rapidly pervious. Some are shallow. Some are so steep that much of the water they receive is lost as runoff. All are free of the mottling related to wetness.

Well drained.—Water is removed from the soil readily, but not rapidly. It is available to plants throughout most of the growing season, and wetness does not inhibit growth of roots for significant periods during most growing seasons. Well drained soils are commonly medium textured. They are mainly free of mottling.

Moderately well drained.—Water is removed from the soil somewhat slowly during some periods. Moderately well drained soils are wet for only a short time during the growing season, but periodically for long enough that most mesophytic crops are affected. They commonly have a slowly pervious layer within or directly below the solum, or periodically receive high rainfall, or both.

Somewhat poorly drained.—Water is removed slowly enough that the soil is wet for significant periods during the growing season. Wetness markedly restricts the growth of mesophytic crops unless artificial drainage is provided. Somewhat poorly drained soils commonly have a slowly pervious layer, a high water table, additional water from seepage, nearly continuous rainfall, or a combination of these.

Poorly drained.—Water is removed so slowly that the soil is saturated periodically during the growing season or remains wet for long periods. Free water is commonly at or near the surface for long enough during the growing season that most mesophytic crops cannot be grown unless the soil is artificially drained. The soil is not continuously saturated in layers directly below plow depth. Poor drainage results from a high water table, a slowly pervious layer within the profile, seepage, nearly continuous rainfall, or a combination of these.

Very poorly drained.—Water is removed from the soil so slowly that free water remains at or on the surface during most of the growing season. Unless the soil is artificially drained, most mesophytic crops cannot be grown. Very poorly drained soils are commonly level or depressed and are frequently ponded. Yet, where rainfall is high and nearly continuous, they can have moderate or high slope gradients, as for example in "hillpeats" and "climatic moors."

Drainage, surface. Runoff, or surface flow of water, from an area.

Eluviation. The movement of material in true solution or colloidal suspension from one place to another within the soil. Soil horizons that have lost material through eluviation are eluvial; those that have received material are illuvial.

Eolian soil material. Earthy parent material accumulated through wind action; commonly refers to sandy material in dunes or to loess in blankets on the surface.

Erosion. The wearing away of the land surface by running water, wind, ice, or other geologic agents and by such processes as gravitational creep.

Erosion (geologic). Erosion caused by geologic processes acting over long geologic periods and resulting in the wearing away of mountains and the building up of such landscape features as flood plains and coastal plains. Synonym: natural erosion.

Erosion (accelerated). Erosion much more rapid than geologic erosion, mainly as a result of the activities of man or other animals or of a catastrophe in nature, for example, fire, that exposes a bare surface.

Excess fines. Excess silt and clay. The soil does not provide a source of gravel or sand for construction purposes.

Excess salts. Excess water soluble salts. Excessive salts restrict the growth of most plants.

Fast intake. The rapid movement of water into the soil.

Favorable. Favorable soil features for the specified use.

Fertility, soil. The quality that enables a soil to provide plant nutrients, in adequate amounts and in proper balance, for the growth of specified plants when light, moisture, temperature, tilth, and other growth factors are favorable.

Field moisture capacity. The moisture content of a soil, expressed as a percentage of the ovendry weight, after the gravitational, or free, water has drained away; the field moisture content 2 or 3 days after a soaking rain; also called *normal field capacity, normal moisture capacity,* or *capillary capacity.*

Fine textured (heavy textured) soil. Sandy clay, silty clay, and clay.

Flooding. The temporary covering of soil with water from overflowing streams, runoff from adjacent slopes, and tides. Frequency, duration, and probable dates of occurrence are estimated. Frequency is expressed as none, rare, occasional, and frequent. *None* means that flooding is not probable; *rare* that it is unlikely but possible under unusual weather conditions; *occasional* that it occurs on an average of once or less in 2 years; and *frequent* that it occurs on an average of more than once in 2 years. Duration is expressed as *very brief* if less than 2 days, *brief* if 2 to 7 days, and *long* if more than 7 days. Probable dates are expressed in months; *November-May*, for example, means that flooding can occur during the period November through May. Water standing for short periods after rainfall or commonly covering swamps and marshes is not considered flooding.

Flood plain. A nearly level alluvial plain that borders a stream and is subject to flooding unless protected artificially.

Forage. Plant material used as feed by domestic animals. Forage can be grazed or cut for hay.

Forb. Any herbaceous plant not a grass or a sedge.

Genesis, soil. The mode of origin of the soil. Refers especially to the processes or soil-forming factors responsible for the formation of the solum, or true soil, from the unconsolidated parent material.

Gleyed soil. A soil having one or more neutral gray horizons as a result of waterlogging and lack of oxygen. The term "gleyed" also designates gray horizons and horizons having yellow and gray mottles as a result of intermittent waterlogging.

Grassed waterway. A natural or constructed waterway, typically broad and shallow, seeded to grass as protection against erosion. Conducts surface water away from cropland.

Gravel. Rounded or angular fragments of rock up to 3 inches (2 millimeters to 7.5 centimeters) in diameter. An individual piece is a pebble.

Green manure (agronomy). A soil-improving crop grown to be plowed under in an early stage of maturity or soon after maturity.

Ground water (geology). Water filling all the unblocked pores of underlying material below the water table, which is the upper limit of saturation.

Gully. A miniature valley with steep sides cut by running water and through which water ordinarily runs only after rainfall. The distinction between a gully and a rill is one of depth. A gully generally is an obstacle to farm machinery and is too deep to be obliterated by ordinary tillage; a rill is of lesser depth and can be smoothed over by ordinary tillage.

Habitat. The natural abode of a plant or animal; refers to the kind of environment in which a plant or animal normally lives, as opposed to the range or geographical distribution.

Hemic soil material (mucky peat). Organic soil material intermediate in degree of decomposition between the less decomposed fibric and the more decomposed sapric material.

Horizon, soil. A layer of soil, approximately parallel to the surface, having distinct characteristics produced by soil-forming processes. The major horizons of mineral soil are as follows:

O horizon.—An organic layer, fresh and decaying plant residue, at the surface of a mineral soil.

A horizon.—The mineral horizon, formed or forming at or near the surface, in which an accumulation of humified organic matter is mixed with the mineral material. Also, a plowed surface horizon most of which was originally part of a B horizon.

A2 horizon.—A mineral horizon, mainly a residual concentration of sand and silt high in content of resistant minerals as a result of the loss of silicate clay, iron, aluminum, or a combination of these.

B horizon.—The mineral horizon below an A horizon. The B horizon is in part a layer of change from the overlying A to the underlying C horizon. The B horizon also has distinctive characteristics caused (1) by accumulation of clay, sesquioxides, humus, or a combination of these; (2) by prismatic or blocky structure; (3) by redder or browner colors than those in the A horizon; or (4) by a combination of these. The combined A and B horizons are generally called the solum, or true soil. If a soil lacks a B horizon, the A horizon alone is the solum.

C horizon.—The mineral horizon or layer, excluding indurated bedrock, that is little affected by soil-forming processes and does not have the properties typical of the A or B horizon. The material of a C horizon may be either like or unlike that from which the solum is presumed to have formed. If the material is known to differ from that in the solum the Roman numeral II precedes the letter C.

R layer.—Consolidated rock beneath the soil. The rock commonly underlies a C horizon, but can be directly below an A or a B horizon.

Humus. The well decomposed, more or less stable part of the organic matter in mineral soils.

Hydrologic soil groups. Refers to soils grouped according to their runoff-producing characteristics. The chief consideration is the inherent capacity of soil bare of vegetation to permit infiltration. The slope and the kind of plant cover are not considered, but are separate factors in predicting runoff. Soils are assigned to four groups. In group A are soils having a high infiltration rate when thoroughly wet and having a low runoff potential. They are mainly deep, well drained, and sandy or gravelly. In group D, at the other extreme, are soils having a very slow infiltration rate and thus a high runoff potential. They have a claypan or clay layer at or near the surface, have a permanent high water table, or are shallow over nearly impervious bedrock or other material. A soil is assigned to two hydrologic groups if part of the acreage is artificially drained and part is undrained.

Increasers. Species in the climax vegetation that increase in amount as the more desirable plants are reduced by close grazing. Increasers commonly are the shorter plants and the less palatable to livestock.

Infiltration. The downward entry of water into the immediate surface of soil or other material, as contrasted with percolation, which is movement of water through soil layers or material.

Infiltration capacity. The maximum rate at which water can infiltrate into a soil under a given set of conditions.

Infiltration rate. The rate at which water penetrates the surface of the soil at any given instant, usually expressed in inches per hour. The rate can be limited by the infiltration capacity of the soil or the rate at which water is applied at the surface.

Invaders. On range, plants that encroach into an area and grow after the climax vegetation has been reduced by grazing. Generally, invader plants are those that follow disturbance of the surface.

Irrigation. Application of water to soils to assist in production of crops. Methods of irrigation are—

Sprinkler.—Water is sprayed over the soil surface through pipes or nozzles from a pressure system.

Subirrigation.—Water is applied in open ditches or tile lines until the water table is raised enough to wet the soil.

Karst (topography). The relief of an area underlain by limestone that dissolves in differing degrees, thus forming numerous depressions or small basins.

Leaching. The removal of soluble material from soil or other material by percolating water.

Light textured soil. Sand and loamy sand.

Liquid limit. The moisture content at which the soil passes from a plastic to a liquid state.

Loam. Soil material that is 7 to 27 percent clay particles, 28 to 50 percent silt particles, and less than 52 percent sand particles.

Low strength. Inadequate strength for supporting loads.

Mineral soil. Soil that is mainly mineral material and low in organic material. Its bulk density is greater than that of organic soil.

Minimum tillage. Only the tillage essential to crop production and prevention of soil damage.

Miscellaneous areas. Areas that have little or no natural soil, are too nearly inaccessible for orderly examination, or cannot otherwise be feasibly classified.

Moderately coarse textured (moderately light textured) soil. Sandy loam and fine sandy loam.

Moderately fine textured (moderately heavy textured) soil. Clay loam, sandy clay loam, and silty clay loam.

Morphology, soil. The physical makeup of the soil, including the texture, structure, porosity, consistence, color, and other physical, mineral, and biological properties of the various horizons, and the thickness and arrangement of those horizons in the soil profile.

Mottling, soil. Irregular spots of different colors that vary in number and size. Mottling generally indicates poor aeration and impeded drainage. Descriptive terms are as follows: abundance—*few, common,* and *many*; size—*fine, medium,* and *coarse*; and contrast—*faint, distinct,* and *prominent*. The size measurements are of the diameter along the greatest dimension. *Fine* indicates less than 5 millimeters (about 0.2 inch); *medium*, from 5 to 15 millimeters (about 0.2 to 0.6 inch); and *coarse*, more than 15 millimeters (about 0.6 inch).

Muck. Dark colored, finely divided, well decomposed organic soil material mixed with mineral soil material. The content of organic matter is more than 20 percent.

Munsell notation. A designation of color by degrees of the three single variables—hue, value, and chroma. For example, a notation of 10YR 6/4 is a color of 10YR hue, value of 6, and chroma of 4.

Neutral soil. A soil having a pH value between 6.6 and 7.3.

Nutrient, plant. Any element taken in by a plant, essential to its growth, and used by it in the production of food and tissue. Plant nutrients are nitrogen, phosphorus, potassium, calcium, magnesium, sulfur, iron, manganese, copper, boron, zinc, and perhaps other elements obtained from the soil; and carbon, hydrogen, and oxygen obtained largely from the air and water.

Parent material. The great variety of unconsolidated organic and mineral material in which soil forms. Consolidated bedrock is not yet parent material by this concept.

Peat. Unconsolidated material, largely undecomposed organic matter, that has accumulated under excess moisture.

Ped. An individual natural soil aggregate, such as a granule, a prism, or a block.

Pedon. The smallest volume that can be called "a soil." A pedon is three dimensional and large enough to permit study of all horizons. Its area ranges from about 10 to 100 square feet (1 square meter to 10 square meters), depending on the variability of the soil.

Percolation. The downward movement of water through the soil.

Percs slowly. The slow movement of water through the soil adversely affecting the specified use.

Permeability. The quality that enables the soil to transmit water or air, measured as the number of inches per hour that water moves through the soil. Terms describing permeability are *very slow* (less than 0.06 inch), *slow* (0.06 to 0.20 inch), *moderately slow* (0.2 to 0.6 inch), *moderate* (0.6 to 2.0 inches), *moderately rapid* (2.0 to 6.0 inches), *rapid* (6.0 to 20 inches), and *very rapid* (more than 20 inches).

Phase, soil. A subdivision of a soil series or other unit in the soil classification system based on differences in the soil that affect its management. A soil series, for example, may be divided into phases on the bases of differences in slope, stoniness, thickness, or some other characterisitc that affects management. These differencees are too small to justify separate series.

pH value. (See Reaction, soil). A numerical designation of acidity and alkalinity in soil.

Piping. Moving water of subsurface tunnels or pipelike cavities in the soil.

Plasticity index. The numerical difference between the liquid limit and the plastic limit; the range of moisture content within which the soil remains plastic.

Plastic limit. The moisture content at which a soil changes from a semisolid to a plastic state.

Plinthite. The sesquioxide-rich, humus-poor, highly weathered mixture of clay with quartz and other diluents that commonly appears as red mottles, usually in platy, polygonal, or reticulate patterns. Plinthite changes irreversibly to an ironstone hardpan or to irregular aggregates on exposure to repeated wetting and drying, especially if it is exposed also to heat from the sun. In a moist soil, plinthite can be cut with a spade, whereas ironstone cannot be cut but can be broken or shattered with a spade. Plinthite is one form of the material that has been called laterite.

Poorly graded. Refers to soil material consisting mainly of particles of nearly the same size. Because there is little difference in size of the particles, density can be increased only slightly by compaction.

Poor outlets. Surface or subsurface drainage outlets difficult or expensive to install.

Productivity (soil). The capability of a soil for producing a specified plant or sequence of plants under a specified system of management. Productivity is measured in terms of output, or harvest, in relation to input.

Profile, soil. A vertical section of the soil extending through all its horizons and into the parent material.

Range (or rangeland). Land that, for the most part, produces native plants suitable for grazing by livestock; includes land supporting some forest trees.

Range condition. The health or productivity of forage plants on a given range, in terms of the potential productivity under normal climate and the best practical management. Condition classes generally recognized are—*excellent, good, fair,* and *poor*. The classification is based on the percentage of original, or assumed climax vegetation on a site, as compared to what has been observed to grow on it when well managed.

Range site. An area of range where climate, soil, and relief are sufficiently uniform to produce a distinct kind and amount of native vegetation.

Reaction, soil. The degree of acidity or alkalinity of a soil, expressed in pH values. A soil that tests to pH 7.0 is described as precisely neutral in reaction because it is neither acid nor alkaline. The degree of acidity or alkalinity is expressed as—

	pH
Extremely acid	Below 4.5
Very strongly acid	4.5 to 5.0
Strongly acid	5.1 to 5.5
Medium acid	5.6 to 6.0
Slightly acid	6.1 to 6.5
Neutral	6.6 to 7.3
Mildly alkaline	7.4 to 7.8
Moderately alkaline	7.9 to 8.4
Strongly alkaline	8.5 to 9.0
Very strongly alkaline	9.1 and higher

Relief. The elevations or inequalities of a land surface, considered collectively.

Residuum (residual soil material). Unconsolidated, weathered, or partly weathered mineral material that accumulates over disintegrating rock.

Rock fragments. Rock or mineral fragments having a diameter of 2 millimeters or more; for example, pebbles, cobbles, stones, and boulders.

Rooting depth. Shallow root zone. The soil is shallow over a layer that greatly restricts roots. See Root zone.

Root zone. The part of the soil that can be penetrated by plant roots.

Runoff. The precipitation discharged in stream channels from a drainage area. The water that flows off the land surface without sinking in is called surface runoff; that which enters the ground before reaching surface streams is called ground-water runoff or seepage flow from ground water.

Sand. As a soil separate, individual rock or mineral fragments from 0.05 millimeter to 2.0 millimeters in diameter. Most sand grains consist of quartz. As a soil textural class, a soil that is 85 percent or more sand and not more than 10 percent clay.

Sapric soil material (muck). The most highly decomposed of all organic soil material. Muck has the least amount of plant fiber, the highest bulk density, and the lowest water content at saturation of all organic soil material.

Seepage. The rapid movement of water through the soil. Seepage adversely affects the specified use.

Series, soil. A group of soils, formed from a particular type of parent material, having horizons that, except for the texture of the A or surface horizon, are similar in all profile characteristics and in arrangement in the soil profile. Among these characteristics are color, texture, structure, reaction, consistence, and mineralogical and chemical composition.

Sheet erosion. The removal of a fairly uniform layer of soil material from the land surface by the action of rainfall and runoff water.

Shrink-swell. The shrinking of soil when dry and the swelling when wet. Shrinking and swelling can damage roads, dams, building foundations, and other structures. It can also damage plant roots.

Silt. As a soil separate, individual mineral particles that range in diameter from the upper limit of clay (0.002 millimeter) to the lower limit of very fine sand (0.05 millimeter). As a soil textural class, soil that is 80 percent or more silt and less than 12 percent clay.

Sinkhole. A depression in a landscape where limestone has been locally dissolved.

Site index. A designation of the quality of a forest site based on the height of the dominant stand at an arbitrarily chosen age. For example, if the average height attained by dominant and codominant trees in a fully stocked stand at the age of 50 years is 75 feet, the site index is 75 feet.

Slickensides. Polished and grooved surfaces produced by one mass sliding past another. In soils, slickensides may occur at the bases of slip surfaces on the steeper slopes; on faces of blocks, prisms, and columns; and in swelling clayey soils, where there is marked change in moisture content.

Slope. The inclination of the land surface from the horizontal. Percentage of slope is the vertical distance divided by horizontal distance, then multiplied by 100. Thus, a slope of 20 percent is a drop of 20 feet in 100 feet of horizontal distance.

Slow intake. The slow movement of water into the soil.

Slow refill. The slow filling of ponds, resulting from restricted permeability in the soil.

Soil. A natural, three-dimensional body at the earth's surface that is capable of supporting plants and has properties resulting from the integrated effect of climate and living matter acting on earthy parent material, as conditioned by relief over periods of time.

Soil separates. Mineral particles less than 2 millimeters in equivalent diameter and ranging between specified size limits. The names and sizes of separates recognized in the United States are as follows: *very coarse sand* (2.0 millimeters to 1.0 millimeter); *coarse sand* (1.0 to 0.5 millimeter); *medium sand* (0.5 to 0.25 millimeter); *fine sand* (0.25 to 0.10 millimeter); *very fine sand* (0.10 to 0.05 millimeter); *silt* (0.005 to 0.002 millimeter); and *clay* (less than 0.002 millimeter).

Solum. The upper part of a soil profile, above the C horizon, in which the processes of soil formation are active. The solum in mature soil consists of the A and B horizons. Generally, the characteristics of the material in these horizons are unlike those of the underlying material. The living roots and other plant and animal life characteristics of the soil are largely confined to the solum.

Stripcropping. Growing crops in a systematic arrangement of strips or bands which provide vegetative barriers to wind and water erosion.

Structure, soil. The arrangement of primary soil particles into compound particles or aggregates that are separated from adjoining aggregates. The principal forms of soil structure are—*platy* (laminated), *prismatic* (vertical axis of aggregates longer than horizontal), *columnar* (prisms with rounded tops), *blocky* (angular or subangular), and *granular*. *Structureless* soils are either *single grained* (each grain by itself, as in dune sand) or *massive* (the particles adhering without any regular cleavage, as in many hardpans).

Subclimax. The imperfect development of a climax plant community because some factor, such as repeated fires, arrests normal plant succession.

Subsoil. Technically, the B horizon; roughly, the part of the solum below plow depth.

Substratum. The part of the soil below the solum.

Subsurface layer. Technically, the A2 horizon. Generally refers to a leached horizon lighter in color and lower in content of organic matter than the overlying surface layer.

Succession, plant. A natural process by which one plant community develops into another over a period of time. Both primary succession beginning with bare land or water and secondary succession in areas that already have vegetation end with the establishment of climax vegetation.

Surface soil. The soil ordinarily moved in tillage, or its equivalent in uncultivated soil, ranging in depth from 4 to 10 inches (10 to 25 centimeters). Frequently designated as the "plow layer," or the "Ap horizon."

Terrace. An embankment, or ridge, constructed across sloping soils on the contour or at a slight angle to the contour. The terrace intercepts surface runoff so that it can soak into the soil or flow slowly to a prepared outlet without harm. A terrace in a field is generally built so that the field can be farmed. A terrace intended mainly for drainage has a deep channel that is maintained in permanent sod.

Terrace (geologic). An old alluvial plain, ordinarily flat or undulating, bordering a river, a lake, or the sea. A stream terrace is frequently called a second bottom, in contrast with a flood plain, and is seldom subject to overflow. A marine terrace, generally wide, was deposited by the sea.

Texture, soil. The relative proportions of sand, silt, and clay particles in a mass of soil. The basic textural classes, in order of increasing proportion of fine particles, are *sand, loamy sand, sandy loam, loam, silt, silt loam, sandy clay loam, clay loam, silty clay loam, sandy clay, silty clay,* and *clay*. The sand, loamy sand, and sandy loam classes may be further divided by specifying "coarse," "fine," or " very fine."

Thin layer. Otherwise suitable soil material too thin for the specified use.

Tilth, soil. The condition of the soil, especially the soil structure, as related to the growth of plants. Good tilth refers to the friable state and is associated with high noncapillary porosity and stable structure. A soil in poor tilth is nonfriable, hard, nonaggregated, and difficult to till.

Topsoil (engineering). Presumably a fertile soil or soil material, or one that responds to fertilization, ordinarily rich in organic matter, used to topdress roadbanks, lawns, and gardens.

Upland (geology). Land at a higher elevation, in general, than the alluvial plain or stream terrace; land above the lowlands along streams.

Unstable fill. Risk of caving or sloughing in banks of fill material.

Variant, soil. A soil having properties sufficiently different from those of other known soils to justify a new series name, but the limited geographic soil area does not justify creation of a new series.

Water control. Regulation of the water table according to the requirements for the intended use. Canals, ditches, tile, pumping, or other appropriate methods can be used.

Water table. The upper limit of the soil or underlying rock material that is wholly saturated with water.

Water table, apparent. A thick zone of free water in the soil. An apparent water table is indicated by the level at which water stands in an uncased borehole after adequate time is allowed for adjustment in the surrounding soil.

Water table, perched. A water table standing above an unsaturated zone. In places an upper, or perched, water table is separated from a lower one by a dry zone.

Weathering. All physical and chemical changes produced in rocks or other deposits at or near the earth's surface by atmospheric agents. These changes result in disintegration and decomposition of the material.

Well graded. Refers to a soil or soil material consisting of particles well distributed over a wide range in size or diameter. Such a soil normally can be easily increased in density and bearing properties by compaction. Contrasts with poorly graded soil.

ILLUSTRATIONS

Figure 1.—Ferns, an important special crop. These leatherleaf ferns are growing under artificial shade on Astatula fine sand, 0 to 8 percent slopes.

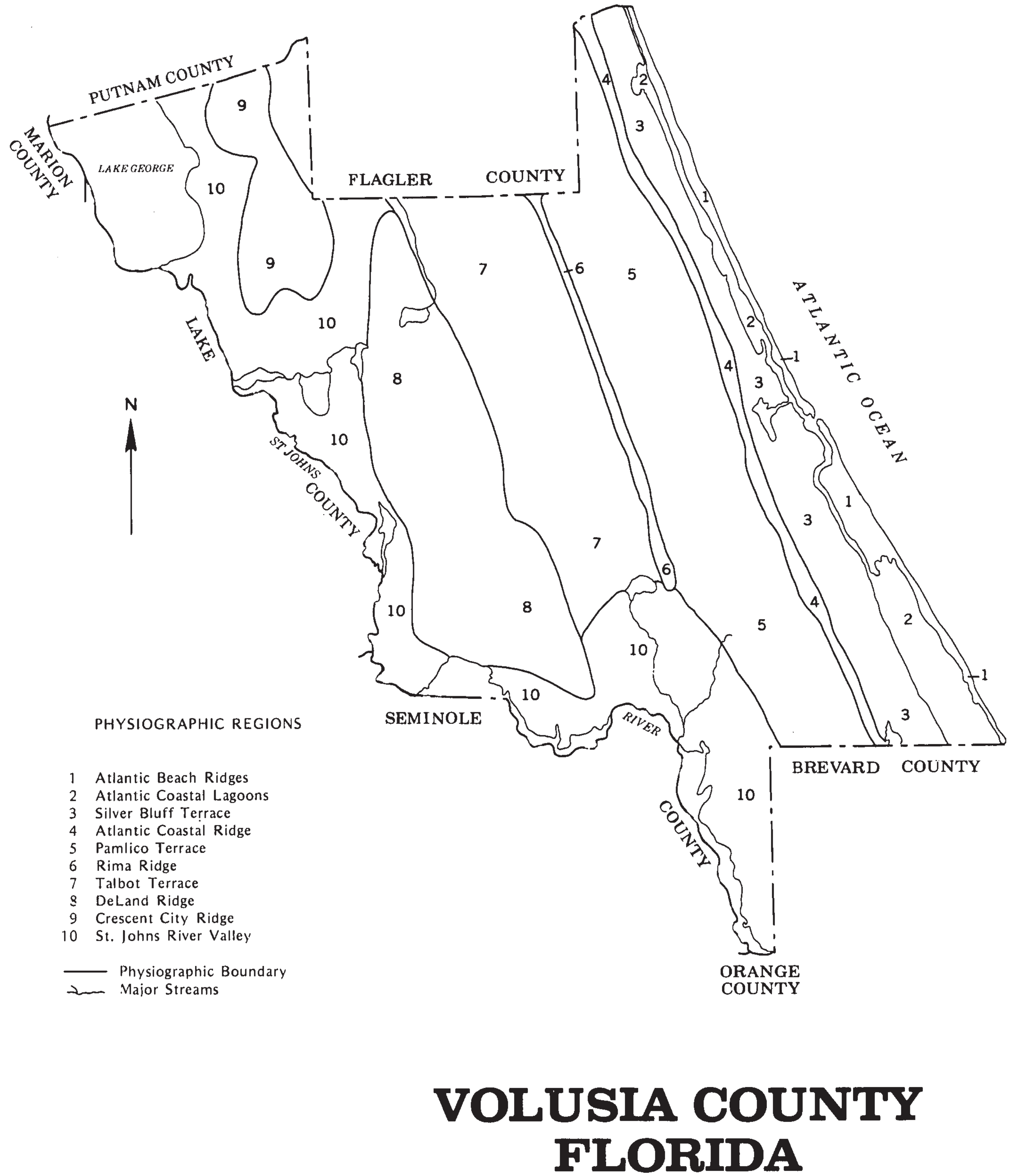

Figure 2.—Physiographic regions showing approximate extent of marine terraces, relict shoreline ridges (Atlantic Coastal Ridge and Rima Ridge) and karst ridges (DeLand Ridge and Crescent City Ridge).

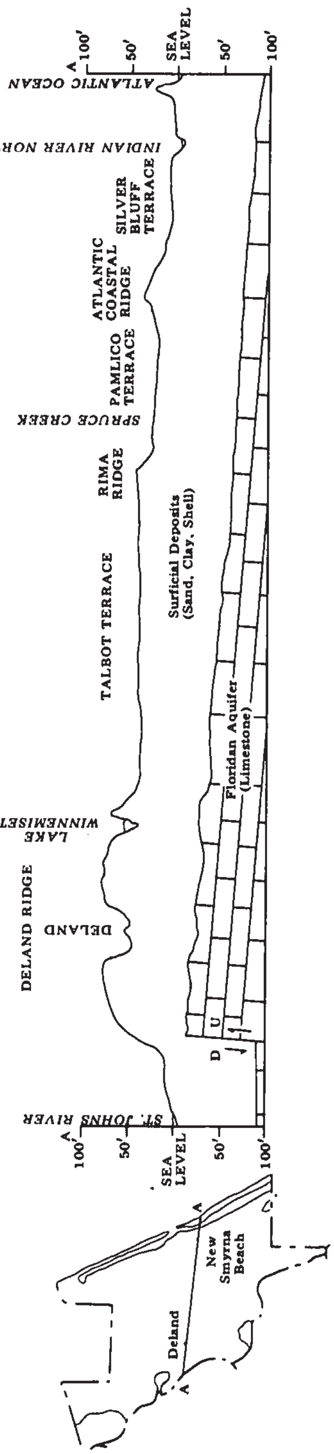

Figure 3.—Cross section of Volusia County.

Figure 4.—Typical plant cover in the flatwoods—scattered slash pine and an understory of sawpalmetto, pineland threeawn, and some bluestem. The soil is Immokalee sand.

Figure 5.—Poorly drained Smyrna fine sand. The water table rises to within 10 inches of the surface in July through September.

Figure 6.—Typical plant cover on the Pineda-Malabar-Wabasso map unit—cabbage palm and scattered clumps of sawpalmetto. The soil is Pineda fine sand.

Figure 7.—Typical plant cover of black needlerush, smooth cordgrass, and marshhay cordgrass on Turnbull muck.

Figure 8.—Typical plant cover, dominantly sawpalmetto, on Palm Beach-Paola association, 2 to 8 percent slopes.

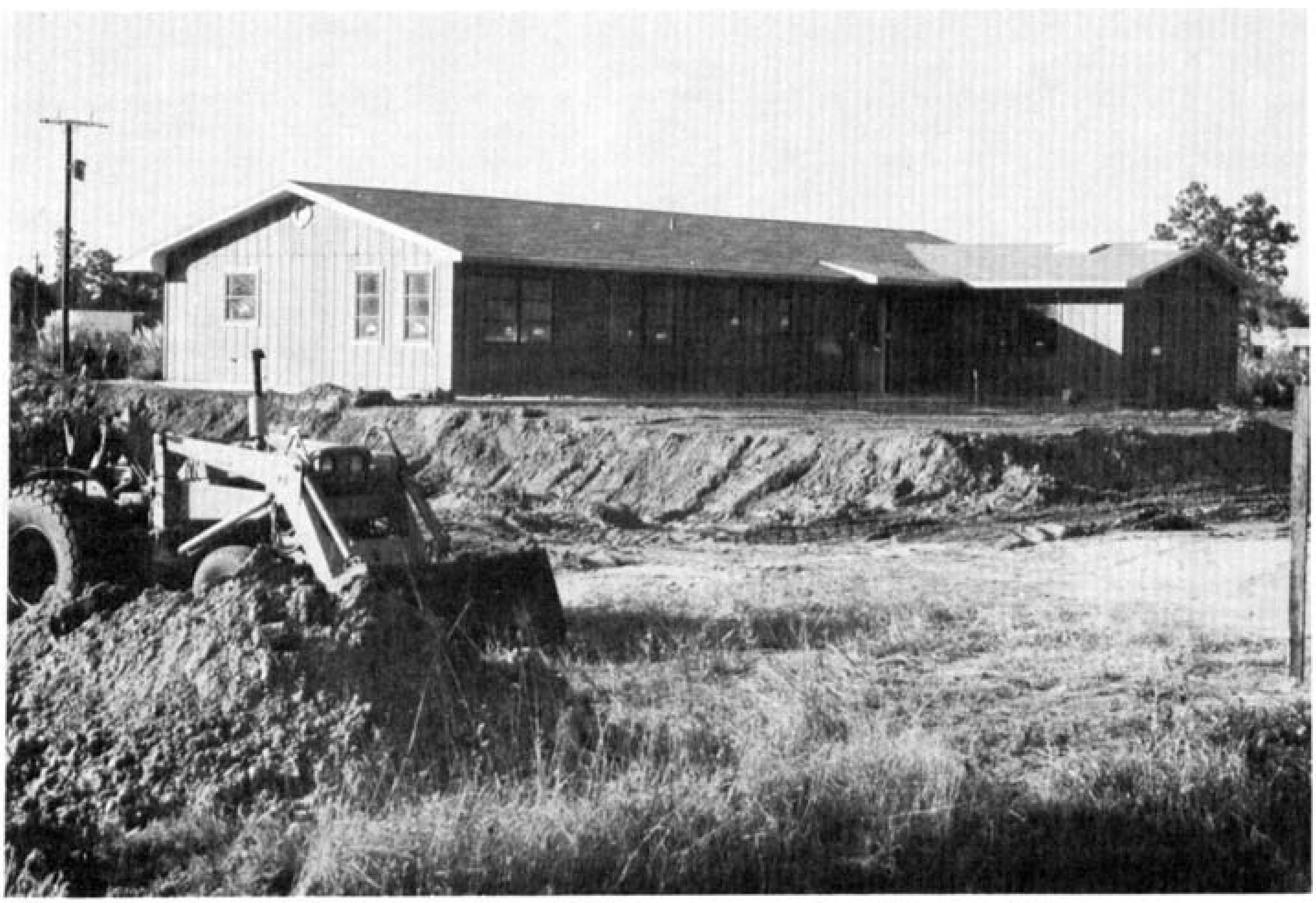

Figure 9.—Mounding on Pineda fine sand. The dwelling was constructed on a 3-foot fill to help overcome wetness.

Figure 10.—Cabbages on Pomona fine sand. A water control system is needed to remove excess water in wet seasons and provide water through subsurface irrigation in dry seasons.

Figure 11.—Water control ditch used for drainage and subsurface irrigation on Smyrna fine sand.

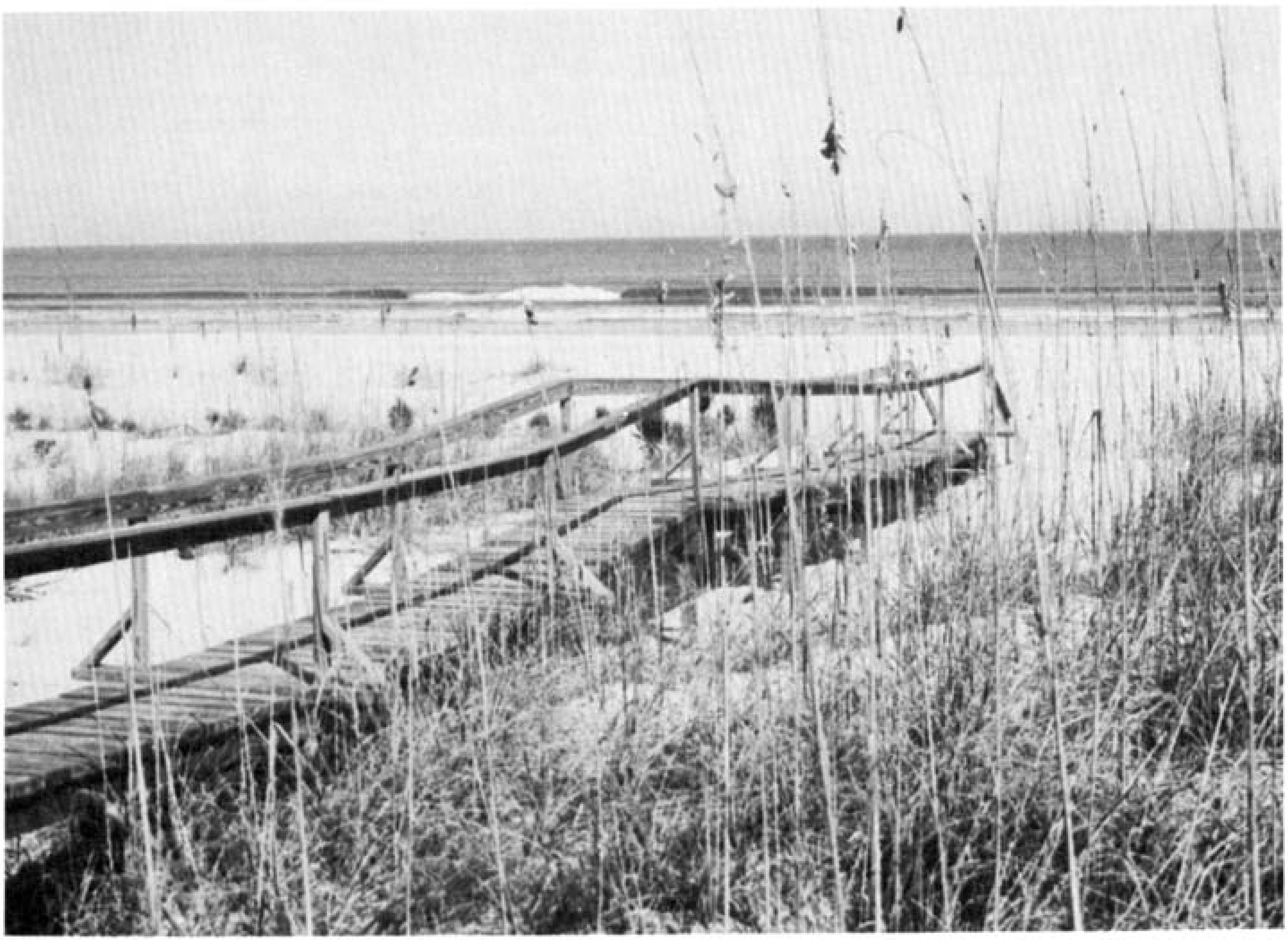

Figure 12.—The fragile plant cover at the fringe of slightly higher areas of Beaches is vulnerable to trampling. Bridges for foot traffic are needed.

Figure 13.—Golf course on Paola fine sand, 0 to 8 percent slopes.

TABLES

TABLE 1.--TEMPERATURE AND PRECIPITATION DATA AT DAYTONA BEACH

[Data recorded in 1951-60 at Regional Airport (11, 12). Elevation 31 feet]

Month	Temperature					Precipitation				
	Average daily	Average daily maximum	Average daily minimum	Average number of days with temperature of--		Normal total	Maximum total	Minimum total	Average number of days with--	
				90°F or higher	32°F or lower				Heavy fog	Thunder-showers
	°F	°F	°F			In	In	In		
January----	59.3	70.1	48.0	0	3	1.96	5.29	0.15	6	1
February---	61.7	71.3	49.3	0	1	2.75	9.13	0.29	3	2
March------	64.8	75.2	53.1	*	*	3.56	7.75	0.25	3	3
April------	69.6	79.8	58.5	1	0	2.97	7.12	**	2	4
May--------	75.1	84.9	64.1	5	0	2.85	6.82	0.08	2	8
June-------	79.4	88.6	69.4	11	0	5.81	15.19	1.35	1	13
July-------	81.1	89.8	71.4	17	0	6.74	14.58	1.25	1	18
August-----	81.3	89.6	71.8	17	0	6.37	19.89	2.01	2	16
September--	79.8	87.1	71.3	6	0	7.00	14.02	1.88	1	8
October----	74.0	81.5	64.8	1	0	5.61	13.00	0.19	2	3
November---	66.2	75.3	55.3	0	*	2.33	7.98	**	3	1
December---	60.9	70.1	49.0	0	2	1.95	5.03	0.06	5	1
Year-------	71.1	80.3	60.5	58	6	49.90	19.89	**	32	79

*Average is less than 0.5 day.
**Trace.

TABLE 2.--TEMPERATURE AND PRECIPITATION DATA AT DELAND

[Data recorded in 1951-60 at Regional Airport (11, 12). Elevation 40 feet]

Month	Temperature							Precipitation		
	Average daily	Average daily maximum	Average daily minimum	Extreme maximum	Extreme minimum	Average number of days with temperature of--		Average total	Average number of days with rainfall of--	
						90°F or higher	32°F or lower		0.10 inch or more	0.05 inch or more
	°F	°F	°F	°F	°F			In		
January---	59.8	71.7	47.8	89	18	0	3	2.03	4	1
February--	61.5	73.8	49.3	90	19	*	2	2.93	5	2
March-----	65.5	77.7	53.4	93	26	*	*	3.75	6	2
April-----	70.2	82.3	58.1	97	31	1	0	3.38	6	3
May-------	75.9	87.9	64.1	100	43	11	0	3.43	7	2
June------	80.2	90.6	69.8	102	54	18	0	7.85	10	4
July------	81.7	91.6	71.7	102	61	25	0	8.38	11	5
August----	81.8	91.6	72.0	98	63	24	0	7.45	11	5
September-	79.8	89.1	70.5	98	53	14	0	6.88	10	4
October---	73.2	83.0	63.0	97	37	1	0	4.93	7	3
November--	65.3	76.7	53.8	90	24	*	1	1.86	3	1
December--	60.6	72.3	48.8	87	17	0	4	1.83	3	1
Year------	71.3	82.4	60.2	102	17	94	10	54.70	83	33

*Average is less than 0.5 day.

TABLE 3.--FREEZE DATA

[Data recorded in 1921-50 (11, 12). Elevation 31 feet at Daytona Beach and 40 feet at DeLand]

DAYTONA BEACH

Freeze threshold temperature	Mean date of last spring occurrence	Mean date of first fall occurrence	Mean number of days between dates	Probability of an occurrence within a given year
°F				
32	January 28	December 20	326	0.77
28	January 7	December 26	353	0.43
24	*	*	*	0.16
20	*	*	*	0.02
16	*	*	*	0

DELAND

Freeze threshold temperature	Mean date of last spring occurrence	Mean date of first fall occurrence	Mean number of days between dates	Probability of an occurrence within a given year
32	February 15	December 14	302	0.98
28	January 24	December 21	331	0.77
24	January 4	*	*	0.25
20	*	*	*	0.10
16	*	*	*	0

*Frequency of occurrence is 1 year in 10, or less.

TABLE 4.--ACREAGE AND PROPORTIONATE EXTENT OF THE SOILS

Map symbol	Soil name	Acres	Percent
1	Apopka fine sand, 0 to 5 percent slopes	10,840	1.5
2	Apopka fine sand, 5 to 12 percent slopes	270	*
3	Arents	1,380	0.2
4	Astatula fine sand, 0 to 8 percent slopes	39,360	5.6
5	Astatula fine sand, 8 to 17 percent slopes	1,250	0.2
6	Astatula-Urban land complex, 0 to 8 percent slopes	3,040	0.4
7	Astor fine sand	2,970	0.4
8	Basinger fine sand, depressional	9,100	1.3
9	Beaches	1,530	0.2
10	Bluff sandy clay loam	2,070	0.3
11	Bulow sand, 0 to 5 percent slopes	1,670	0.2
12	Canaveral sand, 0 to 5 percent slopes	1,950	0.3
13	Cassia fine sand	8,570	1.2
14	Chobee fine sandy loam	10,240	1.4
15	Cocoa sand, 0 to 5 percent slopes	1,780	0.2
16	Cocoa-Urban land complex, 0 to 5 percent slopes	430	0.1
17	Daytona sand, 0 to 5 percent slopes	17,580	2.5
18	Daytona-Urban land complex, 0 to 5 percent slopes	630	0.1
19	Deland fine sand, 0 to 5 percent slopes	7,090	1.0
20	EauGallie fine sand	12,320	1.7
21	EauGallie fine sand, depressional	1,840	0.3
22	Electra fine sand, 0 to 5 percent slopes	2,560	0.4
23	Farmton fine sand	8,110	1.1
24	Fluvaquents	2,880	0.4
25	Gator muck	7,600	1.1
26	Holopaw sand	3,850	0.5
27	Hontoon mucky peat	20,910	2.9
28	Hydraquents	10,780	1.5
29	Immokalee sand	33,930	4.8
30	Immokalee sand, depressional	1,500	0.2
31	Malabar fine sand	13,270	1.9
32	Myakka fine sand	52,660	7.4
33	Myakka fine sand, depressional	7,620	1.1
34	Myakka-St. Johns complex	9,430	1.3
35	Myakka-Urban land complex	1,550	0.2
36	Myakka Variant fine sand	1,880	0.3
37	Orsino fine sand, 0 to 5 percent slopes	10,060	1.4
38	Paisley fine sand	1,490	0.2
39	Palm Beach sand, 2 to 8 percent slopes	2,170	0.3
40	Palm Beach-Urban land-Paola complex, 0 to 8 percent slopes	6,110	0.9
41	Palm Beach-Paola association, 2 to 8 percent slopes	960	0.1
42	Paola fine sand, 0 to 8 percent slopes	23,390	3.3
43	Paola fine sand, 8 to 17 percent slopes	710	0.1
44	Paola-Urban land complex, 0 to 8 percent slopes	1,590	0.2
45	Pineda fine sand	12,860	1.8
46	Pinellas fine sand	1,210	0.2
47	Pits	1,490	0.2
48	Placid fine sand, depressional	2,340	0.3
49	Pomona fine sand	51,580	7.2
50	Pomona fine sand, depressional	6,710	0.9
51	Pomona-St. Johns complex	11,710	1.6
52	Pompano fine sand	3,990	0.6
53	Pompano-Placid complex	8,660	1.2
54	Quartzipsamments, gently sloping	1,930	0.3
55	Riviera fine sand	10,360	1.5
56	Samsula muck	42,660	6.0
57	Satellite sand	3,730	0.5
58	Satellite-Urban land complex	70	*
59	Scoggin sand	5,730	0.8
60	Smyrna fine sand	30,480	4.3
61	St. Johns fine sand	6,930	1.0
62	St. Lucie fine sand, 0 to 8 percent slopes	1,540	0.2
63	Tavares fine sand, 0 to 5 percent slopes	22,230	3.1
64	Tequesta muck	16,550	2.3
65	Terra Ceia muck	28,210	4.0
66	Tomoka muck	15,780	2.2
67	Turnbull muck	6,730	0.9
68	Turnbull Variant sand	2,990	0.4
69	Tuscawilla fine sand	14,210	2.0
70	Tuscawilla-Urban land complex	1,860	0.3

See footnote at end of table.

TABLE 4.--ACREAGE AND PROPORTIONATE EXTENT OF THE SOILS--Continued

Map symbol	Soil name	Acres	Percent
71	Urban land	3,000	0.4
72	Valkaria fine sand	2,390	0.3
73	Wabasso fine sand	10,120	1.4
74	Wabasso fine sand, depressional	2,270	0.3
75	Wauchula fine sand	14,490	2.0
76	Wauchula fine sand, depressional	550	0.1
77	Winder fine sand	2,010	0.3
	Water	4,590	0.6
	Area not mapped	720	0.1
	Total	713,600	100.0

* Less than 0.1 percent.

TABLE 5.--YIELDS PER ACRE OF CROPS AND PASTURE

[Yields are those that can be expected under a high level of management. Absence of a yield indicates that the soil is not suited to the crop or the crop generally is not grown on the soil]

Soil name and map symbol	Oranges	Grapefruit	Watermelons	Cabbage	Cucumbers	Bahiagrass	Grass-clover
	Box	Box	Ton	Crate	Ton	AUM*	AUM*
1 Apopka	500	700	20	---	---	8.0	---
2 Apopka	500	700	18	---	---	7.5	---
3**. Arents							
4 Astatula	350	400	10	---	---	3.0	---
5 Astatula	---	---	---	---	---	---	---
6 Astatula	---	---	---	---	---	---	---
7 Astor	---	---	---	---	---	---	13
8 Basinger	---	---	---	---	---	---	---
9**. Beaches							
10 Bluff	---	---	---	---	---	10	12
11 Bulow	500	700	4.5	---	---	7.0	---
12 Canaveral	400	525	---	---	---	---	---
13 Cassia	250	350	---	---	---	6.0	---
14 Chobee	425	500	---	300	---	---	15.0
15 Cocoa	500	70	---	---	---	---	---
16 Cocoa	---	---	---	---	---	---	---
17 Daytona	250	350	---	---	---	---	---
18 Daytona	---	---	---	---	---	---	---
19 Deland	300	400	---	---	---	4.5	---
20 EauGallie	375	575	---	250	---	8.0	12.0
21 EauGallie	---	---	---	---	---	---	---

See footnotes at end of table.

TABLE 5.--YIELDS PER ACRE OF CROPS AND PASTURE--Continued

Soil name and map symbol	Oranges	Grapefruit	Watermelons	Cabbage	Cucumbers	Bahiagrass	Grass-clover
	Box	Box	Ton	Crate	Ton	AUM*	AUM*
22----------------------- Electra	---	---	---	---	---	6.0	---
23----------------------- Farmton	375	575	---	200	5	8.0	10.0
24**. Fluvaquents							
25----------------------- Gator	---	---	---	---	---	---	---
26----------------------- Holopaw	375	575	---	240	---	8.0	10
27----------------------- Hontoon	---	---	---	315	---	---	---
28**. Hydraquents							
29----------------------- Immokalee	350	550	---	200	---	7.5	12
30----------------------- Immokalee	---	---	---	---	---	---	---
31----------------------- Malabar	325	575	---	200	6	---	12.0
32----------------------- Myakka	350	550	---	320	---	9.0	---
33----------------------- Myakka	---	---	---	---	---	---	---
34----------------------- Myakka	---	---	---	---	---	---	---
35----------------------- Myakka	---	---	---	---	---	---	---
36----------------------- Myakka Variant	---	---	---	320	---	9	12
37----------------------- Orsino	350	450	---	---	---	5.0	---
38----------------------- Paisley	---	---	---	---	---	10	12
39----------------------- Palm Beach	---	---	---	---	---	---	---
40----------------------- Palm Beach	---	---	---	---	---	---	---
41**:							
Palm Beach---------------	---	---	---	---	---	---	---
Paola.							
42, 43. Paola							
44----------------------- Paola	---	---	---	---	---	---	---

See footnotes at end of table.

TABLE 5.--YIELDS PER ACRE OF CROPS AND PASTURE--Continued

Soil name and map symbol	Oranges	Grapefruit	Watermelons	Cabbage	Cucumbers	Bahiagrass	Grass-clover
	Box	Box	Ton	Crate	Ton	AUM*	AUM*
45 Pineda	425	575	---	250	---	---	12.0
46 Pinellas	425	575	---	250	---	---	---
47**. Pits							
48 Placid	---	---	---	---	---	---	---
49 Pomona	---	---	9.5	320	---	8	10
50 Pomona	---	---	---	---	---	---	---
51 Pomona	---	---	---	---	---	---	---
52 Pompano	300	400	---	260	---	8	10
53 Pompano	---	---	---	---	---	---	---
54**. Quartzipsamments							
55 Riviera	425	575	---	400	10.4	---	12
56 Samsula	---	---	---	315	---	---	---
57 Satellite	---	---	5.0	---	---	5.0	---
58 Satellite	---	---	---	---	---	---	---
59 Scoggin	---	---	8.5	---	3.0	9.5	12.0
60 Smyrna	350	550	9.5	200	---	8.0	12.0
61 St. Johns	300	550	---	300	---	8.5	12.0
62 St. Lucie	---	---	---	---	---	---	---
63 Tavares	425	600	8	---	---	8	---
64 Tequesta	---	---	---	480	---	---	---
65 Terra Ceia	---	---	---	340	---	---	---
66 Tomoka	---	---	---	280	---	---	32
67 Turnbull	---	---	---	---	---	---	---

See footnotes at end of table.

TABLE 5.--YIELDS PER ACRE OF CROPS AND PASTURE--Continued

Soil name and map symbol	Oranges	Grapefruit	Watermelons	Cabbage	Cucumbers	Bahiagrass	Grass-clover
	Box	Box	Ton	Crate	Ton	AUM*	AUM*
68------------------------ Turnbull Variant	---	---	---	---	---	---	---
69------------------------ Tuscawilla	425	550	---	---	---	9	12
70------------------------ Tuscawilla	---	---	---	---	---	---	---
71**. Urban land							
72------------------------ Valkaria	350	450	---	400	---	---	9.0
73------------------------ Wabasso	400	575	---	250	---	---	12.0
74------------------------ Wabasso	---	---	---	---	---	---	---
75------------------------ Wauchula	400	575	---	250	---	10.0	12.0
76------------------------ Wauchula	---	---	---	---	---	---	---
77------------------------ Winder	---	---	---	250	5.9	---	12.0

* Animal-unit-month: The amount of forage or feed required to feed one animal unit (one cow, one horse, one mule, five sheep, or five goats) for 30 days.

** See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 6.--POTENTIAL PRODUCTION OF LIVESTOCK FORAGE

[Only soils that produce a significant amount of forage are listed]

Soil name and map symbol	Potential production		Composition of forage		
	Kind of year	Dry weight	Grasses	Forbs	Woody plants and trees
		Lb/Acre	Pct	Pct	Pct
1	Favorable	4,000	60	20	20
Apopka	Normal	3,000			
	Unfavorable	1,500			
2	Favorable	3.500	40	20	40
Apopka	Normal	2,500			
	Unfavorable	1,500			
4	Favorable	4,000	60	20	20
Astatula	Normal	3,000			
	Unfavorable	2,000			
5	Favorable	4,000	60	20	20
Astatula	Normal	3,000			
	Unfavorable	2,000			
7*	Favorable	10,000	85	15	Trace
Astor	Normal	8,000			
	Unfavorable	4,500			
8	Favorable	6,000	85	15	Trace
Basinger	Normal	5,000			
	Unfavorable	2,000			
10	Favorable	10,000	85	15	Trace
Bluff	Normal	8,000			
	Unfavorable	4,500			
11	Favorable	3,500	40	20	40
Bulow	Normal	2,500			
	Unfavorable	1,500			
12	Favorable	3,500	40	20	40
Canaveral	Normal	3,000			
	Unfavorable	2,000			
13	Favorable	3,500	40	20	40
Cassia	Normal	2,500			
	Unfavorable	1,500			
14*	Favorable	10,000	85	15	Trace
Chobee	Normal	8,000			
	Unfavorable	4,500			
15	Favorable	4,000	60	20	20
Cocoa	Normal	3,000			
	Unfavorable	2,000			
17	Favorable	3,500	40	20	40
Daytona	Normal	2,500			
	Unfavorable	1,500			
19	Favorable	4,000	60	20	20
Deland	Normal	3,000			
	Unfavorable	2,000			
20	Favorable	6,000	75	10	15
EauGallie	Normal	4,500			
	Unfavorable	3,000			
21	Favorable	6,000	85	15	Trace
EauGallie	Normal	5,200			
	Unfavorable	4,500			

See footnote at end of table.

TABLE 6.--POTENTIAL PRODUCTION OF LIVESTOCK FORAGE--Continued

Soil name and map symbol	Potential production: Kind of year	Potential production: Dry weight	Composition of forage: Grasses	Composition of forage: Forbs	Composition of forage: Woody plants and trees
		Lb/Acre	Pct	Pct	Pct
22. Electra	Favorable	4,500	75	10	15
	Normal	3,500			
	Unfavorable	3,000			
23. Farmton	Favorable	6,000	75	10	15
	Normal	4,500			
	Unfavorable	3,000			
24. Fluvaquents	Favorable	10,000	85	15	Trace
	Normal	8,000			
	Unfavorable	4,500			
25*. Gator	Favorable	10,000	85	15	Trace
	Normal	8,000			
	Unfavorable	4,500			
26. Holopaw	Favorable	9,000	70	15	15
	Normal	7,500			
	Unfavorable	4,500			
27*. Hontoon	Favorable	10,000	85	15	Trace
	Normal	8,000			
	Unfavorable	4,500			
29. Immokalee	Favorable	6,000	75	10	15
	Normal	4,500			
	Unfavorable	3,000			
30. Immokalee	Favorable	6,000	85	15	Trace
	Normal	5,200			
	Unfavorable	4,500			
31. Malabar	Favorable	6,000	85	15	Trace
	Normal	5,000			
	Unfavorable	2,000			
32. Myakka	Favorable	6,000	75	10	15
	Normal	4,500			
	Unfavorable	3,000			
33. Myakka	Favorable	6,000	85	15	Trace
	Normal	5,200			
	Unfavorable	4,500			
34*. Myakka	Favorable	10,000	85	15	Trace
	Normal	8,000			
	Unfavorable	4,500			
36. Myakka Variant	Favorable	6,000	75	10	15
	Normal	4,500			
	Unfavorable	3,000			
37. Orsino	Favorable	3,500	40	20	40
	Normal	2,500			
	Unfavorable	1,500			
38. Paisley	Favorable	9,000	70	15	15
	Normal	1,500			
	Unfavorable	4,500			
39. Palm Beach	Favorable	3,500	40	20	40
	Normal	2,500			
	Unfavorable	1,500			

See footnote at end of table.

TABLE 6.--POTENTIAL PRODUCTION OF LIVESTOCK FORAGE--Continued

Soil name and map symbol	Potential production: Kind of year	Potential production: Dry weight	Composition of forage: Grasses	Composition of forage: Forbs	Composition of forage: Woody plants and trees
		Lb/Acre	Pct	Pct	Pct
41-----Palm Beach	Favorable	3,500	40	20	40
	Normal	2,500			
	Unfavorable	1,500			
42-----Paola	Favorable	3,500	40	20	40
	Normal	2,500			
	Unfavorable	1,500			
43-----Paola	Favorable	3,500	40	20	40
	Normal	2,500			
	Unfavorable	1,500			
45-----Pineda	Favorable	6,000	85	15	Trace
	Normal	5,000			
	Unfavorable	2,000			
46-----Pinellas	Favorable	9,000	70	15	15
	Normal	7,500			
	Unfavorable	4,500			
48-----Placid	Favorable	10,000	85	15	Trace
	Normal	8,000			
	Unfavorable	4,500			
49-----Pomona	Favorable	6,000	75	10	15
	Normal	4,500			
	Unfavorable	3,000			
50-----Pomona	Favorable	6,000	90	10	Trace
	Normal	5,200			
	Unfavorable	4,500			
51*-----Pomona	Favorable	10,000	85	15	Trace
	Normal	8,000			
	Unfavorable	4,500			
52-----Pompano	Favorable	6,000	85	15	Trace
	Normal	5,000			
	Unfavorable	2,000			
53-----Pompano	Favorable	10,000	85	15	Trace
	Normal	8,000			
	Unfavorable	4,500			
55-----Riviera	Favorable	9,000	60	20	20
	Normal	7,500			
	Unfavorable	4,500			
56*-----Samsula	Favorable	10,000	85	15	Trace
	Normal	8,000			
	Unfavorable	4,500			
57-----Satellite	Favorable	3,500	40	20	40
	Normal	2,500			
	Unfavorable	1,500			
59-----Scoggin	Favorable	9,000	70	15	15
	Normal	7,500			
	Unfavorable	4,500			
60-----Smyrna	Favorable	6,000	75	10	15
	Normal	4,500			
	Unfavorable	3,000			

See footnote at end of table.

TABLE 6.--POTENTIAL PRODUCTION OF LIVESTOCK FORAGE--Continued

Soil name and map symbol	Potential production: Kind of year	Potential production: Dry weight	Composition of forage: Grasses	Composition of forage: Forbs	Composition of forage: Woody plants and trees
		Lb./Acre	Pct	Pct	Pct
61: St. Johns	Favorable	5,500	75	10	15
	Normal	4,500			
	Unfavorable	3,500			
62: St. Lucie	Favorable	3,500	40	20	40
	Normal	2,500			
	Unfavorable	1,500			
63: Tavares	Favorable	4,000	60	20	20
	Normal	3,000			
	Unfavorable	2,000			
64*: Tequesta	Favorable	10,000	85	15	Trace
	Normal	8,000			
	Unfavorable	4,500			
65*: Terra Ceia	Favorable	10,000	85	15	Trace
	Normal	8,000			
	Unfavorable	4,500			
66*: Tomoka	Favorable	10,000	85	15	Trace
	Normal	8,000			
	Unfavorable	4,500			
67*: Turnbull	Favorable	10,000	95	5	Trace
	Normal	9,500			
	Unfavorable	8,000			
68: Turnbull Variant	Favorable	3,500	40	20	40
	Normal	3,000			
	Unfavorable	2,000			
69: Tuscawilla	Favorable	8,000	55	20	25
	Normal	7,000			
	Unfavorable	4,500			
72: Valkaria	Favorable	6,000	85	15	Trace
	Normal	5,000			
	Unfavorable	2,000			
73: Wabasso	Favorable	6,000	75	10	15
	Normal	4,500			
	Unfavorable	3,000			
74: Wabasso	Favorable	6,000	65	15	Trace
	Normal	5,200			
	Unfavorable	4,500			
75: Wauchula	Favorable	6,000	75	10	15
	Normal	4,500			
	Unfavorable	3,000			
76: Wauchula	Favorable	6,000	85	15	Trace
	Normal	5,200			
	Unfavorable	4,500			
77: Winder	Favorable	9,000	60	20	20
	Normal	7,500			
	Unfavorable	4,500			

* Areas of this soil in swamp vegetation do not produce significant amounts of forage.

TABLE 7.--WOODLAND MANAGEMENT AND PRODUCTIVITY

[Only the soils suitable for production of commercial trees are listed. Absence of an entry indicates that information was not available]

Soil name and map symbol	Ordination symbol	Management concerns				Potential productivity		Trees to plant
		Erosion hazard	Equipment limitation	Seedling mortality	Windthrow hazard	Common trees	Site index	
1, 2-------------- Apopka	3s	Slight	Moderate	Moderate	Slight	Slash pine---------- Loblolly pine------- Longleaf pine-------	80 80 70	Slash pine, loblolly pine.
4, 5-------------- Astatula	5s	Slight	Severe	Moderate	Slight	Sand pine-----------	60	Sand pine.
7----------------- Astor	2w	Slight	Severe	Severe	Slight	Slash pine---------- Sweetgum------------ Water oak----------- Loblolly pine------- Longleaf pine-------	87 87 --- 87 75	Slash pine.
8----------------- Basinger	4w	Slight	Severe	Severe	Severe	Pond pine-----------	60	
10---------------- Bluff	2w	Slight	Severe	Severe	Moderate	Slash pine---------- Loblolly pine------- Longleaf pine-------	90 90 80	Slash pine.
11---------------- Bulow	3s	Slight	Slight	Moderate	Slight	Slash pine---------- Longleaf pine------- Sand pine----------- Southern magnolia--- Live oak------------ Laurel oak----------	80 70 70 --- --- ---	Slash pine, sand pine.
12---------------- Canaveral	4s	Slight	Severe	Severe	Slight	Sand pine----------- Slash pine----------	70 70	Slash pine.
13---------------- Cassia	4s	Slight	Moderate	Severe	Slight	Slash pine---------- Longleaf pine-------	70 60	Sand pine.
14---------------- Chobee	2w	Slight	Severe	Moderate	Slight	Slash pine---------- Longleaf pine-------	90 70	Slash pine.
15---------------- Cocoa	3s	Slight	Moderate	Moderate	Slight	Slash pine---------- Longleaf pine------- Sand pine-----------	80 70 60	Slash pine.
17---------------- Daytona	4s	Slight	Moderate	Severe	Moderate	Sand pine-----------	70	Sand pine.
19---------------- Deland	3s	Slight	Moderate	Moderate	Slight	Sand pine----------- Slash pine----------	80 70	Sand pine.
20---------------- EauGallie	3w	Slight	Moderate	Moderate	Slight	Slash pine---------- Longleaf pine-------	80 70	Slash pine.
21---------------- EauGallie	4w	Slight	Severe	Severe	Severe	Pond pine-----------	60	
22---------------- Electra	4s	Slight	Moderate	Severe	Slight	Slash pine---------- Sand pine----------- Longleaf pine-------	70 65 65	Slash pine, sand pine.
23---------------- Farmton	3w	Slight	Moderate	Slight	Slight	Slash pine---------- Longleaf pine-------	80 70	Slash pine.

See footnote at end of table.

TABLE 7.--WOODLAND MANAGEMENT AND PRODUCTIVITY--Continued

Soil name and map symbol	Ordination symbol	Management concerns: Erosion hazard	Equipment limitation	Seedling mortality	Windthrow hazard	Potential productivity: Common trees	Site index	Trees to plant
25 Gator	---	Slight	Severe	Severe	Severe	Sweetgum	---	
						Red maple	---	
						Pond pine	---	
						Baldcypress	---	
26 Holopaw	3w	Slight	Moderate	Severe	Slight	Slash pine	80	Slash pine.
						Longleaf pine	70	
30 Immokalee	4w	Slight	Severe	Severe	Severe	Pond pine	60	
31 Malabar	3w	Slight	Moderate	Severe	Slight	Slash pine	80	Slash pine.
						Longleaf pine	70	
						Pond pine	60	
32 Myakka	4w	Slight	Moderate	Moderate	Moderate	Slash pine	70	Slash pine.
						Longleaf pine	60	
33 Myakka	4w	Slight	Severe	Severe	Severe	Pond pine	60	
34*:								
Myakka	4w	Slight	Severe	Severe	Severe	Pond pine	60	
St. Johns	3w	Slight	Moderate	Moderate	Slight	Pond pine	60	
36 Myakka Variant	4w	Slight	Moderate	Moderate	Moderate	Sweetgum	---	
						Southern magnolia	---	
						Red maple	---	
						Pignut hickory	---	
						Live oak	---	
37 Orsino	4s	Slight	Moderate	Severe	Slight	Slash pine	70	Slash pine, sand pine.
						Longleaf pine	60	
						Sand pine	70	
38 Paisley	1w	Slight	Severe	Severe	Severe	Slash pine	100	Slash pine, loblolly pine.
						Loblolly pine	100	
41*:								
Palm Beach.								
Paola	5s	Slight	Moderate	Severe	Slight	Sand pine	50	Sand pine.
						Slash pine	60	
42, 43 Paola	5s	Slight	Moderate	Severe	Slight	Sand pine	50	Sand pine.
						Slash pine	60	
45 Pineda	3w	Slight	Moderate	Severe	Slight	Slash pine	80	Slash pine.
						Longleaf pine	70	
46 Pinellas	4w	Slight	Moderate	Moderate	Moderate	Slash pine	70	Slash pine.
						Longleaf pine	60	
48 Placid	3w	Slight	Severe	Severe	Slight	Slash pine	80	Slash pine.
49 Pomona	3w	Slight	Moderate	Moderate	Slight	Slash pine	80	Slash pine.
						Loblolly pine	80	
						Longleaf pine	70	
50 Pomona	4w	Slight	Severe	Severe	Severe	Slash pine	70	
						Pond pine	60	

See footnote at end of table.

TABLE 7.--WOODLAND MANAGEMENT AND PRODUCTIVITY--Continued

Soil name and map symbol	Ordination symbol	Management concerns: Erosion hazard	Management concerns: Equipment limitation	Management concerns: Seedling mortality	Management concerns: Windthrow hazard	Potential productivity: Common trees	Potential productivity: Site index	Trees to plant
51*:								
Pomona	4w	Slight	Severe	Severe	Severe	Slash pine Pond pine	70 60	
St. Johns	3w	Slight	Moderate	Moderate	Slight	Pond pine	60	
52 Pompano	4w	Slight	Severe	Severe	Slight	Slash pine Pond pine	70 60	Slash pine.
53*:								
Pompano	4w	Slight	Severe	Severe	Slight	Slash pine Pond pine	70 60	Slash pine.
Placid	3w	Slight	Severe	Severe	Slight	Pond pine	60	
55 Riviera	3w	Slight	Moderate	Moderate	Moderate	Slash pine Longleaf pine	80 70	Slash pine.
57 Satellite	4s	Slight	Moderate	Severe	Slight	Slash pine Longleaf pine Sand pine	70 60 65	Slash pine, sand pine.
59 Scoggin	3w	Slight	Moderate	Moderate	Slight	Slash pine Longleaf pine	80 70	Slash pine.
60 Smyrna	3w	Slight	Moderate	Moderate	Slight	Slash pine Longleaf pine	80 70	Slash pine.
61 St. Johns	3w	Slight	Moderate	Moderate	Slight	Slash pine Longleaf pine	80 70	Slash pine.
62 St. Lucie	5s	Slight	Severe	Moderate	Slight	Sand pine	60	Sand pine.
63 Tavares	3s	Slight	Moderate	Moderate	Slight	Slash pine Longleaf pine	80 70	Slash pine.
64 Tequesta	2w	Slight	Severe	Moderate	Moderate	Slash pine Longleaf pine	90 80	Slash pine.
66 Tomoka	4w	Slight	Severe	Severe	Moderate	Sweetgum Sweetbay Red maple Pond pine	70 --- --- ---	
69 Tuscawilla	2w	Slight	Moderate	Slight	Slight	Live oak Laurel oak Pignut hickory Southern magnolia Sweetgum	--- --- --- --- ---	
72 Valkaria	4w	Slight	Severe	Moderate	Slight	Slash pine Longleaf pine	70 60	Slash pine.
73 Wabasso	3w	Slight	Moderate	Moderate	Moderate	Slash pine Longleaf pine	80 70	Slash pine.
74 Wabasso	4w	Slight	Severe	Severe	Severe	Pond pine	60	
75 Wauchula	3w	Slight	Moderate	Moderate	Slight	Slash pine Longleaf pine	80 65	Slash pine.
76 Wauchula	4w	Slight	Severe	Severe	Severe	Pond pine	60	
77 Winder	2w	Slight	Moderate	Moderate	Moderate	Slash pine Pond pine	90 60	Slash pine.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 8.--BUILDING SITE DEVELOPMENT

[Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," and "severe." Absence of an entry indicates that the soil was not rated]

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
1: Apopka	Severe: cutbanks cave.	Slight	Slight	Slight	Slight	Severe: too sandy.
2: Apopka	Severe: cutbanks cave.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope.	Severe: too sandy.
3*. Arents						
4: Astatula	Severe: cutbanks cave.	Slight	Slight	Moderate: slope.	Slight	Severe: too sandy.
5: Astatula	Severe: cutbanks cave.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope.	Severe: too sandy.
6*:						
Astatula	Severe: cutbanks cave.	Slight	Slight	Moderate: slope.	Slight	Severe: too sandy.
Urban land.						
7: Astor	Severe: cutbanks cave, wetness, floods.	Severe: floods, wetness.	Severe: floods, wetness.	Severe: floods, wetness.	Severe: wetness, floods.	Severe: wetness, floods.
8: Basinger	Severe: cutbanks cave, wetness, ponds.	Severe: wetness, ponds.	Severe: wetness, ponds.	Severe: wetness, ponds.	Severe: wetness, ponds.	Severe: wetness, ponds, too sandy.
9*. Beaches						
10: Bluff	Severe: wetness.	Severe: wetness, floods, shrink-swell.	Severe: wetness, floods, shrink-swell.	Severe: wetness, floods, shrink-swell.	Severe: wetness, shrink-swell, low strength.	Severe: wetness, floods.
11: Bulow	Severe: cutbanks cave.	Slight	Moderate: depth to rock.	Slight	Slight	Severe: too sandy.
12: Canaveral	Severe: cutbanks cave, wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Moderate: wetness.	Severe: too sandy.
13: Cassia	Severe: wetness, cutbanks cave.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.	Moderate: wetness.	Severe: too sandy.
14: Chobee	Severe: floods, wetness.	Severe: floods, wetness.	Severe: floods, wetness.	Severe: floods, wetness.	Severe: floods, wetness.	Severe: floods, wetness.
15: Cocoa	Severe: depth to rock.	Moderate: depth to rock.	Moderate: depth to rock.	Moderate: depth to rock.	Moderate: depth to rock.	Moderate: too sandy.
16*:						
Cocoa	Severe: depth to rock.	Moderate: depth to rock.	Moderate: depth to rock.	Moderate: depth to rock.	Moderate: depth to rock.	Moderate: too sandy.
Urban land.						
17: Daytona	Severe: cutbanks cave.	Slight	Moderate: wetness.	Slight	Slight	Severe: too sandy.

See footnote at end of table.

TABLE 8.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
18*:						
Daytona	Severe: cutbanks cave.	Slight	Moderate: wetness.	Slight	Slight	Severe: too sandy.
Urban land.						
19 Deland	Severe: cutbanks cave.	Slight	Slight	Slight	Slight	Severe: too sandy.
20 EauGallie	Severe: wetness, cutbanks cave.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.
21 EauGallie	Severe: ponds, wetness, cutbanks cave.	Severe: ponds, wetness.	Severe: ponds, wetness.	Severe: ponds, wetness.	Severe: ponds, wetness.	Severe: wetness, ponds.
22 Electra	Severe: cutbanks cave, wetness.	Slight	Moderate: wetness.	Slight	Moderate: wetness.	Severe: too sandy.
23 Farmton	Severe: cutbanks cave, wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness, too sandy.
24*. Fluvaquents						
25 Gator	Severe: cutbanks cave, excess humus, wetness.	Severe: floods, wetness, low strength.	Severe: floods, wetness, low strength.	Severe: floods, wetness, low strength.	Severe: low strength, wetness, floods.	Severe: excess humus, wetness, floods.
26 Holopaw	Severe: wetness, cutbanks cave.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness. too sandy.
27 Hontoon	Severe: excess humus, wetness.	Severe: excess humus, low strength, wetness.	Severe: excess humus, low strength, wetness.	Severe: excess humus, wetness, low strength.	Severe: excess humus, low strength, wetness.	Severe: excess humus, wetness.
28*. Hydraquents						
29 Immokalee	Severe: cutbanks cave, wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness, too sandy.
30 Immokalee	Severe: cutbanks cave, wetness, ponds.	Severe: ponds, wetness.	Severe: ponds, wetness.	Severe: ponds, wetness.	Severe: wetness, ponds.	Severe: wetness, too sandy, ponds.
31 Malabar	Severe: wetness, cutbanks cave.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.
32 Myakka	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness, too sandy.
33 Myakka	Severe: wetness, ponds.	Severe: wetness, ponds.	Severe: wetness, ponds.	Severe: wetness, ponds.	Severe: wetness, ponds.	Severe: wetness, ponds. too sandy.
34*:						
Myakka	Severe: wetness, ponds.	Severe: wetness, ponds.	Severe: wetness, ponds.	Severe: wetness, ponds.	Severe: wetness, ponds.	Severe: wetness, ponds, too sandy.

See footnote at end of table.

TABLE 8.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
34*:						
St. Johns	Severe: wetness, cutbanks cave, ponds.	Severe: wetness, ponds.	Severe: wetness, ponds.	Severe: wetness, ponds.	Severe: wetness, ponds.	Severe: wetness, ponds.
35*:						
Myakka	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness, too sandy.
Urban land.						
36 Myakka Variant	Severe: cutbanks cave, wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness, too sandy.
37 Orsino	Severe: cutbanks cave.	Slight	Moderate: wetness.	Slight	Slight	Severe: too sandy.
38 Paisley	Severe: too clayey, wetness.	Severe: floods, wetness, shrink-swell.	Severe: floods, wetness, shrink-swell.	Severe: floods, wetness, shrink-swell.	Severe: wetness, shrink-swell, low strength.	Severe: too sandy, wetness.
39 Palm Beach	Severe: cutbanks cave.	Slight	Slight	Slight	Slight	Severe: too sandy.
40*:						
Palm Beach	Severe: cutbanks cave.	Slight	Slight	Slight	Slight	Severe: too sandy.
Urban land.						
Paola	Severe: cutbanks cave.	Slight	Slight	Moderate: slope.	Slight	Severe: too sandy.
41*:						
Palm Beach	Severe: cutbanks cave.	Slight	Slight	Slight	Slight	Severe: too sandy.
Paola	Severe: cutbanks cave.	Slight	Slight	Moderate: slope.	Slight	Severe: too sandy.
42 Paola	Severe: cutbanks cave.	Slight	Slight	Moderate: slope.	Slight	Severe: too sandy.
43 Paola	Severe: cutbanks cave.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope.	Severe: too sandy.
44*:						
Paola	Severe: cutbanks cave.	Slight	Slight	Moderate: slope.	Slight	Severe: too sandy.
Urban land.						
45 Pineda	Severe: cutbanks cave, wetness.	Severe: wetness, floods.	Severe: wetness, floods.	Severe: wetness, floods.	Severe: wetness.	Severe: wetness, too sandy.
46 Pinellas	Severe: cutbanks cave, wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.
47*. Pits						
48 Placid	Severe: wetness, cutbanks cave, ponds.	Severe: wetness, ponds.	Severe: wetness, ponds.	Severe: ponds, wetness.	Severe: wetness, ponds.	Severe: wetness, ponds, too sandy.

See footnote at end of table.

TABLE 8.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
49 Pomona	Severe: cutbanks cave, wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness, too sandy.
50 Pomona	Severe: cutbanks cave, wetness, ponds.	Severe: ponds, wetness.	Severe: ponds, wetness.	Severe: ponds, wetness.	Severe: wetness, ponds.	Severe: wetness, too sandy, ponds.
51*:						
Pomona	Severe: cutbanks cave, wetness, ponds.	Severe: ponds, wetness.	Severe: ponds, wetness.	Severe: ponds, wetness.	Severe: wetness, ponds.	Severe: wetness, too sandy, ponds.
St. Johns	Severe: wetness, cutbanks cave, ponds.	Severe: wetness, ponds.	Severe: wetness, ponds.	Severe: wetness, ponds.	Severe: wetness, ponds.	Severe: wetness, ponds.
52 Pompano	Severe: wetness, cutbanks cave.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.
53*:						
Pompano	Severe: wetness, cutbanks cave, ponds.	Severe: wetness, ponds.	Severe: wetness, ponds.	Severe: wetness, ponds.	Severe: wetness, ponds.	Severe: wetness, ponds, too sandy.
Placid	Severe: wetness, cutbanks cave, ponds.	Severe: wetness, ponds.	Severe: wetness, ponds.	Severe: ponds, wetness.	Severe: wetness, ponds.	Severe: wetness, ponds, too sandy.
54*. Quartzipsamments						
55 Riviera	Severe: wetness, cutbanks cave.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness,	Severe: wetness, too sandy.
56 Samsula	Severe: cutbanks cave, wetness.	Severe: wetness, low strength.	Severe: wetness.	Severe: wetness, low strength.	Severe: low strength, wetness.	Severe: excess humus, too sandy.
57 Satellite	Severe: cutbanks cave, wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Moderate: wetness.	Severe: too sandy.
58*:						
Satellite	Severe: cutbanks cave, wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Moderate: wetness.	Severe: too sandy.
Urban land.						
59 Scoggin	Severe: cutbanks cave, wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.
60 Smyrna	Severe: cutbanks cave, wetness.	Severe: wetness.	Severe: wetness.	Severe: corrosive, wetness.	Severe: wetness.	Severe: wetness.
61 St. Johns	Severe: wetness, cutbanks cave.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.
62 St. Lucie	Severe: cutbanks cave.	Slight	Slight	Moderate: slope.	Slight	Severe: too sandy.

See footnote at end of table.

TABLE 8.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
63----------------- Tavares	Severe: cutbanks cave.	Slight---------	Moderate: wetness.	Slight---------	Slight---------	Severe: too sandy.
64----------------- Tequesta	Severe: wetness.	Severe: wetness, excess humus.	Severe: wetness, excess humus.	Severe: wetness, excess humus, corrosive.	Severe: wetness, excess humus.	Severe: wetness.
65----------------- Terra Ceia	Severe: wetness, excess humus.	Severe: wetness, excess humus, low strength.	Severe: wetness, excess humus, low strength.	Severe: wetness, excess humus, low strength.	Severe: wetness, excess humus, low strength.	Severe: wetness, excess humus.
66----------------- Tomoka	Severe: wetness, excess humus, cutbanks cave.	Severe: wetness, excess humus, low strength.	Severe: wetness, excess humus, low strength.	Severe: wetness, excess humus, corrosive.	Severe: excess humus, low strength, wetness.	Severe: wetness, excess humus.
67----------------- Turnbull	Severe: too clayey, wetness, floods.	Severe: floods, wetness, shrink-swell.	Severe: floods, wetness, shrink-swell.	Severe: floods, wetness, shrink-swell.	Severe: low strength, wetness, floods.	Severe: wetness, excess humus, floods.
68----------------- Turnbull Variant	Severe: cutbanks cave, wetness.	Severe: wetness.	Severe: wetness, shrink-swell, low strength.	Severe: wetness.	Severe: wetness.	Severe: too sandy.
69----------------- Tuscawilla	Severe: wetness, cutbanks cave.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness, too sandy.
70*:						
Tuscawilla-------	Severe: wetness, cutbanks cave.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness, too sandy
Urban land.						
71*. Urban land						
72----------------- Valkaria	Severe: wetness, ponds.	Severe: wetness, ponds.	Severe: wetness, ponds.	Severe: wetness, ponds.	Severe: wetness, ponds.	Severe: wetness, ponds.
73----------------- Wabasso	Severe: cutbanks cave, wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.
74----------------- Wabasso	Severe: cutbanks cave, wetness, ponds.	Severe: wetness, ponds.	Severe: wetness, ponds.	Severe: wetness, ponds.	Severe: wetness, ponds.	Severe: wetness, ponds.
75----------------- Wauchula	Severe: wetness, cutbanks cave.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness, too sandy.
76----------------- Wauchula	Severe: ponds, wetness, cutbanks cave.	Severe: ponds, wetness.	Severe: ponds, wetness.	Severe: ponds, wetness.	Severe: ponds, wetness.	Severe: wetness, ponds, too sandy.
77----------------- Winder	Severe: floods, wetness.	Severe: floods, wetness.	Severe: floods, wetness.	Severe: floods, corrosive, wetness.	Severe: floods, wetness.	Severe: floods, wetness.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 9.--SANITARY FACILITIES

[Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," "good," "fair," and other terms. Absence of an entry indicates that the soil was not rated]

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
1-------------------- Apopka	Slight-----------	Severe: seepage.	Severe: too sandy.	Slight-----------	Poor: too sandy, seepage.
2-------------------- Apopka	Moderate: slope.	Severe: seepage, slope.	Severe: too sandy.	Moderate: slope.	Poor: too sandy, seepage.
3*. Arents					
4-------------------- Astatula	Slight-----------	Severe: seepage.	Severe: seepage, too sandy.	Severe: seepage.	Poor: too sandy.
5-------------------- Astatula	Moderate: slope.	Severe: seepage, slope.	Severe: seepage, too sandy.	Severe: seepage.	Poor: too sandy.
6*:					
Astatula-----------	Slight-----------	Severe: seepage.	Severe: seepage, too sandy.	Severe: seepage.	Poor: too sandy.
Urban land.					
7-------------------- Astor	Severe: floods, wetness.	Severe: seepage, floods, wetness.	Severe: floods, seepage, wetness.	Severe: floods, seepage, wetness.	Poor: too sandy, wetness.
8-------------------- Basinger	Severe: wetness, ponds.	Severe: seepage, wetness, ponds.	Severe: seepage, wetness, ponds.	Severe: seepage, wetness, ponds.	Poor: too sandy, seepage, wetness.
9*. Beaches					
10------------------- Bluff	Severe: percs slowly, wetness, floods.	Severe: wetness, floods.	Severe: wetness, floods.	Severe: wetness, floods.	Poor: wetness, too clayey.
11------------------- Bulow	Severe: depth to rock.	Severe: seepage.	Severe: depth to rock, seepage, too sandy.	Severe: seepage.	Poor: too sandy, seepage.
12------------------- Canaveral	Severe: wetness.	Severe: seepage, wetness.	Severe: too sandy, seepage, wetness.	Severe: seepage.	Poor: too sandy, seepage.
13------------------- Cassia	Severe: wetness.	Severe: seepage, wetness.	Severe: wetness, seepage, too sandy.	Severe: wetness, seepage.	Poor: too sandy, seepage.
14------------------- Chobee	Severe: floods, wetness.	Severe: floods, wetness.	Severe: floods, wetness.	Severe: floods, wetness.	Poor: wetness.

See footnote at end of table.

TABLE 9.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
15: Cocoa	Severe: depth to rock.	Severe: depth to rock, seepage.	Severe: depth to rock, seepage, too sandy.	Severe: seepage.	Poor: too sandy, seepage.
16*:					
Cocoa	Severe: depth to rock.	Severe: depth to rock, seepage.	Severe: depth to rock, seepage, too sandy.	Severe: seepage.	Poor: too sandy, seepage.
Urban land.					
17: Daytona	Severe: wetness.	Severe: seepage.	Severe: seepage, wetness, too sandy.	Severe: seepage.	Poor: too sandy, seepage.
18*:					
Daytona	Severe: wetness.	Severe: seepage.	Severe: seepage, wetness, too sandy.	Severe: seepage.	Poor: too sandy, seepage.
Urban land.					
19: Deland	Slight	Severe: seepage.	Severe: seepage, too sandy.	Severe: seepage.	Poor: too sandy, seepage.
20: EauGallie	Severe: wetness, seepage.	Severe: wetness, seepage.	Severe: wetness, seepage.	Severe: wetness, seepage.	Poor: too sandy, wetness.
21: EauGallie	Severe: ponds, wetness, seepage.	Severe: ponds, wetness, seepage.	Severe: ponds, wetness, seepage.	Severe: ponds, wetness, seepage.	Poor: too sandy, wetness.
22: Electra	Severe: wetness.	Severe: wetness, seepage.	Severe: wetness, too sandy, seepage.	Severe: wetness, seepage.	Poor: too sandy.
23: Farmton	Severe: wetness.	Severe: seepage, wetness.	Severe: seepage, wetness, too sandy.	Severe: seepage, wetness.	Poor: too sandy, wetness, seepage.
24*. Fluvaquents					
25: Gator	Severe: floods, wetness.	Severe: floods, excess humus, wetness.	Severe: floods, wetness, excess humus.	Severe: floods, seepage, wetness.	Poor: hard to pack, wetness, excess humus.
26: Holopaw	Severe: wetness.	Severe: wetness, seepage.	Severe: wetness, seepage.	Severe: wetness, seepage.	Poor: wetness, too sandy.
27: Hontoon	Severe: wetness.	Severe: excess humus, seepage, wetness.	Severe: excess humus, seepage, wetness.	Severe: wetness, seepage.	Poor: excess humus, seepage, wetness.
28*. Hydraquents					

See footnote at end of table.

TABLE 9.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
29: Immokalee	Severe: wetness.	Severe: seepage, wetness.	Severe: seepage, too sandy, wetness.	Severe: seepage, wetness.	Poor: seepage, too sandy, wetness.
30: Immokalee	Severe: ponds, wetness.	Severe: seepage, ponds, wetness.	Severe: ponds, seepage, wetness.	Severe: ponds, seepage, wetness.	Poor: seepage, too sandy, wetness.
31: Malabar	Severe: wetness.	Severe: wetness, seepage.	Severe: wetness, seepage, too sandy.	Severe: wetness, seepage.	Poor: too sandy, wetness.
32: Myakka	Severe: wetness.	Severe: seepage, wetness.	Severe: too sandy, wetness.	Severe: seepage, wetness.	Poor: seepage, too sandy, wetness.
33: Myakka	Severe: wetness, ponds.	Severe: seepage, wetness, ponds.	Severe: too sandy, wetness, ponds.	Severe: seepage, wetness, ponds.	Poor: seepage, too sandy, wetness.
34*:					
Myakka	Severe: wetness, ponds.	Severe: seepage, wetness, ponds.	Severe: too sandy, wetness, ponds.	Severe: seepage, wetness, ponds.	Poor: seepage, too sandy, wetness.
St. Johns	Severe: wetness, ponds.	Severe: wetness, seepage, ponds.	Severe: wetness, seepage, ponds.	Severe: wetness, seepage, ponds.	Poor: too sandy, wetness.
35*:					
Myakka	Severe: wetness.	Severe: seepage, wetness.	Severe: too sandy, wetness.	Severe: seepage, wetness.	Poor: seepage, too sandy, wetness.
Urban land.					
36: Myakka Variant	Severe: wetness.	Severe: seepage, wetness.	Severe: seepage, wetness, too sandy.	Severe: seepage, wetness.	Poor: too sandy, wetness, seepage.
37: Orsino	Severe: wetness.	Severe: seepage.	Severe: too sandy, seepage.	Severe: seepage.	Poor: too sandy, seepage.
38: Paisley	Severe: percs slowly, wetness.	Severe: floods.	Severe: wetness, too clayey.	Severe: wetness.	Poor: too clayey.
39: Palm Beach	Slight	Severe: seepage.	Severe: seepage.	Severe: seepage.	Poor: seepage, too sandy.
40*:					
Palm Beach	Slight	Severe: seepage.	Severe: seepage.	Severe: seepage.	Poor: seepage, too sandy.
Urban land.					

See footnote at end of table.

TABLE 9.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
40*:					
Paola	Slight	Severe: seepage.	Severe: seepage, too sandy.	Severe: seepage.	Poor: too sandy.
41*:					
Palm Beach	Slight	Severe: seepage.	Severe: seepage.	Severe: seepage.	Poor: seepage, too sandy.
Paola	Slight	Severe: seepage.	Severe: seepage, too sandy.	Severe: seepage.	Poor: too sandy.
42 Paola	Slight	Severe: seepage.	Severe: seepage, too sandy.	Severe: seepage.	Poor: too sandy.
43 Paola	Moderate: slope.	Severe: seepage, slope.	Severe: seepage, too sandy.	Severe: seepage.	Poor: too sandy.
44*:					
Paola	Slight	Severe: seepage.	Severe: seepage, too sandy.	Severe: seepage.	Poor: too sandy.
Urban land.					
45 Pineda	Severe: wetness.	Severe: seepage, wetness.	Severe: seepage, wetness, too sandy.	Severe: seepage, wetness.	Poor: too sandy, wetness.
46 Pinellas	Severe: wetness.	Severe: wetness, seepage.	Severe: wetness, seepage.	Severe: wetness, seepage.	Poor: seepage, too sandy, wetness.
47*. Pits					
48 Placid	Severe: ponds, wetness.	Severe: ponds, wetness.	Severe: ponds, seepage, wetness.	Severe: ponds, seepage, wetness.	Poor: wetness, too sandy, seepage.
49 Pomona	Severe: wetness, percs slowly.	Severe: seepage, wetness.	Severe: wetness, too sandy.	Severe: seepage, wetness.	Poor: seepage, too sandy, wetness.
50 Pomona	Severe: ponds, wetness, percs slowly.	Severe: seepage, ponds, wetness.	Severe: ponds, wetness, too sandy.	Severe: ponds, seepage, wetness.	Poor: seepage, too sandy, wetness.
51*:					
Pomona	Severe: ponds, wetness, percs slowly.	Severe: seepage, ponds, wetness.	Severe: ponds, wetness, too sandy.	Severe: ponds, seepage, wetness.	Poor: seepage, too sandy, wetness.
St. Johns	Severe: wetness, ponds.	Severe: wetness, seepage, ponds.	Severe: wetness, seepage, ponds.	Severe: wetness, seepage, ponds.	Poor: too sandy, wetness, ponds.

See footnote at end of table.

TABLE 9.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
52 Pompano	Severe: wetness.	Severe: wetness, seepage.	Severe: wetness, seepage.	Severe: wetness, seepage.	Poor: wetness, seepage, too sandy.
53*: Pompano	Severe: wetness, ponds.	Severe: wetness, seepage, ponds.	Severe: wetness, seepage, ponds.	Severe: wetness, seepage, ponds.	Poor: wetness, seepage, too sandy.
Placid	Severe: ponds, wetness.	Severe: ponds, wetness.	Severe: ponds, seepage, wetness.	Severe: ponds, seepage, wetness.	Poor: wetness, too sandy, seepage.
54*. Quartzipsamments					
55 Riviera	Severe: wetness.	Severe: seepage, wetness.	Severe: seepage, wetness, too sandy.	Severe: seepage, wetness.	Poor: wetness, too sandy.
56 Samsula	Severe: wetness.	Severe: seepage, wetness.	Severe: excess humus, seepage, wetness.	Severe: seepage, wetness.	Poor: hard to pack, wetness.
57 Satellite	Severe: wetness.	Severe: wetness, seepage.	Severe: wetness, seepage, too sandy.	Severe: seepage, wetness.	Poor: seepage, wetness, too sandy.
58*: Satellite	Severe: wetness.	Severe: wetness, seepage.	Severe: wetness, seepage, too sandy.	Severe: seepage, wetness.	Poor: seepage, wetness, too sandy.
Urban land.					
59 Scoggin	Severe: wetness.	Severe: seepage, wetness.	Severe: seepage, wetness, too sandy.	Severe: seepage, wetness.	Poor: too sandy, wetness.
60 Smyrna	Severe: wetness.	Severe: seepage, wetness.	Severe: seepage, wetness.	Severe: seepage, wetness.	Poor: too sandy, seepage, wetness.
61 St. Johns	Severe: wetness.	Severe: wetness, seepage.	Severe: wetness, seepage.	Severe: wetness, seepage.	Poor: too sandy, wetness.
62 St. Lucie	Slight	Severe: seepage.	Severe: seepage, too sandy.	Severe: seepage.	Poor: too sandy, seepage.
63 Tavares	Moderate: wetness.	Severe: seepage.	Severe: seepage, wetness, too sandy.	Severe: seepage.	Poor: too sandy.
64 Tequesta	Severe: wetness.	Severe: wetness, excess humus.	Severe: wetness, excess humus.	Severe: wetness, excess humus.	Poor: excess humus, wetness.

See footnote at end of table.

TABLE 9.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
65------------------ Terra Ceia	Severe: wetness.	Severe: wetness, excess humus, seepage.	Severe: wetness, excess humus, seepage.	Severe: wetness, seepage.	Poor: excess humus, wetness.
66------------------ Tomoka	Severe: wetness.	Severe: wetness, excess humus, seepage.	Severe: wetness, seepage.	Severe: wetness, seepage.	Poor: excess humus, wetness, seepage.
67------------------ Turnbull	Severe: floods, wetness, percs slowly.	Severe: floods, excess humus, wetness.	Severe: floods, wetness, too clayey.	Severe: floods, wetness.	Poor: too clayey, wetness.
68------------------ Turnbull Variant	Severe: wetness.	Severe: seepage, wetness.	Severe: wetness, too sandy.	Severe: seepage, wetness.	Poor: too sandy, seepage, wetness.
69------------------ Tuscawilla	Severe: wetness.	Severe: seepage, wetness.	Severe: seepage, wetness.	Severe: seepage, wetness.	Poor: wetness.
70*:					
Tuscawilla---------	Severe: wetness.	Severe: seepage, wetness.	Severe: seepage, wetness.	Severe: seepage, wetness.	Poor: wetness.
Urban land.					
71*. Urban land					
72------------------ Valkaria	Severe: wetness, ponds.	Severe: wetness, ponds.	Severe: wetness, ponds, seepage.	Severe: wetness, ponds, seepage.	Poor: wetness, too sandy, seepage.
73------------------ Wabasso	Severe: wetness.	Severe: seepage, wetness.	Severe: too sandy, seepage, wetness.	Severe: seepage, wetness.	Poor: too sandy, wetness.
74------------------ Wabasso	Severe: wetness, ponds.	Severe: seepage, wetness, ponds.	Severe: too sandy, wetness, ponds.	Severe: seepage, wetness, ponds.	Poor: too sandy, wetness.
75------------------ Wauchula	Severe: wetness.	Severe: wetness, seepage.	Severe: wetness, seepage.	Severe: wetness, seepage.	Poor: too sandy, wetness.
76------------------ Wauchula	Severe: ponds, wetness.	Severe: ponds, wetness, seepage.	Severe: ponds, wetness, seepage.	Severe: ponds, wetness, seepage.	Poor: too sandy, wetness.
77------------------ Winder	Severe: floods, wetness, percs slowly.	Severe: floods, wetness.	Severe: floods, wetness.	Severe: floods, wetness.	Poor: wetness.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 10.--CONSTRUCTION MATERIALS

[Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "good," "fair," and "poor." Absence of an entry indicates that the soil was not rated]

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
1, 2 Apopka	Good	Good	Unsuited	Poor: too sandy.
3*. Arents				
4, 5 Astatula	Good	Good	Unsuited	Poor: too sandy.
6*: Astatula	Good	Good	Unsuited	Poor: too sandy.
Urban land.				
7 Astor	Poor: wetness.	Fair: excess fines.	Unsuited	Poor: too sandy, wetness.
8 Basinger	Poor: wetness.	Fair: excess fines.	Unsuited	Poor: too sandy, wetness.
9*. Beaches				
10 Bluff	Poor: low strength, shrink-swell, wetness.	Poor: excess fines.	Unsuited	Poor: too clayey, wetness.
11 Bulow	Fair: thin layer, area reclaim.	Good	Unsuited	Poor: too sandy.
12 Canaveral	Fair: wetness.	Good	Unsuited	Poor: too sandy.
13 Cassia	Fair: wetness.	Fair: excess fines.	Unsuited	Poor: too sandy.
14 Chobee	Poor: wetness.	Poor: excess fines.	Unsuited	Poor: thin layer, wetness.
15 Cocoa	Good	Fair: excess fines.	Unsuited	Poor: too sandy.
16*: Cocoa	Good	Fair: excess fines.	Unsuited	Poor: too sandy.
Urban land.				
17 Daytona	Good	Good	Unsuited	Poor: too sandy.
18*: Daytona	Good	Good	Unsuited	Poor: too sandy.
Urban land.				

See footnote at end of table.

TABLE 10.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
19: Deland	Good	Good	Unsuited	Poor: too sandy.
20, 21: EauGallie	Poor: wetness.	Fair: excess fines.	Unsuited	Poor: too sandy, wetness.
22: Electra	Good	Good	Unsuited	Poor: too sandy.
23: Farmton	Poor: wetness.	Poor: thin layer.	Unsuited	Poor: too sandy, wetness.
24*. Fluvaquents				
25: Gator	Poor: low strength, wetness.	Poor: excess humus.	Unsuited	Poor: excess humus, wetness.
26: Holopaw	Poor: wetness.	Good	Unsuited	Poor: too sandy, wetness.
27: Hontoon	Poor: excess humus, low strength, wetness.	Poor: excess humus.	Unsuited	Poor: wetness.
28*. Hydraquents				
29, 30: Immokalee	Poor: wetness.	Fair: excess fines.	Unsuited	Poor: too sandy, wetness.
31: Malabar	Poor: wetness.	Fair: excess fines.	Unsuited	Poor: wetness, too sandy.
32, 33: Myakka	Poor: wetness.	Poor: thin layer.	Unsuited	Poor: too sandy, wetness.
34*:				
Myakka	Poor: wetness.	Poor: thin layer.	Unsuited	Poor: too sandy, wetness.
St. Johns	Good	Fair: excess fines.	Unsuited	Fair: thin layer, too sandy, wetness.
35*:				
Myakka	Poor: wetness.	Poor: thin layer.	Unsuited	Poor: too sandy, wetness.
Urban land.				
36: Myakka Variant	Poor: wetness.	Poor: thin layer.	Unsuited	Poor: too sandy, wetness.
37: Orsino	Good	Good	Unsuited	Poor: too sandy.

See footnote at end of table.

TABLE 10.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
38------ Paisley	Poor: shrink-swell, low strength, wetness.	Poor: excess fines.	Unsuited------	Poor: too sandy.
39------ Palm Beach	Good------	Good------	Unsuited------	Poor: too sandy.
40*:				
Palm Beach------	Good------	Good------	Unsuited------	Poor: too sandy.
Urban land.				
Paola------	Good------	Good------	Unsuited------	Poor: too sandy.
41*:				
Palm Beach------	Good------	Good------	Unsuited------	Poor: too sandy.
Paola------	Good------	Good------	Unsuited------	Poor: too sandy.
42, 43------ Paola	Good------	Good------	Unsuited------	Poor: too sandy.
44*:				
Paola------	Good------	Good------	Unsuited------	Poor: too sandy.
Urban land.				
45------ Pineda	Poor: wetness.	Good------	Unsuited------	Poor: too sandy, wetness.
46------ Pinellas	Poor: wetness.	Poor: excess fines.	Unsuited------	Poor: too sandy, wetness.
47*. Pits				
48------ Placid	Poor: wetness.	Fair: excess fines.	Unsuited------	Poor: too sandy, wetness.
49, 50------ Pomona	Poor: wetness.	Poor: thin layer.	Unsuited------	Poor: too sandy, wetness.
51*:				
Pomona------	Poor: wetness.	Poor: thin layer.	Unsuited------	Poor: too sandy, wetness.
St. Johns------	Good------	Fair: excess fines.	Unsuited------	Fair: thin layer, too sandy, wetness.
52------ Pompano	Poor: wetness.	Good------	Unsuited------	Poor: too sandy, wetness.

See footnote at end of table.

TABLE 10.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
53*:				
Pompano	Poor: wetness.	Good	Unsuited	Poor: too sandy, wetness.
Placid	Poor: wetness.	Fair: excess fines.	Unsuited	Poor: too sandy, wetness.
54*. Quartzipsamments				
55 Riviera	Poor: wetness, thin layer.	Poor: excess fines.	Unsuited	Poor: too sandy, wetness.
56 Samsula	Poor: low strength, wetness.	Poor: excess humus.	Unsuited	Poor: excess humus, wetness.
57 Satellite	Fair: wetness.	Good	Unsuited	Poor: too sandy.
58*:				
Satellite	Fair: wetness.	Good	Unsuited	Poor: too sandy.
Urban land.				
59 Scoggin	Poor: wetness.	Poor: thin layer.	Unsuited	Poor: too sandy, wetness.
60 Smyrna	Poor: wetness.	Fair: excess fines.	Unsuited	Poor: too sandy, wetness.
61 St. Johns	Good	Fair: excess fines.	Unsuited	Fair: thin layer, too sandy, wetness.
62 St. Lucie	Good	Good	Unsuited	Poor: too sandy.
63 Tavares	Good	Good	Unsuited	Poor: too sandy.
64 Tequesta	Poor: excess humus, wetness.	Poor: excess humus.	Unsuited	Poor: wetness.
65 Terra Ceia	Poor: wetness, excess humus, low strength.	Poor: excess humus.	Unsuited	Poor: wetness.
66 Tomoka	Poor: excess humus, low strength, wetness.	Poor: excess humus.	Unsuited	Poor: wetness.
67 Turnbull	Poor: low strength, wetness, shrink-swell.	Poor: excess fines, excess humus.	Unsuited	Poor: excess humus, excess salt, wetness.

See footnote at end of table.

TABLE 10.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
68------ Turnbull Variant	Fair: thin layer, wetness.	Poor: excess fines.	Unsuited------	Poor: too sandy.
69------ Tuscawilla	Poor: wetness.	Poor: thin layer.	Unsuited------	Poor: too sandy, wetness.
70*:				
Tuscawilla------	Poor: wetness.	Poor: thin layer.	Unsuited------	Poor: too sandy, wetness.
Urban land.				
71*. Urban land				
72------ Valkaria	Poor: wetness.	Good------	Unsuited------	Poor: wetness, too sandy.
73, 74------ Wabasso	Poor: wetness.	Poor: excess fines.	Unsuited------	Poor: too sandy, wetness.
75, 76------ Wauchula	Poor: wetness.	Fair: excess fines.	Unsuited------	Poor: too sandy.
77------ Winder	Poor: wetness.	Poor: excess fines.	Unsuited------	Poor: thin layer, wetness.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 11.--WATER TABLE DATA

[Data* recorded from March 1972 to December 1973 and May 1974 to December 1975. The symbol > means more than]

Soil series and number of wells sampled	Depth to water table	
	Highest	Lowest
	In	In
Apopka (5)	77	>80
Cassia (6)	17	>80
Daytona (2)	28	>60
Deland (2)	>80	>80
Electra (3)	34	>80
Immokalee (3)	4	58
Pomona, depressional** phase (2)	+3	46
Satellite (3)	10	>60
Scoggin** (1)	+4	58
Smyrna (2)	2	52
Tavares (1)	51	>80
Wauchula (1)	8	>60

* Data are inadequate for a statistical base; however, it will be considered with other water table readings in developing water table depths for soil series.
** A plus sign under "Highest" indicates that the water table is above the surface of the soil.

TABLE 12.--WATER MANAGEMENT

[Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," and "severe." Absence of an entry indicates that the soil was not evaluated]

Soil name and map symbol	Limitations for-- Pond reservoir areas	Limitations for-- Embankments, dikes, and levees	Limitations for-- Aquifer-fed excavated ponds	Features affecting-- Drainage	Features affecting-- Irrigation	Features affecting-- Terraces and diversions	Features affecting-- Grassed waterways
1, 2 Apopka	Severe: seepage.	Severe: piping, seepage, unstable fill.	Severe: no water.	Not needed	Fast intake, seepage.	Not needed	Droughty.
3*. Arents							
4, 5 Astatula	Severe: seepage.	Severe: seepage, unstable fill, piping.	Severe: no water.	Not needed	Droughty, fast intake, seepage.	Not needed	Droughty.
6*: Astatula	Severe: seepage.	Severe: seepage, unstable fill, piping.	Severe: no water.	Not needed	Droughty, fast intake, seepage.	Not needed	Droughty.
Urban land.							
7 Astor	Severe: seepage.	Severe: seepage, wetness, piping.	Slight	Floods	Wetness, floods.	Not needed	Wetness.
8 Basinger	Severe: seepage.	Severe: seepage, piping, wetness.	Slight	Cutbanks cave, wetness, poor outlets.	Wetness, fast intake.	Not needed	Wetness.
9*. Beaches							
10 Bluff	Slight	Moderate: shrink-swell.	Slight	Percs slowly, wetness.	Wetness, percs slowly.	Not needed	Wetness, percs slowly.
11 Bulow	Severe: seepage.	Severe: no water.	Severe: no water.	Not needed	Droughty, fast intake, soil blowing.	Too sandy, soil blowing.	Droughty.
12 Canaveral	Severe: seepage.	Severe: seepage, piping, unstable fill.	Moderate: deep to water.	Cutbanks cave	Droughty, fast intake.	Not needed	Droughty.
13 Cassia	Severe: seepage.	Severe: seepage, piping.	Moderate: deep to water.	Cutbanks cave	Fast intake, droughty.	Not needed	Droughty.

See footnote at end of table.

TABLE 12.--WATER MANAGEMENT--Continued

Soil name and map symbol	Limitations for-- Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Features affecting-- Drainage	Irrigation	Terraces and diversions	Grassed waterways
14----------------- Chobee	Moderate: seepage.	Moderate: thin layer.	Moderate: slow refill.	Floods, poor outlets, wetness.	Floods, wetness.	Not needed-----	Wetness.
15----------------- Cocoa	Severe: depth to rock, seepage.	Severe: piping, seepage, unstable fill.	Severe: no water.	Not needed-----	Droughty, fast intake.	Not needed-----	Droughty.
16*:							
Cocoa------------	Severe: depth to rock, seepage.	Severe: piping, seepage, unstable fill.	Severe: no water.	Not needed-----	Droughty, fast intake.	Not needed-----	Droughty.
Urban land.							
17----------------- Daytona	Severe: seepage.	Severe: seepage, piping.	Moderate: deep to water.	Not needed-----	Droughty, fast intake, soil blowing.	Too sandy, soil blowing.	Droughty.
18*:							
Daytona----------	Severe: seepage.	Severe: seepage, piping.	Moderate: deep to water.	Not needed-----	Droughty, fast intake, soil blowing.	Too sandy, soil blowing.	Droughty.
Urban land.							
19----------------- Deland	Severe: seepage.	Severe: seepage, piping.	Severe: no water.	Not needed-----	Droughty, fast intake, soil blowing.	Too sandy, soil blowing.	Droughty.
20----------------- EauGallie	Severe: seepage.	Severe: seepage, unstable fill.	Moderate: deep to water.	Cutbanks cave	Fast intake, wetness.	Not needed-----	Wetness.
21----------------- EauGallie	Severe: seepage.	Severe: seepage, unstable fill.	Slight---------	Ponds, poor outlets, cutbanks cave.	Ponds, fast intake, wetness.	Not needed-----	Wetness.
22----------------- Electra	Severe: seepage.	Severe: seepage, piping.	Moderate: deep to water.	Cutbanks cave	Fast intake----	Not needed-----	Droughty.
23----------------- Farmton	Severe: seepage.	Severe: seepage, piping, wetness.	Moderate: slow refill.	Favorable------	Wetness, fast intake.	Not needed-----	Wetness.
24*. Fluvaquents							

See footnote at end of table.

TABLE 12.--WATER MANAGEMENT--Continued

Soil name and map symbol	Limitations for--			Features affecting--			
	Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Drainage	Irrigation	Terraces and diversions	Grassed waterways
25-----------------Gator	Severe: seepage.	Severe: excess humus, wetness.	Slight----------	Floods, excess humus.	Wetness, floods.	Not needed-----	Wetness.
26-----------------Holopaw	Severe: seepage.	Severe: piping, seepage.	Slight----------	Wetness, cutbanks cave.	Wetness, fast intake.	Not needed-----	Wetness.
27-----------------Hontoon	Severe: excess humus, seepage.	Severe: compressible, low strength, excess humus.	Slight----------	Excess humus, poor outlets, wetness.	Favorable------	Not needed-----	Wetness.
28*. Hydraquents							
29-----------------Immokalee	Severe: seepage.	Severe: seepage, piping, wetness.	Moderate: deep to water.	Favorable------	Wetness, fast intake.	Not needed-----	Wetness.
30-----------------Immokalee	Severe: seepage.	Severe: seepage, piping, wetness.	Slight----------	Ponds----------	Wetness, fast intake, ponds.	Not needed-----	Wetness.
31-----------------Malabar	Severe: seepage.	Severe: seepage, piping, wetness.	Slight----------	Cutbanks cave, wetness.	Wetness---------	Not needed-----	Wetness.
32-----------------Myakka	Severe: seepage.	Severe: seepage, piping, wetness.	Moderate: deep to water.	Cutbanks cave, wetness.	Wetness, droughty.	Not needed-----	Wetness.
33-----------------Myakka	Severe: seepage.	Severe: seepage, piping, wetness.	Slight----------	Cutbanks cave, poor outlets, wetness.	Wetness, ponds, droughty.	Not needed-----	Wetness.
34*: Myakka------------	Severe: seepage.	Severe: seepage, piping, wetness.	Slight----------	Cutbanks cave, poor outlets, wetness.	Wetness, ponds, droughty.	Not needed-----	Wetness.
St. Johns---------	Moderate: seepage.	Severe: unstable fill, seepage, piping.	Slight----------	Wetness, poor outlets.	Wetness, ponds.	Not needed-----	Wetness.

See footnote at end of table.

TABLE 12.--WATER MANAGEMENT--Continued

Soil name and map symbol	Limitations for-- Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Features affecting-- Drainage	Irrigation	Terraces and diversions	Grassed waterways
35*:							
Myakka	Severe: seepage.	Severe: seepage, piping, wetness.	Moderate: deep to water.	Cutbanks cave, wetness.	Wetness, droughty.	Not needed	Wetness.
Urban land.							
36 Myakka Variant	Severe: seepage.	Severe: seepage, piping, wetness.	Moderate: deep to water.	Favorable	Wetness, fast intake.	Not needed	Wetness.
37 Orsino	Severe: seepage.	Severe: seepage, piping, erodes easily.	Severe: deep to water.	Not needed	Fast intake, droughty.	Not needed	Droughty.
38 Paisley	Slight	Severe: shrink-swell, low strength, hard to pack.	Slight	Percs slowly, wetness.	Wetness, percs slowly.	Not needed	Wetness.
39 Palm Beach	Severe: seepage.	Severe: seepage, unstable fill, piping.	Severe: no water.	Not needed	Droughty, fast intake.	Not needed	Droughty.
40*:							
Palm Beach	Severe: seepage.	Severe: seepage, unstable fill, piping.	Severe: no water.	Not needed	Droughty, fast intake.	Not needed	Droughty.
Urban land.							
Paola	Severe: seepage.	Severe: seepage, piping.	Severe: no water.	Not needed	Droughty, fast intake, soil blowing.	Not needed	Droughty.
41*:							
Palm Beach	Severe: seepage.	Severe: seepage, unstable fill, piping.	Severe: no water.	Not needed	Droughty, fast intake.	Not needed	Droughty.
Paola	Severe: seepage.	Severe: seepage, piping.	Severe: no water.	Not needed	Droughty, fast intake, soil blowing.	Not needed	Droughty.
42, 43 Paola	Severe: seepage.	Severe: seepage, piping.	Severe: no water.	Not needed	Droughty, fast intake, soil blowing.	Not needed	Droughty.

See footnote at end of table.

TABLE 12.--WATER MANAGEMENT--Continued

Soil name and map symbol	Limitations for-- Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Features affecting-- Drainage	Irrigation	Terraces and diversions	Grassed waterways
44*:							
Paola	Severe: seepage.	Severe: seepage, piping.	Severe: no water.	Not needed	Droughty, fast intake, soil blowing.	Not needed	Droughty.
Urban land.							
45 Pineda	Severe: seepage.	Severe: seepage, piping, wetness.	Moderate: deep to water.	Favorable	Wetness, fast intake.	Not needed	Wetness.
46 Pinellas	Moderate: seepage.	Severe: thin layer, seepage, piping.	Slight	Cutbanks cave, wetness.	Wetness	Not needed	Wetness.
47*. Pits							
48 Placid	Severe: seepage.	Severe: seepage, piping.	Slight	Wetness, cutbanks cave, poor outlets.	Wetness, ponds.	Not needed	Wetness.
49 Pomona	Severe: seepage.	Severe: seepage, piping, wetness.	Slight	Favorable	Wetness, fast intake.	Not needed	Wetness.
50 Pomona	Severe: seepage.	Severe: seepage, piping, wetness.	Slight	Ponds	Wetness, fast intake, ponds.	Not needed	Wetness.
51*:							
Pomona	Severe: seepage.	Severe: seepage, piping, wetness.	Slight	Ponds	Wetness, fast intake, ponds.	Not needed	Wetness.
St. Johns	Moderate: seepage.	Severe: unstable fill, seepage, piping.	Slight	Wetness, poor outlets. ponds.	Wetness ponds.	Not needed	Wetness.
52 Pompano	Severe: seepage.	Severe: seepage, piping.	Slight	Wetness, cutbanks cave.	Wetness	Not needed	Wetness.
53*:							
Pompano	Severe: seepage.	Severe: seepage, piping.	Slight	Wetness, cutbanks cave.	Wetness	Not needed	Wetness.

See footnote at end of table.

TABLE 12.--WATER MANAGEMENT--Continued

Soil name and map symbol	Limitations for--			Features affecting--			
	Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Drainage	Irrigation	Terraces and diversions	Grassed waterways
53*:							
Placid	Severe: seepage.	Severe: seepage, piping.	Slight	Wetness, cutbanks cave, poor outlets.	Wetness, ponds.	Not needed	Wetness.
54*. Quartzipsamments							
55 Riviera	Severe: seepage.	Severe: seepage, piping, wetness.	Slight	Favorable	Wetness, fast intake.	Not needed	Wetness.
56 Samsula	Severe: seepage.	Severe: excess humus, wetness.	Slight	Excess humus, poor outlets.	Ponds	Not needed	Wetness.
57 Satellite	Severe: seepage.	Severe: seepage, piping.	Moderate: deep to water.	Cutbanks cave	Droughty, fast intake, wetness.	Not needed	Droughty.
58*:							
Satellite	Severe: seepage.	Severe: seepage, piping.	Moderate: deep to water.	Cutbanks cave	Droughty, fast intake, wetness.	Not needed	Droughty.
Urban land.							
59 Scoggin	Severe: seepage.	Severe: seepage, piping, wetness.	Slight	Ponds	Wetness, fast intake.	Not needed	Wetness.
60 Smyrna	Severe: seepage.	Severe: seepage, piping, unstable fill.	Slight	Wetness	Wetness	Not needed	Wetness.
61 St. Johns	Moderate: seepage.	Severe: unstable fill, seepage, piping.	Slight	Wetness, poor outlets.	Wetness	Not needed	Wetness.
62 St. Lucie	Severe: seepage.	Severe: seepage, piping.	Severe: no water.	Not needed	Droughty, fast intake, soil blowing.	Not needed	Droughty.
63 Tavares	Severe: seepage.	Severe: seepage, piping.	Severe: no water.	Not needed	Droughty, fast intake, soil blowing.	Too sandy, soil blowing.	Droughty.

See footnote at end of table.

TABLE 12.--WATER MANAGEMENT--Continued

Soil name and map symbol	Limitations for--			Features affecting--			
	Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Drainage	Irrigation	Terraces and diversions	Grassed waterways
64: Tequesta	Moderate: seepage.	Severe: excess humus, seepage, compressible.	Slight	Wetness	Wetness	Not needed	Wetness.
65: Terra Ceia	Severe: excess humus, seepage.	Severe: excess humus, seepage, unstable fill.	Slight	Wetness, excess humus.	Wetness	Not needed	Wetness.
66: Tomoka	Severe: excess humus, seepage.	Severe: compressible, low strength, piping.	Slight	Wetness, poor outlets, excess humus.	Wetness	Not needed	Wetness.
67: Turnbull	Severe: seepage.	Severe: wetness, excess salt.	Severe: salty water.	Floods, excess humus, excess salt.	Wetness, floods, excess salt.	Not needed	Wetness, excess salt, percs slowly.
68: Turnbull Variant	Severe: seepage.	Severe: seepage.	Severe: slow refill, salty water.	Poor outlets	Wetness, droughty, soil blowing.	Not needed	Wetness, excess salt, droughty.
69: Tuscawilla	Moderate: seepage.	Severe: wetness.	Slight	Favorable	Wetness	Not needed	Wetness.
70*:							
Tuscawilla	Moderate: seepage.	Severe: wetness.	Slight	Favorable	Wetness	Not needed	Wetness.
Urban land.							
71*. Urban land							
72: Valkaria	Severe: seepage.	Severe: seepage, piping.	Slight	Ponds, wetness, cutbanks cave.	Wetness	Not needed	Wetness.
73: Wabasso	Severe: seepage.	Severe: seepage, piping, unstable fill.	Moderate: deep to water.	Cutbanks cave, wetness.	Wetness	Not needed	Wetness.
74: Wabasso	Severe: seepage.	Severe: seepage, piping, unstable fill.	Slight	Cutbanks cave, wetness, poor outlets.	Wetness, ponds.	Not needed	Wetness.
75: Wauchula	Severe: seepage.	Severe: seepage, wetness.	Moderate: deep to water.	Cutbanks cave	Fast intake, wetness.	Not needed	Wetness.

See footnote at end of table.

TABLE 12.--WATER MANAGEMENT--Continued

Soil name and map symbol	Limitations for--			Features affecting--			
	Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Drainage	Irrigation	Terraces and diversions	Grassed waterways
76----------------- Wauchula	Severe: seepage.	Severe: seepage, wetness.	Slight----------	Ponds, poor outlets, cutbanks cave.	Ponds, fast intake, wetness.	Not needed-----	Wetness.
77----------------- Winder	Moderate: seepage.	Favorable------	Slight----------	Floods, wetness.	Floods, wetness.	Not needed-----	Wetness.

*See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 13.--RECREATIONAL DEVELOPMENT

[Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," and "severe." Absence of an entry indicates that the soil was not rated]

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
1, 2. Apopka	Moderate: too sandy.	Moderate: too sandy.	Severe: too sandy.	Moderate: too sandy.	Severe: too sandy.
3*. Arents					
4. Astatula	Severe: too sandy.	Severe: too sandy.	Severe: too sandy.	Severe: too sandy.	Severe: too sandy.
5. Astatula	Severe: too sandy.	Severe: too sandy.	Severe: too sandy, slope.	Severe: too sandy.	Severe: too sandy.
6*:					
Astatula	Severe: too sandy.	Severe: too sandy.	Severe: too sandy.	Severe: too sandy.	Severe: too sandy.
Urban land.					
7. Astor	Severe: floods, wetness, too sandy.	Severe: floods, wetness, too sandy.	Severe: too sandy, wetness, floods.	Severe: wetness, too sandy.	Severe: wetness, floods.
8. Basinger	Severe: wetness, ponds, too sandy.	Severe: wetness, too sandy.	Severe: wetness, ponds, too sandy.	Severe: wetness, too sandy.	Severe: wetness, ponds, too sandy.
9*. Beaches					
10. Bluff	Severe: wetness, floods.	Severe: wetness.	Severe: wetness, floods.	Severe: wetness.	Severe: wetness, too sandy.
11. Bulow	Severe: too sandy.	Severe: too sandy.	Severe: too sandy.	Severe: too sandy.	Severe: too sandy.
12. Canaveral	Severe: too sandy.	Severe: too sandy.	Severe: too sandy, slope.	Severe: too sandy.	Severe: too sandy.
13. Cassia	Severe: too sandy.	Severe: too sandy.	Severe: too sandy.	Severe: too sandy.	Severe: too sandy.
14. Chobee	Severe: floods, wetness.	Severe: floods, wetness.	Severe: floods, wetness.	Severe: floods, wetness.	Severe: floods, wetness.
15. Cocoa	Moderate: too sandy.	Moderate: too sandy.	Moderate: slope, too sandy.	Moderate: too sandy.	Moderate: too sandy.
16*:					
Cocoa	Moderate: too sandy.	Moderate: too sandy.	Moderate: slope, too sandy.	Moderate: too sandy.	Moderate: too sandy.
Urban land.					

See footnote at end of table.

TABLE 13.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
17-------------------- Daytona	Severe: too sandy.	Severe: too sandy.	Severe: too sandy.	Severe: too sandy.	Severe: too sandy.
18*:					
Daytona--------------	Severe: too sandy.	Severe: too sandy.	Severe: too sandy.	Severe: too sandy.	Severe: too sandy.
Urban land.					
19-------------------- Deland	Severe: too sandy.	Severe: too sandy.	Severe: too sandy.	Severe: too sandy.	Severe: too sandy.
20-------------------- EauGallie	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.
21-------------------- EauGallie	Severe: wetness, ponds.	Severe: wetness, ponds.	Severe: wetness, ponds.	Severe: wetness, ponds.	Severe: wetness, ponds.
22-------------------- Electra	Severe: too sandy.	Severe: too sandy.	Severe: too sandy.	Severe: too sandy.	Severe: too sandy.
23-------------------- Farmton	Severe: wetness, too sandy.	Severe: wetness, too sandy.	Severe: too sandy, wetness.	Severe: wetness, too sandy.	Severe: wetness, too sandy.
24*. Fluvaquents					
25-------------------- Gator	Severe: floods, wetness, excess humus.	Severe: floods, wetness, excess humus.	Severe: excess humus, wetness, floods.	Severe: wetness, excess humus.	Severe: excess humus, wetness, floods.
26-------------------- Holopaw	Severe: wetness, too sandy.	Severe: wetness, too sandy.	Severe: wetness, too sandy.	Severe: wetness, too sandy.	Severe: wetness, too sandy.
27-------------------- Hontoon	Severe: excess humus, wetness.	Severe: excess humus, wetness.	Severe: excess humus, wetness.	Severe: excess humus, wetness.	Severe: excess humus, wetness.
28*. Hydraquents					
29-------------------- Immokalee	Severe: wetness, too sandy.	Severe: wetness, too sandy.	Severe: wetness, too sandy.	Severe: wetness, too sandy.	Severe: wetness, too sandy.
30-------------------- Immokalee	Severe: ponds, wetness, too sandy.	Severe: ponds, wetness, too sandy.	Severe: wetness, too sandy, ponds.	Severe: wetness, too sandy, ponds.	Severe: wetness, too sandy, ponds.
31-------------------- Malabar	Severe: wetness, too sandy.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.
32-------------------- Myakka	Severe: wetness, too sandy.	Severe: wetness, too sandy.	Severe: wetness, too sandy.	Severe: wetness, too sandy.	Severe: wetness, too sandy.

See footnote at end of table.

TABLE 13.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
33------------------- Myakka	Severe: wetness, ponds, too sandy.	Severe: wetness, ponds, too sandy.	Severe: wetness, ponds, too sandy.	Severe: wetness, ponds, too sandy.	Severe: wetness, ponds, too sandy.
34*:					
Myakka---------------	Severe: wetness, ponds, too sandy.	Severe: wetness, ponds, too sandy.	Severe: wetness, ponds, too sandy.	Severe: wetness, ponds, too sandy.	Severe: wetness, ponds, too sandy.
St. Johns------------	Severe: wetness, ponds.	Severe: wetness, ponds.	Severe: wetness, ponds.	Severe: wetness, ponds.	Severe: wetness, ponds.
35*:					
Myakka---------------	Severe: wetness, too sandy.	Severe: wetness, too sandy.	Severe: wetness, too sandy.	Severe: wetness, too sandy.	Severe: wetness, too sandy.
Urban land.					
36------------------- Myakka Variant	Severe: wetness, too sandy.	Severe: wetness, too sandy.	Severe: too sandy, wetness.	Severe: wetness, too sandy.	Severe: wetness, too sandy.
37------------------- Orsino	Severe: too sandy.	Severe: too sandy.	Severe: too sandy.	Severe: too sandy.	Severe: too sandy.
38------------------- Paisley	Severe: floods, wetness, too sandy.	Severe: wetness, too sandy.	Severe: too sandy, wetness.	Severe: too sandy, wetness.	Severe: too sandy, wetness.
39------------------- Palm Beach	Severe: too sandy.	Severe: too sandy.	Severe: too sandy.	Severe: too sandy.	Severe: too sandy.
40*:					
Palm Beach-----------	Severe: too sandy.	Severe: too sandy.	Severe: too sandy.	Severe: too sandy.	Severe: too sandy.
Urban land.					
Paola----------------	Severe: too sandy.	Severe: too sandy.	Severe: too sandy, soil blowing.	Severe: too sandy.	Severe: too sandy.
41*:					
Palm Beach-----------	Severe: too sandy.	Severe: too sandy.	Severe: too sandy.	Severe: too sandy.	Severe: too sandy.
Paola----------------	Severe: too sandy.	Severe: too sandy.	Severe: too sandy, soil blowing.	Severe: too sandy.	Severe: too sandy.
42------------------- Paola	Severe: too sandy.	Severe: too sandy.	Severe: too sandy, soil blowing.	Severe: too sandy.	Severe: too sandy.
43------------------- Paola	Severe: too sandy.	Severe: too sandy.	Severe: slope, too sandy, soil blowing.	Severe: too sandy.	Severe: too sandy.

See footnote at end of table.

TABLE 13.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
44*:					
Paola	Severe: too sandy.	Severe: too sandy.	Severe: too sandy, soil blowing.	Severe: too sandy.	Severe: too sandy.
Urban land.					
45 Pineda	Severe: wetness, too sandy.	Severe: wetness, too sandy.	Severe: too sandy, wetness.	Severe: wetness, too sandy.	Severe: wetness, too sandy.
46 Pinellas	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.
47*. Pits					
48 Placid	Severe: ponds, wetness, too sandy.	Severe: ponds, wetness, too sandy.	Severe: too sandy, wetness, ponds.	Severe: wetness, ponds, too sandy.	Severe: wetness, ponds, too sandy.
49 Pomona	Severe: wetness, too sandy.	Severe: wetness, too sandy.	Severe: wetness, too sandy.	Severe: wetness, too sandy.	Severe: wetness, too sandy.
50 Pomona	Severe: ponds, wetness, too sandy.	Severe: ponds, wetness, too sandy.	Severe: wetness, too sandy, ponds.	Severe: wetness, too sandy, ponds.	Severe: wetness, too sandy, ponds.
51*:					
Pomona	Severe: ponds, wetness, too sandy.	Severe: ponds, wetness, too sandy.	Severe: wetness, too sandy, ponds.	Severe: wetness, too sandy, ponds.	Severe: wetness, too sandy, ponds.
St. Johns	Severe: wetness, ponds.	Severe: wetness, ponds.	Severe: wetness, ponds.	Severe: wetness, ponds.	Severe: wetness, ponds.
52 Pompano	Severe: wetness, too sandy.	Severe: wetness, too sandy.	Severe: wetness, too sandy.	Severe: wetness, too sandy.	Severe: wetness, too sandy.
53*:					
Pompano	Severe: wetness, too sandy.	Severe: wetness, too sandy.	Severe: wetness, too sandy.	Severe: wetness, too sandy.	Severe: wetness, too sandy.
Placid	Severe: ponds, wetness, too sandy.	Severe: ponds, wetness, too sandy.	Severe: too sandy, wetness, ponds.	Severe: wetness, ponds, too sandy.	Severe: wetness, ponds, too sandy.
54*. Quartzipsamments					
55 Riviera	Severe: wetness, too sandy.	Severe: wetness, too sandy.	Severe: too sandy, wetness.	Severe: wetness, too sandy.	Severe: wetness, too sandy.
56 Samsula	Severe: excess humus, wetness.	Severe: excess humus, wetness.	Severe: excess humus, wetness.	Severe: excess humus, wetness.	Severe: excess humus, wetness.

See footnote at end of table.

TABLE 13.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
57-------------------- Satellite	Severe: too sandy, wetness.	Severe: too sandy.	Severe: too sandy, wetness.	Severe: too sandy.	Severe: too sandy.
58*:					
Satellite------------	Severe: too sandy, wetness.	Severe: too sandy.	Severe: too sandy, wetness.	Severe: too sandy.	Severe: too sandy.
Urban land.					
59-------------------- Scoggin	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.
60-------------------- Smyrna	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.
61-------------------- St. Johns	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.
62-------------------- St. Lucie	Severe: too sandy.	Severe: too sandy.	Severe: too sandy.	Severe: too sandy.	Severe: too sandy.
63-------------------- Tavares	Moderate: too sandy.	Moderate: too sandy.	Severe: too sandy.	Moderate: too sandy.	Severe: too sandy.
64-------------------- Tequesta	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.
65-------------------- Terra Ceia	Severe: wetness, excess humus.	Severe: wetness, excess humus.	Severe: wetness, excess humus.	Severe: wetness, excess humus.	Severe: wetness, excess humus.
66-------------------- Tomoka	Severe: wetness, excess humus.	Severe: wetness, excess humus.	Severe: wetness, excess humus.	Severe: wetness, excess humus.	Severe: wetness, excess humus.
67-------------------- Turnbull	Severe: floods, wetness, percs slowly.	Severe: floods, wetness, excess humus.	Severe: excess humus, wetness, floods.	Severe: wetness, excess humus, floods.	Severe: wetness, excess humus, floods.
68-------------------- Turnbull Variant	Severe: wetness, too sandy.	Severe: too sandy.	Severe: too sandy, wetness.	Severe: too sandy.	Servere: too sandy.
69-------------------- Tuscawilla	Severe: wetness, too sandy.	Severe: wetness, too sandy.	Severe: wetness, too sandy.	Severe: wetness, too sandy.	Severe: wetness, too sandy.
70*:					
Tuscawilla-----------	Severe: wetness, too sandy.	Severe: wetness, too sandy.	Severe: wetness, too sandy.	Severe: wetness, too sandy.	Severe: wetness, too sandy.
Urban land.					
71*. Urban land					
72-------------------- Valkaria	Severe: wetness, ponds.	Severe: wetness, ponds.	Severe: wetness, ponds.	Severe: wetness, ponds.	Severe: wetness, ponds.

See footnote at end of table.

TABLE 13.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
73-------------------- Wabasso	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.
74-------------------- Wabasso	Severe: wetness, ponds.	Severe: wetness, ponds.	Severe: wetness, ponds.	Severe: wetness, ponds.	Severe: wetness, ponds.
75-------------------- Wauchula	Severe: wetness, too sandy.	Severe: wetness, too sandy.	Severe: wetness, too sandy.	Severe: wetness, too sandy.	Severe: wetness, too sandy.
76-------------------- Wauchula	Severe: ponds, wetness, too sandy.	Severe: ponds, wetness, too sandy.	Severe: ponds, wetness, too sandy.	Severe: ponds, wetness, too sandy.	Severe: ponds, wetness, too sandy.
77-------------------- Winder	Severe: floods, wetness, percs slowly.	Severe: floods, wetness.	Severe: floods, wetness.	Severe: floods, wetness.	Severe: floods, wetness.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 14.--WILDLIFE HABITAT POTENTIALS

[See text for definitions of "good," "fair," "poor," and "very poor." Absence of an entry indicates that the soil was not rated]

Soil name and map symbol	Potential for habitat elements: Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood trees	Coniferous plants	Shrubs	Wetland plants	Shallow water areas	Potential as habitat for--: Openland wildlife	Woodland wildlife	Wetland wildlife	Rangeland wildlife
1, 2 Apopka	Poor	Fair	Fair	Poor	Fair	---	Very poor.	Very poor.	Fair	Poor	Very poor.	---
3*. Arents												
4, 5 Astatula	Poor	Poor	Poor	Poor	Poor	---	Very poor.	Very poor.	Poor	Poor	Very poor.	---
6*: Astatula	Poor	Poor	Poor	Poor	Poor	---	Very poor.	Very poor.	Poor	Poor	Very poor.	---
Urban land.												
7 Astor	Very poor.	Poor	Poor	Fair	Poor	---	Good	Good	Poor	Fair	Good	---
8 Basinger	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	---	Good	Good	Very poor.	Very poor.	Good	---
9*. Beaches												
10 Bluff	Very poor.	Poor	Fair	Fair	Fair	---	Good	Good	Poor	Fair	Good	---
11 Bulow	Poor	Poor	Poor	Fair	Poor	---	Very poor.	Very poor.	Poor	Fair	Very poor.	---
12 Canaveral	Poor	Poor	Fair	Poor	Poor	---	Very poor.	Very poor.	Poor	Poor	Very poor.	---
13 Cassia	Very poor.	Poor	Poor	Poor	Fair	---	Very poor.	Very poor.	Poor	Poor	Very poor.	---
14 Chobee	Poor	Poor	Poor	Fair	Poor	---	Good	Good	Poor	Poor	Good	---
15 Cocoa	Poor	Poor	Poor	Poor	Poor	---	Very poor.	Very poor.	Poor	Poor	Very poor.	---
16*: Cocoa	Poor	Poor	Poor	Poor	Poor	---	Very poor.	Very poor.	Poor	Poor	Very poor.	---
Urban land.												
17 Daytona	Poor	Poor	Poor	Poor	Poor	---	Very poor.	Very poor.	Poor	Poor	Very poor.	---
18*: Daytona	Poor	Poor	Poor	Poor	Poor	---	Very poor.	Very poor.	Poor	Poor	Very poor.	---
Urban land.												
19 Deland	Poor	Poor	Poor	Poor	Fair	---	Very poor.	Very poor.	Poor	Poor	Very poor.	---
20 EauGallie	Poor	Poor	Poor	Poor	Poor	---	Poor	Very poor.	Poor	Poor	Poor	---

See footnote at end of table.

TABLE 14.--WILDLIFE HABITAT POTENTIALS--Continued

Soil name and map symbol	Potential for habitat elements: Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood trees	Coniferous plants	Shrubs	Wetland plants	Shallow water areas	Potential as habitat for--: Openland wildlife	Woodland wildlife	Wetland wildlife	Rangeland wildlife
21----------------- EauGallie	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	---	Fair	Good	Very poor.	Very poor.	Good	---
22----------------- Electra	Poor	Poor	Fair	Poor	Poor	---	Poor	Poor	Poor	Poor	Poor	---
23----------------- Farmton	Poor	Poor	Fair	Poor	Fair	---	Fair	Poor	Poor	Fair	Poor	---
24*. Fluvaquents												
25----------------- Gator	Very poor.	Very poor.	Very poor.	Fair	Very poor.	---	Good	Good	Very poor.	Poor	Good	---
26----------------- Holopaw	Poor	Fair	Fair	Poor	Fair	---	Fair	Fair	Fair	Fair	Fair	---
27----------------- Hontoon	Very poor.	Very poor.	Poor	Fair	Very poor.	---	Good	Good	Very poor.	Fair	Good	---
28*. Hydraquents												
29. Immokalee	Poor	Fair	Good	Poor	Fair	---	Fair	Poor	Fair	Fair	Poor	---
30----------------- Immokalee	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	---	Fair	Good	Very poor.	Very poor.	Good	---
31----------------- Malabar	Poor	Poor	Poor	Poor	Poor	---	Fair	Fair	Poor	Poor	Fair	---
32----------------- Myakka	Poor	Fair	Good	Poor	Fair	---	Fair	Poor	Fair	Fair	Poor	---
33----------------- Myakka	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	---	Fair	Good	Very poor.	Very poor.	Good	---
34*:												
Myakka------------	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	---	Fair	Good	Very poor.	Very poor.	Good	---
St. Johns---------	Poor	Fair	Fair	Poor	Fair	---	Fair	Fair	Fair	Fair	Fair	---
35*:												
Myakka------------	Poor	Fair	Good	Poor	Fair	---	Fair	Poor	Fair	Fair	Poor	---
Urban land.												
36----------------- Myakka Variant	Poor	Fair	Good	Good	Fair	---	Fair	Poor	Fair	Fair	Poor	---
37----------------- Orsino	Poor	Poor	Fair	Poor	Poor	---	Very poor.	Very poor.	Poor	Poor	Very poor.	---
38----------------- Paisley	Poor	Fair	Fair	Fair	Fair	---	Good	Good	Fair	Fair	Good	---
39----------------- Palm Beach	Poor	Poor	Poor	Very poor.	Very poor.	---	Very poor.	Very poor.	Poor	---	Very poor.	---
40*:												
Palm Beach--------	Poor	Poor	Poor	Very poor.	Very poor.	---	Very poor.	Very poor.	Poor	---	Very poor.	---
Urban land.												

See footnote at end of table.

TABLE 14.--WILDLIFE HABITAT POTENTIALS--Continued

Soil name and map symbol	Potential for habitat elements: Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood trees	Coniferous plants	Shrubs	Wetland plants	Shallow water areas	Potential as habitat for--: Openland wildlife	Woodland wildlife	Wetland wildlife	Rangeland wildlife
40*:												
Paola	Poor	Poor	Fair	Very poor.	Poor	---	Very poor.	Very poor.	Poor	Poor	Very poor.	---
41*:												
Palm Beach	Poor	Poor	Poor	Very poor.	Very poor.	---	Very poor.	Very poor.	Poor	---	Very poor.	---
Paola	Poor	Poor	Fair	Very poor.	Poor	---	Very poor.	Very poor.	Poor	Poor	Very poor.	---
42, 43 Paola	Poor	Poor	Fair	Very poor.	Poor	---	Very poor.	Very poor.	Poor	Poor	Very poor.	---
44*:												
Paola	Poor	Poor	Fair	Very poor.	Poor	---	Very poor.	Very poor.	Poor	Poor	Very poor.	---
Urban land.												
45 Pineda	Poor	Fair	Fair	Poor	Poor	---	Good	Fair	Fair	Poor	Fair	---
46 Pinellas	Very poor.	Poor	Poor	Poor	Poor	---	Fair	Fair	Poor	Poor	Fair	---
47*. Pits												
48 Placid	Very poor.	Very poor.	Very poor.	Very poor.	Poor	---	Good	Good	Very poor.	Very poor.	Good	---
49 Pomona	Poor	Fair	Fair	Poor	Fair	---	Fair	Fair	Fair	Fair	Fair	---
50 Pomona	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	---	Fair	Good	Very poor.	Very poor.	Good	---
51*:												
Pomona	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	---	Fair	Good	Very poor.	Very poor.	Good	---
St. Johns	Poor	Fair	Fair	Poor	Fair	---	Fair	Fair	Fair	Fair	Fair	---
52 Pompano	Poor	Fair	Poor	Poor	Poor	---	Fair	Fair	Poor	Poor	Fair	---
53*:												
Pompano	Poor	Fair	Poor	Poor	Poor	---	Fair	Fair	Poor	Poor	Fair	---
Placid	Very poor.	Very poor.	Very poor.	Very poor.	Poor	---	Good	Good	Very poor.	Very poor.	Good	---
54*. Quartzipsamments												
55 Riviera	Poor	Fair	Fair	Fair	Fair	---	Poor	Fair	Fair	Fair	Fair	---
56 Samsula	Very poor.	Very poor.	Poor	Fair	Very poor.	---	Good	Good	Very poor.	Poor	Good	---
57 Satellite	Very poor.	Poor	Poor	Poor	Poor	---	Poor	Very poor.	Poor	Poor	Very poor.	---

See footnote at end of table.

TABLE 14.--WILDLIFE HABITAT POTENTIALS--Continued

Soil name and map symbol	Potential for habitat elements: Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood trees	Coniferous plants	Shrubs	Wetland plants	Shallow water areas	Potential as habitat for--: Openland wildlife	Woodland wildlife	Wetland wildlife	Rangeland wildlife
58*:												
Satellite	Very poor.	Poor	Poor	Poor	Poor	---	Poor	Very poor.	Poor	Poor	Very poor.	---
Urban land.												
59 Scoggin	Very poor.	Poor	Fair	Fair	Fair	---	Good	Good	Fair	Fair	Good	---
60 Smyrna	Poor	Fair	Fair	Poor	Fair	---	Fair	Fair	Fair	Fair	Fair	---
61 St. Johns	Poor	Fair	Fair	Poor	Fair	---	Fair	Fair	Fair	Fair	Fair	---
62 St. Lucie	Poor	Poor	Fair	Very poor.	Poor	---	Very poor.	Very poor.	Poor	Poor	Very poor.	---
63 Tavares	Poor	Fair	Fair	Poor	Fair	---	Very poor.	Very poor.	Fair	Fair	Very poor.	---
64 Tequesta	Poor	Fair	Fair	Poor	Poor	---	Good	Good	Poor	Poor	Good	---
65 Terra Ceia	Very poor.	Poor	Poor	Poor	Poor	---	Good	Good	Poor	Poor	Good	---
66 Tomoka	Very poor.	Poor	Poor	Fair	Poor	---	Good	Good	Poor	Poor	Good	---
67 Turnbull	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	---	Fair	Good	Very poor.	Very poor.	Fair	---
68 Turnbull Variant	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	---	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	---
69 Tuscawilla	Poor	Fair	Fair	Good	Fair	---	Fair	Fair	Fair	Good	Fair	---
70*:												
Tuscawilla	Poor	Fair	Fair	Good	Fair	---	Fair	Fair	Fair	Good	Fair	---
Urban land.												
71*. Urban land												
72 Valkaria	Poor	Fair	Fair	Fair	Fair	---	Good	Fair	Poor	Poor	Good	---
73 Wabasso	Poor	Poor	Poor	Poor	Good	---	Fair	Poor	Poor	Fair	Poor	---
74 Wabasso	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	---	Good	Good	Very poor.	Very poor.	Good	---
75 Wauchula	Poor	Poor	Poor	Poor	Poor	---	Poor	Very poor.	Poor	Poor	Poor	---
76 Wauchula	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	---	Fair	Good	Poor	Poor	Good	---
77 Winder	Poor	Fair	Fair	Fair	Fair	---	Fair	Fair	Fair	Fair	Fair	---

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 15.--ENGINEERING PROPERTIES AND CLASSIFICATIONS

[The symbol < means less than; > means more than. Absence of an entry indicates that data were not estimated]

Soil name and map symbol	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Frag- ments > 3 inches	Percentage passing sieve number-- 4	10	40	200	Liquid limit	Plas- ticity index
	In				Pct					Pct	
1------------------ Apopka	0-62	Fine sand--------	SP, SP-SM	A-3	0	100	100	85-100	3-10	---	NP
	62-80	Sandy loam, sandy clay loam, sandy clay.	SM-SC, SC	A-2-4, A-2-6, A-4, A-6	0	98-100	95-100	60-95	20-40	20-40	4-20
2------------------ Apopka	0-44	Fine sand--------	SP, SP-SM	A-3	0	100	100	85-100	3-10	---	NP
	44-80	Sandy loam, sandy clay loam, sandy clay.	SM-SC, SC	A-2-4, A-2-6, A-4, A-6	0	98-100	95-100	60-95	20-40	20-40	4-20
3*. Arents											
4------------------ Astatula	0-95	Fine sand--------	SP, SP-SM	A-3	0	100	100	75-99	1-7	---	NP
5------------------ Astatula	0-80	Fine sand--------	SP, SP-SM	A-3	0	100	100	75-99	1-7	---	NP
6*: Astatula-----------	0-95	Fine sand--------	SP, SP-SM	A-3	0	100	100	75-99	1-7	---	NP
Urban land.											
7------------------ Astor	0-55	Fine sand--------	SP-SM, SM	A-3, A-2-4	0	100	100	85-100	5-15	---	NP
	55-82	Sand, fine sand	SP-SM, SM	A-3, A-2-4	0	100	100	85-100	5-15	---	NP
8------------------ Basinger	0-90	Fine sand--------	SP, SP-SM	A-3, A-2-4	0	100	100	85-100	2-12	---	NP
9*. Beaches											
10----------------- Bluff	0-5	Sandy clay loam	SC	A-6, A-7	0	100	95-100	85-95	36-50	35-50	20-35
	5-68	Sandy clay loam, sandy clay.	SC, CL, CH	A-6, A-7	0	100	95-100	85-95	36-55	35-55	20-40
11----------------- Bulow	0-5	Sand-------------	SP	A-3	0	100	100	70-95	1-4	---	NP
	5-20	Sand, coarse sand.	SP	A-3	0	100	100	70-95	1-4	---	NP
	20-45	Sand, coarse sand.	SP	A-3	0	100	100	70-95	1-4	---	NP
	45-50	Sandy loam, sandy clay loam.	SC, SM-SC	A-2-4, A-2-6	0	100	100	70-95	18-35	20-40	4-15
	50	Weathered bedrock.	---	---	---	---	---	---	---	---	---

See footnote at end of table.

TABLE 15.--ENGINEERING PROPERTIES AND CLASSIFICATIONS--Continued

Soil name and map symbol	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Frag- ments > 3 inches	Percentage passing sieve number--: 4	10	40	200	Liquid limit	Plas- ticity index
	In				Pct					Pct	
12----------------- Canaveral	0-9	Sand------------	SP	A-3	0	100	100	90-100	1-4	---	NP
	9-80	Fine sand, sand, coarse sand.	SP	A-3	0	70-100	70-95	65-90	1-3	---	NP
13----------------- Cassia	0-28	Fine sand-------	SP, SP-SM	A-3	0	100	100	90-100	2-7	---	NP
	28-36	Sand, fine sand, loamy sand.	SP-SM, SM	A-3, A-2-4	0	100	100	90-100	5-20	---	NP
	36-80	Sand, fine sand	SP, SP-SM	A-3	0	100	100	90-100	2-10	---	NP
14----------------- Chobee	0-6	Fine sandy loam	SM-SC, SC	A-2-4	0	100	100	85-99	11-25	20-30	4-10
	6-54	Sandy clay loam		A-2-6, A-2-7, A-6, A-7	0	100	100	85-99	25-45	35-45	20-25
	54-64	Loamy sand, loamy fine sand, fine sandy loam.	SM, SM-SC, SC	A-2-4	0	100	100	80-99	12-25	<30	NP-10
15----------------- Cocoa	0-26	Sand------------	SP, SP-SM, SM	A-3, A-2-4	0	100	100	70-90	4-15	---	NP
	26-30	Sand, loamy sand, loamy fine sand.	SP-SM, SM	A-2-4	0	100	100	80-90	10-25	---	NP
	30	Weathered bedrock.	---	---	---	---	---	---	---	---	---
16*:											
Cocoa-------------	0-26	Sand------------	SP, SP-SM, SM	A-3, A-2-4	0	100	100	70-90	4-15	---	NP
	26-30	Sand, loamy sand, loamy fine sand.	SP-SM, SM	A-2-4	0	100	100	80-90	10-25	---	NP
	30	Weathered bedrock.	---	---	---	---	---	---	---	---	---
Urban land.											
17----------------- Daytona	0-36	Sand------------	SP, SP-SM	A-3	0	100	100	70-95	2-10	---	NP
	36-47	Sand, fine sand, coarse sand.	SP-SM	A-3, A-2-4	0	100	100	70-95	5-12	---	NP
	47-80	Sand, fine sand, coarse sand.	SP, SP-SM	A-3	0	100	100	70-95	4-10	---	NP
18*:											
Daytona-----------	0-36	Sand------------	SP, SP-SM	A-3	0	100	100	70-95	2-10	---	NP
	36-47	Sand, fine sand, coarse sand.	SP-SM	A-3, A-2-4	0	100	100	70-95	5-12	---	NP
	47-80	Sand, fine sand, coarse sand.	SP, SP-SM	A-3	0	100	100	70-95	4-10	---	NP
Urban land.											
19----------------- Deland	0-4	Fine sand-------	SP, SP-SM	A-3	0	100	100	80-99	2-7	---	NP
	4-55	Sand, fine sand	SP, SP-SM	A-3	0	100	100	80-99	2-7	---	NP
	55-67	Sand, fine sand	SP-SM, SM	A-3, A-2-4	0	100	100	80-99	5-15	---	NP
	67-94	Sand, fine sand	SP-SM, SM	A-3, A-2-4	0	100	100	80-99	5-20	---	NP

See footnote at end of table.

TABLE 15.--ENGINEERING PROPERTIES AND CLASSIFICATIONS--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag- ments > 3 inches	Percentage passing sieve number--				Liquid limit	Plas- ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
20----------------- EauGallie	0-21	Fine sand-------	SP, SP-SM	A-3	0	100	100	80-98	2-5	---	NP
	21-35	Sand, fine sand	SP-SM, SM	A-3, A-2-4	0	100	100	80-98	5-20	---	NP
	35-52	Sand, fine sand	SP, SP-SM	A-3, A-2-4	0	100	100	80-98	2-12	---	NP
	52-61	Sandy loam, fine sandy loam, sandy clay loam.	SM, SM-SC, SC	A-2-4, A-2-6	0	100	100	80-98	20-35	<40	NP-20
	61-65	Sand, loamy sand, loamy fine sand.	SP-SM, SM	A-3, A-2-4	0	100	100	80-98	5-25	---	NP
21----------------- EauGallie	0-23	Fine sand-------	SP, SP-SM	A-3	0	100	100	80-98	2-5	---	NP
	23-35	Sand, fine sand	SP-SM, SM	A-3, A-2-4	0	100	100	80-98	5-20	---	NP
	35-43	Sand, fine sand	SP, SP-SM	A-3, A-2-4	0	100	100	80-98	2-12	---	NP
	43-67	Sandy loam, fine sandy loam, sandy clay loam.	SM, SM-SC, SC	A-2-4, A-2-6	0	100	100	80-98	20-35	<40	NP-20
	67-84	Sand, loamy sand, loamy fine sand.	SP-SM, SM	A-3, A-2-4	0	100	100	80-98	5-25	---	NP
22----------------- Electra	0-35	Fine sand-------	SP, SP-SM	A-3	0	100	95-100	75-99	3-10	---	NP
	35-52	Sand, fine sand	SP-SM, SM	A-3, A-2-4	0	100	100	80-99	8-15	---	NP
	52-57	Sand, fine sand	SP-SM	A-3, A-2-4	0	100	100	80-99	5-12	---	NP
	57-70	Fine sandy loam, sandy clay loam.	SC, SM-SC	A-2, A-4, A-6	0	100	100	80-99	20-45	20-45	4-20
23----------------- Farmton	0-7	Fine sand-------	SP, SP-SM	A-3	0	100	100	80-99	2-7	---	NP
	7-34	Fine sand, sand	SP, SP-SM	A-3	0	100	100	80-99	2-7	---	NP
	34-50	Fine sand, sand	SP-SM, SM	A-3, A-2-4	0	100	100	80-99	5-15	---	NP
	50-80	Fine sandy loam, sandy loam, sandy clay loam.	SM, SM-SC, SC	A-2-4	0	100	100	80-99	15-35	<35	NP-10
24*. Fluvaquents											
25----------------- Gator	0-34	Muck------------	Pt	A-8	---	---	---	---	---	---	---
	34-46	Sandy clay loam, sandy loam, fine sandy loam.	SC, SM-SC	A-2, A-4, A-6	0	100	100	85-99	20-40	20-40	4-15
	46-52	Stratified loamy fine sand to fine sandy loam.	SM	A-2-4	0	100	100	80-99	13-20	---	NP
	52-58	Fine sand, sand	SP-SM	A-3, A-2-4	0	100	100	80-99	5-12	---	NP
26----------------- Holopaw	0-55	Sand------------	SP, SP-SM	A-3	0	100	95-100	70-95	2-10	---	NP
	55-63	Sandy loam, sandy clay loam.	SM, SM-SC	A-2-4	0	100	95-100	70-99	15-30	<25	NP-7
	63-70	Loamy sand------	SM	A-2-4	0	100	95-100	70-99	13-20	---	NP

See footnote at end of table.

TABLE 15.--ENGINEERING PROPERTIES AND CLASSIFICATIONS--Continued

Soil name and map symbol	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Fragments > 3 inches	Percentage passing sieve number--: 4	10	40	200	Liquid limit	Plasticity index
	In				Pct					Pct	
27----------------- Hontoon	0-60	Muck------------	Pt	---	0	---	---	---	---	---	---
	60-65	Mucky sand, sand	SP, SP-SM	A-3	0	100	100	80-95	2-8	---	NP
28*. Hydraquents											
29----------------- Immokalee	0-10	Sand------------	SP, SP-SM	A-3	0	100	100	70-100	2-10	---	NP
	10-34	Fine sand, sand	SP, SP-SM	A-3	0	100	100	70-100	2-10	---	NP
	34-43	Fine sand, sand	SP-SM, SM	A-3, A-2-4	0	100	100	70-100	5-21	---	NP
	43-85	Fine sand, sand	SP, SP-SM	A-3	0	100	100	70-100	2-10	---	NP
30----------------- Immokalee	0-8	Sand------------	SP, SP-SM	A-3	0	100	100	70-100	2-10	---	NP
	8-36	Fine sand, sand	SP, SP-SM	A-3	0	100	100	70-100	2-10	---	NP
	36-50	Fine sand, sand	SP-SM, SM	A-3, A-2-4	0	100	100	70-100	5-21	---	NP
	50-80	Fine sand, sand	SP, SP-SM	A-3	0	100	100	70-100	2-10	---	NP
31----------------- Malabar	0-15	Fine sand-------	SP, SP-SM	A-3	0	100	100	80-90	2-10	---	NP
	15-32	Sand, fine sand	SP, SP-SM	A-3, A-2-4	0	100	100	80-90	3-12	---	NP
	32-42	Sand, fine sand	SP, SP-SM	A-3	0	100	100	80-90	2-10	---	NP
	42-80	Sandy clay loam, fine sandy loam, sandy loam.	SC, SM-SC	A-2, A-4, A-6	0	100	100	80-90	22-40	20-40	4-15
32----------------- Myakka	0-27	Fine sand-------	SP, SP-SM	A-3	0	100	100	85-100	2-10	---	NP
	27-43	Sand, fine sand, loamy fine sand.	SM, SP-SM	A-3, A-2-4	0	100	100	85-100	5-20	---	NP
	43-78	Sand, fine sand	SP, SP-SM	A-3	0	100	100	85-100	2-8	---	NP
33----------------- Myakka	0-25	Fine sand-------	SP, SP-SM	A-3	0	100	100	85-100	2-10	---	NP
	25-39	Sand, fine sand, loamy fine sand.	SM, SP-SM	A-3, A-2-4	0	100	100	85-100	5-20	---	NP
	39-80	Sand, fine sand	SP, SP-SM	A-3	0	100	100	85-100	2-8	---	NP
34*: Myakka------------	0-27	Fine sand-------	SP, SP-SM	A-3	0	100	100	85-100	2-10	---	NP
	27-43	Sand, fine sand, loamy fine sand.	SM, SP-SM	A-3, A-2-4	0	100	100	85-100	5-20	---	NP
	43-78	Sand, fine sand	SP, SP-SM	A-3	0	100	100	85-100	2-8	---	NP
St. Johns---------	0-10	Fine sand-------	SP, SP-SM	A-3	0	100	100	75-95	3-10	---	NP
	10-26	Sand, fine sand	SP, SP-SM	A-3	0	100	100	85-95	3-10	---	NP
	26-43	Sand, fine sand	SP-SM, SP	A-3, A-2-4	0	100	100	85-95	5-20	---	NP
	43-60	Sand, fine sand	SP, SP-SM	A-3	0	100	100	80-90	2-10	---	NP
35*: Myakka------------	0-27	Fine sand-------	SP, SP-SM	A-3	0	100	100	85-100	2-10	---	NP
	27-43	Sand, fine sand, loamy fine sand.	SM, SP-SM	A-3, A-2-4	0	100	100	85-100	5-20	---	NP
	43-78	Sand, fine sand	SP, SP-SM	A-3	0	100	100	85-100	2-8	---	NP
Urban land.											

See footnote at end of table.

TABLE 15.--ENGINEERING PROPERTIES AND CLASSIFICATIONS--Continued

Soil name and map symbol	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Fragments > 3 inches	Percentage passing sieve number-- 4	10	40	200	Liquid limit	Plasticity index
	In				Pct					Pct	
36----------------- Myakka Variant	0-7	Fine sand-------	SP, SP-SM	A-3	0	100	100	85-100	2-10	---	NP
	7-28	Sand, fine sand	SP, SP-SM	A-3	0	100	100	85-100	2-10	---	NP
	28-40	Sand, fine sand	SP-SM, SM	A-3, A-2-4	0	100	100	85-100	5-15	---	NP
	40-45	Sand, fine sand	SP-SM	A-3, A-2-4	0	100	100	85-100	5-12	---	NP
	45-80	Sand, fine sand	GP-GM, SP-SM	A-1-B, A-1-A, A-3	0	40-80	30-70	20-60	5-10	---	NP
37----------------- Orsino	0-30	Fine sand-------	SP	A-3	0	100	100	85-95	1-3	---	NP
	30-80	Sand, fine sand	SP, SP-SM	A-3	0	100	100	85-95	2-7	---	NP
38----------------- Paisley	0-13	Fine sand-------	SP-SM	A-3, A-2-4	0	100	100	80-99	5-12	---	NP
	13-70	Sandy clay, clay	CH, CL	A-7	0	95-100	90-100	75-95	51-70	41-51	25-35
39----------------- Palm Beach	0-80	Sand------------	SP, SW	A-3	0	100	75-95	15-90	1-4	---	NP
40*:											
Palm Beach--------	0-80	Sand------------	SP, SW	A-3	0	100	75-95	15-90	1-4	---	NP
Urban land.											
40*:											
Paola-------------	0-25	Sand------------	SP	A-3	0	100	100	85-100	1-2	---	NP
	25-80	Sand, fine sand	SP	A-3	0	100	100	80-100	1-4	---	NP
41*:											
Palm Beach--------	0-80	Sand------------	SP, SW	A-3	0	100	75-95	15-90	1-4	---	NP
Paola-------------	0-26	Sand------------	SP	A-3	0	100	100	85-100	1-2	---	NP
	26-85	Sand, fine sand	SP	A-3	0	100	100	80-100	1-4	---	NP
42----------------- Paola	0-26	Fine sand-------	SP	A-3	0	100	100	85-100	1-2	---	NP
	26-85	Sand, fine sand	SP	A-3	0	100	100	80-100	1-4	---	NP
43----------------- Paola	0-30	Fine sand-------	SP	A-3	0	100	100	85-100	1-2	---	NP
	30-80	Sand, fine sand	SP	A-3	0	100	100	80-100	1-4	---	NP
44*:											
Paola-------------	0-26	Fine sand-------	SP	A-3	0	100	100	85-100	1-2	---	NP
	26-85	Sand, fine sand	SP	A-3	0	100	100	80-100	1-4	---	NP
Urban land.											
45----------------- Pineda	0-40	Fine sand-------	SP, SP-SM	A-3	0	100	100	80-95	2-5	---	NP
	40-96	Sandy loam, fine sandy loam, sandy clay loam.	SC, SM-SC	A-2-4, A-2-6	0	100	100	80-95	15-35	20-30	4-12
46----------------- Pinellas	0-19	Fine sand-------	SP	A-3	0	100	100	90-100	2-4	---	NP
	19-29	Sand, fine sand	SP-SM	A-3, A-2-4	0	100	100	90-100	5-12	---	NP
	29-45	Fine sandy loam, sandy clay loam.	SM, SM-SC, SC	A-2-4	0	100	100	90-100	12-35	20-30	5-13
	45-60	Sand------------	SP	A-3	0-5	80-100	75-100	60-95	2-4	---	NP
47*. Pits											

See footnote at end of table.

TABLE 15.--ENGINEERING PROPERTIES AND CLASSIFICATIONS--Continued

Soil name and map symbol	Depth	USDA texture	Classification Unified	Classification AASHTO	Frag-ments > 3 inches	Percentage passing sieve number-- 4	10	40	200	Liquid limit	Plas-ticity index
	In				Pct					Pct	
48-----------------Placid	0-15	Fine sand-------	SP, SP-SM, SM	A-3, A-2-4	0	100	100	90-100	1-20	---	NP
	15-75	Fine sand, sand, loamy fine sand.	SP, SP-SM, SM	A-3, A-2-4	0	100	100	90-100	1-20	---	NP
49-----------------Pomona	0-5	Fine sand-------	SP, SP-SM	A-3, A-2-4	0	100	100	85-100	2-12	---	NP
	5-18	Sand, fine sand	SP, SP-SM	A-3, A-2-4	0	100	100	85-100	2-12	---	NP
	18-45	Sand, fine sand	SP-SM, SM	A-3, A-2-4	0	100	100	85-100	5-15	---	NP
	45-50	Sand, fine sand	SP, SP-SM	A-3, A-2-4	0	100	100	85-100	2-12	---	NP
	50-60	Sandy clay loam, sandy loam, sandy clay.	SC, SM-SC	A-2, A-4, A-6	0	100	95-100	85-100	25-50	25-40	4-16
50-----------------Pomona	0-7	Fine sand-------	SP, SP-SM	A-3, A-2-4	0	100	100	85-100	2-12	---	NP
	7-14	Sand, fine sand	SP, SP-SM	A-3, A-2-4	0	100	100	85-100	2-12	---	NP
	14-33	Sand, fine sand	SP-SM, SM	A-3, A-2-4	0	100	100	85-100	5-15	---	NP
	33-53	Sand, fine sand	SP, SP-SM	A-3, A-2-4	0	100	100	85-100	2-12	---	NP
	53-70	Sandy clay loam, sandy loam, sandy clay.	SC, SM-SC	A-2, A-4, A-6	0	100	95-100	85-100	25-50	25-40	4-16
51*: Pomona------------	0-7	Fine sand-------	SP, SP-SM	A-3, A-2-4	0	100	100	85-100	2-12	---	NP
	7-14	Sand, fine sand	SP, SP-SM	A-3, A-2-4	0	100	100	85-100	2-12	---	NP
	14-33	Sand, fine sand	SP-SM, SM	A-3, A-2-4	0	100	100	85-100	5-15	---	NP
	33-53	Sand, fine sand	SP, SP-SM	A-3, A-2-4	0	100	100	85-100	2-12	---	NP
	53-70	Sandy clay loam, sandy loam, sandy clay.	SC, SM-SC	A-2, A-4, A-6	0	100	95-100	85-100	25-50	25-40	4-16
St. Johns---------	0-10	Fine sand-------	SP, SP-SM	A-3	0	100	100	75-95	3-10	---	NP
	10-27	Sand, fine sand	SP, SP-SM	A-3	0	100	100	85-95	3-10	---	NP
	27-45	Sand, fine sand	SP-SM, SM	A-3, A-2-4	0	100	100	85-95	5-20	---	NP
	45-75	Sand, fine sand	SP, SP-SM	A-3	0	100	100	80-90	2-10	---	NP
52-----------------Pompano	0-80	Fine sand-------	SP, SP-SM	A-3, A-2-4	0	100	100	75-100	1-12	---	NP
53*: Pompano-----------	0-80	Fine sand-------	SP, SP-SM	A-3, A-2-4	0	100	100	75-100	1-12	---	NP
Placid------------	0-15	Fine sand-------	SP, SP-SM, SM	A-3, A-2-4	0	100	100	90-100	1-20	---	NP
	15-75	Fine sand, sand, loamy fine sand.	SP, SP-SM, SM	A-3, A-2-4	0	100	100	90-100	1-20	---	NP

See footnote at end of table.

TABLE 15.--ENGINEERING PROPERTIES AND CLASSIFICATIONS--Continued

Soil name and map symbol	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Frag- ments > 3 inches	Percentage passing sieve number--: 4	10	40	200	Liquid limit	Plas- ticity index
	In				Pct					Pct	
54*. Quartzipsamments											
55----------------- Riviera	0-25	Fine sand--------	SP, SP-SM	A-3, A-2-4	0	100	100	80-100	4-12	---	NP
	25-38	Sandy loam, sandy clay loam.	SM, SM-SC, SC	A-2-4	0	100	100	80-100	15-35	<35	NP-15
	38-43	Sandy loam, sandy clay loam.	SM-SC, SC	A-2-4, A-2-6	0	100	100	80-100	20-35	20-40	4-20
	43-64	Sand, fine sand, loamy sand.	SP, SP-SM	A-3, A-1, A-2-4	0	60-80	50-75	40-70	3-10	---	NP
56----------------- Samsula	0-36	Muck-------------	Pt	---	---	---	---	---	---	---	---
	36-60	Sand, fine sand, loamy sand.	SP-SM, SM, SP	A-3, A-2-4	0	100	100	80-100	2-20	---	NP
57----------------- Satellite	0-80	Sand-------------	SP	A-3	0	100	100	60-95	1-4	---	NP
58*:											
Satellite----------	0-80	Sand-------------	SP	A-3	0	100	100	60-95	1-4	---	NP
Urban land.											
59----------------- Scoggin	4-0		Pt	A-8	0	---	---	---	---	---	---
	0-7	Sand, fine sand	SP-SM, SM	A-3, A-2-4	0	100	100	85-100	5-20	---	NP
	7-36	Sand, fine sand	SP, SP-SM	A-3, A-2-4	0	100	100	90-100	3-12	---	NP
	36-49	Fine sandy loam, sandy clay loam.	SC, SM-SC	A-2-4, A-2-6	0	100	100	90-100	20-35	20-40	4-15
	49-54	Fine sandy loam, loamy fine sand, fine sand.	SM, SM-SC	A-2-4	0	100	100	90-100	15-25	<28	NP-7
60----------------- Smyrna	0-17	Fine sand--------	SP, SP-SM	A-3	0	100	100	80-100	2-10	---	NP
	17-27	Sand, fine sand	SM, SP-SM	A-3, A-2-4	0	100	100	80-100	5-20	---	NP
	27-80	Sand, fine sand	SP, SP-SM	A-3	0	100	100	80-100	2-10	---	NP
61----------------- St. Johns	0-10	Fine sand--------	SP, SP-SM	A-3	0	100	100	75-95	3-10	---	NP
	10-26	Sand, fine sand	SP, SP-SM	A-3	0	100	100	85-95	3-10	---	NP
	26-43	Sand, fine sand	SP-SM, SM	A-3, A-2-4	0	100	100	85-95	5-20	---	NP
	43-60	Sand, fine sand	SP, SP-SM	A-3	0	100	100	80-90	2-10	---	NP
62----------------- St. Lucie	0-80	Fine sand--------	SP	A-3	0	100	100	85-99	1-4	---	NP
63----------------- Tavares	0-80	Fine sand--------	SP, SP-SM	A-3	0	100	95-100	85-100	2-8	---	NP
64----------------- Tequesta	12-0	Muck-------------	Pt	---	0	---	---	---	---	---	---
	0-25	Sand, fine sand	SP, SP-SM	A-3, A-2-4	0	100	100	80-100	2-12	---	NP
	25-31	Sandy loam, sandy clay loam.	SM, SM-SC, SC	A-2-4	0	100	100	80-100	15-35	<40	NP-40
	31-70	Sand, loamy sand	SP, SP-SM	A-3, A-2-4	0	60-100	50-100	40-80	3-20	---	NP

See footnote at end of table.

TABLE 15.--ENGINEERING PROPERTIES AND CLASSIFICATIONS--Continued

Soil name and map symbol	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Frag- ments > 3 inches	Percentage passing sieve number--: 4	10	40	200	Liquid limit	Plas- ticity index
	In				Pct					Pct	
65----------------- Terra Ceia	0-64	Muck------------	Pt	---	---	---	---	---	---	---	---
66----------------- Tomoka	0-34	Muck------------	Pt	---	0	---	---	---	---	---	NP
	34-39	Sand, fine sand, loamy sand.	SP-SM, SM	A-3, A-2-4	0	100	100	80-95	5-15	---	NP
	39-60	Sandy clay loam, sandy loam, fine sandy loam.	SM, SM-SC, SC	A-2, A-4, A-6	0	100	100	80-95	25-40	<35	NP-15
67----------------- Turnbull	14-0	Muck------------	Pt	A-8	0	---	---	---	---	---	---
	0-36	Clay------------	CH	A-7	0	100	100	90-100	75-95	70-95	45-60
	36-80	Loamy fine sand, fine sand.	SP-SM, SM	A-2-4, A-3	0	95-100	90-100	75-90	5-20	---	NP
68----------------- Turnbull Variant	0-50	Sand------------	SP	A-3	0	80-95	70-90	51-65	1-4	---	NP
	50-55	Muck------------	Pt	A-8	0	---	---	---	---	---	---
	55-60	Clay------------	CH, MH	A-7	0	100	100	85-100	51-95	55-90	20-55
69----------------- Tuscawilla	0-10	Fine sand-------	SP-SM	A-3, A-2-4	0	85-100	85-100	75-90	5-12	---	NP
	10-40	Sandy clay loam, fine sandy loam.	SC	A-2, A-4, A-6	0-15	85-100	85-100	80-95	25-40	28-40	8-20
	40-62	Fine sand, sand, loamy fine sand.	SP-SM, SM	A-3, A-2-4	0	100	100	80-100	5-15	---	NP
	62-80	Fine sand, sand, loamy fine sand.	SP-SM, SM	A-3, A-2-4	0	85-100	80-95	75-95	5-15	---	NP
70*:											
Tuscawilla--------	0-10	Fine sand-------	SP-SM	A-3, A-2-4	0	85-100	85-100	75-90	5-12	---	NP
	10-40	Sandy clay loam, fine sandy loam.	SC	A-2, A-4, A-6	0-15	85-100	85-100	80-95	25-40	28-40	8-20
	40-62	Fine sand, sand, loamy fine sand.	SP-SM, SM	A-3, A-2-4	0	100	100	80-100	5-15	---	NP
	62-80	Fine sand, sand, loamy fine sand.	SP-SM, SM	A-3, A-2-4	0	85-100	80-95	75-95	5-15	---	NP
Urban land.											
71*. Urban land											
72----------------- Valkaria	0-10	Fine sand-------	SP, SP-SM	A-3	0	100	75-100	75-98	2-10	---	NP
	10-35	Sand, fine sand	SP, SP-SM	A-3	0	100	75-100	75-98	2-10	---	NP
	35-48	Sand, fine sand	SP, SP-SM	A-3	0	100	75-100	75-98	3-10	---	NP
	48-75	Sand, fine sand	SP, SP-SM	A-3	0	100	75-100	75-98	2-10	---	NP
73, 74------------- Wabasso	0-24	Fine sand-------	SP, SP-SM	A-3	0	100	100	95-100	2-10	---	NP
	24-35	Sand, fine sand	SP-SM, SM	A-3, A-2-4	0	100	100	95-100	5-20	---	NP
	35-39	Sand, fine sand	SP, SP-SM	A-3	0	100	100	95-100	2-10	---	NP
	39-80	Sandy loam, fine sandy loam, sandy clay loam.	SC, SM-SC	A-2-4, A-2-6	0	100	100	95-100	20-35	20-30	5-13

See footnote at end of table.

TABLE 15.--ENGINEERING PROPERTIES AND CLASSIFICATIONS--Continued

Soil name and map symbol	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Fragments > 3 inches	Percentage passing sieve number--: 4	10	40	200	Liquid limit	Plasticity index
	In				Pct					Pct	
75----------------- Wauchula	0-7	Fine sand-------	SP-SM	A-3, A-2-4	0	100	100	90-100	5-12	---	NP
	7-20	Sand, fine sand	SP-SM	A-3, A-2-4	0	100	100	90-100	5-12	---	NP
	20-29	Sand, fine sand, loamy fine sand.	SP-SM, SM	A-3, A-2-4	0	100	100	90-100	8-25	---	NP
	29-34	Sand, fine sand	SP-SM, SM	A-3, A-2-4	0	100	100	90-100	5-20	---	NP
	34-80	Sandy loam, fine sandy loam, sandy clay loam.	SM, SM-SC, SC	A-2-4, A-2-6, A-4, A-6	0	100	92-100	90-100	25-50	<40	NP-20
76----------------- Wauchula	0-7	Fine sand-------	SP-SM	A-3, A-2-4	0	100	100	90-100	5-12	---	NP
	7-22	Sand, fine sand	SP-SM	A-3, A-2-4	0	100	100	90-100	5-12	---	NP
	22-31	Sand, fine sand, loamy fine sand.	SP-SM, SM	A-3, A-2-4	0	100	100	90-100	8-25	---	NP
	31-37	Sand, fine sand	SP-SM, SM	A-3, A-2-4	0	100	100	90-100	5-20	---	NP
	37-60	Sandy loam, fine sandy loam, sandy clay loam.	SM, SM-SC, SC	A-2-4, A-2-6, A-4, A-6	0	100	92-100	90-100	25-50	<40	NP-20
77----------------- Winder	0-12	Fine sand-------	SP, SP-SM	A-3, A-2-4	0	100	100	80-100	2-12	---	NP
	12-35	Sandy clay loam	SC	A-2-4, A-2-6	0	100	100	80-100	18-35	20-40	11-26
	35-53	Sandy loam, sandy clay loam.	SM, SM-SC, SC	A-2-4	0	60-80	50-75	40-70	15-35	<35	NP-20
	53-80	Sand, fine sand, loamy sand.	SP, SP-SM, SM	A-3, A-2-4	0	60-80	50-75	40-70	3-20	---	NP

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 16.--PHYSICAL AND CHEMICAL PROPERTIES OF SOILS

[The symbol < means less than; > means more than. Entries under "Erosion factors--T" apply to the entire profile. Entries under "Wind erodibility group" and "Organic matter" apply only to the surface layer. Absence of an entry indicates that data were not available or were not estimated]

Soil name and map symbol	Depth	Clay <2mm	Moist bulk density	Permea-bility	Available water capacity	Soil reaction	Salinity	Shrink-swell potential	Erosion factors K	Erosion factors T	Wind erodi-bility group	Organic matter
	In	Pct	G/cm3	In/hr	In/in	pH	Mmhos/cm					Pct
1----------------	0-62	---	---	6.0-20	0.03-0.05	4.5-6.0	<2	Very low	0.17	5	2	---
Apopka	62-80	---	---	0.6-2.0	0.12-0.17	4.5-6.0	<2	Very low	0.28			
2----------------	0-44	---	---	6.0-20	0.03-0.05	4.5-6.0	<2	Very low	0.17	5	2	---
Apopka	44-80	---	---	0.6-2.0	0.12-0.17	4.5-6.0	<2	Very low	0.28			
3*. Arents												
4---------------- Astatula	0-95	---	---	>20	0.02-0.05	4.5-6.0	<2	Very low	0.15	5	2	---
5---------------- Astatula	0-80	---	---	>20	0.02-0.05	4.5-6.0	<2	Very low	0.15	5	2	---
6*:												
Astatula--------	0-95	---	---	>20	0.02-0.05	4.5-6.0	<2	Very low	0.15	5	2	---
Urban land.												
7----------------	0-55	2-7	1.30-1.60	6.0-20	0.15-0.20	6.1-8.4	<2	Very low	0.17	5	---	2-15
Astor	55-82	2-7	1.50-1.70	6.0-20	0.05-0.10	6.1-8.4	<2	Very low	---			
8---------------- Basinger	0-90	1-6	1.40-1.65	>20	0.03-0.07	3.6-7.3	<2	Very low	0.10	5	2	.2-1
9*. Beaches												
10---------------	0-5	---	---	0.2-0.6	0.18-0.20	5.6-7.3	<2	Moderate	0.37	4	---	---
Bluff	5-68	---	---	0.06-0.2	0.12-0.17	6.1-8.4	<2	High-------	0.37			
11---------------	0-5	1-3	1.30-1.40	6.0-20	0.05-0.07	5.1-7.3	<2	Low--------	0.17	3	2	.5-1
Bulow	5-20	1-3	1.30-1.45	6.0-20	0.02-0.05	5.1-7.3	<2	Low--------	0.17			
	20-45	1-3	1.40-1.60	6.0-20	0.02-0.05	6.1-7.3	<2	Low--------	0.17			
	45-50	15-30	1.55-1.65	2.0-6.0	0.10-0.15	6.1-7.3	<2	Low--------	0.28			
	50	---	---	---	---	---	---	-----------	---			
12---------------	0-9	---	---	>20	0.02-0.05	6.6-8.4	<2	Very low	0.15	5	2	---
Canaveral	9-80	---	---	>20	0.02-0.05	6.6-8.4	<2	Very low	0.15			
13---------------	0-28	1-4	1.30-1.55	6.0-20	0.03-0.07	4.5-6.0	<2	Low--------	0.15	5	2	<1
Cassia	28-36	2-10	1.30-1.55	0.6-6.0	0.10-0.15	4.5-6.0	<2	Low--------	0.20			
	36-80	1-5	1.40-1.60	6.0-20	0.03-0.07	4.5-6.0	<2	Low--------	0.15			
14---------------	0-6	---	---	2.0-6.0	0.10-0.15	6.1-7.3	<2	Low--------	0.24	5	3	---
Chobee	6-54	---	---	0.6-2.0	0.12-0.17	7.4-8.4	<2	Moderate	0.32			
	54-64	---	---	6.0-20	0.06-0.10	7.4-8.4	<2	Low--------	0.20			
15---------------	0-26	---	---	6.0-20	0.02-0.05	5.6-7.8	<2	Very low	0.17	3	2	---
Cocoa	26-30	---	---	6.0-20	0.05-0.10	5.6-7.8	<2	Very low	0.17			
	30	---	---	---	---	---	---	-----------	---			
16*:												
Cocoa-----------	0-26	---	---	6.0-20	0.02-0.05	5.6-7.8	<2	Very low	0.17	3	2	---
	26-30	---	---	6.0-20	0.05-0.10	5.6-7.8	<2	Very low	0.17			
	30	---	---	---	---	---	---	-----------	---			
Urban land.												
17---------------	0-36	<1-3	1.20-1.50	>20	0.02-0.05	3.6-6.0	<2	Very low	0.17	5	1	.5-1
Daytona	36-47	2-6	1.35-1.60	2.0-6.0	0.10-0.15	3.6-6.0	<2	Very low	0.20			
	47-80	1-4	1.45-1.70	>20	0.02-0.05	3.6-6.0	<2	Very low	0.17			

See footnote at end of table.

TABLE 16.--PHYSICAL AND CHEMICAL PROPERTIES OF SOILS--Continued

Soil name and map symbol	Depth	Clay <2mm	Moist bulk density	Permeability	Available water capacity	Soil reaction	Salinity	Shrink-swell potential	Erosion factors K	Erosion factors T	Wind erodibility group	Organic matter
	In	Pct	G/cm3	In/hr	In/in	pH	Mmhos/cm					Pct
18*:												
Daytona---------	0-36	<1-3	1.20-1.50	>20	0.02-0.05	3.6-6.0	<2	Very low	0.17	5	1	.5-1
	36-47	2-6	1.35-1.60	2.0-6.0	0.10-0.15	3.6-6.0	<2	Very low	0.20			
	47-80	1-4	1.45-1.70	>20	0.02-0.05	3.6-6.0	<2	Very low	0.17			
Urban land.												
19--------------- Deland	0-4	1-5	1.40-1.50	>20	0.02-0.05	4.5-6.5	<2	Low-------	0.15	5	2	.5-1
	4-55	1-5	1.50-1.60	>20	0.02-0.05	4.5-6.5	<2	Low-------	0.20			
	55-67	1-5	1.30-1.40	2.0-6.0	0.10-0.15	4.5-6.0	<2	Low-------	0.20			
	67-94	1-5	1.55-1.65	0.6-2.0	0.10-0.15	3.6-5.5	<2	Low-------	0.20			
20--------------- EauGallie	0-21	---	---	6.0-20	0.02-0.05	4.5-5.5	<2	Low-------	0.17	5	2	---
	21-35	---	---	0.6-6.0	0.05-0.10	5.1-6.5	<2	Low-------	0.20			
	35-52	---	---	6.0-20	0.02-0.05	5.6-7.8	<2	Low-------	0.17			
	52-61	---	---	0.6-6.0	0.10-0.15	5.6-7.8	<2	Low-------	0.32			
	61-65	---	---	2.0-6.0	0.05-0.10	5.6-7.8	<2	Low-------	0.32			
21--------------- EauGallie	0-23	---	---	6.0-20	0.02-0.05	4.5-5.5	<2	Low-------	0.17	5	2	---
	23-35	---	---	0.6-6.0	0.05-0.10	5.1-6.5	<2	Low-------	0.20			
	35-43	---	---	6.0-20	0.02-0.05	5.6-7.8	<2	Low-------	0.17			
	43-67	---	---	0.6-6.0	0.10-0.15	5.6-7.8	<2	Low-------	0.32			
	67-84	---	---	2.0-6.0	0.05-0.10	5.6-7.8	<2	Low-------	0.32			
22--------------- Electra	0-2	1-6	1.40-1.55	6.0-20	0.05-0.10	3.6-5.5	<2	Very low	0.15	5	2	1-2
	2-35	1-6	1.45-1.70	6.0-20	0.02-0.07	3.6-5.5	<2	Very low	0.15			
	35-52	1-6	1.50-1.70	0.6-2.0	0.10-0.15	3.6-5.5	<2	Very low	0.20			
	52-57	1-6	1.45-1.70	6.0-20	0.07-0.10	3.6-5.5	<2	Very low	0.20			
	57-70	18-38	1.60-1.75	0.2-0.6	0.10-0.15	3.6-5.5	<2	Very low	0.32			
23--------------- Farmton	0-7	1-4	1.35-1.50	6.0-20	0.08-0.12	3.6-5.5	<2	Low-------	0.20	5	2	1-2
	7-34	1-4	1.50-1.65	6.0-20	0.02-0.07	3.6-5.5	<2	Low-------	0.20			
	34-50	2-7	1.55-1.70	0.6-2.0	0.10-0.15	3.6-5.5	<2	Low-------	0.20			
	50-80	12-27	1.60-1.70	0.6-2.0	0.12-0.17	3.6-5.5	<2	Low-------	0.24			
24*. Fluvaquents												
25--------------- Gator	0-34	0-2	0.20-0.30	6.0-20	0.30-0.40	4.5-6.0	>16	Low-------	---	---	---	55-80
	34-46	14-30	1.60-1.70	0.6-2.0	0.10-0.15	6.1-8.4	2-8	Low-------	0.32			
	46-52	3-12	1.60-1.70	0.6-2.0	0.10-0.15	6.1-8.4	2-4	Low-------	0.24			
	52-58	2-7	1.40-1.65	6.0-20	0.03-0.05	6.1-8.4	2-4	Low-------	0.15			
26--------------- Holopaw	0-55	---	---	6.0-20	0.03-0.07	5.1-7.3	<2	Very low	0.15	5	---	---
	55-63	---	---	2.0-6.0	0.10-0.15	6.1-8.4	<2	Low-------	0.20			
	63-70	---	---	6.0-20	0.05-0.10	6.6-8.4	<2	Very low	0.17			
27--------------- Hontoon	0-60	---	---	6.0-20	0.20-0.25	4.5-5.5	<2	Low-------	---	---	2	---
	60-65	---	---	6.0-20	0.15-0.20	4.5-5.5	<2	Low-------	---			
28*. Hydraquents												
29--------------- Immokalee	0-10	1-5	1.20-1.50	6.0-20	0.05-0.08	4.5-6.0	<2	Low-------	0.15	5	2	1-2
	10-34	1-5	1.45-1.70	6.0-20	0.02-0.05	4.5-6.0	<2	Low-------	0.15			
	34-43	2-7	1.30-1.60	0.6-2.0	0.10-0.15	4.5-6.0	<2	Low-------	0.20			
	43-85	1-5	1.40-1.60	6.0-20	0.02-0.05	4.5-6.0	<2	Low-------	0.15			
30--------------- Immokalee	0-8	1-5	1.20-1.50	6.0-20	0.05-0.08	4.5-6.0	<2	Low-------	0.15	5	2	1-2
	8-36	1-5	1.45-1.70	6.0-20	0.02-0.05	4.5-6.0	<2	Low-------	0.15			
	36-50	2-7	1.30-1.60	0.6-2.0	0.10-0.15	4.5-6.0	<2	Low-------	0.20			
	50-80	1-5	1.40-1.60	6.0-20	0.02-0.05	4.5-6.0	<2	Low-------	0.15			
31--------------- Malabar	0-15	<4	1.20-1.55	6.0-20	0.03-0.08	5.6-8.4	<2	Low-------	0.20	5	---	1-2
	15-32	1-5	1.50-1.75	6.0-20	0.05-0.10	5.6-8.4	<2	Low-------	0.20			
	32-42	1-5	1.50-1.70	6.0-20	0.02-0.05	5.6-8.4	<2	Low-------	0.20			
	42-80	12-25	1.60-1.70	0.6-2.0	0.10-0.15	5.6-8.4	<2	Low-------	0.32			

See footnote at end of table.

TABLE 16.--PHYSICAL AND CHEMICAL PROPERTIES OF SOILS--Continued

Soil name and map symbol	Depth	Clay <2mm	Moist bulk density	Permea- bility	Available water capacity	Soil reaction	Salinity	Shrink- swell potential	Erosion factors K	Erosion factors T	Wind erodi- bility group	Organic matter
	In	Pct	G/cm3	In/hr	In/in	pH	Mmhos/cm					Pct
32---------------- Myakka	0-27	<2	1.36-1.44	6.0-20	0.02-0.05	3.6-6.5	<2	Low--------	0.20	5	2	1-2
	27-43	2-8	1.47-1.59	0.6-6.0	0.10-0.15	3.6-6.5	<2	Low--------	0.20			
	43-78	<2	1.48-1.61	6.0-20	0.02-0.05	3.6-6.5	<2	Low--------	0.17			
33---------------- Myakka	0-25	<2	1.36-1.44	6.0-20	0.02-0.05	3.6-6.5	<2	Low--------	0.20	5	2	1-2
	25-39	2-8	1.47-1.59	0.6-6.0	0.10-0.15	3.6-6.5	<2	Low--------	0.20			
	39-80	<2	1.48-1.61	6.0-20	0.02-0.05	3.6-6.5	<2	Low--------	0.17			
34*:												
Myakka-----------	0-27	<2	1.36-1.44	6.0-20	0.02-0.05	3.6-6.5	<2	Low--------	0.20	5	2	1-2
	27-43	2-8	1.47-1.59	0.6-6.0	0.10-0.15	3.6-6.5	<2	Low--------	0.20			
	43-78	<2	1.48-1.61	6.0-20	0.02-0.05	3.6-6.5	<2	Low--------	0.17			
St. Johns--------	0-10	---	---	6.0-20	0.10-0.15	4.5-5.5	<2	Low--------	0.20	5	---	---
	10-26	---	---	6.0-20	0.03-0.08	4.5-5.5	<2	Low--------	0.20			
	26-43	---	---	0.6-2.0	0.10-0.15	4.5-5.5	<2	Low--------	0.20			
	43-60	---	---	6.0-20	0.03-0.08	4.5-5.5	<2	Low--------	0.15			
35*:												
Myakka-----------	0-27	<2	1.36-1.44	6.0-20	0.02-0.05	3.6-6.5	<2	Low--------	0.20	5	2	1-2
	27-43	2-8	1.47-1.59	0.6-6.0	0.10-0.15	3.6-6.5	<2	Low--------	0.20			
	43-78	<2	1.48-1.61	6.0-20	0.02-0.05	3.6-6.5	<2	Low--------	0.17			
Urban land.												
36---------------- Myakka Variant	0-7	1-4	1.20-1.50	6.0-20	0.05-0.10	4.5-6.0	<2	Low--------	0.20	5	2	1-3
	7-28	1-4	1.40-1.70	6.0-20	0.02-0.05	4.5-6.0	<2	Low--------	0.20			
	28-40	1-6	1.40-1.60	0.6-2.0	0.10-0.15	4.5-6.0	<2	Low--------	0.20			
	40-45	1-5	1.40-1.70	2.0-6.0	0.05-0.10	6.1-7.3	<2	Low--------	0.17			
	45-80	1-4	1.40-1.70	6.0-20	0.02-0.05	6.6-8.4	<2	Low--------	0.17			
37---------------- Orsino	0-30	---	---	>20	0.02-0.08	4.5-6.0	<2	Very low	0.17	5	2	---
	30-80	---	---	>20	0.02-0.08	4.5-6.0	<2	Very low	0.17			
38---------------- Paisley	0-13	---	---	6.0-20	0.05-0.08	4.5-6.5	<2	Low--------	0.24	5	2	---
	13-70	---	---	0.06-0.2	0.15-0.18	5.6-8.4	<2	High-------	0.32			
39---------------- Palm Beach	0-80	---	---	>20	0.02-0.05	7.4-8.4	<2	Low--------	0.15	5	1	---
40*:												
Palm Beach-------	0-80	---	---	>20	0.02-0.05	7.4-8.4	<2	Low--------	0.15	5	1	---
Urban land.												
Paola------------	0-25	---	---	>20	0.02-0.05	4.5-5.0	<2	Very low	0.15	5	1	---
	25-80	---	---	>20	0.02-0.05	4.5-5.0	<2	Very low	0.15			
41*:												
Palm Beach-------	0-80	---	---	>20	0.02-0.05	7.4-8.4	<2	Low--------	0.15	5	1	---
Paola------------	0-26	---	---	>20	0.02-0.05	4.5-5.0	<2	Very low	0.15	5	1	---
	26-85	---	---	>20	0.02-0.05	4.5-5.0	<2	Very low	0.15			
42---------------- Paola	0-26	---	---	>20	0.02-0.05	4.5-5.0	<2	Very low	0.15	5	1	---
	26-85	---	---	>20	0.02-0.05	4.5-5.0	<2	Very low	0.15			
43---------------- Paola	0-30	---	---	>20	0.02-0.05	4.5-5.0	<2	Very low	0.15	5	1	---
	30-80	---	---	>20	0.02-0.05	4.5-5.0	<2	Very low	0.15			
44*:												
Paola------------	0-26	---	---	>20	0.02-0.05	4.5-5.0	<2	Very low	0.15	5	1	---
	26-85	---	---	>20	0.02-0.05	4.5-5.0	<2	Very low	0.15			
Urban land.												
45---------------- Pineda	0-40	1-3	1.40-1.65	6.0-20	0.02-0.05	5.6-7.3	<2	Low--------	0.17	5	2	.1-2
	40-96	12-25	1.50-1.70	2.0-6.0	0.10-0.15	6.6-8.4	<2	Low--------	0.24			

See footnote at end of table.

TABLE 16.--PHYSICAL AND CHEMICAL PROPERTIES OF SOILS--Continued

Soil name and map symbol	Depth	Clay <2mm	Moist bulk density	Permea- bility	Available water capacity	Soil reaction	Salinity	Shrink- swell potential	Erosion factors K	Erosion factors T	Wind erodi- bility group	Organic matter
	In	Pct	G/cm3	In/hr	In/in	pH	Mmhos/cm					Pct
46--------------- Pinellas	0-19	---	---	6.0-20	0.02-0.05	5.6-7.8	<2	Low--------	0.17	5	2	---
	19-29	---	---	6.0-20	0.10-0.15	6.6-7.8	<2	Low--------	0.17			
	29-45	---	---	0.6-2.0	0.10-0.15	6.6-8.4	<2	Low--------	0.24			
	45-60	---	---	6.0-20	0.02-0.05	7.9-8.4	<2	Low--------	0.17			
47*. Pits												
48--------------- Placid	0-15	<10	1.20-1.40	6.0-20	0.15-0.20	3.6-5.5	<2	Very low	0.17	5	2	2-10
	15-75	<10	1.30-1.60	6.0-20	0.05-0.08	3.6-6.5	<2	Very low	0.17			
49--------------- Pomona	0-5	1-6	1.20-1.50	6.0-20	0.05-0.10	3.6-5.5	<2	Low--------	0.20	5	2	1-2
	5-18	1-6	1.45-1.70	6.0-20	0.03-0.08	3.6-5.5	<2	Low--------	0.20			
	18-45	2-7	1.30-1.60	0.6-20	0.10-0.15	3.6-5.5	<2	Low--------	0.20			
	45-50	1-6	1.40-1.60	6.0-20	0.03-0.08	3.6-5.5	<2	Low--------	0.20			
	50-60	16-36	1.50-1.70	0.2-0.6	0.13-0.17	3.6-5.5	<2	Low--------	0.32			
50--------------- Pomona	0-7	1-6	1.20-1.50	6.0-20	0.05-0.10	3.6-5.5	<2	Low--------	0.20	5	2	1-2
	7-14	1-6	1.45-1.70	6.0-20	0.03-0.08	3.6-5.5	<2	Low--------	0.20			
	14-33	2-7	1.30-1.60	0.6-20	0.10-0.15	3.6-5.5	<2	Low--------	0.20			
	33-53	1-6	1.40-1.60	6.0-20	0.03-0.08	3.6-5.5	<2	Low--------	0.20			
	53-70	16-36	1.50-1.70	0.2-0.6	0.13-0.17	3.6-5.5	<2	Low--------	0.32			
51*:												
Pomona-----------	0-7	1-6	1.20-1.50	6.0-20	0.05-0.10	3.6-5.5	<2	Low--------	0.20	5	2	1-2
	7-14	1-6	1.45-1.70	6.0-20	0.03-0.08	3.6-5.5	<2	Low--------	0.20			
	14-33	2-7	1.30-1.60	0.6-20	0.10-0.15	3.6-5.5	<2	Low--------	0.20			
	33-53	1-6	1.40-1.60	6.0-20	0.03-0.08	3.6-5.5	<2	Low--------	0.20			
	53-70	16-36	1.50-1.70	0.2-0.6	0.13-0.17	3.6-5.5	<2	Low--------	0.32			
St. Johns--------	0-10	---	---	6.0-20	0.10-0.15	4.5-5.5	<2	Low--------	0.20	5	---	---
	10-27	---	---	6.0-20	0.03-0.08	4.5-5.5	<2	Low--------	0.20			
	27-45	---	---	0.6-2.0	0.10-0.15	4.5-5.5	<2	Low--------	0.20			
	45-75	---	---	6.0-20	0.03-0.08	4.5-5.5	<2	Low--------	0.15			
52--------------- Pompano	0-80	<5	1.30-1.65	>20	0.02-0.05	4.5-7.8	<2	Very low	0.17	5	2	1-5
53*:												
Pompano----------	0-80	<5	1.30-1.65	>20	0.02-0.05	4.5-7.8	<2	Very low	0.17	5	2	1-5
Placid-----------	0-15	<10	1.20-1.40	6.0-20	0.15-0.20	3.6-5.5	<2	Very low	0.17	5	2	2-10
	15-75	<10	1.30-1.60	6.0-20	0.05-0.08	3.6-6.5	<2	Very low	0.17			
54*. Quartzipsamments												
55--------------- Riviera	0-25	1-6	1.40-1.65	6.0-20	0.05-0.08	4.5-6.5	<2	Low--------	0.17	4	2	.1-2
	25-38	12-25	1.50-1.70	6.0-20	0.10-0.14	6.1-8.4	<2	Low--------	0.28			
	38-43	15-25	1.50-1.70	2.0-6.0	0.12-0.15	6.1-8.4	<2	Low--------	0.28			
	43-64	1-8	1.40-1.65	6.0-20	0.05-0.08	7.9-8.4	<2	Low--------	0.15			
56--------------- Samsula	0-36	---	---	6.0-20	0.20-0.25	4.5-5.5	<2	Low--------	---	---	2	---
	36-60	---	---	6.0-20	0.02-0.05	3.6-5.5	<2	Low--------	---			
57--------------- Satellite	0-80	<2	1.50-1.60	>20	0.02-0.05	4.5-7.8	<2	Very low	0.15	5	2	<1
58*:												
Satellite--------	0-80	<2	1.50-1.60	>20	0.02-0.05	4.5-7.8	<2	Very low	0.15	5	2	<1
Urban land.												
59--------------- Scoggin	4-0	0-2	0.20-0.30	6.0-20	0.20-0.25	4.5-5.5	<2	-----------	---	---	---	40-60
	0-7	1-4	1.30-1.45	6.0-20	0.10-0.15	3.6-6.5	<2	Low--------	0.20			
	7-36	1-4	1.50-1.70	6.0-20	0.02-0.05	3.6-6.5	<2	Low--------	0.20			
	36-49	12-28	1.60-1.75	0.6-2.0	0.10-0.15	4.5-5.5	<2	Low--------	0.24			
	49-54	5-20	1.50-1.65	2.0-6.0	0.05-0.10	4.5-5.5	<2	Low--------	0.20			

See footnote at end of table.

TABLE 16.--PHYSICAL AND CHEMICAL PROPERTIES OF SOILS--Continued

Soil name and map symbol	Depth	Clay <2mm	Moist bulk density	Permea-bility	Available water capacity	Soil reaction	Salinity	Shrink-swell potential	Erosion factors K	Erosion factors T	Wind erodi-bility group	Organic matter
	In	Pct	G/cm3	In/hr	In/in	pH	Mmhos/cm					Pct
60---------------- Smyrna	0-17	---	---	6.0-20	0.03-0.07	3.6-7.3	<2	Low--------	0.20	5	2	---
	17-27	---	---	0.6-6.0	0.10-0.15	3.6-7.3	<2	Low--------	0.20			
	27-80	---	---	6.0-20	0.03-0.07	4.5-5.5	<2	Low--------	0.17			
61---------------- St. Johns	0-10	---	---	6.0-20	0.10-0.15	4.5-5.5	<2	Low--------	0.20	5	---	---
	10-26	---	---	6.0-20	0.03-0.08	4.5-5.5	<2	Low--------	0.20			
	26-43	---	---	0.6-2.0	0.10-0.15	4.5-5.5	<2	Low--------	0.20			
	43-60	---	---	6.0-20	0.03-0.08	4.5-5.5	<2	Low--------	0.15			
62---------------- St. Lucie	0-80	<2	1.50-1.60	>20	0.02-0.05	3.6-7.3	<2	Very low	0.15	5	1	<1
63---------------- Tavares	0-80	---	---	>20	0.02-0.05	4.5-6.5	<2	Very low	0.17	5	2	---
64---------------- Tequesta	12-0	---	---	6.0-20	0.20-0.25	5.1-7.3	<2	Very low	---	---	2	---
	0-25	---	---	6.0-20	0.05-0.10	5.1-7.3	<2	Low--------	0.20			
	25-31	---	---	0.6-2.0	0.10-0.15	6.1-8.4	<2	Low--------	0.32			
	31-70	---	---	6.0-20	0.02-0.05	6.1-8.4	<2	Low--------	0.20			
65---------------- Terra Ceia	0-64	---	---	6.0-20	0.30-0.50	5.6-8.4	<2	Low--------	---	---	2	---
66---------------- Tomoka	0-34	---	---	6.0-20	0.30-0.50	3.6-4.4	<2	Very low	---	---	---	---
	34-39	---	---	6.0-20	0.05-0.10	3.6-4.4	<2	Very low	---			
	39-60	---	---	0.6-6.0	0.10-0.15	3.6-4.4	<2	Low--------	---			
67---------------- Turnbull	14-0	5-20	0.10-0.20	6.0-20	0.25-0.35	6.1-7.8	>16	Low--------	---	---	---	22-55
	0-36	60-85	---	<0.06	0.15-0.20	6.1-8.4	>16	High-------	---			
	36-80	3-12	1.40-1.60	6.0-20	0.05-0.10	6.1-8.4	>16	Low--------	---			
68---------------- Turnbull Variant	0-50	1-2	1.55-1.70	6.0-20	0.01-0.04	6.6-8.4	<2	Low--------	0.17	5	2	<.5
	50-55	1-5	0.20-0.40	0.6-2.0	0.20-0.25	5.6-7.3	>16	Low--------	0.17			
	55-60	40-80	1.60-1.75	0.06-0.2	0.10-0.15	6.6-8.4	>16	High-------	0.32			
69---------------- Tuscawilla	0-10	1-5	1.10-1.40	6.0-20	0.05-0.10	5.6-8.4	<2	Low--------	0.20	5	---	1-3
	10-40	14-30	1.25-1.55	0.6-2.0	0.08-0.12	6.6-8.4	<2	Low--------	0.24			
	40-62	1-7	1.55-1.70	6.0-20	0.03-0.08	7.4-8.4	<2	Low--------	0.20			
	62-80	1-7	1.55-1.70	6.0-20	0.03-0.08	7.4-8.4	<2	Low--------	0.20			
70*:												
Tuscawilla-------	0-10	1-5	1.10-1.40	6.0-20	0.05-0.10	5.6-8.4	<2	Low--------	0.20	5	---	1-3
	10-40	14-30	1.25-1.55	0.6-2.0	0.08-0.12	6.6-8.4	<2	Low--------	0.24			
	40-62	1-7	1.55-1.70	6.0-20	0.03-0.08	7.4-8.4	<2	Low--------	0.20			
	62-80	1-7	1.55-1.70	6.0-20	0.03-0.08	7.4-8.4	<2	Low--------	0.20			
Urban land.												
71*. Urban land												
72---------------- Valkaria	0-10	---	---	6.0-20	0.05-0.10	5.1-7.3	<2	Low--------	0.15	5	---	---
	10-35	---	---	6.0-20	0.03-0.08	5.1-7.3	<2	Low--------	0.15			
	35-48	---	---	6.0-20	0.05-0.10	5.1-8.4	<2	Low--------	0.15			
	48-75	---	---	6.0-20	0.03-0.08	5.1-8.4	<2	Low--------	0.15			
73, 74------------ Wabasso	0-24	---	---	6.0-20	0.02-0.05	4.5-6.5	<2	Low--------	0.20	5	2	---
	24-35	---	---	0.6-2.0	0.10-0.15	4.5-7.3	<2	Low--------	0.20			
	35-39	---	---	6.0-20	0.02-0.05	5.6-7.8	<2	Low--------	0.20			
	39-80	---	---	0.6-2.0	0.10-0.15	5.6-7.8	<2	Low--------	0.24			
75---------------- Wauchula	0-7	<2	1.36-1.44	6.0-20	0.08-0.15	3.6-6.5	<2	Low--------	0.20	5	2	1-2
	7-20	<2	1.48-1.61	6.0-20	0.02-0.05	3.6-6.5	<2	Low--------	0.20			
	20-29	2-8	1.47-1.59	0.6-2.0	0.15-0.25	3.6-5.5	<2	Low--------	0.20			
	29-34	<2	1.48-1.61	6.0-20	0.08-0.10	4.5-5.5	<2	Low--------	0.20			
	34-80	15-30	1.60-1.69	0.6-2.0	0.11-0.17	4.5-5.5	<2	Low--------	0.37			

See footnote at end of table.

TABLE 16.--PHYSICAL AND CHEMICAL PROPERTIES OF SOILS--Continued

Soil name and map symbol	Depth	Clay <2mm	Moist bulk density	Permea- bility	Available water capacity	Soil reaction	Salinity	Shrink- swell potential	Erosion factors K	Erosion factors T	Wind erodi- bility group	Organic matter
	In	Pct	G/cm3	In/hr	In/in	pH	Mmhos/cm					Pct
76---------------- Wauchula	0-7	<2	1.36-1.44	6.0-20	0.08-0.15	3.6-6.5	<2	Low--------	0.20	5	2	1-2
	7-22	<2	1.48-1.61	6.0-20	0.02-0.05	3.6-6.5	<2	Low--------	0.20			
	22-31	2-8	1.47-1.59	0.6-6.0	0.15-0.25	3.6-5.5	<2	Low--------	0.20			
	31-37	<2	1.48-1.61	6.0-20	0.08-0.10	4.5-5.5	<2	Low--------	0.20			
	37-60	15-30	1.60-1.69	0.6-6.0	0.11-0.17	4.5-5.5	<2	Low--------	0.37			
77---------------- Winder	0-12	---	---	6.0-20	0.03-0.08	5.6-7.8	<2	Low--------	0.20	5	2	---
	12-35	---	---	0.06-0.2	0.10-0.15	6.6-8.4	<2	Low--------	0.32			
	35-53	---	---	0.06-2.0	0.06-0.12	7.4-8.4	<2	Low--------	0.32			
	53-80	---	---	0.06-0.2	0.03-0.06	7.4-8.4	<2	Low--------	0.32			

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 17.--SOIL AND WATER FEATURES

[The definitions of "flooding" and "water table" in the Glossary explain terms such as "rare," "brief," "apparent," and "perched." The symbol < means less than; > means more than. Absence of an entry indicates that the feature is not a concern]

Soil name and map symbol	Hydro-logic group	Flooding			High water table			Bedrock		Subsidence		Risk of corrosion	
		Frequency	Duration	Months	Depth	Kind	Months	Depth	Hard-ness	Ini-tial	Total	Uncoated steel	Concrete
					Ft			In		In	In		
1, 2-------------- Apopka	A	None--------	---	---	>6.0	---	---	>60	---	---	---	Moderate	High.
3*. Arents													
4, 5-------------- Astatula	A	None--------	---	---	>6.0	---	---	>60	---	---	---	Low------	High.
6*:													
Astatula---------	A	None--------	---	---	>6.0	---	---	>60	---	---	---	Low------	High.
Urban land.													
7----------------- Astor**	D	Common------	Very long	Jun-Jan	+2-0	Apparent	Jun-Jan	>60	---	---	---	High-----	Low.
8----------------- Basinger**	A/D	None--------	---	---	+2-1.0	Apparent	Jun-Feb	>60	---	---	---	High-----	Moderate.
9*. Beaches													
10---------------- Bluff	D	Common------	Long------	Jun-Nov	0-1.0	Apparent	Jul-Dec	>60	---	---	---	High-----	Low.
11---------------- Bulow	A	None--------	---	---	>6.0	---	---	42-60	Rip-pable	---	---	Low------	Low.
12---------------- Canaveral	C	None--------	---	---	1.0-3.0	Apparent	Jun-Nov	>60	---	---	---	Moderate	Low.
13---------------- Cassia	C	None--------	---	---	1.5-3.5	Apparent	Jul-Jan	>60	---	---	---	Moderate	High.
14---------------- Chobee	B/D	Frequent----	Very long	Jun-Feb	0-1.0	Apparent	Jun-Feb	>60	---	---	---	Moderate	Low.
15---------------- Cocoa	A	None--------	---	---	>6.0	---	---	20-40	Hard	---	---	Low------	Low.
16*:													
Cocoa------------	A	None--------	---	---	>6.0	---	---	20-40	Hard	---	---	Low------	Low.
Urban land.													
17---------------- Daytona	B	None--------	---	---	3.5-5.0	Apparent	Jul-Nov	>60	---	---	---	Moderate	High.

See footnotes at end of table.

TABLE 17.--SOIL AND WATER FEATURES--Continued

Soil name and map symbol	Hydro-logic group	Flooding			High water table			Bedrock		Subsidence		Risk of corrosion	
		Frequency	Duration	Months	Depth	Kind	Months	Depth	Hard-ness	Ini-tial	Total	Uncoated steel	Concrete
					Ft			In		In	In		
18*:													
Daytona----------	B	None---------	---	---	3.5-5.0	Apparent	Jul-Nov	>60	---	---	---	Moderate	High.
Urban land.													
19---------------- Deland	A	None---------	---	---	>6.0	---	---	>60	---	---	---	Low-------	High.
20---------------- EauGallie	B/D	None---------	---	---	0-1.0	Apparent	Jun-Feb	>60	---	---	---	High-----	Moderate.
21---------------- EauGallie**	B/D	None---------	---	---	+1-1.0	Apparent	Jun-Sep	>60	---	---	---	High-----	Moderate.
22---------------- Electra	C	None---------	---	---	2.0-3.5	Apparent	Jul-Oct	>60	---	---	---	Low-------	High.
23---------------- Farmton	D	None---------	---	---	0-1.0	Apparent	Jun-Oct	>60	---	---	---	High-----	High.
24* Fluvaquents													
25---------------- Gator**	D	Frequent----	Very long	Jun-Apr	+1-0	Apparent	Jun-Mar	>60	---	2-6	20-28	High-----	High.
26---------------- Holopaw	B/D	None---------	---	---	0-1.0	Apparent	Jun-Nov	>60	---	---	---	High-----	Moderate.
27---------------- Hontoon**	A/D	None---------	---	---	+2-1.0	Apparent	Jan-Dec	>60	---	4-8	>52	High-----	High.
28* Hydraquents													
29---------------- Immokalee	A/D	None---------	---	---	0-1.0	Apparent	Jun-Feb	>60	---	---	---	High-----	High.
30---------------- Immokalee**	A/D	None---------	---	---	+2-1.0	Apparent	Jun-Sep	>60	---	---	---	High-----	High.
31---------------- Malabar	B/D	None---------	---	---	0-1.0	Apparent	Jun-Sep	>60	---	---	---	High-----	Low.
32---------------- Myakka	A/D	None---------	---	---	0-1.0	Apparent	Jun-Feb	>60	---	---	---	High-----	High.
33---------------- Myakka**	A/D	None---------	---	---	+2-1.0	Apparent	Jun-Sep	>60	---	---	---	High-----	High.

See footnotes at end of table.

TABLE 17.--SOIL AND WATER FEATURES--Continued

Soil name and map symbol	Hydro- logic group	Flooding			High water table			Bedrock		Subsidence		Risk of corrosion	
		Frequency	Duration	Months	Depth	Kind	Months	Depth	Hard- ness	Ini- tial	Total	Uncoated steel	Concrete
					Ft			In		In	In		
34*:													
Myakka**----------	A/D	None--------	---	---	+2-1.0	Apparent	Jun-Feb	>60	---	---	---	High-----	High.
St. Johns**------	B/D	None--------	---	---	+2-1.0	Apparent	Jun-Apr	>60	---	---	---	High-----	High.
35*:													
Myakka-----------	A/D	None--------	---	---	0-1.0	Apparent	Jun-Sep	>60	---	---	---	High-----	High.
36----------------- Myakka Variant	D	None--------	---	---	0-1.0	Apparent	Jul-Oct	>60	---	---	---	High-----	High.
37----------------- Orsino	A	None--------	---	---	3.5-5.0	Apparent	Jun-Dec	>60	---	---	---	Low------	Moderate.
38----------------- Paisley	D	Rare--------	---	---	0-1.0	Apparent	Jun-Nov	>60	---	---	---	High-----	Moderate.
39----------------- Palm Beach	A	None--------	---	---	>6.0	---	---	>60	---	---	---	Low------	Low.
40*:													
Palm Beach-------	A	None--------	---	---	>6.0	---	---	>60	---	---	---	Low------	Low.
Urban land.													
Paola------------	A	None--------	---	---	>6.0	---	---	>60	---	---	---	Low------	High.
41*:													
Palm Beach-------	A	None--------	---	---	>6.0	---	---	>60	---	---	---	Low------	Low.
Paola------------	A	None--------	---	---	>6.0	---	---	>60	---	---	---	Low------	High.
42, 43------------ Paola	A	None--------	---	---	>6.0	---	---	>60	---	---	---	Low------	High.
44*:													
Paola------------	A	None--------	---	---	>6.0	---	---	>60	---	---	---	Low------	High.
Urban land.													
45----------------- Pineda	B/D	Rare--------	---	---	0-1.0	Apparent	Jun-Nov	>60	---	---	---	High-----	Low.
46----------------- Pinellas	B/D	None--------	---	---	0-1.0	Apparent	Jun-Nov	>60	---	---	---	High-----	Low.
47*. Pits													
48----------------- Placid	A/D	None--------	---	---	+2-1.0	Apparent	Jun-Mar	>60	---	---	---	High-----	High.

See footnotes at end of table.

TABLE 17.--SOIL AND WATER FEATURES--Continued

Soil name and map symbol	Hydro-logic group	Flooding			High water table			Bedrock		Subsidence		Risk of corrosion	
		Frequency	Duration	Months	Depth	Kind	Months	Depth	Hard-ness	Ini-tial	Total	Uncoated steel	Concrete
					Ft			In		In	In		
49----------------- Pomona	B/D	None---------	---	---	0-1.0	Apparent	Jul-Sep	>60	---	---	---	High-----	High.
50----------------- Pomona*	B/D	None---------	---	---	+2-1.0	Apparent	Jul-Sep	>60	---	---	---	High-----	High.
51*:													
Pomona**---------	B/D	None---------	---	---	+2-1.0	Apparent	Jul-Sep	>60	---	---	---	High-----	High.
St. Johns**------	B/D	None---------	---	---	+2-1.0	Apparent	Jun-Apr	>60	---	---	---	High-----	High.
52----------------- Pompano	A/D	None---------	---	---	0-1.0	Apparent	Jun-Nov	>60	---	---	---	High-----	Moderate.
53*:													
Pompano**--------	A/D	None---------	---	---	+2-1.0	Apparent	Jun-Nov	>60	---	---	---	High-----	Moderate.
Placid**---------	A/D	None---------	---	---	+2-1.0	Apparent	Jun-Mar	>60	---	---	---	High-----	High.
54*. Quartzipsamments													
55----------------- Riviera	B/D	None---------	---	---	0-1.0	Apparent	Jun-Dec	>60	---	---	---	High-----	High.
56----------------- Samsula**	A/D	None---------	---	---	+2-1.0	Apparent	Jan-Dec	>60	---	16-20	30-36	High-----	High.
57----------------- Satellite	C	None---------	---	---	1.0-3.5	Apparent	Jun-Nov	>60	---	---	---	Low------	Moderate.
58*:													
Satellite--------	C	None---------	---	---	1.0-3.5	Apparent	Jun-Nov	>60	---	---	---	Low------	Moderate.
Urban land.													
59----------------- Scoggin**	D	None---------	---	---	+1-1.0	Apparent	Jun-Feb	>60	---	---	---	High-----	High.
60----------------- Smyrna	A/D	None---------	---	---	0-1.0	Apparent	Jul-Oct	>60	---	---	---	High-----	High.
61----------------- St. Johns	B/D	None---------	---	---	0-1.0	Apparent	Jun-Apr	>60	---	---	---	High-----	High.
62----------------- St. Lucie	A	None---------	---	---	>6.0	---	---	>60	---	---	---	Low------	Moderate.
63----------------- Tavares	A	None---------	---	---	3.5-6.0	Apparent	Jun-Dec	>60	---	---	---	Low------	High.

See footnotes at end of table.

TABLE 17.--SOIL AND WATER FEATURES--Continued

Soil name and map symbol	Hydrologic group	Flooding			High water table			Bedrock		Subsidence		Risk of corrosion	
		Frequency	Duration	Months	Depth	Kind	Months	Depth	Hardness	Initial	Total	Uncoated steel	Concrete
					Ft			In		In	In		
64----------------- Tequesta**	B/D	None---------	---	---	+2-1.0	Marsh	Jan-Dec	>60	---	3-6	8-12	High------	Low.
65----------------- Terra Ceia**	A/D	None---------	---	---	+1-1.0	Marsh	Jun-Apr	>60	Hard	4-8	50-60	Moderate	Moderate.
66----------------- Tomoka**	A/D	None---------	---	---	+1-0	Marsh	Jun-Apr	>60	---	---	24	High------	High.
67----------------- Turnbull**	D	Frequent-----	Very long	Jan-Dec	+2-1.0	Apparent	Jan-Dec	>60	---	12-14	14-24	High------	High.
68----------------- Turnbull Variant	C	None---------	---	---	1.0-3.0	Apparent	Jan-Dec	>60	---	---	---	High------	High.
69----------------- Tuscawilla	D	None---------	---	---	0-1.0	Apparent	Jul-Sep	>60	---	---	---	High------	Low.
70*: Tuscawilla--------	D	None---------	---	---	0-1.0	Apparent	Jul-Sep	>60	---	---	---	High------	Low.
Urban land.													
71*. Urban land													
72----------------- Valkaria	B/D	Common-------	Very long	Jun-Sep	0-1.0	Apparent	Jun-Sep	>60	---	---	---	High------	Moderate.
73----------------- Wabasso	B/D	None---------	---	---	0-1.0	Apparent	Jun-Oct	>60	---	---	---	Moderate	High.
74----------------- Wabasso**	B/D	None---------	---	---	+2-1.0	Apparent	Jun-Oct	>60	---	---	---	Moderate	High.
75----------------- Wauchula	B/D	None---------	---	---	0-1.0	Apparent	Jun-Feb	>60	---	---	---	High------	High.
76----------------- Wauchula**	B/D	None---------	---	---	+1-1.0	Apparent	Jun-Sep	>60	---	---	---	High------	High.
77----------------- Winder	B/D	Frequent-----	Long-------	Jul-Oct	0-1.0	Apparent	Jun-Dec	>60	---	---	---	High------	Low.

* See description of the map unit for composition and behavior characteristics of the map unit.
** A plus sign under "Depth to high water table" indicates that the water table is above the surface of the soil.

TABLE 18.--PHYSICAL PROPERTIES OF SELECTED SOILS

Soil series and sample numbers	Depth	Horizon	Particle size distribution (Percent less than 2 mm): Sand: Very coarse (2.0-1.0)	Sand: Coarse (1.0-0.5)	Sand: Medium (0.5-0.25)	Sand: Fine (0.25-0.1)	Sand: Very fine (0.1-0.05)	Sand: Total (2.0-0.05)	Silt (0.05-0.002)	Clay (<0.002)	Textural class	Hydr. cond. (sat.)	Bulk density field moist	Water content: 1/10 bar	Water content: 1/3 bar	Water content: 15 bar
	In											Cm/hr	G/cc	----Pct (wt)----		
Astatula:																
S73FL064-4-1	0-4	A	0.0	0.5	10.2	81.1	5.4	97.2	1.3	1.5	fine sand	36.2	1.43	16.3	11.6	1.4
S73FL064-4-2	4-10	C1	0.0	0.5	9.7	82.1	5.6	97.9	1.1	1.0	fine sand	56.5	1.42	4.9	3.1	0.8
S73FL064-4-3	10-22	C2	0.0	0.5	9.4	82.2	5.9	98.0	1.0	1.0	fine sand	56.5	1.41	3.1	1.6	0.5
S73FL064-4-4	22-41	C3	0.0	0.6	10.3	82.6	5.3	98.8	0.3	0.9	fine sand	55.2	1.47	2.9	1.4	0.5
S73FL064-4-5	41-57	C4	0.0	0.6	10.7	82.9	4.4	98.6	0.6	0.8	fine sand	60.5	1.48	2.4	1.0	0.3
S73FL064-4-6	57-92	C5	0.0	0.6	11.3	82.3	4.2	98.9	0.6	0.5	fine sand	64.4	1.49	2.3	0.8	0.3
Bulow:																
S75FL127-17-1	0-5	A1	0.5	15.3	51.6	29.1	1.1	97.6	1.6	0.8	sand	152.0	1.34	7.0	5.6	1.6
S75FL127-17-2	5-20	A2	0.9	15.4	51.3	30.3	0.9	98.8	0.6	0.6	sand	155.0	1.34	5.8	4.9	1.4
S75FL127-17-3	20-25	B11	0.7	15.7	51.2	29.5	1.0	98.1	1.0	0.9	sand	135.0	1.43	3.9	3.2	0.9
S75FL127-17-4	25-45	B12	0.6	13.5	47.1	35.0	1.2	97.4	1.1	1.5	sand	147.0	1.57	3.9	3.2	0.7
S75FL127-17-5	45-50	B2t	0.6	7.7	34.7	29.0	1.0	73.0	1.0	26.0	sandy clay loam	10.2	1.60	15.6	13.9	9.4
Daytona:																
S74FL127-15-1	0-5	A1	0.0	3.9	44.5	45.9	1.5	95.8	2.4	1.7	sand	67.3	1.26	9.1	8.1	3.5
S74FL127-15-2	5-21	A2	0.0	3.7	45.3	47.7	1.6	98.4	0.9	0.7	sand	59.8	1.57	3.3	3.0	0.9
S74FL127-15-3	21-36	A2	0.0	3.9	43.8	47.7	1.9	97.4	1.2	1.3	sand	48.0	1.55	2.7	2.4	0.7
S74FL127-15-4	36-38	B2h	0.0	3.6	42.5	44.9	1.8	92.9	2.6	4.5	sand	28.6	1.44	9.0	7.2	2.8
S74FL127-15-5	38-47	B3&Bh	0.1	3.7	43.5	45.9	1.7	94.9	2.1	3.0	sand	36.8	1.51	6.9	5.9	2.2
S74FL127-15-6	47-80	C	0.0	3.9	42.9	48.8	1.5	97.1	1.4	1.5	sand	25.0	1.65	4.4	2.7	0.5
Deland:																
S76FL127-28-1	0-4	A1	0.0	0.9	13.3	82.7	1.5	98.4	1.4	0.2	fine sand	33.0	1.42	6.7	4.8	2.6
S76FL127-28-2	4-10	A21	0.0	0.9	11.9	84.0	1.6	98.4	1.0	0.6	fine sand	27.6	1.53	5.4	3.9	1.0
S76FL127-28-3	10-19	A22	0.0	0.8	11.5	83.2	1.6	97.1	1.8	1.1	fine sand	27.6	1.49	7.4	5.9	0.9
S76FL127-28-4	19-36	A23	0.0	0.9	11.9	83.6	1.4	97.8	1.4	0.8	fine sand	48.6	1.46	4.7	2.8	0.5
S76FL127-28-5	36-55	A24	0.0	0.8	11.5	84.7	1.3	98.3	1.1	0.6	fine sand	57.8	1.48	4.1	2.4	0.3
S76FL127-28-6	55-67	B1h	0.0	1.4	10.5	81.6	0.9	94.4	3.8	1.8	fine sand	25.0	1.44	6.0	4.1	0.7
S76FL127-28-7	67-78	B21h	0.0	0.7	7.4	84.0	1.0	93.1	6.6	0.3	fine sand	3.7	1.39	24.5	17.5	2.4
S76FL127-28-8	78-89	B22h	0.1	1.3	13.3	77.4	0.7	92.8	6.7	0.5	fine sand	3.4	1.42	24.6	16.7	2.7
S76FL127-28-9	89-96	B23h	0.0	0.8	7.0	83.1	1.9	92.8	6.5	0.7	fine sand	--	--	--	--	--
Farmton:*																
S76FL127-26-1	0-6	Ap	0.0	0.6	12.0	79.5	4.8	96.9	2.5	0.6	fine sand	31.6	1.37	8.1	5.6	2.9
S76FL127-26-2	6-34	A2	0.0	0.7	10.5	81.6	4.8	97.6	2.0	0.4	fine sand	31.9	1.46	4.5	2.9	1.4
S76FL127-26-3	34-56	B2h	0.0	0.6	10.0	77.6	4.7	92.9	3.9	3.2	fine sand	2.2	1.54	24.2	12.4	4.6
S76FL127-26-4	56-81	B2tg	0.0	0.6	8.9	69.1	3.9	82.5	2.6	14.9	fine sandy loam	0.5	1.63	20.3	15.4	6.3
Gator:*																
S76FL127-32-1	0-10	Oa1	--	--	--	--	--	--	--	--	--	--	--	--	--	--
S76FL127-32-2	10-22	Oa2	--	--	--	--	--	--	--	--	--	--	--	--	--	--
S76FL127-32-3	22-26	IIC1	0.0	0.0	4.8	72.1	6.2	83.1	10.1	6.8	loamy fine sand	--	--	--	--	--
S76FL127-32-4	26-32	IIC2	0.0	0.0	3.9	72.4	6.0	82.3	10.3	7.4	loamy fine sand	--	--	--	--	--
S76FL127-32-5	32-74	IIIC3	0.0	0.0	3.1	66.3	6.3	72.7	11.1	13.2	fine sandy loam	--	--	--	--	--

See footnote at end of table.

TABLE 18.--PHYSICAL PROPERTIES OF SELECTED SOILS--Continued

Soil series and sample numbers	Depth	Horizon	Particle size distribution (Percent less than 2 mm): Sand: Very coarse (2.0-1.0)	Sand: Coarse (1.0-0.5)	Sand: Medium (0.5-0.25)	Sand: Fine (0.25-0.1)	Sand: Very fine (0.1-0.05)	Sand: Total (2.0-0.05)	Silt (0.05-0.002)	Clay <0.002	Textural class	Hydr. cond. (sat.)	Bulk density field moist	Water content: 1/10 bar	Water content: 1/3 bar	Water content: 15 bar
	In											Cm/hr	G/cc	----Pct (wt)----		
Immokalee:																
S76FL127-8-1	0-5	A11	0.3	15.0	63.0	17.2	0.7	96.2	2.6	1.2	sand	39.0	1.24	10.5	8.0	2.3
S76FL127-8-2	5-10	A12	0.4	13.3	61.4	21.4	1.5	98.0	1.6	0.4	sand	05.0	1.37	7.4	5.3	2.1
S76FL127-8-3	10-16	A21	0.5	14.5	63.9	18.7	0.8	98.4	0.2	1.4	sand	12.0	1.44	4.2	2.9	1.2
S76FL127-8-4	16-34	A22	0.7	14.9	60.1	21.4	1.3	98.4	0.3	1.3	sand	73.6	1.58	3.1	2.2	1.2
S76FL127-8-5	34-39	B21h	0.9	11.8	47.8	18.8	2.3	81.4	14.1	4.5	loamy sand	5.0	1.10	44.5	33.2	4.9
S76FL127-8-6	39-43	B22h	1.3	15.4	50.0	20.7	1.9	89.3	7.0	3.7	sand	10.5	1.42	21.0	15.3	2.9
S76FL127-8-7	43-85	C	1.3	14.5	55.2	24.4	1.7	97.1	1.4	1.5	sand	--	--	--	--	--
Malabar:																
S75FL127-23-1	0-2	A1	0.0	0.3	11.3	65.2	12.8	89.6	7.6	2.9	fine sand	17.0	1.18	23.4	17.8	5.4
S75FL127-23-2	2-9	A21	0.0	1.8	20.8	67.8	7.9	98.3	1.6	0.1	fine sand	22.6	1.52	6.3	4.3	1.5
S75FL127-23-3	9-15	A22	0.1	2.2	22.2	66.0	8.1	98.6	1.1	0.3	fine sand	28.0	1.52	3.9	2.7	1.5
S75FL127-23-4	15-24	B2ir	0.0	2.0	19.7	65.7	7.9	95.3	1.9	2.8	fine sand	21.7	1.56	6.0	3.9	1.7
S75Fl127-23-5	24-32	B3ir	0.0	1.9	19.2	66.3	7.9	95.3	2.6	2.1	fine sand	5.0	1.74	9.0	5.0	1.9
S75FL127-23-6	32-42	A'2	0.0	1.9	18.7	66.0	8.0	94.6	2.4	3.0	fine sand	7.5	1.65	7.2	4.2	1.1
S75FL127-23-7	42-53	B'21tg	0.1	1.8	16.5	56.1	7.1	81.5	2.5	16.0	fine sandy loam	6.8	1.68	19.6	18.4	8.6
S75FL127-23-8	53-80	B'22tg	0.0	1.3	14.3	60.3	9.5	85.4	2.2	12.4	loamy fine sand	1.0	1.65	19.2	16.5	7.9
Myakka:																
S74FL127-16-1	0-5	A1	0.1	1.5	18.1	69.4	3.1	92.2	5.7	2.1	fine sand	48.9	1.27	11.0	8.5	3.4
S74FL127-16-2	5-27	A2	0.2	2.1	17.8	74.3	4.1	98.5	0.7	0.8	fine sand	34.8	1.54	3.8	2.8	1.2
S74FL127-16-3	27-31	B21h	0.2	2.0	15.5	63.5	3.5	84.7	6.2	9.1	loamy fine sand	6.2	1.23	39.5	32.1	5.4
S74FL127-16-4	31-43	B22h	0.1	2.1	16.8	69.5	3.9	92.4	1.4	6.2	fine sand	2.0	1.43	18.8	14.1	3.8
S74FL127-16-5	43-78	B3&Bh	0.1	2.1	17.2	71.6	3.8	94.8	1.1	4.1	fine sand	--	--	--	--	--
S74FL127-16-6	78-90	B'2h	0.1	1.9	15.0	73.0	4.2	94.2	1.3	4.5	fine sand	--	--	--	--	--
Paola:																
S74FL127-6-1	0-6	A1	0.1	2.8	35.7	57.5	1.0	97.1	1.5	1.4	fine sand	62.4	1.39	5.2	3.4	1.3
S74FL127-6-2	6-15	A21	0.0	2.5	33.4	61.3	1.5	98.7	0.6	0.7	fine sand	70.3	1.50	2.6	1.8	1.2
S74FL127-6-3	15-26	A22	0.0	2.2	29.9	64.3	1.9	98.3	0.3	1.4	fine sand	65.7	1.44	2.6	2.0	0.8
S74FL127-6-4	26-45	B&A	0.0	2.4	31.2	62.2	1.8	97.6	0.8	1.6	fine sand	70.3	1.50	3.3	2.1	0.7
S74FL127-6-5	45-64	B&A	0.1	2.4	32.5	61.2	1.6	97.8	1.1	1.1	fine sand	70.3	1.50	3.3	2.1	0.7
S74FL127-6-6	64-85	C	0.1	3.0	34.4	58.5	1.6	97.6	0.1	2.3	fine sand	53.2	1.50	3.6	2.4	0.8
Smyrna:																
S74FL127-11-1	0-4	A1	0.0	0.2	1.8	81.8	3.2	87.0	8.9	4.1	fine sand	10.5	1.19	19.8	14.6	6.0
S74FL127-11-2	4-8	A21	0.0	0.2	1.6	88.9	3.6	94.3	3.7	2.0	fine sand	18.0	1.50	7.9	5.0	2.8
S74FL127-11-3	8-17	A22	0.0	0.1	1.5	91.9	3.8	97.3	1.4	1.3	fine sand	25.9	1.49	4.6	2.6	1.0
S74FL127-11-4	17-19	B21h	0.0	0.1	1.4	89.3	3.5	94.3	2.3	3.3	fine sand	--	--	--	--	--
S74FL127-11-5	19-24	B22h	0.0	0.2	2.9	82.3	2.1	87.5	7.5	5.0	fine sand	8.7	1.29	18.2	14.7	5.2
S74FL127-11-6	24-27	B23h	0.0	0.2	1.4	86.8	2.9	91.3	3.8	4.9	fine sand	18.2	1.35	13.6	10.8	4.3
S74FL127-11-7	27-50	C1	0.0	0.1	1.3	90.6	2.8	94.8	2.2	3.0	fine sand	14.9	1.47	9.3	6.4	1.4
S74FL127-11-8	50-72	C2	0.0	0.0	0.5	95.5	3.4	99.4	0.0	0.6	fine sand	--	--	--	--	--

See footnote at end of table.

TABLE 18.--PHYSICAL PROPERTIES OF SELECTED SOILS--Continued

Soil series and sample numbers	Depth	Horizon	Particle size distribution (Percent less than 2 mm): Sand: Very coarse (2.0-1.0)	Coarse (1.0-0.5)	Medium (0.5-0.25)	Fine (0.25-0.1)	Very fine (0.1-0.05)	Total (2.0-0.05)	Silt (0.05-0.002)	Clay <0.002	Textural class	Hydr. cond. (sat.)	Bulk density field moist	Water content: 1/10 bar	1/3 bar	15 bar
	In											Cm/hr	G/cc	Pct (wt)		
Tavares:																
S74FL127-14-1	0-8	A1	0.1	1.3	12.1	76.2	6.6	96.3	1.7	2.0	fine sand	41.1	1.33	5.9	4.5	1.3
S74FL127-14-2	8-24	C1	0.0	1.3	11.9	77.5	6.9	97.6	0.8	1.4	fine sand	41.4	1.40	4.3	2.8	0.7
S74FL127-14-3	24-48	C2	0.0	1.3	11.9	78.5	6.7	98.4	0.0	1.6	fine sand	33.2	1.49	3.3	2.2	0.5
S74FL127-14-4	48-64	C3	0.1	1.2	11.3	79.4	6.6	98.6	0.0	1.4	fine sand	31.5	1.52	3.0	2.2	0.4
S74FL127-14-5	64-80	C3	0.1	1.1	70.6	26.6	0.8	99.2	0.0	0.8	sand	46.3	1.42	2.7	2.0	0.5
Turnbull:																
S74FL127-30-1	14-0	01	--	--	--	--	--	--	--	--	--	--	--	--	--	--
S74FL127-30-2	0-36	C1g	0.0	0.1	0.5	5.4	3.2	9.2	16.6	74.2	clay	--	--	--	--	--
S74FL127-30-3	36-66	C2g	0.0	1.3	1.9	65.0	18.6	86.8	4.4	8.8	loamy fine sand	--	--	--	--	--
Tuscawilla:																
S74FL127-18-1	0-3	A1	0.1	1.5	11.4	71.4	3.3	87.7	11.3	1.0	fine sand	81.1	1.07	17.2	14.3	7.7
S75FL127-18-2	3-10	A2	0.2	1.7	11.8	75.3	5.2	94.2	3.6	2.3	fine sand	19.8	1.38	5.6	4.7	2.2
S75FL127-18-3	10-13	B21t	0.1	1.3	9.1	66.2	5.2	81.9	4.1	14.0	fine sandy loam	0.6	1.50	14.4	12.9	6.6
S75FL127-18-4	13-32	B22tca	0.1	1.0	6.2	43.4	2.9	53.6	26.9	19.5	fine sandy loam	0.4	1.25	30.7	25.8	18.8
S75FL127-18-5	32-40	B23tca	1.0	3.2	8.2	60.2	6.0	78.6	6.7	14.7	fine sandy loam	3.6	1.48	14.7	11.7	7.2
S75FL127-18-6	40-62	IIC1	0.1	0.6	8.3	83.0	4.5	96.5	1.2	2.3	fine sand	23.6	1.57	9.0	6.0	1.5
S75FL127-18-7	62-68	IIC2	0.1	0.2	10.9	85.6	1.8	98.6	0.8	0.6	fine sand	--	--	--	--	--
S75FL127-18-8	68-80	IIC3ca	1.3													
Wabasso:																
S75FL127-24-1	0-7	A1	0.0	0.9	13.9	67.5	10.3	92.6	4.3	3.1	fine sand	16.8	1.44	9.1	6.4	2.5
S75FL127-24-2	7-12	A21	0.0	0.8	12.3	71.5	11.9	96.5	2.9	0.6	fine sand	23.8	1.43	6.0	3.8	1.4
S75FL127-24-3	12-24	A22	0.0	1.0	11.9	72.8	11.9	97.6	2.2	0.2	fine sand	23.0	1.48	12.9	10.2	1.2
S75FL127-24-4	24-30	B21h	0.0	0.8	9.2	65.9	11.6	87.5	6.6	5.9	loamy fine sand	0.7	1.78	16.5	13.8	4.0
S75FL127-24-5	30-35	B22h	0.0	1.0	8.9	70.3	11.9	92.1	4.5	3.4	fine sand	1.6	1.56	18.7	13.1	4.4
S75FL127-24-6	35-39	B3	0.0	0.7	8.3	72.8	13.2	95.0	3.0	2.0	fine sand	4.8	1.60	9.7	6.4	1.6
S75FL127-24-7	39-51	B'21tg	0.0	0.7	8.5	58.3	11.3	78.8	1.4	9.8	fine sand	0.0	1.74	19.0	16.9	9.2
S75FL127-24-8	51-72	B'22tg	0.1	0.4	4.5	50.8	15.1	70.9	5.1	24.0	sandy clay loam	0.0	1.70	20.4	17.2	10.6
S75FL127-24-9	72-80	B'23tg	0.9	0.7	2.3	40.8	20.9	65.6	7.5	26.9	sandy clay loam	0.0	1.68	21.5	18.6	13.8
Wauchula:																
S73FL064-1-1	0-3	A11	0.0	0.5	5.8	62.2	14.4	82.9	14.7	2.4	loamy fine sand	17.5	1.25	20.0	14.4	4.2
S73FL064-1-2	3-7	A12	0.0	0.5	6.2	67.1	17.2	91.0	8.1	0.9	fine sand	17.1	1.42	7.6	4.3	1.1
S73FL064-1-3	7-13	A21	0.0	0.4	5.7	68.2	18.2	92.5	6.5	1.0	fine sand	12.5	1.42	11.2	3.8	0.7
S73FL064-1-4	13-20	A22	0.0	0.5	5.2	67.0	18.9	91.6	7.3	1.1	fine sand	11.8	1.54	6.3	2.5	0.6
S73FL064-1-5	20-25	B21h	0.0	0.5	4.6	60.2	17.5	82.8	9.5	7.7	loamy fine sand	2.5	1.42	25.9	22.0	4.2
S73FL064-1-6	25-29	B22h	0.0	0.5	5.0	63.2	18.2	86.9	7.5	5.6	loamy fine sand	7.3	1.40	23.1	15.5	3.6
S73FL064-1-7	29-34	B3	0.1	0.5	5.0	64.5	18.5	88.6	7.1	4.3	fine sand	4.2	1.51	20.2	13.0	2.6
S73FL064-1-8	34-49	B'21tg	0.0	0.3	4.2	51.7	13.5	69.7	3.9	26.4	sandy clay loam	1.0	1.57	24.4	22.9	8.4
S73FL064-1-9	49-71	B'22tg	0.0	0.2	2.7	54.6	12.6	70.1	3.4	26.5	sandy clay loam	0.3	1.74	18.5	17.2	10.6
S73FL064-1-10	71-80	B'3	0.0	0.3	4.0	59.7	13.0	77.0	3.0	20.0	sandy clay loam	--	--	--	--	--

* Pedon sampled at location different from that of the typical pedon described under the heading "Soil series and morphology."

TABLE 19.--CHEMICAL PROPERTIES OF SELECTED SOILS

Soil series and sample number	Depth	Extractable bases (5B1)					Extract-able acidity	Cation exchange capacity	Base satura-tion	Organic carbon	Electrical conduc-tivity	pH			Pyrophosphate extractable			Citrate dithionite extractable	
		Ca	Mg	Na	K	Sum						H_2O (1:1)	$CaCl_2$ .01M (1:2)	KCl 1N (1:1)	C	Fe	Al	Al	Fe
	In	Meq/100g							Pct	Pct	Mmho/cm				Pct	Pct	Pct	Pct	Pct
Astatula:**																			
S73FL064-4-1	0-4	0.2	tr	tr	tr	0.2	3.4	3.6	6	0.72	0.02	5.3	4.3	4.0	--	--	--	--	--
S73FL064-4-2	4-10	0.1	tr	tr	tr	0.1	2.1	2.2	5	0.32	0.02	5.6	4.7	4.5	--	--	--	--	--
S73FL064-4-3	10-22	0.1	tr	tr	tr	0.1	1.6	1.7	6	0.25	0.02	5.6	4.8	4.6	--	--	--	--	--
S73FL064-4-4	22-41	tr	tr	tr	tr	tr	0.9	0.9	0	0.10	0.02	5.7	4.9	4.7	--	--	--	--	--
S73FL064-4-5	41-57	tr	tr	tr	tr	tr	0.5	0.5	0	0.09	0.02	5.8	5.1	4.9	--	--	--	--	--
S73FL064-4-6	57-92	tr	tr	tr	tr	tr	0.3	0.3	0	0.05	0.02	6.2	5.6	5.3	--	--	--	--	--
Bulow:																			
S75FL0127-17-1	0-5	0.3	0.1	tr	tr	0.4	2.4	2.8	14	0.72	0.06	5.2	4.2	3.5	--	--	--	--	--
S75FL0127-17-2	5-20	tr	tr	tr	tr	tr	0.3	0.3	--	0.08	0.04	6.9	5.3	4.7	--	--	--	--	--
S75FL0127-17-3	20-25	0.2	tr	tr	tr	0.2	0.5	0.7	28	0.09	0.04	6.5	5.5	4.9	--	--	--	--	--
S75FL0127-17-4	25-45	0.2	tr	tr	tr	0.2	0.6	0.8	25	0.06	0.03	6.4	5.6	4.9	--	--	--	--	--
S75FL0127-17-5	45-50	9.0	0.4	0.1	0.1	9.6	5.2	14.8	65	0.36	0.14	7.3	6.2	5.5	--	--	--	--	--
Daytona:																			
S74FL127-15-1	0-5	0.4	0.2	tr	tr	0.6	3.4	4.0	15	0.46	0.04	4.3	3.5	3.0	--	--	--	--	--
S74FL127-15-2	5-21	tr	tr	tr	0.0	tr	0.8	0.8	--	0.07	0.02	4.8	4.3	3.6	--	--	--	--	--
S74FL127-15-3	21-36	tr	tr	tr	0.0	tr	0.4	0.4	--	0.03	0.03	5.5	5.3	4.1	--	--	--	--	--
S74FL127-15-4	36-38	tr	tr	0.1	tr	0.1	13.8	13.9	1	1.17	0.08	4.0	3.6	3.5	1.02	0.00	0.19	0.24	0.02
S74FL127-15-5	38-47	0.0	tr	tr	tr	tr	6.0	6.0	--	0.53	0.03	4.5	4.0	3.8	0.44	0.00	0.11	0.11	0.02
S74FL127-15-6	47-80	tr	tr	tr	tr	tr	0.6	0.6	--	0.08	0.04	5.3	4.9	4.4	--	--	--	--	--
Deland:																			
S76FL127-28-1	0-4	0.46	0.10	0.02	0.02	0.60	1.82	2.42	25	0.58	0.02	5.6	4.4	4.0	--	--	--	--	--
S76FL127-28-2	4-10	0.18	0.02	0.00	0.00	0.20	0.76	0.96	21	0.18	0.02	5.9	5.3	4.3	--	--	--	--	--
S76FL127-28-3	10-19	0.09	0.01	0.00	0.00	0.10	2.73	2.83	4	0.36	0.02	5.7	5.4	4.5	--	--	--	--	--
S76FL127-28-4	19-36	0.01	0.00	0.00	0.00	0.01	1.82	1.83	1	0.20	0.02	6.2	6.0	4.8	--	--	--	--	--
S76FL127-28-5	36-55	0.01	0.00	0.00	0.00	0.01	1.21	1.22	1	0.10	0.02	6.1	6.2	4.9	--	--	--	--	--
S76FL127-28-6	55-67	0.01	0.01	0.00	0.00	0.02	4.25	4.27	<1	0.39	0.02	5.8	5.2	4.6	0.34	0.02	0.15	0.11	0.04
S76FL127-28-7	67-78	0.03	0.03	0.01	0.00	0.07	18.82	18.89	<1	1.75	0.02	5.3	4.5	4.4	2.02	0.01	0.65	0.54	0.02
S76FL127-28-8	78-89	0.00	0.10	0.38	0.01	0.49	23.97	24.46	2	1.93	0.17	4.8	4.5	4.3	1.90	0.00	0.72	0.60	0.02
S76FL127-28-9	89-96	0.00	0.01	0.01	0.00	0.02	24.58	24.60	<1	1.94	0.02	5.3	4.6	4.4	1.95	0.01	0.72	0.71	0.02
Farmton:**																			
S76FL127-26-1	0-6	0.49	0.20	0.04	0.05	0.78	2.96	3.74	21	0.94	0.04	4.6	3.6	3.2	--	--	--	--	--
S76FL127-26-2	6-34	0.06	0.02	0.00	0.01	0.09	0.30	0.39	23	0.13	0.02	5.9	5.0	4.1	--	--	--	--	--
S76FL127-26-3	34-56	0.16	0.19	0.04	0.01	0.04	13.20	13.60	3	1.78	0.04	4.3	3.5	3.3	1.72	0.01	0.10	0.08	0.02
S76FL127-26-4	56-81	0.18	0.29	0.04	0.04	0.55	8.19	8.74	6	0.46	0.04	4.9	4.0	3.9	--	--	--	--	--
Gator:**																			
S76FL127-32-1	0-10	33.33	17.26	35.34	0.40	86.33	17.26	103.59	83	10.17	55.00	5.8	5.8	5.8	--	--	--	--	--
S76FL127-32-2	10-22	37.86	19.73	39.69	0.46	97.74	23.90	121.64	80	13.01	46.00	5.9	5.9	5.7	--	--	--	--	--
S76FL127-32-3	22-26	7.78	3.41	5.69	0.14	17.02	3.49	20.51	83	2.01	4.10	6.5	6.4	6.3	--	--	--	--	--
S76FL127-32-4	26-32	4.03	2.28	3.99	0.13	10.43	0.99	11.42	91	0.33	3.35	7.7	7.6	7.4	--	--	--	--	--
S76FL127-32-5	32-74	4.53	2.86	4.73	0.18	12.30	1.66	13.96	88	0.20	2.95	8.0	7.9	7.6	--	--	--	--	--

See footnotes at end of table.

TABLE 19.--CHEMICAL PROPERTIES OF SELECTED SOILS--Continued

Soil series and sample number	Depth	Extractable bases (5B1)					Extract-able acidity	Cation exchange capacity	Base satura-tion	Organic carbon	Electrical conduc-tivity	pH			Pyrophosphate extractable			Citrate dithionite extractable	
		Ca	Mg	Na	K	Sum						H_2O (1:1)	$CaCl_2$ .01M (1:2)	KCl 1N (1:1)	C	Fe	Al	Al	Fe
	In	Meq/100g							Pct	Pct	Mmho/cm				Pct	Pct	Pct	Pct	Pct
Immokalee:																			
S74FL127-8-1	0-5	0.6	0.2	tr	tr	0.8	4.8	5.6	14	1.35	0.03	4.5	3.5	3.3	--	--	--	--	--
S74FL127-8-2	5-10	0.1	0.1	tr	tr	0.2	1.2	1.4	14	0.47	0.02	5.0	3.7	3.4	--	--	--	--	--
S74FL127-8-3	10-16	tr	tr	tr	tr	tr	1.0	1.0	--	0.44	0.02	5.2	3.9	3.5	--	--	--	--	--
S74FL127-8-4	16-34	tr	tr	tr	tr	tr	0.5	0.5	--	0.21	0.05	5.5	4.2	3.8	--	--	--	--	--
S74FL127-8-5	34-39	tr	0.2	0.1	0.1	0.4	24.4	24.8	2	6.04	0.15	3.7	3.1	2.9	2.66	0.00	0.03	0.11	0.00
S74FL127-8-6	39-43	tr	0.2	0.1	0.1	0.4	20.4	20.8	2	3.22	0.11	3.7	3.1	2.9	2.78	0.00	0.03	0.10	0.00
S74FL127-8-7	43-85	tr	tr	tr	tr	tr	1.0	1.0	--	0.25	0.04	5.2	3.7	3.4	--	--	--	--	--
Malabar:																			
S75FL127-23-1	0-2	1.4	0.2	0.1	0.1	8.1	2.4	4.2	43	3.82	0.20	4.5	3.9	3.4	--	--	--	--	--
S75FL127-23-2	2-9	0.1	0.1	tr	tr	0.1	1.4	1.5	7	0.28	0.05	5.2	4.6	4.1	--	--	--	--	--
S75FL127-23-3	9-15	0.1	tr	tr	tr	0.1	0.5	0.6	17	0.12	0.05	5.5	5.1	4.5	--	--	--	--	--
S75FL127-23-4	15-24	0.2	tr	tr	0.0	0.2	0.6	0.8	25	0.10	0.06	6.4	5.9	5.5	0.04	0.03	0.02	0.00	1.724
S75FL127-23-5	24-32	0.4	tr	tr	tr	0.4	0.4	0.8	50	0.06	0.05	6.6	6.1	5.8	0.05	0.04	0.01	0.01	0.663
S75FL127-23-6	32-42	0.3	0.1	tr	tr	0.4	0.6	1.0	40	0.06	0.06	6.4	6.0	5.3	--	--	--	--	--
S75FL127-23-7	42-53	4.6	0.7	0.1	0.1	5.5	3.9	9.4	58	0.22	0.19	5.5	5.2	4.6	--	--	--	--	--
S75FL127-23-8	53-80	5.1	0.5	0.0	0.1	5.9	2.7	8.6	69	0.16	0.41	6.3	6.1	5.7	--	--	--	--	--
Myakka:																			
S74FL127-16-1	0-5	1.5	0.1	tr	tr	1.6	12.4	14.0	11	2.39	0.07	4.2	3.2	3.0	--	--	--	--	--
S74FL127-16-2	5-27	0.1	0.1	0.1	tr	0.3	0.0	0.3	100	0.15	0.09	4.3	3.8	3.4	--	--	--	--	--
S74FL127-16-3	27-31	tr	0.1	0.1	tr	0.2	26.2	26.4	1	3.53	0.09	3.8	3.2	3.1	2.46	0.00	0.24	0.24	0.03
S74FL127-16-4	31-43	tr	tr	0.1	tr	0.1	11.6	11.7	1	1.41	0.11	3.9	3.7	3.6	1.00	0.00	0.21	0.19	0.02
S74FL127-16-5	43-78	tr	tr	tr	tr	tr	6.9	6.9	--	0.84	0.04	4.4	3.9	3.7	0.60	0.00	0.12	0.12	0.03
S74FK127-16-6	78-90	tr	tr	tr	tr	tr	10.7	10.7	--	0.86	0.04	4.6	4.1	3.9	0.72	0.01	0.42	0.32	0.03
Paola:																			
S74FL127-6-1	0-6	0.5	0.1	tr	tr	0.6	1.9	2.5	24	0.64	0.01	4.9	4.0	3.9	--	--	--	--	--
S74FL127-6-2	6-15	0.1	tr	tr	tr	0.1	0.4	0.5	20	0.12	0.01	5.8	4.4	4.0	--	--	--	--	--
S74FL127-6-3	15-26	0.1	tr	tr	tr	0.1	0.2	0.3	33	0.04	0.01	6.3	5.1	4.8	--	--	--	--	--
S74FL127-6-4	26-45	0.1	tr	tr	tr	0.1	1.1	1.2	8	0.11	0.02	6.0	5.2	4.8	--	--	--	--	--
S74FL127-6-5	45-64	0.1	tr	tr	tr	0.1	1.1	1.2	8	0.10	0.02	5.9	5.3	5.0	--	--	--	--	--
S74FL127-6-6	64-85	tr	tr	tr	tr	tr	1.1	1.1	--	0.10	0.02	5.9	5.3	5.2	--	--	--	--	--
Smyrna:																			
S74FL127-11-1	0-4	2.2	0.8	tr	0.1	3.1	21.0	24.1	13	4.23	0.07	4.4	3.3	2.9	--	--	--	--	--
S74FL127-11-2	4-8	0.8	0.3	tr	tr	1.1	7.1	8.2	13	1.46	0.05	4.1	3.3	2.9	--	--	--	--	--
S74FL127-11-3	8-17	0.1	tr	tr	tr	0.1	1.9	2.0	5	0.25	0.02	4.3	3.9	3.6	--	--	--	--	--
S74FL127-11-4	17-19	0.2	0.2	tr	tr	0.4	4.1	4.5	9	0.82	0.04	4.2	3.4	3.2	0.46	0.04	0.03	0.03	0.02
S74FL127-11-5	19-24	tr	0.1	tr	tr	0.1	51.9	52.0	0	3.65	0.03	4.4	3.6	3.5	3.82	0.02	0.64	0.67	0.04
S74FL127-11-6	24-27	tr	tr	tr	tr	tr	27.7	27.7	--	1.72	0.05	4.5	3.9	3.8	2.04	0.02	0.48	0.42	0.03
S74FL127-11-7	27-50	tr	tr	tr	tr	tr	9.8	9.8	--	0.56	0.05	4.9	4.4	4.3	0.71	0.02	0.31	0.29	0.03
S74FL127-11-8	50-72	tr	tr	tr	tr	tr	0.8	0.8	--	0.04	0.05	5.6	5.3	4.9	--	--	--	--	--

See footnotes at end of table.

TABLE 19.--CHEMICAL PROPERTIES OF SELECTED SOILS--Continued

Soil series and sample number	Depth	Extractable bases (5B1)					Extract-able acidity	Cation exchange capacity	Base satura-tion	Organic carbon	Electrical conduc-tivity	pH			Pyrophosphate extractable			Citrate dithionite extractable	
		Ca	Mg	Na	K	Sum						H_2O (1:1)	$CaCl_2$ .01M (1:2)	KCl 1N (1:1)	C	Fe	Al	Al	Fe
	In	Meq/100g							Pct	Pct	Mmho/cm				Pct	Pct	Pct	Pct	Pct
Tavares:																			
S74FL127-14-1	0-8	0.3	tr	tr	tr	0.3	3.8	4.1	7	0.70	0.03	4.9	4.0	3.8	--	--	--	--	--
S74FL127-14-2	8-24	0.1	tr	0.0	0.0	0.1	1.9	2.0	5	0.22	0.02	5.5	5.0	4.4	--	--	--	--	--
S74FL127-14-3	24-48	tr	tr	0.0	0.0	tr	0.4	0.4	--	0.04	0.02	5.8	5.6	4.7	--	--	--	--	--
S74FL127-14-4	48-64	tr	tr	0.0	0.0	tr	0.4	0.4	--	0.02	0.02	5.9	5.9	4.8	--	--	--	--	--
S74FL127-14-5	64-85	tr	tr	0.0	0.0	tr	1.0	1.0	--	0.02	0.02	6.4	6.1	5.0	--	--	--	--	--
Turnbull:																			
S76FL127-30-1	14-0	18.60	64.61	222.54	9.05	314.80	23.10	337.90	93	13.89	294.00	5.8	5.9	5.7	--	--	--	--	--
S76FL127-30-2	0-36	5.97	21.40	61.45	4.24	93.06	8.89	101.95	91	2.73	65.25	7.3	6.8	6.7	--	--	--	--	--
S76FL127-30-3	36-66	14.86	4.59	15.66	0.94	36.05	0.99	37.04	97	0.66	26.25	7.3	7.3	7.1	--	--	--	--	--
Tuscawilla:																			
S75FL127-18-1	0-3	9.2	1.0	0.5	0.2	10.9	5.9	16.8	65	3.08	0.70	6.0	5.7	5.3	--	--	--	--	--
S75FL127-18-2	3-10	1.6	0.3	tr	tr	1.9	1.5	3.4	56	0.43	0.06	6.3	5.7	5.2	--	--	--	--	--
S75FL127-18-3	10-13	12.2	0.6	0.2	0.1	13.1	4.8	17.9	73	0.85	0.29	6.9	6.3	5.9	--	--	--	--	--
S75FL127-18-4	13-32	25.0	0.6	0.7	0.1	26.4	2.1	28.5	96	0.45	0.08	7.6	7.2	7.0	--	--	--	--	--
S75FL127-18-5	32-40	23.8	0.5	0.4	0.1	24.8	2.6	27.4	90	0.19	0.44	7.9	7.3	7.0	--	--	--	--	--
S75FL127-18-6	40-62	3.2	0.1	0.1	tr	3.4	0.5	3.9	87	0.04	0.24	8.0	7.4	7.3	--	--	--	--	--
S75FL127-18-7	62-68	1.4	0.1	0.1	tr	1.6	0.4	2.0	80	0.05	0.55	7.5	7.3	7.3	--	--	--	--	--
S75FL127-18-8	68-80	17.4	0.1	0.3	tr	17.8	0.2	18.0	99	0.15	0.80	7.7	7.5	7.5	--	--	--	--	--
Wabasso:																			
S75FL127-24-1	0-7	0.4	0.4	0.1	0.1	1.0	9.4	10.4	10	1.98	0.13	4.3	3.3	2.7	--	--	--	--	--
S75FL127-24-2	7-12	0.1	tr	tr	tr	0.1	1.6	1.7	6	0.29	0.07	4.7	3.6	3.1	--	--	--	--	--
S75FL127-24-3	12-24	0.1	tr	tr	tr	0.1	1.0	1.1	9	0.12	0.03	5.2	3.9	3.5	--	--	--	--	--
S75FL127-24-4	24-30	7.7	0.7	0.1	tr	8.5	6.8	15.3	56	1.56	0.45	6.1	5.8	5.4	1.35	0.08	0.11	0.05	0.07
S75FL127-24-5	30-35	5.3	0.6	0.2	tr	6.1	7.1	13.2	46	1.09	0.19	6.1	5.6	5.1	0.89	0.05	0.25	0.23	0.05
S75FL127-24-5	35-39	2.1	0.2	0.2	tr	2.5	2.7	5.2	48	0.35	0.22	6.0	5.6	5.2	--	--	--	--	--
S75FL127-24-7	39-51	6.6	0.9	0.7	0.1	8.3	4.8	13.1	63	0.25	0.23	6.2	5.8	5.0	--	--	--	--	--
S75FL127-24-8	51-72	9.8	0.8	0.8	0.1	11.5	4.6	16.1	71	0.12	0.12	7.2	6.7	6.0	--	--	--	--	--
S75FL127-24-9	72-80	16.8	1.3	1.2	0.2	19.5	7.5	27.0	72	0.06	0.50	7.5	6.9	6.1	--	--	--	--	--
Wauchula:																			
S73FL064-1-1	0-3	1.3	0.7	0.1	0.1	2.2	13.5	15.5	14	4.40	--	4.1	3.2	3.0	--	--	--	--	--
S73FL064-1-2	3-7	0.4	0.2	tr	tr	0.6	2.9	3.5	17	0.77	--	4.4	3.4	3.4	--	--	--	--	--
S73FL064-1-3	7-13	0.1	0.1	tr	tr	0.2	0.7	0.9	22	0.21	--	5.7	4.1	4.2	--	--	--	--	--
S73FL064-1-4	13-20	0.1	0.1	tr	tr	0.2	0.3	0.5	40	0.14	--	6.4	4.3	4.4	--	--	--	--	--
S73FL064-1-5	20-25	0.1	0.1	0.1	tr	0.3	15.9	16.2	2	1.95	--	4.8	3.9	3.9	1.39	0.03	0.32	0.23	0.04
S73FL064-1-6	25-29	tr	tr	0.1	0.1	0.2	13.8	14.0	1	1.25	--	5.2	4.3	4.3	0.95	0.03	0.48	0.36	0.06
S73FL064-1-7	29-34	tr	tr	tr	tr	tr	10.9	10.9	0	0.77	--	5.3	4.5	4.4	0.53	0.04	0.31	0.25	0.08
S73FL064-1-8	34-49	0.1	0.6	0.1	0.1	0.9	9.7	10.6	9	0.50	--	5.0	4.1	4.0	--	--	--	--	--
S73FL064-1-9	49-71	0.2	1.0	0.1	0.1	1.4	6.1	7.5	19	0.18	--	4.8	4.0	3.8	--	--	--	--	--
S73FL064-1-10	71-80	0.5	1.3	0.1	0.1	2.0	4.1	6.1	33	0.50	--	4.6	3.9	3.4	--	--	--	--	--

* tr means--less than 0.05 meq/100g.

** Pedon sampled at location different from that of the typical pedon described under the heading "Soil series and morphology."

TABLE 20.--CLAY MINERALOGY OF SELECTED SOILS

Soil series and sample number	Depth	Horizon	Percentage of clay minerals*				
			Mont-morillonite	14 angstrom intergrade	Kaolinite	Gibbsite	Quartz
	In						
Astatula:**							
S73FL064-4-1	0-4	A	0	48	20	12	20
S73FL064-4-4	22-41	C3	0	30	20	30	20
S73FL064-4-6	57-92	C5	0	30	20	45	5
Bulow:							
S75FL127-17-1	0-5	A1	tr	36	20	0	36
S75FL127-17-4	25-45	B12	10	60	18	0	12
S75FL127-17-5	45-50	B2t	30	53	13	0	4
Daytona:							
S74FL127-15-1	0-5	A1	0	0	0	0	100
S74FL127-15-4	36-38	B2h	0	9	5	0	86
S74FL127-15-6	47-80	C	0	11	10	0	79
Deland:							
S76FL127-28-1	0-4	A1	16	15	7	0	62
S76FL127-28-6	55-67	B1h	0	0	0	0	100
S76FL127-28-9	94-130	B23h	0	8	4	0	88
Farmton:**							
S76FL127-26-1	0-6	Ap	0	0	0	0	100
S76FL127-26-3	34-56	B2h	tr	4	7	0	89
S76FL127-26-4	56-81	B2tg	tr	29	58	0	13
Gator:**							
S76FL127-32-1	22-26	IIC1	80	0	15	1	4
S76FL127-32-5	32-74	IIIC3	70	0	20	0	10
Immokalee:							
S74FL127-8-1	0-5	A11	18	8	7	0	67
S74FL127-8-4	16-34	A22	0	5	10	0	85
S74FL127-8-5	34-39	B21h	0	7	15	0	78
S74FL127-8-7	43-85	C	0	0	5	0	95
Malabar:							
S75FL127-23-1	0-2	A1	32	24	9	0	35
S75FL127-23-4	15-24	B2ir	10	49	16	0	25
S75FL127-23-7	42-53	B'21tg	45	26	25	0	4
Myakka:							
S74FL127-16-1	0-5	A1	36	12	7	0	45
S74FL127-16-3	27-31	B21h	45	3	7	0	45
S74FL127-16-5	43-78	B3&Bh	8	40	14	0	38
S74FL127-16-6	78-90	B'2h	tr	35	19	0	46
Paola:							
S74FL127-6-1	0-6	A1	14	0	13	0	73
S74FL127-6-3	15-26	A22	5	0	8	0	87
S74FL127-6-5	45-64	B&A	0	22	15	4	59
S74FL127-6-6	64-85	C	0	20	13	7	55
Smyrna:							
S74FL127-11-1	0-4	Ap	0	0	3	0	97
S74FL127-11-4	17-19	B21h	0	41	27	0	32
S74FL127-11-8	50-72	C	0	30	25	0	45
Tavares:							
S74FL127-14-1	0-8	A1	0	37	15	0	48
S74FL127-14-2	8-24	C1	0	50	24	0	28
S74FL127-14-5	64-80	C3	0	55	16	0	29

See footnotes at end of table.

TABLE 20.--CLAY MINERALOGY OF SELECTED SOILS--Continued

Soil series and sample number	Depth	Horizon	Percentage of clay minerals*				
			Mont-morillonite	14 angstrom intergrade	Kaolinite	Gibbsite	Quartz
	In						
Turnbull:							
S76FL127-30-2	0-3	C1g	49	51	0	0	0
S76FL127-30-3	36-66	C2g	75	0	19	0	6
Tuscawilla:							
S75FL127-18-1	0-3	A1	55	24	9	0	12
S75FL127-18-3	10-13	B21t	80	14	4	0	2
S75FL127-18-6	40-62	IIC1	48	27	15	0	10
Wabasso:							
S75FL127-24-1	0-7	A1	0	0	0	0	100
S75FL127-24-4	24-30	B21h	0	25	8	0	67
S75FL127-24-7	39-51	B'21tg	40	39	17	0	4
S75FL127-24-9	72-80	B'23tg	77	12	9	0	2
Wauchula:							
S73FL064-1-1	0-3	A11	0	0	0	0	100
S73FL064-1-5	20-25	B21h	22	14	7	0	57
S73FL064-1-8	34-49	B'21tg	0	30	42	28	tr

* tr means trace--less than 0.05 meq/100g.

** Pedon sampled at different location than the typical pedon described under the heading "Soil series and morphology."

TABLE 21.--ENGINEERING TEST DATA

[Tests performed by the Florida Department of Transportation (FDOT) in cooperation with the U.S. Bureau of Public Roads, in accordance with standard procedures of the American Associated of State Highway and Transportation Officials (AASHTO). NP means nonplastic]

Soil name and location	FDOT report number	Depth	Moisture density*: Maximum dry density	Moisture density*: Optimum moisture content	Mechanical analysis**: Percentage passing sieve--: No. 10 (2.0 mm)	No. 40 (0.42 mm)	No. 200 (0.074 mm)	Percentage smaller than--: 0.05 mm	0.02 mm	0.005 mm	0.002 mm	Liquid limit	Plasticity index	Classification: AASHTO***	Classification: Unified
		In	Pcf	Pct								Pct			
Apopka fine sand:															
North of DeLand at junction	32	7-24	99.1	16.6	100	99	4	3	1	0	0	--	NP	A-3(0)	SP
of State Routes 15A and 11	33	24-60	106.1	13.1	100	99	7	6	4	2	2	--	NP	A-3(0)	SP-SM
in NW corner, 100 feet north	34	60-80	112.4	13.4	100	99	26	25	20	12	10	25	8	A-2-4(0)	SC
of State Route 15A and 300															
feet west of State Route 11.															
sec. 16, T. 16 S., R. 29 E.															
Astatula fine sand:															
1/4 mile east of junction of	11	22-40	100.3	16.6	100	99	2	1	0	0	0	--	NP	A-3(0)	SP
of U.S. Highways 92 and 17	12	56-90	99.1	14.2	100	99	1	1	0	0	0	--	NP	A-3(0)	SP
and State Route 15A.															
NW1/4SW1/4, sec. 33, T. 17															
S., R. 30 E.															
Astatula fine sand:															
Southeast of DeLand, about	13	10-26	100.7	16.5	100	97	2	1	0	0	0	--	NP	A-3(0)	SP
3/4 mile south of I-4 and	14	52-78	100.0	16.4	100	98	2	1	0	0	0	--	NP	A-3(0)	SP
State Route 430A overpass.	15	78-95	99.8	13.9	100	98	2	1	0	0	0	--	NP	A-3(0)	SP
NW1/4SW1/4 sec. 7, T. 18 S.,															
R. 31 E.															
Bluff sandy clay loam:															
About 100 yards west of I-4	63	2-8	102.4	14.6	100	100	42	29	16	10	7	36	10	A-4(0)	SC
1/4 mile south of borrow pit	64	22-68	113.3	13.1	100	93	32	30	25	23	21	37	23	A-2-6(0)	SC
on flood plain adjacent to															
Lake Monroe. sec. 10, T. 19															
S., R. 30 E.															
Bulow fine sand:															
About 2 miles south of	45	5-20	99.8	9.1	100	72	2	1	0	0	0	--	NP	A-3(0)	SP
Flagler County Line, 1.9	46	25-45	103.6	9.2	100	93	2	1	0	0	0	--	NP	A-3(0)	SP
miles south on Old Dixie															
Highway from intersection															
I-95, then 0.2 mile west of															
Old Dixie Highway. sec. 37,															
T. 13 S., R. 31 E.															
Daytona fine sand:															
East of DeLand, about 1.5	40	5-36	100.2	13.8	100	90	3	2	0	0	0	--	NP	A-3(0)	SP
mile north of Lake Winne-	41	36-47	106.3	13.2	100	91	7	4	1	0	0	--	NP	A-3(0)	SP-SM
misett. sec 12, T. 17 S., R.															
30 E.															

See footnotes at end of table.

TABLE 21.--ENGINEERING TEST DATA--Continued

Soil name and location	FDOT report number	Depth	Moisture density*: Maximum dry density	Moisture density*: Optimum moisture content	Mechanical analysis**: Percentage passing sieve--: No. 10 (2.0 mm)	No. 40 (0.42 mm)	No. 200 (0.074 mm)	Percentage smaller than--: 0.05 mm	0.02 mm	0.005 mm	0.002 mm	Liquid limit	Plasticity index	Classification: AASHTO***	Unified
		In	Pcf	Pct								Pct			
Daytona fine sand:															
4 miles north of U.S. Highway 92 on Marsh Road, 200 yards east, of Marsh Road on trail. sec. 14, T. 16 S., R. 30. E.	35	4-53	97.1	16.2	100	96	2	1	0	0	0	--	NP	A-3(0)	SP
	36	53-60	102.8	15.0	100	96	4	3	2	1	0	--	NP	A-3(0)	SP
	37	60-90	101.4	14.5	100	96	2	1	0	0	0	--	NP	A-3(0)	SP
Deland fine sand:															
On Rima Ridge off Indian Lake Road, about 0.75 mile southeast of Scoggin Lake and 100 yards southeast of corner of Old Clark Field. sec. 24, T. 15 S., R. 31 E.	68	4-55	100.1	17.5	100	98	3	3	3	2	2	--	NP	A-3(0)	SP
	69	67-94	91.0	21.7	100	98	7	0	0	0	0	--	NP	A-3(0)	SP-SM
Electra fine sand:															
About midway between I-95 and Tomoko River. NW1/4NE1/4 sec. 16, T. 15 S., R. 29 E.	25	8-35	96.7	17.6	100	98	3	1	0	0	0	--	NP	A-3(0)	SP
	26	41-52	103.3	14.1	100	98	5	4	2	0	0	--	NP	A-3(0)	SP-SM
	27	57-70	110.1	12.8	100	99	21	20	19	18	17	23	6	A-2-4(0)	SM-SC
Farmton fine sand:															
About 0.9 mile southeast of Barberville from the intersection of State Route 40 and U.S. Highway 17. sec. 21, T. 15 S., R. 29 E.	65	7-34	97.0	18.1	100	98	5	3	1	0	0	--	NP	A-3(0)	SP-SM
	66	34-56	98.7	16.4	100	99	10	6	0	0	0	--	NP	A-3(0)	SP-SM
	67	56-80	111.9	13.9	100	99	19	17	15	14	14	--	NP	A-2-4(0)	SM
Immokalee fine sand:															
About 2.6 miles south of junction of Florida Highways 44 and 415 on 415 to Rasley Road. sec. 1, T. 18 S., R. 32 E.	20	16-34	100.4	14.2	100	75	3	1	0	0	0	--	NP	A-3(0)	SP
	21	34-39	97.0	21.5	100	75	12	10	6	3	2	--	NP	A-2-4(0)	SP-SM
	22	43-85	104.9	11.3	100	70	4	4	2	0	0	--	NP	A-3(0)	SP
Malabar fine sand:															
Farmton wildlife management area, 1 mile south of Florida East Coast Railway, 25 feet west of roadway. NW1/4NW1/4 sec. 20, T. 19 S., R. 33 E.	58	15-24	104.0	15.4	100	96	7	5	3	1	1	--	NP	A-3(0)	SP-SM
	59	53-80	114.7	12.7	100	97	18	17	15	13	12	--	NP	A-2-4(0)	SM
Myakka fine sand:															
3 miles west of junction of Florida Highways 11 and 40. sec. 2, T. 14 S., R. 29 E.	42	0-5	97.9	16.8	100	96	3	2	0	0	0	--	NP	A-3(0)	SP
	43	27-43	97.8	18.1	100	96	10	6	0	0	0	--	NP	A-3(0)	SP-SM
	44	43-78	102.7	14.8	100	96	5	2	0	0	0	--	NP	A-3(0)	SP-SM

See footnotes at end of table.

TABLE 21.--ENGINEERING TEST DATA--Continued

Soil name and location	FDOT report number	Depth	Moisture density*: Maximum dry density	Moisture density*: Optimum moisture content	Mechanical analysis**: Percentage passing sieve--: No. 10 (2.0 mm)	No. 40 (0.42 mm)	No. 200 (0.074 mm)	Percentage smaller than--: 0.05 mm	0.02 mm	0.005 mm	0.002 mm	Liquid limit	Plasticity index	Classification: AASHTO***	Unified
		In	Pcf	Pct								Pct			
Paola fine sand:															
East of DeLand about 1/4 mile west of intersection of I-4 and State Route 44 on north side of State Route 44, 50 feet north of pavement. sec. 19, T. 17 S., R. 31 E.	16	15-26	108.7	16.7	100	94	2	1	0	0	0	--	NP	A-3(0)	SP
	17	26-64	102.5	13.6	100	94	3	2	0	0	0	--	NP	A-3(0)	SP
Pineda fine sand:															
About 9.5 miles east of DeLand to woods road, south, about 2 miles. sec. 27, T. 17 S., R. 31 E.	6	2-16	100.5	15.5	100	98	9	4	1	0	0	--	NP	A-3(0)	SP-SM
	7	23-30	105.9	13.9	100	99	14	10	5	3	2	--	NP	A-2-4(0)	SM
	8	42-56	114.3	14.2	100	99	26	22	18	17	16	24	6	A-2-4(0)	SM-SC
Satellite sand:															
Southeast of DeLand, 2.6 miles south of junction of Florida Highways 44 and 415, on 415 to Rasley Road, southeast 1.15 miles on Rasley Road, 300 feet south on road. sec. 6, T. 18 S., R. 32 E.	23	24-51	100.5	15.3	100	78	3	2	0	0	0	--	NP	A-3(0)	SP
	24	66-80	102.2	14.5	100	83	3	2	1	0	0	--	NP	A-3(0)	SP
Scoggin loamy sand:															
About 1/4 mile east of Plantation Pines. NW1/4NW1/4 sec. 8, T. 15 S., R. 31 E.	70	32-59	111.7	15.5	100	98	40	35	27	17	6	31	7	A-4(1)	SM-SC
Smyrna fine sand:															
1 mile west of Florida East Coast Railway line and 75 yards north of Nova Road in field within city limits of Port Orange.	28	0-8	89.5	21.4	100	100	8	5	1	0	0	--	NP	A-3(0)	SP-SM
	29	8-17	96.2	17.6	100	100	4	3	1	0	0	--	NP	A-3(0)	SP
	30	17-27	92.2	20.4	100	100	12	9	2	0	0	--	NP	A-2-4(0)	SP-SM
	31	27-80	99.9	14.1	100	100	3	2	1	0	0	--	NP	A-3(0)	SP
Tavares fine sand:															
Southeast of DeLand, 0.25 mile east of State Route 15A on trail. sec. 34, T. 17 S., R 29 E.	38	8-24	100.7	13.2	100	97	3	2	0	0	0	--	NP	A-3(0)	SP
	39	24-48	98.9	16.2	100	97	2	1	0	0	0	--	NP	A-3(0)	SP
Turnbull muck:															
About 75 yards east of Bulow Creek and 50 feet northwest of road connecting Old Dixie Highway and John Anderson Highway.	72	0-36	77.0	35.6	100	100	92	87	78	60	52	83	50	A-7-6(20)	H

See footnotes at end of table.

TABLE 21.--ENGINEERING TEST DATA--Continued

Soil name and location	FDOT report number	Depth	Moisture density*: Maximum dry density	Moisture density*: Optimum moisture content	Mechanical analysis**: Percentage passing sieve--: No. 10 (2.0 mm)	No. 40 (0.42 mm)	No. 200 (0.074 mm)	Percentage smaller than--: 0.05 mm	0.02 mm	0.005 mm	0.002 mm	Liquid limit	Plasticity index	Classification: AASHTO***	Unified
		In	Pcf	Pct								Pct			
Tuscawilla loamy sand:															
About 1.4 mile south of Flagler County Line in Bulow Hammock. NW1/4 sec. 37, T. 31 S., R. 30 E.	47	13-32	90.4	25.5	100	84	33	30	24	14	10	39	16	A-2-6(1)	SC
	48	40-62	102.1	16.3	100	99	6	5	3	2	2	--	NP	A-3(0)	SP-SM
Wabasso fine sand:															
About 7 miles east of Osteen on Maytown Road, south about 1.2 miles on graded road, southeast about 1.3 miles on graded road, southwest about 0.6 mile to bend in graded road, 50 feet on west side of road. SE1/4NW1/4 sec. 29, T. 19 S., R. 33 E.	60	12-24	95.8	7.7	100	98	5	3	0	0	0	--	NP	A-3(0)	SP-SM
	61	24-30	106.8	13.5	100	98	13	9	5	0	0	--	NP	A-2-4(0)	SM
	62	39-51	113.3	14.4	100	99	24	22	18	17	16	--	NP	A-2-4(0)	SM
Wauchula fine sand:															
About 9.5 miles east of DeLand to woods road, south about 1 mile. SW1/4NW1/4 sec. 23, T. 17 S., R. 31 E.	1	7-13	102.5	15.3	100	99	16	9	3	0	0	--	NP	A-2-4(0)	SM
	2	20-25	108.9	13.8	100	99	26	18	9	5	4	--	NP	A-2-4(0)	SM
	3	34-49	109.2	16.5	100	99	36	30	22	21	20	28	9	A-4(0)	SC
	4	49-71	109.6	16.3	100	99	34	30	23	22	21	39	22	A-2-6(2)	SC
	5	71-80	111.6	14.5	100	99	26	22	17	16	16	31	10	A-2-4(0)	SC

* Based on AASHTO Designation T99-70 (1).

** Mechanical analysis according to AASHTO designation T88-70 (1). Results by this procedure differ somewhat from results obtained by the soil survey procedure of the Soil Conservation Service (SCS). In the AASHTO procedure, the fine material is analyzed by the hydrometer method and the various grain-sized fractions are calculated on the basis of all the material, including that coarser than 2 millimeters in diameter. In the SCS soil survey procedure, the fine material is analyzed by the pipette method and the material coarser than 2 millimeters in diameter is excluded from calculations of grain-sized fractions. The mechanical analyses used in this table are not suitable for use in naming textural classes for soil.

*** Based on AASHTO Designation M 145-66 (1).

TABLE 22.--CLASSIFICATION OF THE SOILS

Soil name	Family or higher taxonomic class
Apopka	Loamy, siliceous, hyperthermic Grossarenic Paleudults
Astatula	Hyperthermic, uncoated Typic Quartzipsamments
Astor	Sandy, siliceous, hyperthermic Cumulic Haplaquolls
Basinger	Siliceous, hyperthermic Spodic Psammaquents
Bluff	Fine-loamy, mixed, hyperthermic Typic Haplaquolls
Bulow	Loamy, siliceous, hyperthermic Typic Hapludalfs
Canaveral	Mixed, hyperthermic Aquic Udipsamments
Cassia	Sandy, siliceous, hyperthermic Typic Haplohumods
Chobee	Fine-loamy, mixed, hyperthermic Typic Argiaquolls
Cocoa	Sandy, siliceous, hyperthermic Psammentic Hapludalfs
Daytona	Sandy, siliceous, hyperthermic Entic Haplohumods
Deland	Sandy, siliceous, hyperthermic Grossarenic Entic Haplohumods
EauGallie	Sandy, siliceous, hyperthermic Alfic Haplaquods
Electra	Sandy, siliceous, hyperthermic Arenic Ultic Haplohumods
Farmton	Sandy, siliceous, hyperthermic Arenic Haplaquods
Gator	Loamy, siliceous, euic, hyperthermic Terric Medisaprists
Holopaw	Loamy, siliceous, hyperthermic Grossarenic Ochraqualfs
Hontoon	Dysic, hyperthermic Typic Medisaprists
Immokalee	Sandy, siliceous, hyperthermic Arenic Haplaquods
Malabar	Loamy, siliceous, hyperthermic Grossarenic Ochraqualfs
Myakka	Sandy, siliceous, hyperthermic Aeric Haplaquods
Myakka Variant	Sandy, siliceous, hyperthermic Aeric Haplaquods
Orsino	Hyperthermic, uncoated Spodic Quartzipsamments
Paisley	Fine, montmorillonitic, hyperthermic Typic Albaqualfs
Palm Beach	Carbonatic, hyperthermic Typic Udipsamments
Paola	Hyperthermic, uncoated Spodic Quartzipsamments
Pineda	Loamy, siliceous, hyperthermic Arenic Glossaqualfs
Pinellas	Loamy, mixed, hyperthermic Arenic Ochraqualfs
Placid	Sandy, siliceous, hyperthermic Typic Humaquepts
Pomona	Sandy, siliceous, hyperthermic Ultic Haplaquods
Pompano	Siliceous, hyperthermic Typic Psammaquents
Riviera	Loamy, siliceous, hyperthermic Arenic Glossaqualfs
Samsula	Sandy or sandy-skeletal, siliceous, dysic, hyperthermic Terric Medisaprists
Satellite	Hyperthermic, uncoated Aquic Quartzipsamments
Scoggin	Fine-loamy, siliceous, hyperthermic Typic Ochraquults
Smyrna	Sandy, siliceous, hyperthermic Aeric Haplaquods
St. Johns	Sandy, siliceous, hyperthermic Typic Haplaquods
St. Lucie	Hyperthermic, uncoated Typic Quartzipsamments
Tavares	Hyperthermic, uncoated Typic Quartzipsamments
Tequesta	Loamy, siliceous, hyperthermic Arenic Glossaqualfs
Terra Ceia	Euic, hyperthermic Typic Medisaprists
Tomoka	Loamy, siliceous, dysic, hyperthermic Terric Medisaprists
Turnbull	Clayey over sandy or sandy-skeletal, montmorillonitic, nonacid, hyperthermic Typic Hydraquents
Turnbull Variant	Mixed, hyperthermic Aquic Udipsamments
Tuscawilla	Fine-loamy, mixed, hyperthermic Typic Ochraqualfs
Valkaria	Siliceous, hyperthermic Spodic Psammaquents
Wabasso	Sandy, siliceous, hyperthermic Alfic Haplaquods
Wauchula	Sandy, siliceous, hyperthermic Ultic Haplaquods
Winder	Fine-loamy, siliceous, hyperthermic Typic Glossaqualfs

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