United States
Department of

In cooperation with the
University of Florida

Soil Survey of

How To Use This Soil Survey

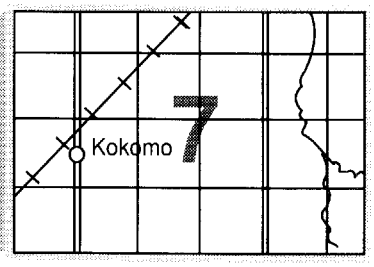
General Soil Map

The general soil map, which is the color map preceding the detailed soil maps, shows the survey area divided into groups of associated soils called general soil map units. This map is useful in planning the use and management of large areas.

To find information about your area of interest, locate that area on the map, identify the name of the map unit in the area on the color-coded map legend, then refer to the section **General Soil Map Units** for a general description of the soils in your area.

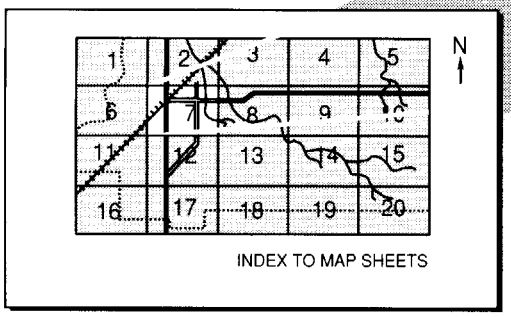
Detailed Soil Maps

The detailed soil maps follow the general soil map. These maps can be useful in planning the use and management of small areas.



MAP SHEET

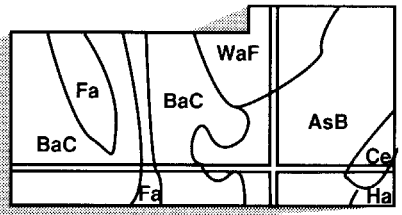
To find information about your area of interest, locate that area on the **Index to Map Sheets**, which precedes the soil maps. Note the number of the map sheet, and turn to that sheet.



INDEX TO MAP SHEETS

Locate your area of interest on the map sheet. Note the map unit symbols that are in that area. Turn to the **Index to Map Units** (see Contents), which lists the map units by symbol and name and shows the page where each map unit is described.

MAP SHEET

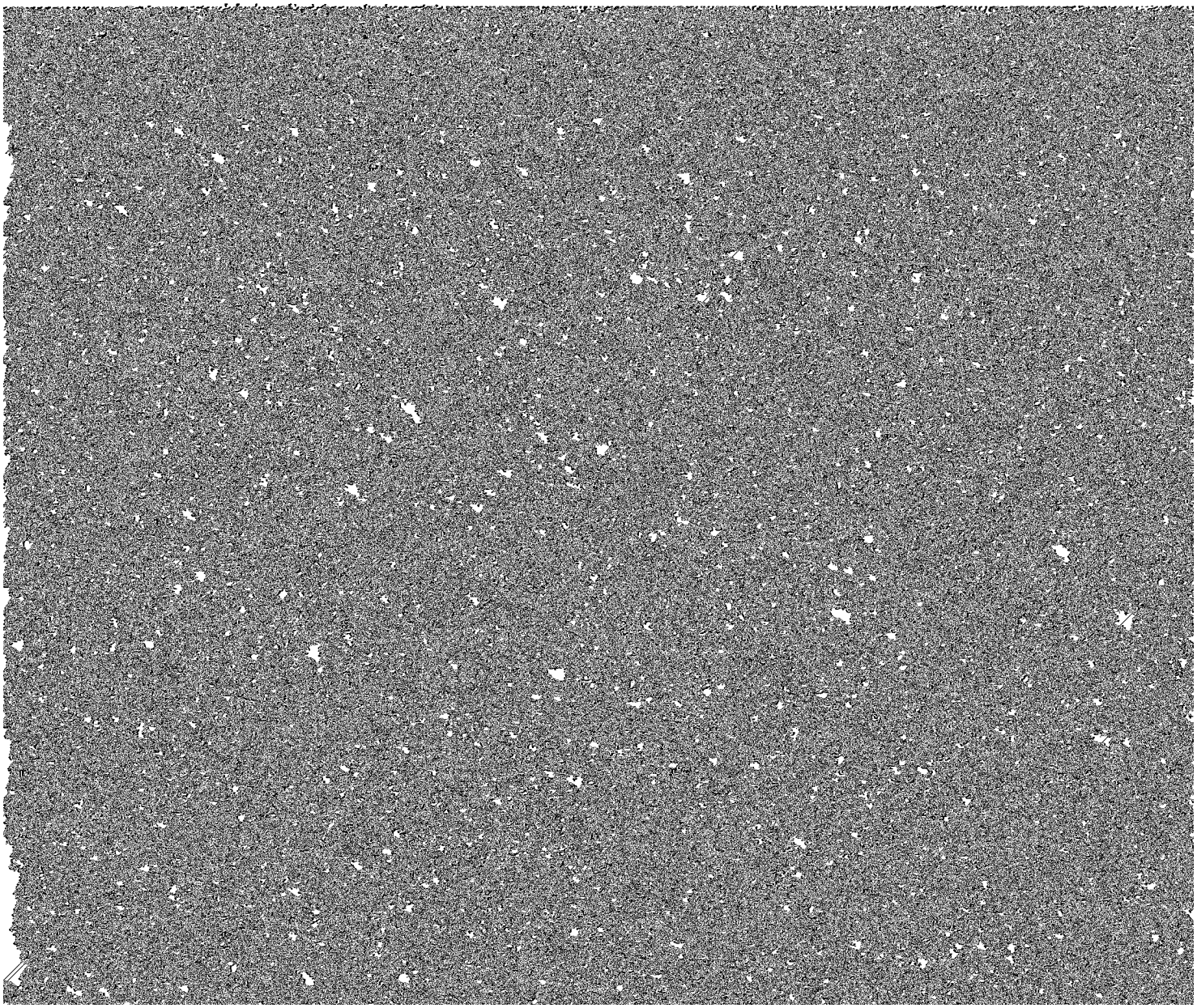


AREA OF INTEREST

NOTE: Map unit symbols in a soil survey may consist only of numbers or letters, or they may be a combination of numbers and letters.

The **Summary of Tables** shows which table has data on a specific land use for each detailed soil map unit. See **Contents** for sections of this publication that may address your specific needs.

This soil survey is a publication of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and other Federal, State, and local agencies. The Natural Resources Conservation Service (formerly the Soil Conservation Service) has leadership for the Federal part of the National Cooperative Soil Survey.



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Foreword

This soil survey contains information that can be used in land-planning programs in Flagler County. It contains predictions of soil behavior for selected land uses. The survey also highlights limitations and hazards inherent in the soil, improvements needed to overcome the limitations, and the impact of selected land uses on the environment.

This soil survey is designed for many different users. Farmers, foresters, and agronomists can use it to evaluate the potential of the soil and the management needed for maximum food and fiber production. Planners, community officials, engineers, developers, builders, and home buyers can use the survey to plan land use, select sites for construction, and identify special practices needed to ensure proper performance. Conservationists, teachers, students, and specialists in recreation, wildlife management, waste disposal, and pollution control can use the survey to help them understand, protect, and enhance the environment.

Great differences in soil properties can occur within short distances. Some soils are seasonally wet or subject to flooding. Some are shallow to bedrock. Some are too unstable to be used as a foundation for buildings or roads. Clayey or wet soils are poorly suited to use as 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 soil is shown on the detailed soil maps. Each soil in the survey area is described. Information on specific uses is given for each soil. Help in using this publication and additional information are available at the local office of the Natural Resources Conservation Service or the Cooperative Extension Service.

T. Niles Glasgow
State Conservationist
Natural Resources Conservation Service

Soil Survey of Flagler County, Florida

By Elmer L. Readle, Robert Baldwin, Kim C. Goerg, and Jeffrey E. Leppo,
Natural Resources Conservation Service

United States Department of Agriculture, Natural Resources Conservation Service,
In cooperation with
University of Florida, Institute of Food and Agricultural Sciences, Agricultural Experiment Stations, and Soil Science Department, and the Florida Department of Agriculture and Consumer Services

FLAGLER COUNTY is in the northeastern part of peninsular Florida (fig. 1). It is bordered by St. Johns County to the north, by Putnam County to the west, by Volusia County to the south, and by the Atlantic Ocean to the east.

The total area of the county is 314,090 acres, or about 507 square miles. Areas of water more than 40 acres in size make up 10,688 acres. The county is about 29 miles from the north to south and about 23 miles from the east to west. The county seat, Bunnell, is in the east-central part of the county.

The economy of Flagler County is somewhat diversified, although agriculture, construction, tourism, and light industry are the main economic elements.

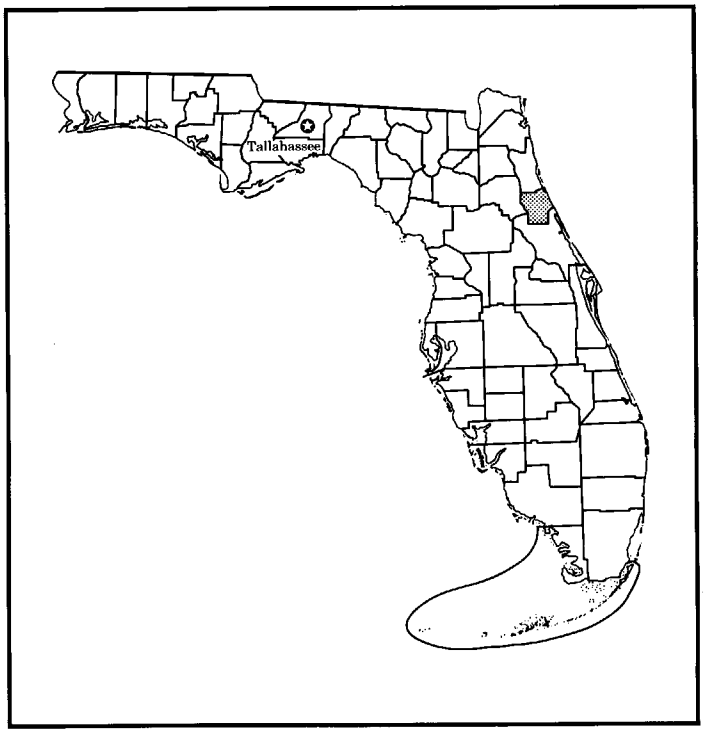


Figure 1.—Location of Flagler County in Florida.

General Nature of the County

In this section, environmental and cultural factors that affect the use and management of soils in Flagler County are described. These factors include climate, history and development, physiography and geomorphology, water and mineral resources, farming, recreation, and transportation.

Climate

This section was compiled from data and information provided by the National Climatic Data Center in Asheville, North Carolina, and from data collected by the University of Florida Agriculture Research Center in Hastings, Florida.

Flagler County has a subtropical maritime climate that is characterized by long, warm and humid summers and mild winters. Both summer and winter temperatures are moderated by the close proximity to the Atlantic Ocean. The frequency of frost and freezing temperatures is greater in the western part of the county, and rainfall is more frequent in the eastern part.

The average annual temperature is about 70 degrees F, and the average annual rainfall is about 53 inches. Rainfall is heaviest during the summer. The winters are generally mild, except for brief invasions of cold, dry air associated with cold fronts that move southward across the state. The prevailing winds are primarily from the east, but many are from the southwest or northwest. The average wind speed is about 10 to 12 miles per hour but is slightly higher during a period from mid-February through March. The hurricane season extends from June to November.

In summer, temperatures vary only slightly from day to day. The afternoon temperatures can reach 90 degrees or more, and by morning the temperature can fall into the low 70's. Although temperatures above 100 degrees have been recorded, they rarely occur. Daytime temperatures rarely exceed 95 degrees because of the cooling effects of sea breezes near the coast and because of the thunderstorms that occur further inland. The probability of a thunderstorm occurring at a given location on any summer day is about 50 percent.

The temperatures in winter vary considerably from day to day as periodic cold fronts move southward across the state. Temperatures may vary from the 70-degree range during the middle of the day to below freezing in the early morning. The coldest days generally occur on the second or third day after a front passes through the area. The average daily maximum winter temperature is 67 degrees, and the average daily minimum temperature is 40 degrees. Temperatures of 32 degrees or lower, which occur 12 to 15 times per year, have been recorded as early as the middle of November and as late as the middle of March. Table 1 gives data on temperatures and precipitation for the survey area from 1952 to 1987. Table 2 shows freeze dates in spring and fall.

The average annual rainfall is about 53 inches. About 60 percent of the rainfall occurs during the rainy season, which extends from June through the middle of October. The remainder is evenly distributed during the rest of the year and can occur at any time during the [illegible] any time of the day. Overcast, drizzly conditions can sometimes last for 2 or 3 days. Droughty conditions can occur at any time, even during the rainy season, but these conditions are generally more severe in the spring because the temperatures are higher and the rate of plant growth is increased.

Tropical storms or depressions can produce very heavy rainfall at any time from June to November. These low pressure systems produce very high winds and large amounts of rainfall, which may affect weather conditions for several days. The more intense storm systems can cause considerable damage and flooding in the lower areas. High surf and storm-driven waves can inundate the lower areas along bays and inlets. They can cause severe erosion along beaches, especially in areas where the natural vegetation has been removed or is badly disturbed.

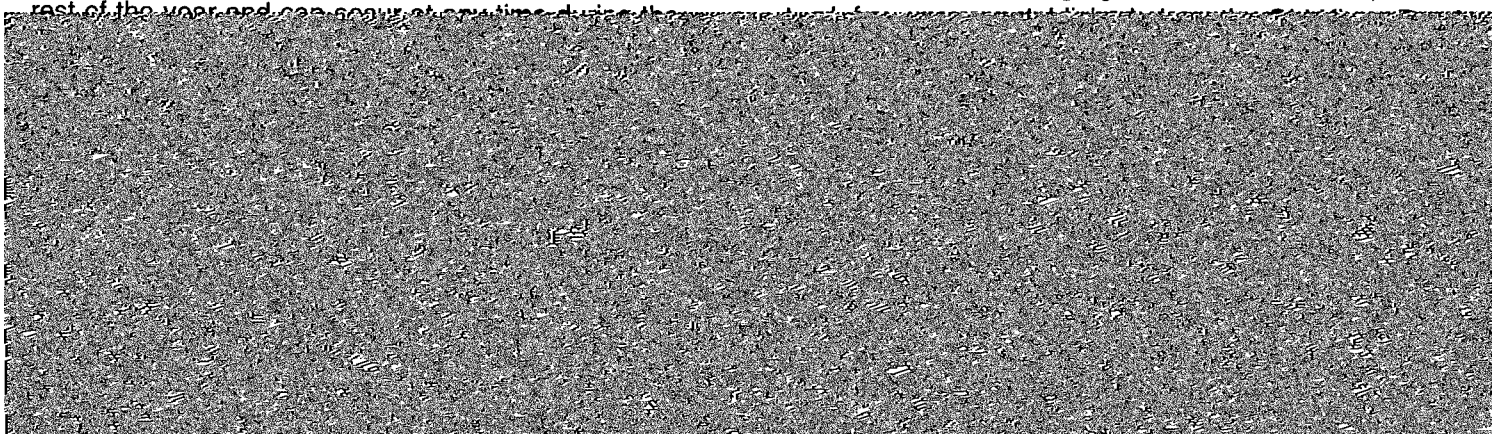
During fall and early winter, heavy fog is common early in the morning, but it usually dissipates soon after sunrise. The dew is usually heavy in the morning because of the high humidity. In the spring, the relative humidity in the afternoon ranges from 40 to 50 percent. From June through September, the relative humidity early in the morning ranges from 40 to 60 percent and results in a heavy dew.

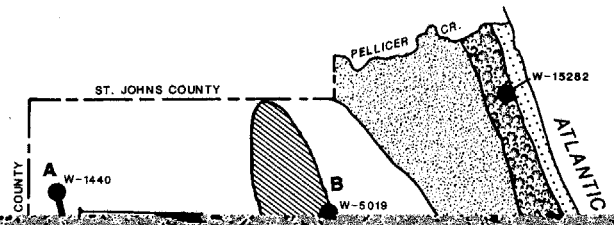
History and Development

John A. Clegg, historian and author, prepared this section.

The Timicuan Indians were early inhabitants of the area now known as Flagler County. They lived in the hammocks beside the rivers on the East Coast *(8)*. As the Spanish settled Florida, Indian missions were established at St. Joseph and Bulowville. The first permanent European family to settle in this area was the Duponts. They arrived in 1792. Many descendants of this family still live in Flagler County.

Although large sugar plantations were established in the early 1800's, all of these plantations were burned during the Seminole Indian War from 1835 to 1836. After about 1850, orange groves, cattle ranches, and [illegible]





above mean sea level. Crescent Lake is the major drainage basin in the western half of the county. Tributaries flowing into the lake include Salt Creek, Haw Creek, Black Branch, and Hunter Branch. Lake Diston, located in the southwestern corner of the county, receives drainage from the surrounding wetlands and

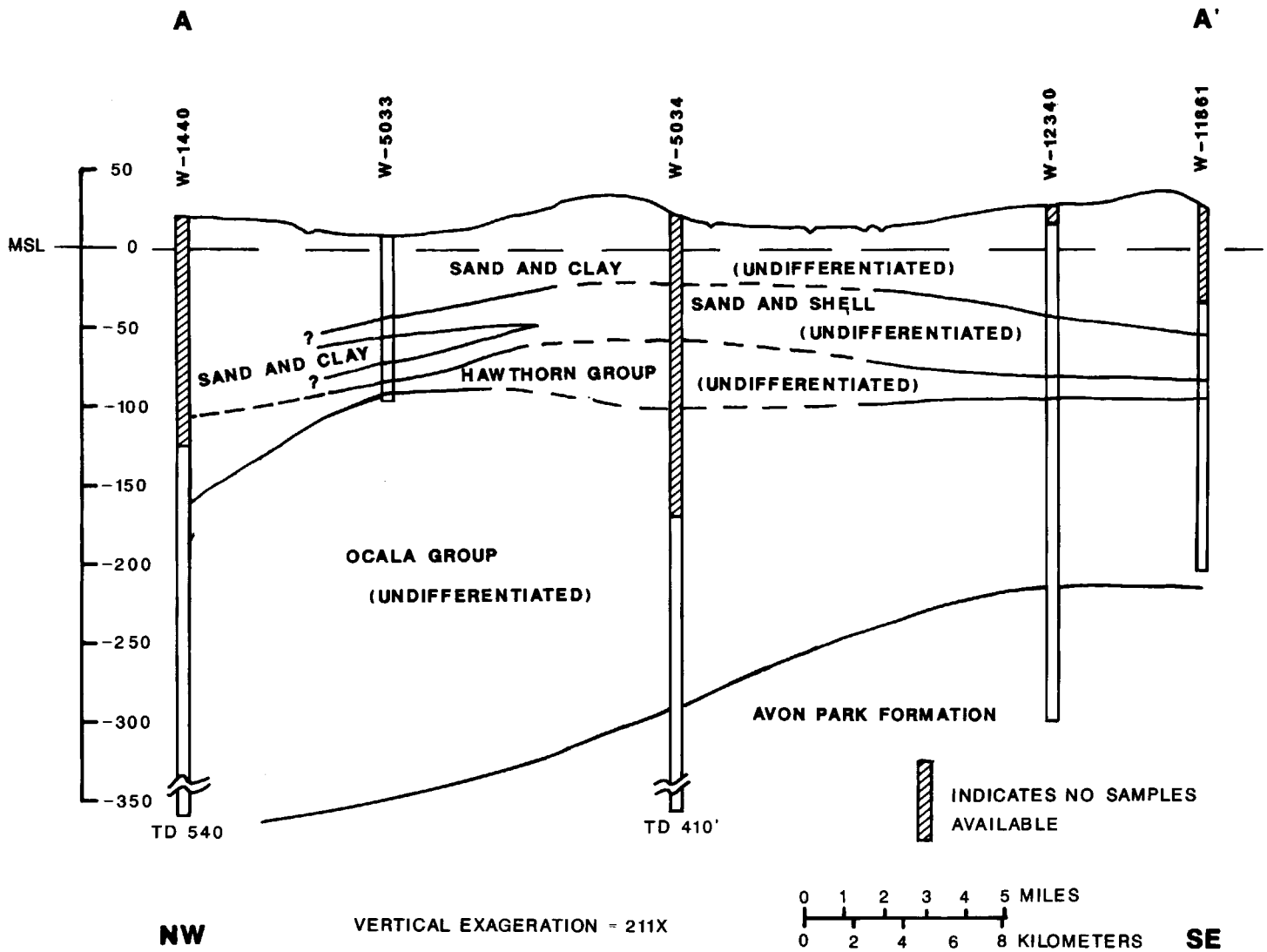
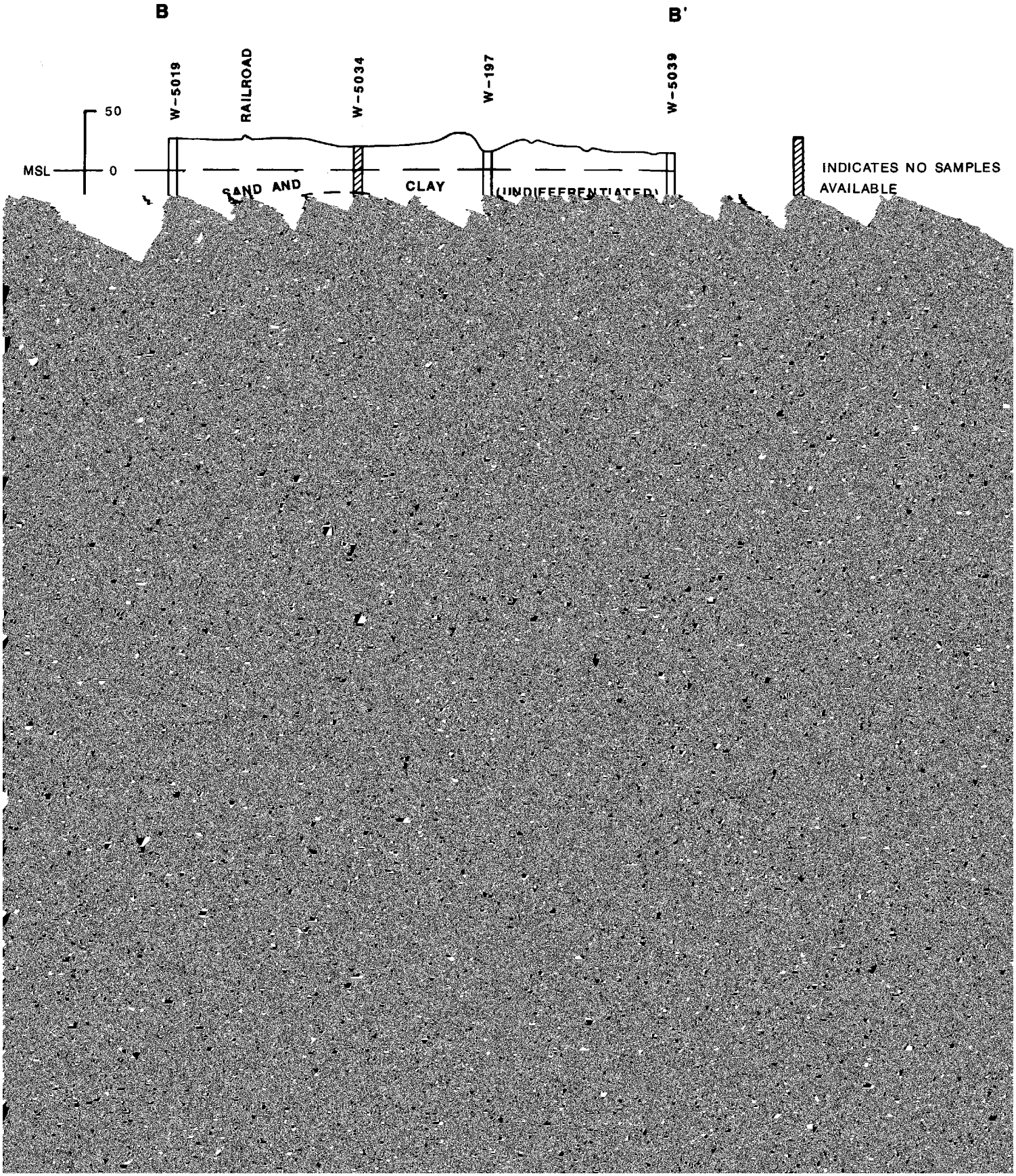


Figure 3.—A geologic cross-section of A to A′, as indicated in figure 2, in Flagler County.

sea level. This formation is a component of the Floridan aquifer system.

The Ocala Group *(16)* consists of three formations. In ascending order, they are the Inglis Formation, the Williston Formation, and the Crystal River Formation. The lithology of the Ocala Group generally consists of tan to buff, coarsely granular limestone of the Inglis Formation at the base, which becomes more indurated in the Williston Formation, and white to cream, chalky, massive marine limestone in the Crystal River Formation. The fossils within these formations include a variety of foraminifera, bryzoans, mollusks, and echinoids. The delineation of the Ocala Group into formations was based upon the presence of these fossils and the lithology. Sediments from the Ocala Group range in thickness from 50 feet in the southern part of Flagler County to approximately 200 feet in the northwestern part. The depth to the top of the Ocala Group averages about 100 feet below mean sea level. The Ocala Group is a component of the Floridan aquifer system and is the principle source of water in the area.

The Hawthorn Group *(17)* unconformably overlies the Ocala Group beneath Flagler County. Three formations are in the Hawthorn Group in northern Florida. In ascending order, they are the Penney Farms Formation, which consists of interbedded phosphatic sand, clay, and carbonate; the Marks Head Formation, which consists of complexly interbedded phosphatic clay, sand, and carbonate; and the Coosawatchee Formation, which consists of green to tan phosphatic quartz sand


B
B'
W-5019
RAILROAD
W-5034
W-197
W-5039
50
MSL
0
SAND AND
CLAY
(UNDIFFERENTIATED)
INDICATES NO SAMPLES AVAILABLE

eventually become absent in areas toward the western part of Flagler County. The total thickness of Pliocene to Holocene deposits in the area ranges from about 50 to 140 feet.

Water and Mineral Resources

Jonathan D. Arthur, geologist, Florida Geological Survey, helped to prepare this section.

Water Resources

The water resources in Flagler County are used for agricultural, industrial, residential, and recreational purposes. In most parts of the county, adequate supplies of fresh water are available for most uses. However, during periods of high usage or during seasonal dry periods, temporary shortages may be experienced. An increasing population and urban development in the county are placing increased demands upon the water supplies in Flagler County.

Three main sources of water, or aquifer systems, are in Flagler County. They are a surficial aquifer system, which is made up of surface water and ground water; an intermediate aquifer system; and the Floridan aquifer system.

The surficial aquifer system is the uppermost freshwater aquifer in Flagler County. The surface water in lakes, ponds, and streams and the ground water is used to a limited extent for irrigation or domestic purposes. Ground water is subsurface water in the zone of saturation. The zone of saturation is a zone in which all pore spaces are filled with water under a pressure no greater than atmospheric pressure. The quantity of surface water and ground water available is directly and immediately affected by the amount of rainfall received. The surficial aquifer system is not confined, and its upper surface reflects the depth to the water table. In general, the water table fluctuates with the rate of precipitation and conforms to the topography of the land surface. The surficial aquifer system is recharged primarily by rainfall percolating downward through the loose surficial siliciclastic sediments and, to a lesser extent, by seepage upward from the underlying Floridian aquifer system. The surficial aquifer system can yield quantities of water suitable for consumption, but in some areas, the concentration of iron and tannic acid color the water and impart a poor taste.

The intermediate aquifer system is primarily within the sediments of the Hawthorn Group. These sediments consist of variable amounts of sand and shell fragments and some silt and clay. The aquifer underlies all of Flagler County. It ranges in thickness from 5 to 80 feet. It yields good quality water that is the primary source for domestic uses and, to a limited extent, municipal uses. The intermediate aquifer system is recharged primarily by rainfall in the county.

The Floridan aquifer system is the major source of water for irrigation, public uses, and industry. It underlies all of Flagler County at a depth that ranges from about 80 to 190 feet. This aquifer consists mainly of Eocene limestone and dolomite from the Avon Park Formation and the Ocala Group. The Floridan aquifer is recharged by the overlying surficial and intermediate aquifers. In some parts of the county, this aquifer yields water that has a high chloride content as a result of the intrusion of salt water.

Dead Lake and Crescent Lake are the major freshwater bodies in Flagler County. Several smaller lakes are on the Espanola Ridge northwest of Espanola. Haw Creek, Pellicer Creek, and Bulow Creek are the major streams in the county. These water areas are intensively used for recreational purposes.

Mineral Resources

The mineral resources in Flagler County include sand, clay, and coquina. An overview of these resources and their commercial use is provided in the following paragraphs.

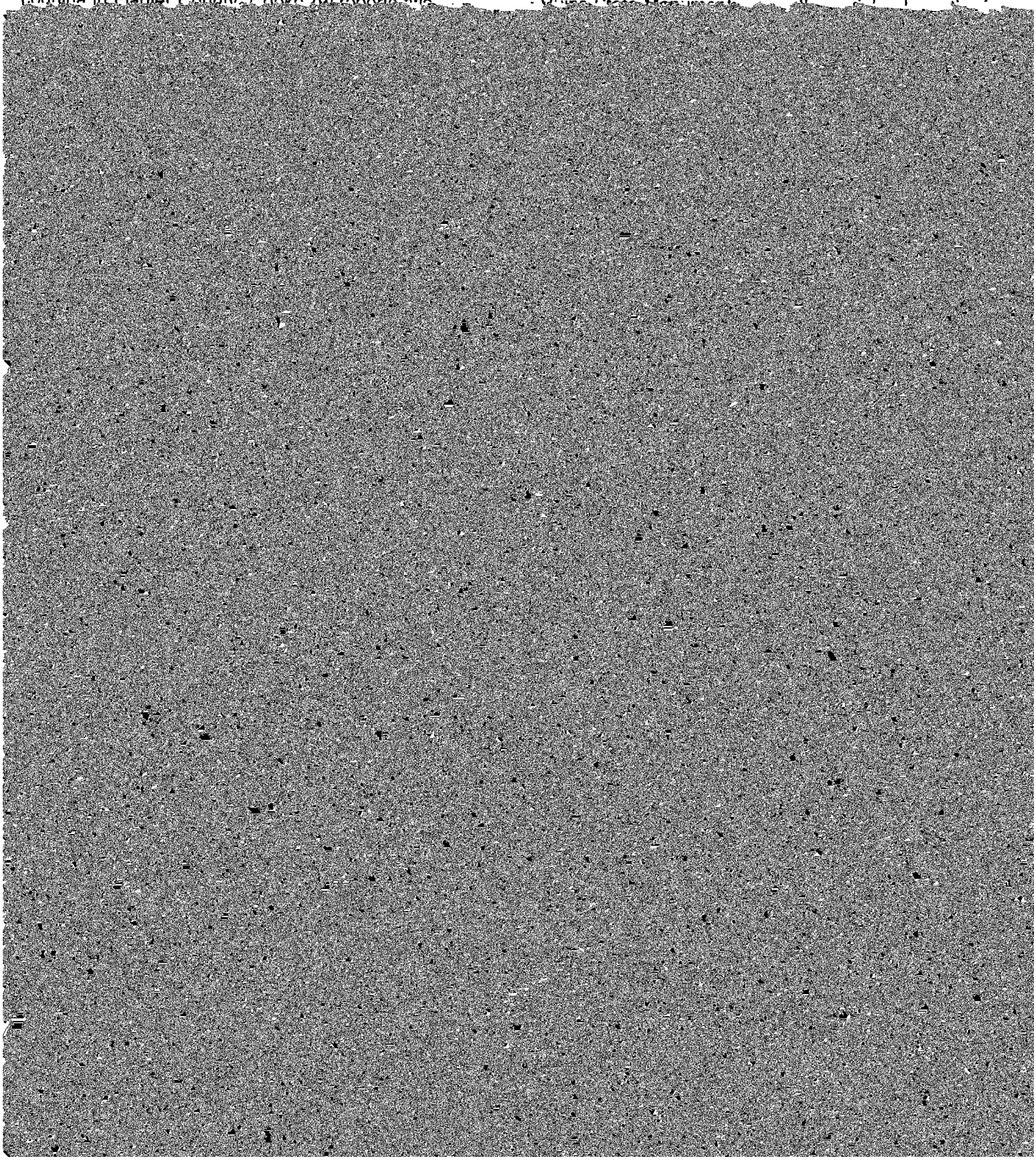
Sand accumulations cover about 75 percent of Flagler County. The maximum thickness of the sand is in the northwestern part of the county, where it reaches a depth of 140 feet. The sand commonly contains small shell fragments and localized clay lenses. Recent tests by the Florida Geological Survey indicate that the sand is suitable for brick masonry, sand-cement, riprap, sand-asphalt hot mix, and sand seal coat. Because it contains a large percentage of impurities, the sand is probably not suitable for the manufacture of glass. Although economic heavy mineral deposits occur in north-central and northeastern Florida, no public information exists regarding the abundance or distribution of heavy minerals in the sand bodies in Flagler County.

Few relatively pure clay deposits occur near the surface in Flagler County. Most of the clay is found as a clayey-sand lithology. Calver *(7)* reports pure clay deposits located near Black Point and Haw Creek that are suitable for the manufacture of common brick, hollow block, and drain tile. Bell *(4)* reports an eight-foot thick unit of clay at a depth of three feet in the vicinity of Shell Bluff, which borders Crescent Lake. This clay is thought to underlie an extensive portion of western Flagler County. Physical properties suggest that the Shell Bluff clay may also be used for brick, tile, and hollow blockware. Bell also reports exposures of clay beds near St. Johns Park, on the north shore of Dead Lake.

Coquina is a clastic sedimentary rock composed of shells and shell fragments cemented by calcium

carbonate. The Anastasia Formation is the source of coquina in Flagler County. Cooke (8) reports the

Bulow Creek State Reserve and Bulow Plantation



discussion of the suitability, limitations, and management of the soils for specified uses. Soil scientists observed the steepness, length, and shape of slopes; the general pattern of drainage; the kinds of crops and native plants growing on the soils; and the kinds of bedrock. They dug many holes to study the soil profile, which is the sequence of natural layers, or horizons, in a soil. The profile extends from the surface down into the unconsolidated material from which the soil formed. The unconsolidated material is devoid of roots and other living organisms and has not been changed by other biological activity.

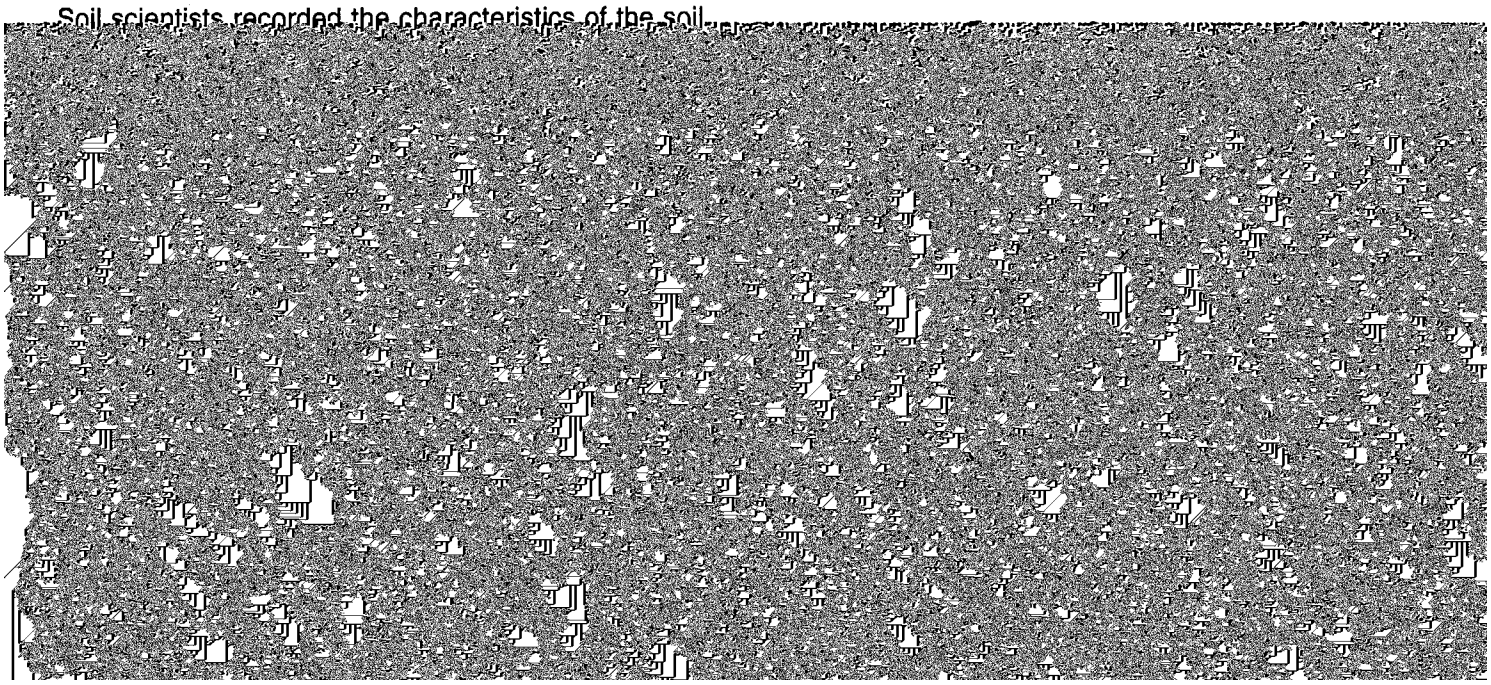
The soils in the survey area occur in an orderly pattern that is related to the geology, landforms, relief, climate, and natural vegetation of the area. Each kind of soil is associated with a particular kind of landscape or with a segment of the landscape. By observing the soils in the survey area and relating their position to specific segments of the landscape, a soil scientist develops a concept, or model, of how the soils were formed. Thus, during mapping, this model enables the soil scientist to predict with a considerable degree of accuracy the kind of soil at a specific location on the landscape.

Commonly, individual soils on the landscape merge into one another as their characteristics gradually change. To construct an accurate soil map, however, soil scientists must determine the boundaries between the soils. They can observe only a limited number of soil profiles. Nevertheless, these observations, supplemented by an understanding of the soil-landscape relationship, are sufficient to verify predictions of the kinds of soil in an area and to determine the boundaries.

Soil scientists recorded the characteristics of the soil of the soils in the area are generally collected for laboratory analyses and for engineering tests. Soil scientists interpret the data from these analyses and tests as well as the field-observed characteristics and the soil properties to determine the expected behavior of the soils under different uses. Interpretations for all of the soils are field tested through observation of the soils in different uses under different levels of management. Some interpretations are modified to fit local conditions, and some new interpretations are developed to meet local needs. Data are assembled from other sources, such as research information, production records, and field experience of specialists. For example, data on crop yields under defined levels of management are assembled from farm records and from field or plot experiments on the same kinds of soil.

Predictions about soil behavior are based not only on soil properties but also on such variables as climate and biological activity. Soil conditions are predictable over long periods of time, but they are not predictable from year to year. For example, soil scientists can predict with a fairly high degree of accuracy that a given soil will have a high water table within certain depths in most years, but they cannot assure that a high water table will always be at a specific level in the soil on a specific date.

After soil scientists located and identified the significant natural bodies of soil in the survey area, they drew the boundaries of these bodies on aerial photographs and identified each as a specific map unit. Aerial photographs show trees, buildings, fields, roads, and rivers, all of which help in locating boundaries accurately.



In the general soil map units, they are called soils of minor extent.

Most inclusions have properties and behavioral patterns similar to those of the dominant soil or soils in the map unit, and thus they do not affect use and management. These are called noncontrasting (similar) inclusions. They may or may not be mentioned in the map unit descriptions. Other inclusions, however, have properties and behavior divergent enough to affect use or require different management. These are contrasting (dissimilar) inclusions. They generally occupy small areas and cannot be shown separately on the soil maps because of the scale used in mapping. The inclusions of contrasting soils are mentioned in the map unit descriptions. A few inclusions may not have been observed and consequently are not mentioned in the descriptions, especially where the soil pattern was so complex that it was impractical to make enough observations to identify all of the kinds of soils on the landscape.

The presence of inclusions in a map unit in no way diminishes the usefulness or accuracy of the soil data. The objective of soil mapping is not to delineate pure taxonomic classes of soils but rather to separate the landscape into segments that have similar use and management requirements. The delineation of such landscape segments on the map provides sufficient information for the development of resource plans, but onsite investigation is needed to plan for intensive uses in small areas.

In Flagler County, a ground-penetrating radar (GPR) system and hand transfers were used to document the type and variability of soils occurring within map units *(10, 11, 13)*. The GPR system was successfully used on all the soils to detect the presence of major soil horizons or other soil features, to determine their variability, and to measure their depth. In Flagler County, 325 random transects were made with the GPR and by hand. Information from notes and ground-truth observations made in the field were used, along with radar data from this study, to classify the soils and to determine the composition of map units. The map units, described in the section "Detailed Soil Map Units," are based on this data.

General Soil Map Units

The general soil map at the back of this publication shows broad areas that have a distinctive pattern of soils, relief, and drainage. Each map unit on the general soil map is a unique natural landscape. Typically, it 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 another but in a different pattern.

The general soil map can be used to compare the suitability of large areas for general land uses. Areas of suitable soils can be identified on the map. Likewise, areas where the soils are not suitable can be identified.

Because of its small scale, the map is not suitable for planning the management of a farm or field or for selecting a site for a road or a building or other [illegible]

palmetto, maidencane, pineland threeawn, gallberry, bluestem, panicum, and sedges.

This map unit makes up about 18,952 acres, or about 7 percent of the county. It is about 37 percent Pineda soils, 25 percent Winder soils, 18 percent Riviera soils, and 20 percent soils of minor extent.

Pineda soils are poorly drained and are in sloughs and low areas on flatwoods. Slopes range from 0 to 1 percent. Typically, the surface layer is gray fine sand about 3 inches thick. The subsurface layer is light gray fine sand about 10 inches thick. The upper part of the subsoil is brownish yellow fine sand to a depth of 19 inches and yellowish brown fine sand to a depth of 24 inches. A layer of grayish brown fine sand about 2 inches thick is between the upper and lower parts of the

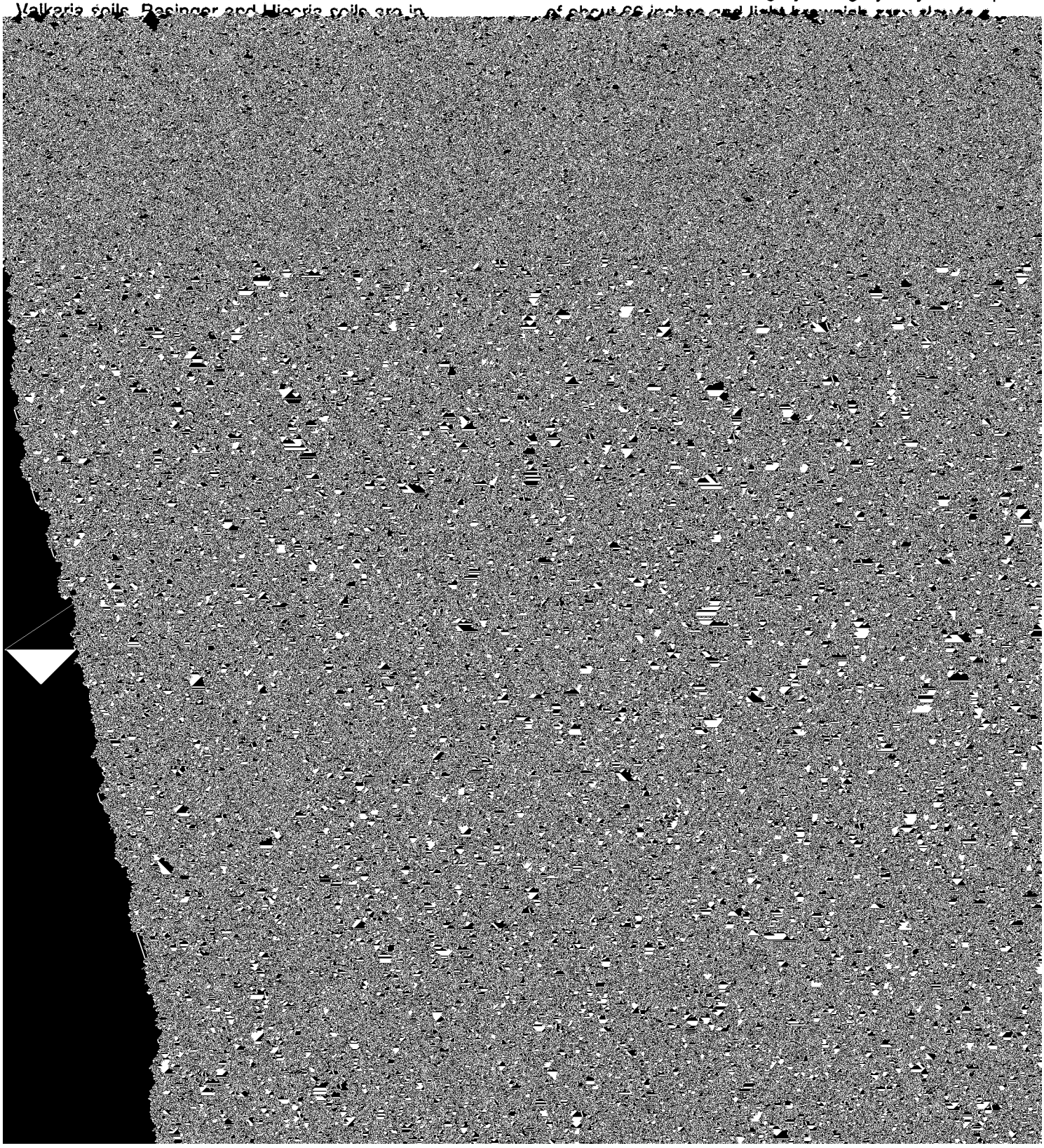
a depth of 51 inches. The underlying material is gray [illegible] inches thick. The subsurface layer is light [illegible] fi[illegible]

of Espanola to the St. Johns County line. Slopes range [illegible] improved pasture. Most areas in the eastern part are

or more. Slopes range from 0 to 2 percent.

The soils of minor extent in this map unit are Basinger, EauGallie, Hicoria, Myakka, Wabasso, and Valkaria soils. Basinger and Hicoria soils are in

flood plains. Slopes are 0 to 1 percent. Typically, the surface layer is very dark gray clay about 12 inches thick. The subsoil is dark gray and gray clay to a depth of about 66 inches and light brownish gray clay to a



in the lower 21 inches. The underlying material, to a depth of 80 inches, is fine sand. The upper 10 inches is very dark gray, the following 9 inches is grayish brown, and the lower 30 inches is light brownish gray.

Hontoon soils are very poorly drained and are in depressions. Slopes are less than 1 percent. Typically, the surface soil is muck. It is more than 80 inches thick. It is dark reddish brown in the upper 25 inches and is black in the lower 55 inches.

The soils of minor extent in this map unit are Basinger, Placid, and St. Johns soils. These minor soils did not form in organic material. They are usually along the outer margin of depressional areas.

Most areas of this map unit support the natural vegetation and are used for wildlife habitat. The map unit is not suited to the commercial production of pine trees. Wetness is the major limitation. In some areas cypress and other hardwoods are harvested during extended dry periods.

7. Hicoria-Riviera-Gator

Nearly level, poorly drained and very poorly drained soils; some have a thick or thin dark sandy or mucky surface layer over a loamy subsoil, and some have a thick layer of muck over a loamy substratum

This map unit consists mainly of very poorly drained soils in swamps and depressions on the flatwoods. These areas are ponded for long periods. The map unit is mainly in the northwestern part of the county, but a small area is in the center of the county, about 5 miles west of Bunnell. Slopes range from 0 to 2 percent.

The natural vegetation on these soils consists of cypress, red maple, sweetgum, and waxmyrtle and scattered areas of slash pine and water oak. The understory vegetation consists of sawgrass, maidencane, needlegrass, fern, sedges, and other water-tolerant grasses.

This map unit makes up about 8,583 acres, or about 3 percent of the county. It is about 45 percent Hicoria soils, 25 percent Riviera soils, 18 percent Gator soils, and 12 percent soils of minor extent.

Hicoria soils are very poorly drained and are in depressions. Slopes are 0 to 1 percent. Typically, the surface soil is about 20 inches thick. It is black mucky fine sand in the upper 10 inches and very dark gray fine sand in the lower 10 inches. The subsurface layer is dark gray fine sand to a depth of 32 inches. The subsoil is gray sandy clay loam to a depth of about 55 inches and is gray fine sandy loam to a depth of 80 inches or more.

Riviera soils are very poorly drained and are in depressions. Slopes are 0 to 1 percent. Typically, the surface layer is very dark gray fine sand about 3 inches thick. The subsurface layer is grayish brown fine sand to a depth of 22 inches. The subsoil extends to a depth of 50 inches. The upper 13 inches is dark grayish brown fine sandy loam that has tongues of light gray fine sand, the next 5 inches is dark grayish brown sandy clay loam, and the lower 10 inches is gray sandy clay loam. The next layer is dark grayish brown fine sandy loam about 10 inches thick. The underlying material is light brownish gray loamy sand to a depth of 80 inches or more.

Gator soils are very poorly drained and are in depressions. Typically, the surface soil is muck to a depth of about 26 inches. The upper part is black, and the lower part is very dark gray. The underlying material is dark grayish brown fine sandy loam to a depth of about 29 inches, dark gray fine sandy loam to a depth of about 49 inches, and gray sandy clay loam to a depth of 80 inches or more.

The soils of minor extent in this map unit are Basinger, Favoretta, Hontoon, Samsula, and Winder soils. Basinger, Favoretta, and Winder soils formed in mineral materials. They are on the outer edges of the swamps and depressions. Hontoon and Samsula soils are in depressions. Hontoon soils formed in organic layers more than 80 inches thick, and Samsula soils formed in organic layers less than 52 inches thick.

Most areas of this map unit support the natural vegetation and are used for wildlife habitat. In some areas hardwoods are harvested during extended dry periods. This map unit is poorly suited or is generally not suited to the commercial production of trees. Wetness is the major limitation.

8. Placid-Basinger-St. Johns

Nearly level, very poorly drained sandy soils; some have a thick or thin dark surface layer over a dark organic-stained subsoil, and some have a thick dark-colored surface layer over sandy underlying material

This map unit consists of soils in swamps, depressions, and poorly defined drainageways on the flatwoods. It is mainly in the northeastern part of the county north of Bunnell, but a small area is in the southeastern part of the county west of Favoretta. Slopes are 0 to 1 percent.

The natural vegetation on these soils consists of pondcypress, red maple, sweetgum, and swamp elm. The understory vegetation consists of sawgrass, maidencane, sedges, iris, waxmyrtle, and greenbrier.

This map unit makes up about 5,949 acres, or about 1 percent of the county. It is about 55 percent Placid soils, 25 percent Basinger soils, 15 percent St. Johns soils, and 5 percent soils of minor extent.

Placid soils are very poorly drained and are in depressions and narrow drainageways. Slopes are 0 to 1 percent. Typically, the surface layer is fine sand about 15 inches thick. It is black in the upper 8 inches and very dark gray in the lower 7 inches. The underlying material, to a depth of about 80 inches, is grayish brown fine sand in the upper part, light brownish gray fine sand in the next part, and light gray fine sand in the lower part.

Basinger soils are very poorly drained and are in maidencane, and a few water-tolerant sedges and grasses.

This map unit makes up about 8,752 acres, or about 3 percent of the county. It is about 55 percent Favoretta soils, 35 percent Chobee soils, and 10 percent soils of minor extent.

Favoretta soils are very poorly drained and are along drainageways and on flood plains. Slopes range from 0 to 2 percent. Typically, the surface layer is very dark gray clay about 12 inches thick. The subsoil is dark

soils, 37 percent Pellicer soils, and 21 percent soils of minor extent.

Turnbull soils are very poorly drained and are in the tidal marshes. Slopes are less than 1 percent. Typically, the surface layer is very dark gray muck about 8 inches thick. The underlying material is olive gray clay to a depth of 42 inches and is gray loamy fine sand to a depth of 80 inches.

Pellicer soils are very poorly drained and are in the tidal marshes. Slopes are less than 1 percent. Typically, the surface layer is very dark grayish brown silty clay loam about 10 inches thick. The underlying material is dark gray clay loam to a depth of 50 inches, dark gray sandy clay to a depth of 55 inches, and dark gray fine sandy loam to a depth of 80 inches or more.

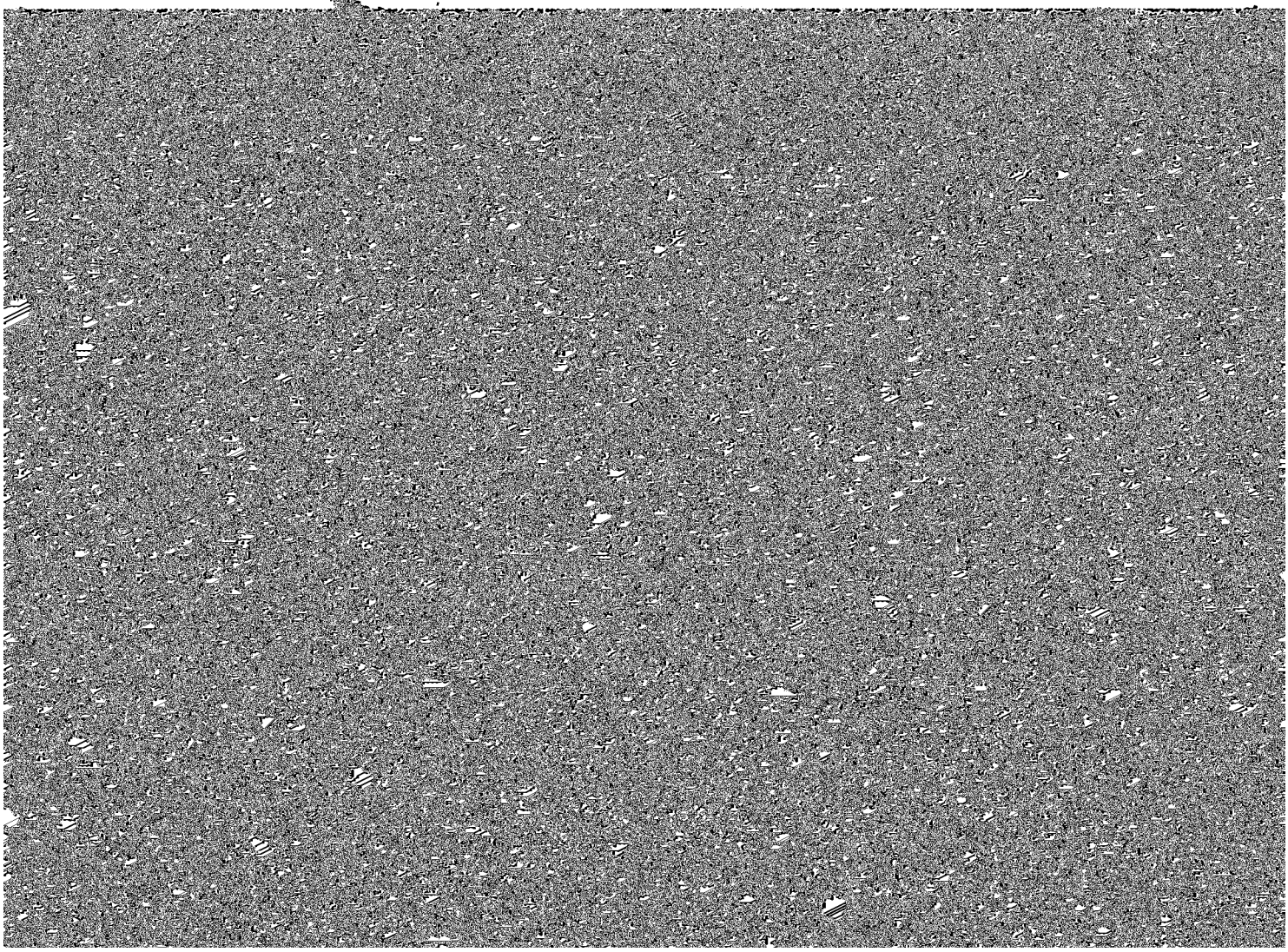
The soils of minor extent in this map unit are Terra Ceia soils, which formed in organic material. They are subject to tidal flooding.

about 7 inches thick. The subsurface layer is grayish brown fine sand about 5 inches thick. The upper part of the subsoil is grayish brown sandy loam to a depth of 25 inches. It has tongues of grayish brown fine sand mixed from the overlying subsurface layer. The lower part of the subsoil is gray, light gray, and greenish gray sandy clay loam to a depth of about 58 inches. The underlying material is greenish gray sandy loam to a depth of 80 inches or more.

Most areas of this map unit support the natural vegetation and are used for wildlife habitat. Flooding and wetness are the major limitations for other uses.

Soils on Sand Ridges and Coastal Dunes

The five general map units in this group consist mainly of excessively drained to somewhat poorly drained, nearly level to sloping soils on ridges and slopes adjacent to well defined drainageways and



subsoil, to a depth of 49 inches, is brown fine sand. It has common tongues of white fine sand in the upper part and is pale brown fine sand in the lower part. The underlying layer is light gray fine sand to a depth of 80 inches.

Astatula soils are excessively drained and are on high ridges and knolls. Slopes range from 0 to 8 percent. Typically, the surface layer is dark grayish

This map unit makes up 12,918 acres, or about 4 percent of the county. It is about 36 percent Cassia and similar soils, 32 percent Pomello and similar soils, 10 percent Orsino soils, and 22 percent soils of minor extent.

Pomello soils are moderately well drained and are on moderately high ridges and knolls. Slopes range from 0 to 5 percent. Typically, the surface layer is dark gray

14. Palm Beach-Narcoossee-Welaka

Nearly level to sloping, well drained to excessively drained, somewhat poorly drained and well drained soils; some are sandy and have shell fragments throughout

slopes of primary dunes and high knolls. Slopes range from 2 to 5 percent. Typically, the surface layer is dark gray fine sand about 3 inches thick. The subsurface layer is light gray fine sand about 9 inches thick. The

about 10 inches thick, that tongues into the underlying horizon. The subsoil is yellowish brown fine sand to a depth of 31 inches. The underlying material is yellowish brown fine sand to a depth of 80 inches.

Pomello soils are moderately well drained and are on moderately high knolls and ridges. Slopes range from 0 to 5 percent. Typically, the surface layer is dark gray fine sand about 5 inches thick. The subsurface layer is light gray fine sand about 36 inches thick. The subsoil, to a depth of about 66 inches, is very dark brown fine sand in the upper 14 inches and very dark gray fine sand in the lower 11 inches. The underlying material to a depth of about 80 inches is grayish brown fine sand in the upper part and is gray fine sand in the lower part.

Cocoa soils are well drained and are on narrow coastal ridges. Slopes range from 0 to 5 percent. Typically, the surface layer is grayish brown sand about 3 inches thick. The subsurface layer is pale brown sand about 13 inches thick. The upper part of the subsoil is reddish yellow sand to a depth of 29 inches. The lower part of the subsoil is yellowish red loamy sand to a depth of about 35 inches. Coquina limestone is at a depth of about 35 inches, but the depth varies from about 20 to 40 inches within a short distance.

Similar soils are Adamsville, Astatula, and Tavares soils. Adamsville and Tavares soils are in the lower areas. Astatula soils do not have a light-colored subsurface layer. The soils of minor extent are Bimini, Bulow, Cassia, and Orsino soils. Bimini soils have shells in the substratum. Bulow soils are underlain by limestone below a depth of 42 inches. Cassia and Orsino soils have an organic-stained subsoil or a high-chroma subsoil.

Most areas of this map unit support the natural vegetation and are used for wildlife habitat. Some areas are used for homesites. A few areas have been cleared and are used for improved pasture. A large area in the northeastern part of the county is used for Washington Oaks State Garden Park and Marineland. Some areas west of Graham Swamp are used for the commercial production of pine trees. The soils in this map unit are well suited to building site development, are moderately suited to the production of trees, and are poorly suited to pasture. Droughtiness is the main limitation for the production of trees or for pasture.

Soils on a Low-Lying Hammock

The general soil map unit in this group consists of nearly level, poorly drained and very poorly drained soils. Some have a sandy surface layer less than 20 inches thick and are loamy below that depth. Others are clayey throughout. This map unit makes up about 8,414 acres, or about 3 percent of the county.

16. Favoretta-Tuscawilla

Nearly level, poorly drained and very poorly drained soils; some have a sandy surface layer less than 20 inches thick and are loamy below that depth, and some are clayey throughout

This map unit consists mainly of soils on a narrow, hardwood hydric hammock that runs parallel to the Atlantic coastline and is about 1 mile inland. It consists mainly of poorly drained areas that are interspersed with numerous very poorly drained depressional areas, which are ponded for long periods of time, and poorly to well defined drainageways, which are periodically flooded. Slopes range from 0 to 2 percent.

The natural vegetation on these soils consists mainly of deciduous hardwoods, such as American hornbeam, pignut hickory, red maple, sweetgum, and southern magnolia. Other trees include cabbage palm, laurel oak, longleaf pine, slash pine, and water oak. The understory vegetation consists of bluestem, maidencane, panicum, pineland threeawn, saw palmetto, sedges, and waxmyrtle.

This map unit makes up about 8,414 acres, or about 3 percent of the survey area. It is about 52 percent Favoretta soils, 32 percent Tuscawilla soils, and 16 percent soils of minor extent.

Favoretta soils are very poorly drained. Slopes are less than 1 percent. Typically, the surface layer is very dark gray clay about 12 inches thick. The subsoil is dark gray and gray clay to a depth of 66 inches and is light brownish gray clay to a depth of 80 inches or more.

Tuscawilla soils are poorly drained. Slopes are 0 to 1 percent. Typically, the surface layer is black fine sand about 5 inches thick. The subsurface layer is dark gray fine sand about 7 inches thick. The upper part of the subsoil is dark gray sandy clay loam to a depth of about 25 inches. The lower part of the subsoil is gray sandy clay loam that is mixed with shells and calcium carbonate nodules to a depth of about 45 inches. The underlying layer is gray loamy fine sand that is mixed with shells and calcium carbonate nodules to a depth of 60 inches and light gray gravelly fine sandy loam that has about 20 percent shells and nodules to a depth of 80 inches or more.

The soils of minor extent in this map unit are EauGallie, Pineda, Pomona, Wabasso, and Winder soils. These soils are poorly drained. They are in low flatwood areas.

Most areas of this map unit support the natural vegetation and are used as wildlife habitat. Wetness and flooding are the main limitations for other uses.

Detailed Soil Map Units

The map units on the detailed soil maps at the back of this survey represent the soils in the survey area. The map unit descriptions in this section, along with the soil maps, can be used to determine the suitability and potential of a soil for specific uses. They also can be used to plan the management needed for those uses. More information on each map unit, or soil, is given under the heading "Use and Management of the Soils."

Each map unit on the detailed soil maps represents an area on the landscape and consists of one or more soils for which the unit is named.

A symbol identifying the soil precedes the map unit name in the soil descriptions. Each description includes general facts about the soil and gives the principal hazards and limitations to be considered in planning for specific uses.

Soils that have profiles that are almost alike make up a *soil series.* Except for differences in texture of the surface layer or of the underlying material, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement.

Soils of one series can differ in texture of the surface layer or of the underlying material. They also can differ in slope, stoniness, salinity, wetness, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases.* Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management.

Some map units are made up of two or more major soils. These map units are called soil complexes or undifferentiated groups.

A *soil complex* consists of two or more soils in such an intricate pattern or in such small areas that they cannot be shown separately on the soil maps. The pattern and proportion of the soils are somewhat similar in all areas. Pineda-Wabasso complex is an example.

An *undifferentiated group* is made up of two or more soils that could be made up of only one of the major soils, or it can be made up of all of them. Favoretta, Chobee, and Winder soils, frequently flooded, is an undifferentiated group in this survey area.

Most map units include small scattered areas of soils other than those for which the map unit is named. Some of these included soils have properties that differ substantially from those of the major soil or soils. Such differences could significantly affect use and management of the soils in the map unit. The included soils are identified in each map unit description. Some small areas of strongly contrasting soils are identified by a special symbol on the soil maps.

This survey includes *miscellaneous areas.* Such areas have little or no soil material and support little or no vegetation. Pits is an example. Miscellaneous areas are shown on the soil maps. Some that are too small to be shown are identified by a special symbol on the soil maps.

Table 3 gives the acreage and proportionate extent of each map unit. Other tables (see "Summary of Tables") give properties of the soils and the limitations, capabilities, and potentials for many uses. The Glossary defines many of the terms used in describing the soils.

2—Riviera fine sand. This very deep, nearly level, poorly drained soil is in broad to narrow, low areas on the flatwoods. Individual areas of this soil are irregular in shape. They range from 3 to 700 acres in size. Slopes are smooth and are less than 2 percent.

In 80 percent of the areas mapped as Riviera fine sand, Riviera and similar soils make up 84 to 96 percent of the map unit. Dissimilar soils make up 4 to 16 percent.

Typically, the surface layer is black fine sand about 6 inches thick. The subsurface layer extends to a depth of 28 inches. It is gray fine sand in the upper part and light gray and grayish brown fine sand in the lower part. The upper part of the subsoil, to a depth of 35 inches, is

Some areas contain soils that are similar to the Riviera soil but have a surface layer more than 8 inches thick or have a brown or pale brown sandy layer above the subsoil.

The dissimilar soils in this map unit include small areas of Favoretta, EauGallie, and Wabasso soils. They are in landscape positions similar to those of the Riviera soil. Favoretta soils are clayey throughout. EauGallie and Wabasso soils have an organic-stained layer in the subsoil.

The seasonal high water table is at a depth of 6 to 18 inches for as much as 6 months during most years. It recedes to a depth of more than 40 inches during long dry periods. Permeability is slow or very slow. Available water capacity is low.

Most areas are used for woodland or for the production of vegetable crops. A few areas are used for pasture and hay. The natural vegetation consists of slash pine, longleaf pine, cabbage palm, scattered baldcypress, sweetgum, water oak, and red maple. The understory vegetation consists of gallberry, maidencane, saw palmetto, pineland threeawn, and bluestem.

This soil is moderately suited to cultivated crops. The main limitations are excessive wetness and poor soil quality. Irish potatoes and cabbage are the main crops grown. Proper row management, lateral ditches or tiles, and well constructed outlets help to remove the excess surface water. A furrow irrigation system is suited to this soil. Land grading and smoothing improve the surface drainage, allow a more uniform application of irrigation water, and permit the more efficient use of farm equipment. Returning all of the crop residue to the soil and including grasses, legumes, or grass-legume mixtures in the crop rotation help to conserve moisture, maintain fertility, and control erosion. Frequent applications of fertilizer and lime are needed for the best yields.

With good water-control management, this soil is well suited to pasture. The main limitations are a result of the wetness. Excessive water on the surface can be removed by using field ditches and tile drains. Grasses and legumes grow well if adequate fertilizer is used. The low available water capacity limits the production of plants during extended dry periods. Deep-rooted plants, such as coastal bermudagrass and bahiagrass, tolerate droughty conditions better if they are properly fertilized and limed. Proper stocking rates, a system of pasture rotation, and the timely deferment of grazing help to keep the pasture in good condition.

from a fully stocked stand of trees 25 years old. The main management concerns for producing and harvesting timber are the equipment limitation, the seedling mortality rate, the windthrow hazard, and plant competition. Planting on beds helps to overcome the limitations caused by the excessive wetness. Although conventional methods of harvesting timber generally can be used, their use can be limited during rainy seasons. The use of equipment during wet periods can cause soil compaction. Using special equipment, such as high-flotation rubber tires or crawler machinery, can reduce the equipment limitation. Site preparation, such as chopping, applying herbicide, and bedding, reduces debris, reduces immediate plant competition, and facilitates hand and mechanical planting. Other good management practices include the selection of appropriate species, restricted burning, and a harvesting system that leaves residual biomass distributed throughout the site.

This soil is well suited to range and grazeable woodland. It has a moderate to high potential for the production of native forage. The dominant plants suitable for grazing include chalky bluestem, creeping bluestem, indiangrass, and panicum. This soil is in the North Florida Flatwoods range site.

This soil has severe limitations for dwellings without basements, local roads and streets, and small commercial buildings because of the wetness caused by the seasonal high water table. If suitable outlets are available, shallow surface drainage can help to remove the excess water. Suitable fill material can be used to elevate building sites and increase the effective depth to the water table. The limitations are severe for shallow excavations because cutbacks are unstable and excavations fill with water when the water table is high. Shoring sidewalls of excavations can help to prevent caving. Installing dewatering wells can lower the water table and help to overcome the wetness. The wetness and the slow permeability in the subsoil are severe limitations for septic tank absorption fields. Using suitable fill to mound the absorption field can help to overcome these limitations. The seepage and the wetness are severe limitations for sewage lagoons and trench-type sanitary landfills. Lining the lagoons and trenches with impervious soil material can reduce the excess seepage. Water-control measures should be used to remove the excess surface and ground water.

The wetness, the slow permeability in the subsoil, and the sandy surface are severe limitations for recreational development. This soil remains wet for long

The trafficability of the sandy surface layer is poor in areas of high use as a result of the loose, unstable sand. Planting a vegetative cover, adding mulch or suitable topsoil, or constructing paved areas can help to overcome the limitations caused by the sandy surface layer.

The potential of this soil as habitat for openland, woodland, and wetland wildlife is fair. Areas of this soil provide nesting sites, den sites, and food and cover for a diverse and numerous wildlife population. Many larger animals are found in areas where this soil joins other ecological communities. Areas of this soil are well suited to deer, quail, bobcat, skunk, opossum, and raccoon. Other species typically include cottontail rabbit, fox squirrel, gray fox, and a variety of birds, reptiles, and amphibians.

This Riviera soil is in capability subclass IIIw. The woodland ordination symbol is 10w. The ecological community is North Florida Flatwoods.

3—Samsula and Hontoon soils, depressional. These very deep, nearly level, very poorly drained soils are in depressions on the flatwoods. Individual areas are circular to irregular in shape. They range from 3 to 6,000 acres in size. Slopes are smooth to concave. [illegible] areas of Basinger soils and other mineral soils that have a loamy subsoil. Basinger soils are sandy throughout and do not have the surface layer of muck. These dissimilar soils are usually along the outer margin of depressional areas.

In most years, undrained areas of this map unit are ponded for 6 months or more. The water table is ponded as much as 24 inches above the surface, except during long dry periods. The permeability of the Samsula and Hontoon soils is rapid. The available water capacity is moderate in the Samsula soil and very high in the Hontoon soil.

Most areas of this map unit are used for wildlife habitat. The natural vegetation consists of bay and cypress and scattered areas of red maple and sweetgum. The understory vegetation consists of maidencane, sawgrass, greenbrier, sedges, ferns, and other water-tolerant grasses.

In their natural state, these soils are poorly suited to cultivated crops. Because the map unit is typically in the flatwoods, adequate water outlets for drainage are not generally available or are difficult to install.

This map unit is poorly suited to pasture. The main limitations are the excessive wetness and the ponding. Water stands above the surface for long periods. [illegible]

roadbeds can help to overcome the wetness and the low strength. The limitations are severe for shallow excavations because cutbanks are unstable, the content of organic matter is high, and water stands on the surface. Shoring the sidewalls of excavations prevents caving. The installation of water-control measures that remove the excess surface water and ground water helps to overcome the limitations caused by wetness. The ponding and the poor filtering of effluent are severe

loam in the upper part and dark gray loamy fine sand in the lower part. The underlying material is greenish gray loamy fine sand to a depth of 80 inches or more. Some areas contain soils that are similar to the Wabasso soil but have a very weakly expressed upper subsoil layer.

The dissimilar soils in this map unit include small areas of Malabar and Riviera soils, and also included are areas of soils that have a thick, dark surface layer. The soils are in landscape positions similar to those of

in good condition. Applications of fertilizer and lime are necessary for the optimum growth of grasses and legumes.

This soil is well suited to the production of slash pine. Based on a 50-year site curve, the mean site index for slash pine is 80. The potential for commercial production of pulpwood is 42 cords per acre harvested from a fully stocked stand of trees 25 years old. The main management concerns for producing and harvesting timber are the equipment limitation, the seedling mortality rate, and plant competition. The sandy texture of the surface layer and the wetness limit the use of equipment. After harvesting, reforestation

sewage lagoons and trench-type sanitary landfills. Lining the lagoons and trenches with impervious soil material can reduce the excess seepage. Water-control measures should be used to remove the excess surface and ground water.

The wetness, the slow permeability in the subsoil, and the sandy surface are severe limitations for recreational development. This soil remains wet for long periods because water runs through it slowly. The installation of a water-control system that removes excess water can reduce the wetness caused by the seasonal high water table and the slow permeability. The trafficability of the sandy surface layer is poor in

inches. The subsoil extends to a depth of 56 inches. In sequence downward, it is yellowish brown and brown,

maintain fertility, and control erosion. Frequent applications of fertilizer and lime are generally needed

elevate building sites and increase the effective depth

the map unit. Dissimilar soils make up 1 to 7 percent

limits the choice of plants and the period of grazing. The main suitable pasture plants are bermudagrass, bahiagrass, and clover. Proper stocking rates, a system of pasture rotation, and the timely deferment of grazing help to keep the pasture in good condition. Periodic mowing and clipping help to maintain uniform growth, discourage selective grazing, and reduce clumpy growth. Applications of fertilizer are needed for the optimum growth of grasses and legumes.

This soil is well suited to the commercial production of pine trees. Slash pine or loblolly pine are the recommended trees to plant. The wetness limits the use of equipment. Using special equipment, such as rubber tires or crawler machinery, and harvesting during dry periods can reduce the equipment limitation. Harvesting during dry periods reduces soil compaction and minimizes root damage during thinning operations. Planting on beds helps to overcome the limitations caused by the excessive wetness. Only those trees that can tolerate seasonal wetness should be planted. Site preparation, such as chopping, burning, applying herbicide, and bedding, reduces debris, reduces immediate plant competition, and facilitates hand and mechanical planting. Special site preparation, such as harrowing and bedding (or double bedding), helps to establish seedlings, reduces the seedling mortality rate, and increases early plant growth. Harvesting systems that remove all of the tree biomass from a site will reduce the fertility of that site. A logging system that leaves residual logging biomass distributed over the site is preferred.

This soil is highly suited to grazeable woodland. The dominant forage includes chalky bluestem, maidencane, indiangrass, and various species of panicum and sedges.

This soil has severe limitations for dwellings without basements, local roads and streets, and small commercial buildings. A drainage system is needed to overcome the wetness. Fill material is needed to make this soil suitable for most urban uses. The low strength is a limitation in areas where this soil is used for roads, streets, or buildings. The subsoil shrinks and swells excessively as the moisture content changes. Roads and streets can be built if they are designed to compensate for the instability of the subsoil. Buildings and roads can be designed to offset the effects of shrinking and swelling. If buildings are constructed on this soil, properly designed foundations and footings and the diversion of runoff away from buildings help to prevent the structural damage that results from shrinking and swelling. The wetness is a severe limitation for shallow excavations. Water-control measures are needed to keep the excavations from filling with water. The wetness and the very slow permeability are severe limitations for septic tank absorption fields. Using suitable fill to mound the absorption fields can help to overcome the wetness. Excavating the clayey soil material and backfilling with suitable fill material may also be needed to ensure the proper functioning of the system. The wetness is a severe limitation for sewage lagoons and trench-type sanitary landfills. Water-control measures that maintain the seasonal high water table at a lower depth can help to overcome the wetness.

The wetness, the slow permeability, and the high content of clay in the surface layer are severe limitations for recreational development. The seasonal high water table at or near the surface of the soil causes the excessive wetness. Because of the very slow permeability, the soil dries out slowly. The installation of a well designed water-control system can help to overcome these limitations. The high content of clay in the surface layer results in poor trafficability during wet seasons and can create a hazard of blowing dust during dry seasons. Using vegetation and mulch or constructing paved areas can help to overcome these limitations.

The potential of this soil as habitat for openland and woodland wildlife is fair and for wetland wildlife is good. Areas of this soil provide some of the most productive and diverse wildlife habitat in the county. The hardwoods provide good food and cover for a number of species. The animals generally include wild hogs, deer, turkey, black bear, gray squirrel, woodpeckers, owls, and reptiles.

This Favoretta soil is in capability subgroup IIIw. The woodland ordination is 6w. The ecological community is Wetland Hardwood Hammock.

7—Favoretta, Chobee, and Winder soils, frequently flooded. These very deep, nearly level, poorly drained and very poorly drained soils are in drainageways and on flood plains along major streams on the flatwoods. These soils are frequently flooded during wet seasons. Individual areas range from elongated to irregular in shape. They range from 20 to more than 1,000 acres in size. Slopes are smooth to concave and range from 0 to 2 percent.

Favoretta, Chobee, Winder, and similar soils make up 93 to 99 percent of the map unit in 90 percent of the areas mapped as Favoretta, Chobee, and Winder soils, frequently flooded. Dissimilar soils make up 1 to 7 percent.

Generally, the mapped areas are 48 percent Favoretta and similar soils, 28 percent Chobee and similar soils, and 21 percent Winder and similar soils. The soils do not occur in a regular and repeating pattern. Each of the soils is not present in every

mapped area, and the relative proportion of the soils is variable. Although individual areas of the soils are large enough to map separately, they were mapped as one unit based upon the present and predicted uses.

Typically, the surface layer of the Favoretta soil is very dark gray clay about 10 inches thick. The subsoil extends to a depth of 80 inches or more. It is dark gray clay in the upper 28 inches, gray clay in the next 30 inches, and light brownish gray clay to a depth of 80

tolerant sedges and grasses. Most areas of this map unit are used as wildlife habitat. The natural-growth hardwoods are harvested in some areas.

In their natural state, these soils are generally unsuited to most cultivated crops because of the high content of clay, the flooding, and the excessive wetness (fig. 5). Water-control measures that include protection from flooding can help to overcome these limitations.

In their natural state, these soils are poorly suited to

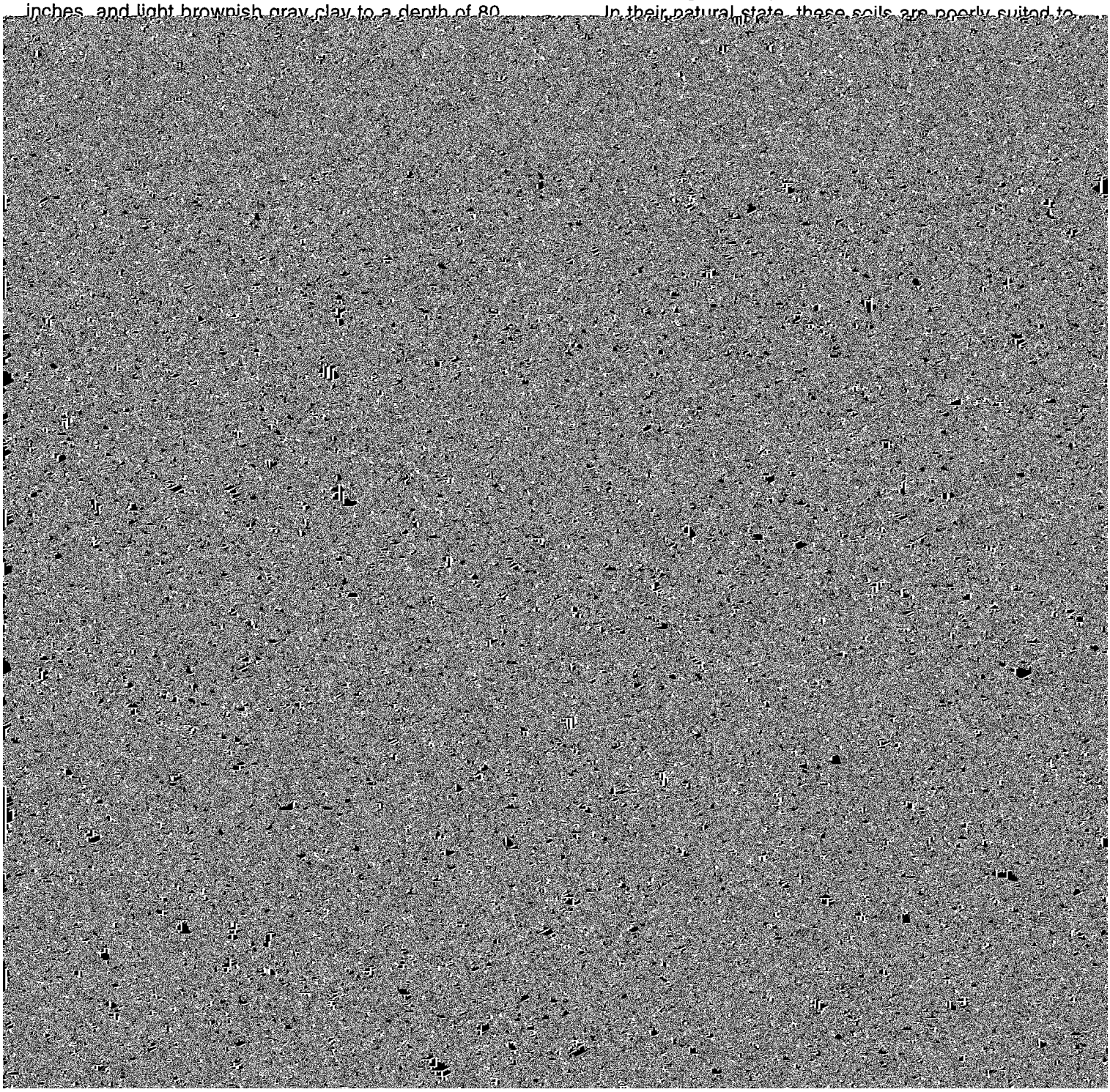


Figure 5.—An area of Favoretta, Chobee, and Winder soils, frequently flooded. This map unit has severe limitations for most uses because of the flooding.

slowly. Protection from flooding is needed when this map unit is used for camp areas and playgrounds. Trafficability limitations on the Favoretta soil are a result of the high content of clay. They can be overcome by establishing suitable vegetation or by constructing paved areas.

The potential of this map unit as habitat for openland and woodland wildlife is fair and for wetland wildlife is good. The dense hardwood vegetation provides a good source of food and cover. The animals in this unit are adapted to wet conditions and to periodic flooding. The map unit is especially well suited to waterfowl, reptiles, amphibians, and mammals. Species include deer, gray squirrel, otter, raccoon, and black bear.

This map unit is in capability subclass VIw. The woodland ordination symbol is 6w for the Favoretta and Chobee soils and is 11w for the Winder soil. The ecological community is Swamp Hardwoods.

8—Hicoria, Riviera, and Gator soils, depressional. These very deep, nearly level, very poorly drained soils are in depressions on the flatwoods. Individual areas

are circular to irregular in shape. They range from 3 to 1,500 acres in size. Undrained areas are ponded for 6 to 9 months or more each year. Slopes are concave and range from 0 to 1 percent.

Hicoria, Riviera, Gator, and similar soils make up 75 to 96 percent of the map unit in 90 percent of the areas mapped as Hicoria, Riviera, and Gator soils, depressional. Dissimilar soils make up 4 to 25 percent.

organic-stained layer in the subsoil. Basinger soils are sandy throughout.

In most years, undrained areas of this map unit are ponded, and as much as 24 inches of water is above the surface for 6 months or more except during extended dry periods. Permeability is slow and moderately slow in the Hicoria soil and is slow and very slow in the Riviera and Gator soils. The available water

limitations is difficult. Outlets needed for water control are often not readily available. Using fill to elevate building sites and roadways and removing the organic layers can help to overcome the wetness and the low strength. The limitations are severe for shallow excavations because cutbanks are unstable, the content of organic matter is high, and water stands on the surface. Shoring the sidewalls of excavations prevents caving. The installation of a water-control system that removes excess surface water can help to overcome

dark reddish brown fine sand that is well coated with organic material to a depth of 33 inches, dark brown to brown fine sand to a depth of about 45 inches, light gray fine sand to a depth of 56 inches, and light gray fine sandy loam to a depth of 70 inches. The substratum is light gray loamy fine sand to a depth of 80 inches or more. Some areas contain soils that are similar to the EauGallie soil but do not have an organic-stained layer in the subsoil. Some soils have a loamy subsoil above a depth of 40 inches, and other soils do

for commercial production of pulpwood is 42 cords per acre harvested from a fully stocked stand of trees 25 years old. The main management concerns for producing and harvesting timber are the equipment limitation, the seedling mortality rate, and plant competition. The sandy texture of the surface layer and the wetness limit the use of equipment. Using special equipment, such as large rubber tires or crawler machinery, and harvesting during dry periods can reduce the equipment limitation. Harvesting during dry periods reduces soil compaction and minimizes root damage during thinning operations. Planting on beds helps to overcome the limitations caused by the excessive wetness. The soil often has a very low content of organic matter, and a harvest system that removes all of the tree biomass from the site reduces the fertility of the soil in these areas. A logging system that leaves residual biomass distributed over the site is preferred.

This soil is well suited to range and grazeable woodland. It has a moderate to high potential for the production of native forage. The dominant plants suitable for grazing include chalky bluestem, creeping bluestem, indiangrass, and panicum. This soil is in the North Florida Flatwoods range site.

This soil has severe limitations for dwellings without basements, local roads and streets, and small commercial buildings because of the wetness caused by the seasonal high water table. If suitable outlets are available, shallow surface drainage can help to remove topsoil, or constructing paved areas can help to overcome the limitations caused by the sandy surface layer.

The potential of this soil as habitat for openland, woodland, and wetland wildlife is poor. Areas of this soil provide nesting sites, den sites, and food and cover for a diverse and numerous wildlife population. Many larger animals are found in areas where this soil joins other ecological communities. Areas of this soil are well suited to deer, quail, bobcat, skunk, opossum, and raccoon. Other species typically include cottontail rabbit, fox squirrel, gray fox, and a variety of birds, reptiles, and amphibians.

This EauGallie soil is in capability subclass IVw. The woodland ordination symbol is 10w. The ecological community is North Florida Flatwoods.

10—Winder fine sand. This very deep, nearly level, poorly drained soil is on low flatwoods. Individual areas are irregular in shape. They range from 5 to 2,000 acres in size. Slopes are smooth to concave and are less than 2 percent.

In 95 percent of the areas mapped as Winder fine sand, Winder and similar soils make up 87 to 99 percent of the map unit. Dissimilar soils make up 1 to 13 percent.

Typically, the surface layer is very dark gray fine sand about 7 inches thick. The subsurface layer is grayish brown fine sand about 5 inches thick. The upper part of the subsoil is grayish brown sandy loam to a

Figure 6.—Furrow irrigation on a field of cabbage in an area of Winder fine sand.

of gallberry, saw palmetto, pineland threeawn, bluestem, panicum, and sedges.

This soil is moderately suited to vegetable crops. The main limitations are excessive wetness during rainy seasons and droughtiness during dry seasons. Cabbage, Irish potatoes, and other vegetables are the main crops grown. An adequate drainage system is needed. Ditches and tile drains can be used to lower

the water table. Proper arrangement and bedding of tree rows, lateral ditches or tiles, and well constructed outlets help to remove the excess surface water and lower the water table. Land grading and smoothing improve the surface drainage and permit the more efficient use of farm equipment. Irrigation is generally feasible in most areas where irrigation water is readily available (fig. 6). Because of the slow permeability, sprinkler irrigation systems are suited to this soil. Returning all of the crop residue to the soil and including grasses, legumes, or grass-legume mixtures in the crop rotation help to conserve moisture, maintain fertility, and control erosion. Crops respond well to applications of lime and fertilizer.

This soil is well suited to pasture. The main limitations are the wetness and the poor soil quality. Excessive water on the surface can be removed by applying surface drainage. The main suitable pasture plants are bermudagrass, bahiagrass, and white clover. Proper stocking rates, a system of pasture rotation, and the timely deferment of grazing help to keep the pasture in good condition. Periodic mowing and clipping help to maintain uniform growth, discourage selective grazing, and reduce clumpy growth. Applications of fertilizer are needed for the optimum growth of grasses and legumes.

This soil is well suited to the production of slash pine. Based on a 50-year site curve, the mean site index for slash pine is 90. The potential for commercial production of pulpwood is 42 cords per acre harvested from a fully stocked stand of trees 25 years old. The main management concerns for producing and harvesting timber are the equipment limitation, the seedling mortality rate, the windthrow hazard, and the plant competition. The excessive wetness and the sandy surface layer limit the use of equipment. Using special equipment, such as high-flotation rubber tires or crawler machinery, and harvesting during dry periods practices include the selection of appropriate species and restricted burning.

This soil is poorly suited to range or grazeable woodland. Areas that support the natural vegetation generally are densely shaded by the closed canopy of the hardwoods. Grasses and other plants that provide forage for animals do not grow well, but areas of this soil provide shade and shelter for cattle during periods of bad weather. This map unit is not assigned to a range site.

This soil has severe limitations for dwellings without basements, local roads and streets, and small commercial buildings because of the wetness caused by the seasonal high water table. If suitable outlets are available, shallow surface drainage can help to remove the excess water. Suitable fill material can be used to elevate building sites and increase the effective depth to the water table. The limitations are severe for shallow excavations because cutbanks are unstable and excavations fill with water when the water table is high. Shoring sidewalls of excavations can help to prevent caving. Installing dewatering wells can lower the water table and help to overcome the wetness. The wetness and the slow permeability in the subsoil are severe limitations for septic tank absorption fields. Using suitable fill to mound the absorption field can help to overcome these limitations. The seepage and the wetness are severe limitations for sewage lagoons and trench-type sanitary landfills. Lining the lagoons and trenches with impervious soil material can reduce the excess seepage. A water-control system should be installed to remove the excess surface water and ground water.

The wetness, the slow permeability in the subsoil, and the sandy surface are severe limitations for recreational development. Installing water-control measures can reduce the wetness caused by the

11—Myakka fine sand. This very deep, nearly level, poorly drained soil is in broad flatwood areas. Individual areas are irregular in shape. They range from 5 to 600 acres in size. Slopes are smooth to convex and range from 0 to 2 percent.

In 90 percent of the areas mapped as Myakka fine sand, Myakka and similar soils [illegible]

growth. Applications of fertilizer and lime are needed for the optimum growth of grasses and legumes.

This soil is moderately suited to the commercial production of pine trees. Based on a 50-year site curve, the mean site index for slash pine is 70. The potential for commercial production for pulpwood is 35 cords per

remove the excess surface and ground water.

The wetness and the sandy surface are severe limitations for recreational development. Installing

Typically, the surface layer of the Basinger soil is black fine sand about 2 inches thick. The subsurface layer is about 27 inches thick. It is light gray fine sand

is the water table, which is above the surface for much of the year. The ponding and the high content of organic matter in the surface layer prevent the use of heavy equipment. The high water table will kill planted seedlings. Outlets are generally not present in these areas, and drainage is not practical.

This map unit is poorly suited to range or grazeable woodland. Water covers the surface of the soil for long periods of time. The growth of forage suitable for use by cattle is limited by the excessive wetness and the dense

13—Immokalee fine sand. This very deep, nearly level, poorly drained soil is on broad flats and low knolls on the flatwoods. Individual areas are irregular in shape. They range from 5 to 600 acres in size. Slopes are smooth to convex and range from 0 to 2 percent.

In 95 percent of the areas mapped as Immokalee fine sand, Immokalee and similar soils make up 93 to 99 percent of the map unit. Dissimilar soils make up 1 to 7 percent.

Typically, the surface layer is black fine sand about 5

the crop residue to the soil and including grasses, legumes, or grass-legume mixtures in the crop rotation help to maintain fertility and tilth. Maintaining crop residue on or near the surface helps to control runoff, maintain soil tilth, and maintain the content of organic matter. Soil blowing is a hazard in cultivated areas. It can be controlled with a good ground cover of close-growing plants. Crops respond well to applications of lime and nitrogen, phosphorus, and potassium fertilizer.

This soil is moderately suited to pasture. The main limitations are excessive wetness during rainy seasons and droughtiness during extended dry periods. The wetness limits the choice of plants and the period of grazing. Grazing when the soil is wet results in the compaction of the surface layer and damages the plant community. Excessive water on the surface can be removed by using shallow surface ditches. The low or very low available water capacity of the soil limits the production of plants during extended dry periods. Deep-rooted plants, such as coastal bermudagrass and bahiagrass, tolerate droughty conditions better if they are properly fertilized and limed. Proper stocking rates, a system of pasture rotation, and the timely deferment of grazing help to keep the pasture in good condition.

suitable, the soil can be compacted if heavy equipment is used when the soil is wet. The soil often has a very low content of organic matter, and a harvest system that removes all of the tree biomass reduces the fertility of the soil in these areas. A logging system that leaves residual logging biomass distributed over the site is preferred.

This soil is moderately suited to range and grazeable woodland. It has a moderate to high potential for the production of native forage. The dominant plants suitable for grazing include chalky bluestem, creeping bluestem, indiangrass, and panicum. This soil is in the North Florida Flatwoods range site.

This soil has severe limitations for dwellings without basements, local roads and streets, and small commercial buildings because of the wetness caused by the seasonal high water table. If suitable outlets are available, shallow surface drainage can help to remove the excess water. Suitable fill material can be used to elevate building sites and increase the effective depth to the water table. The limitations are severe for shallow excavations because cutbanks are unstable and excavations fill with water when the water table is high. Shoring sidewalls of excavations can help to prevent

This Immokalee soil is in capability subclass IVw. The woodland ordination symbol is 8w. The ecological community is North Florida Flatwoods.

14—Pineda fine sand. This very deep, nearly level, poorly drained soil is in sloughs and on low flatwoods. Individual areas are irregular in shape. They range from 5 to 1,000 acres in size. Slopes are smooth to concave. They are mainly less than 1 percent but range from 0 to 2 percent.

In 95 percent of the areas mapped as Pineda fine sand, Pineda and similar soils make up 92 to 99 percent of the map unit. Dissimilar soils make up 1 to 8 percent.

Typically, the surface layer is gray fine sand about 3 inches thick. The subsurface layer is light gray fine sand about 10 inches thick. The upper part of the subsoil is brownish yellow fine sand to a depth of 19 inches and yellowish brown fine sand to a depth of 24 inches. A grayish brown fine sand layer about 2 inches thick is between the upper and lower parts of the subsoil. The lower part of the subsoil is light gray and has tongues of grayish brown fine sand to a depth of 33 inches. It is gray fine sandy loam to a depth of 40 inches. The underlying material is dark gray loamy fine sand to a depth of 47 inches and greenish gray loamy fine sand to a depth of 80 inches or more. Some areas contain soils that are similar to the Pineda soil but in which the depth to the loamy subsoil is more than 40 inches. Also included in mapping are some soils that are similar to the Pineda soil but have a brown upper subsoil layer and other soils that have a loamy subsoil

vegetable crops can be grown. Proper row management, lateral ditches or tiles, and well constructed outlets help to remove the excess surface water. A furrow irrigation system is suited to this soil. Land grading and smoothing improve the surface drainage, allow a more uniform application of irrigation water, and permit the more efficient use of farm equipment. Returning all of the crop residue to the soil and including grasses, legumes, or grass-legume mixtures in the crop rotation help to conserve moisture, maintain fertility, and control erosion. Frequent applications of fertilizer and lime are generally needed for the best yields.

With good water-control management, this soil is well suited to pasture. The main limitations are a result of the wetness. Excessive water can be removed by using field ditches and tile drains. Grasses and legumes grow well if adequate fertilizer is used. The low available water capacity limits the production of plants during extended dry periods. Deep-rooted plants, such as coastal bermudagrass and bahiagrass, tolerate droughty conditions better if they are properly fertilized and limed. Proper stocking rates, a system of pasture rotation, and the timely deferment of grazing help to keep the pasture in good condition.

This soil is well suited to the production of slash pine. Based on a 50-year site curve, the mean site index for slash pine is 80. The potential for commercial production of pulpwood is 42 cords per acre harvested from a fully stocked stand of trees 25 years old. The main management concerns for producing and

to produce a large amount of forage. It is in the Slough range site.

This soil has severe limitations for dwellings without [illegible]

sand, 0 to 5 percent slopes, Pomello and similar soils make up 85 to 99 percent of the map unit. Dissimilar soils make up 1 to 15 percent.

[illegible]

tolerate droughty conditions better if they are properly fertilized and limed. A system of grazing rotation helps to maintain the quality of forage. Proper stocking rates, a system of pasture rotation, and the timely deferment

measures and lining the lagoons and trenches with impervious soil material can help to overcome the limitations.

The sandy surface is a severe limitation for

A seasonal high water table is at a depth of 0 to 6 inches for 2 to 6 months in most years. Permeability is slow or very slow. The available water capacity is low.

The natural vegetation consists of scattered areas of slash pine, cabbage palm, water oak, red maple, sweetgum, and cypress. The understory vegetation consists of maidencane, pineland threeawn, chalky bluestem, and panicum and scattered areas of saw palmetto. Most areas are used for the commercial production of pine trees. A few areas are used as improved pasture.

By applying good water-control and soil-improving measures, this soil is moderately suited to cultivated [illegible] helps to overcome the limitations caused by the excessive wetness. Although conventional methods of harvesting timber generally can be used, their use can be limited during rainy seasons, which are generally from June to December. The use of equipment during wet periods can cause soil compaction. Soil compaction results in less infiltration and aeration and restricted root growth. Site preparation, such as chopping, burning, applying herbicide, and bedding, reduces debris, reduces immediate plant competition, and facilitates hand and mechanical planting. Using a nitrogen fertilizer combined with phosphorus, based on a soil test or tissue analysis, at mid-rotation can provide

paved areas can help to overcome the limitations caused by the sandy surface layer.

The potential of this soil as habitat for openland and woodland wildlife is poor and for wetland wildlife is fair. Areas of this soil provide a good source of food for bobwhite quail, deer, and wading birds. They produce poor cover for most wildlife species, but the adjacent flatwoods produce good escape routes and an edge effect. Other species include fox, rabbit, opossum, and a variety of birds, reptiles, and amphibians.

This Malabar soil is in capability subclass IVw. The woodland ordination symbol is 10w. The ecological community is Slough.

17—Holopaw fine sand. This very deep, nearly level, poorly drained soil is in broad to narrow, low flatwood areas. Individual areas are irregular in shape. They range from 5 to 80 acres or more in size. Slopes are smooth to concave. They are mainly less than 1 percent but range from 0 to 2 percent.

In 80 percent of the areas mapped as Holopaw fine sand, Holopaw and similar soils make up 79 to 98 percent of the map unit. Dissimilar soils make up 2 to 21 percent.

Typically, the surface layer is very dark gray fine sand about 4 inches thick. The subsurface layer is light gray and gray fine sand to a depth of 45 inches. The subsoil is light gray fine sandy loam to a depth of 55 inches. The underlying material, to a depth of 80 inches or more, is light gray loamy fine sand. Some areas contain soils that are similar to the Holopaw soil but in which the depth to the subsoil layer is less than 40 inches. Also included in mapping are some soils that are similar to the Holopaw soil but have a thin, dark sandy layer above the subsoil and other soils that have a loamy sand subsoil.

The dissimilar soils in this map unit include small areas of Valkaria soils that are sandy throughout. Valkaria soils are in landscape positions similar to those of the Holopaw soil.

A seasonal high water table is at a depth of 0 to 6 inches for 2 to 6 months during most years. Permeability is moderate to moderately slow. Available water capacity is low to moderate.

The natural vegetation consists of slash pine, longleaf pine, cabbage palm, sweetgum, red maple, and water oak. The understory vegetation consists of waxmyrtle and gallberry and scattered areas of saw palmetto, bluestem, and panicum. Most areas are used for the commercial production of pine trees. A few areas are used as improved pasture, and some areas are crops. It is limited mainly by excessive wetness during rainy seasons and by droughtiness during periods of low rainfall. The root zone is limited by the seasonal high water table, which is less than 10 inches below the surface of the soil during the growing season. Irish potatoes, cabbage, and a variety of other vegetable crops are grown. Proper row management, lateral ditches or tiles, and well constructed outlets help to remove the excess surface water. A furrow irrigation system is suited to this soil. Land grading and smoothing improve the surface drainage, allow a more uniform application of irrigation water, and permit the more efficient use of farm equipment. Returning all of the crop residue to the soil and including grasses, legumes, or grass-legume mixtures in the crop rotation help to conserve moisture, maintain fertility, and control erosion. Frequent applications of fertilizer and lime are generally needed to improve soil quality.

With good water-control management, this soil is moderately suited to pasture. The main limitations are a result of the wetness. Excessive water on the surface can be removed by using field ditches and tile drains in areas where water outlets are available. Grasses and legumes grow well if adequate fertilizer is used. The low available water capacity limits the production of plants during extended dry periods. Deep-rooted plants, such as coastal bermudagrass and bahiagrass, tolerate droughty conditions better if they are properly fertilized and limed. Proper stocking rates, a system of pasture rotation, and the timely deferment of grazing help to keep the pasture in good condition.

This soil is well suited to the production of pine trees. Slash pine is the recommended species for commercial woodland production. Based on a mean site index of 80 for slash pine, the yield from an even-aged, fully stocked stand of trees 25 years old is 42 cords per acre. Seedling mortality, the equipment limitation, and plant competition are management concerns. Droughtiness causes seedling mortality. Using special equipment, such as oversized rubber tires on harvesting equipment, reduces the equipment limitation, minimizes the damage to roots, and reduces soil compaction during thinning operations. The seedling mortality rate can be reduced by providing good site preparation. Site preparation, such as chopping, applying herbicide, and bedding reduces debris, controls immediate plant competition, and facilitates mechanical planting. Planting trees on bedded rows lowers the effective depth of the water table. The soil often has a very low content of organic matter, and harvesting systems that remove all of the tree biomass reduce the fertility of the

wetness is a severe limitation. With the use of a complete water-control system that removes excess water rapidly and provides a means of applying surface irrigation, this map unit is suited to a number of vegetable crops. Good management includes a crop rotation that keeps the soil in close-growing crops to help to maintain soil quality. Soil-improving cover crops and all other crop residue should be plowed under the surface. Seedbed preparation should include bedding. Fertilizer and lime should be applied according to the needs of the crop and the soil condition.

This map unit is moderately suited to pasture and hay. Excess surface water can be removed from most areas by field drains. Suitable pasture plants include bermudagrass, bahiagrass, and clover. Proper grazing management, weed control, and applications of fertilizer are needed to ensure the maximum quality of forage.

This map unit is moderately suited to the production of slash pine. Based on a 50-year site curve, the mean site index for slash pine is 68 for the Valkaria soil and 80 for the Smyrna soil. The yield is 33 cords per acre for the Valkaria soil and 42 cords per acre for the Smyrna soil from fully stocked stand of trees 25 years old. The main management concern is the seasonal wetness that results in seedling mortality, plant competition, and equipment limitations. Site preparation, such as chopping and bedding (or double bedding), helps to establish seedlings, reduces the mortality rate, and increases early plant growth. Planting on beds should be done so that it does not block the natural drainage. Restricting the use of equipment to drier periods and using low-pressure ground equipment reduce the problems associated with soil compaction. The hardwood understory can be reduced by girdling, burning, cutting unwanted trees, and chopping late in fall and winter, followed by a second chopping or herbicide application in spring and burning in summer. Using a nitrogen fertilizer combined with phosphorus and potassium at planting time can provide an excellent growth response. Additional applications of fertilizer at mid-rotation should be based on soil test or tissue analyses. Pine trees grow best with an adequate phosphorus supply.

This map unit is well suited to range and grazeable woodland. The dominant forage is bluestem, maidencane, and pineland threeawn. The natural vegetation on the Valkaria soil is scattered areas of trees and shrubs. It has a more open canopy than the vegetation on the Smyrna soil. When well managed, this map unit has the potential to produce large amounts of forage. The Valkaria soil is in the Slough range site, and the Smyrna soil is in the North Florida Flatwoods range site.

This map unit has severe limitations for dwellings without basements, local roads and streets, and small commercial buildings because of the wetness caused by the seasonal high water table. If adequate water outlets are available, shallow surface drainage can help remove the excess wetness. Suitable fill material can be used to elevate building sites and increase the effective depth to the water table. The limitations are severe for shallow excavations because cutbanks are unstable and excavations fill with water when the water table is high. Shoring sidewalls of excavations can help to prevent caving. Installing dewatering wells can lower the water table and help to overcome the wetness. The wetness and the poor filtering of effluent are severe limitations for septic tank absorption fields. Using suitable fill to mound the absorption field can help to overcome the limitations. The seepage and the wetness are severe limitations for sewage lagoons and trench-type sanitary landfills. Lining trenches with impervious soil material can reduce the excess seepage. Water-control measures should be used to remove the excess surface and ground water.

The wetness and the sandy surface are severe limitations for recreational development. Installing water-control measures can reduce the wetness caused by the seasonal high water table. The trafficability of the sandy surface layer is poor in areas of high use as a result of the loose, unstable sand. Planting a vegetative cover, adding mulch or suitable topsoil, or constructing paved areas can help to overcome the limitations caused by the sandy surface layer.

The potential of the Valkaria soil as habitat for openland and woodland wildlife is poor and for wetland wildlife is good. Areas of this soil provide a good source of food for bobwhite quail, deer, and wading birds. They produce poor cover for most wildlife species, but the adjacent flatwoods produce good escape routes and an edge effect. Other species in areas of this soil include fox, rabbit, opossum, and variety of birds, reptiles, and amphibians.

The potential of the Smyrna soil as habitat for all forms of wildlife is fair. Areas of this soil provide good food and cover, nesting sites, and den sites for a diverse and numerous wildlife population. The species typically include deer, quail, turkey, feral hog, raccoon, opossum, and a variety of birds.

The unit is in capability subclass IVw. The Valkaria soil has a woodland ordination symbol of 8w, and the ecological community is Slough. The Smyrna soil has a woodland ordination symbol of 10w, and the ecological community is North Florida Flatwoods.

19—Valkaria fine sand. This very deep, nearly level, poorly drained soil is on low broad flats and in sloughs connecting depressions. Individual areas are irregular in

shape. They range from 5 to 100 acres in size. Slopes are smooth to concave. They are mainly less than 1 percent but range to 2 percent.

In 95 percent of areas mapped as Valkaria fine sand, Valkaria and similar soils make up 81 to 99 percent of the map unit. Dissimilar soils make up 1 to 19 percent.

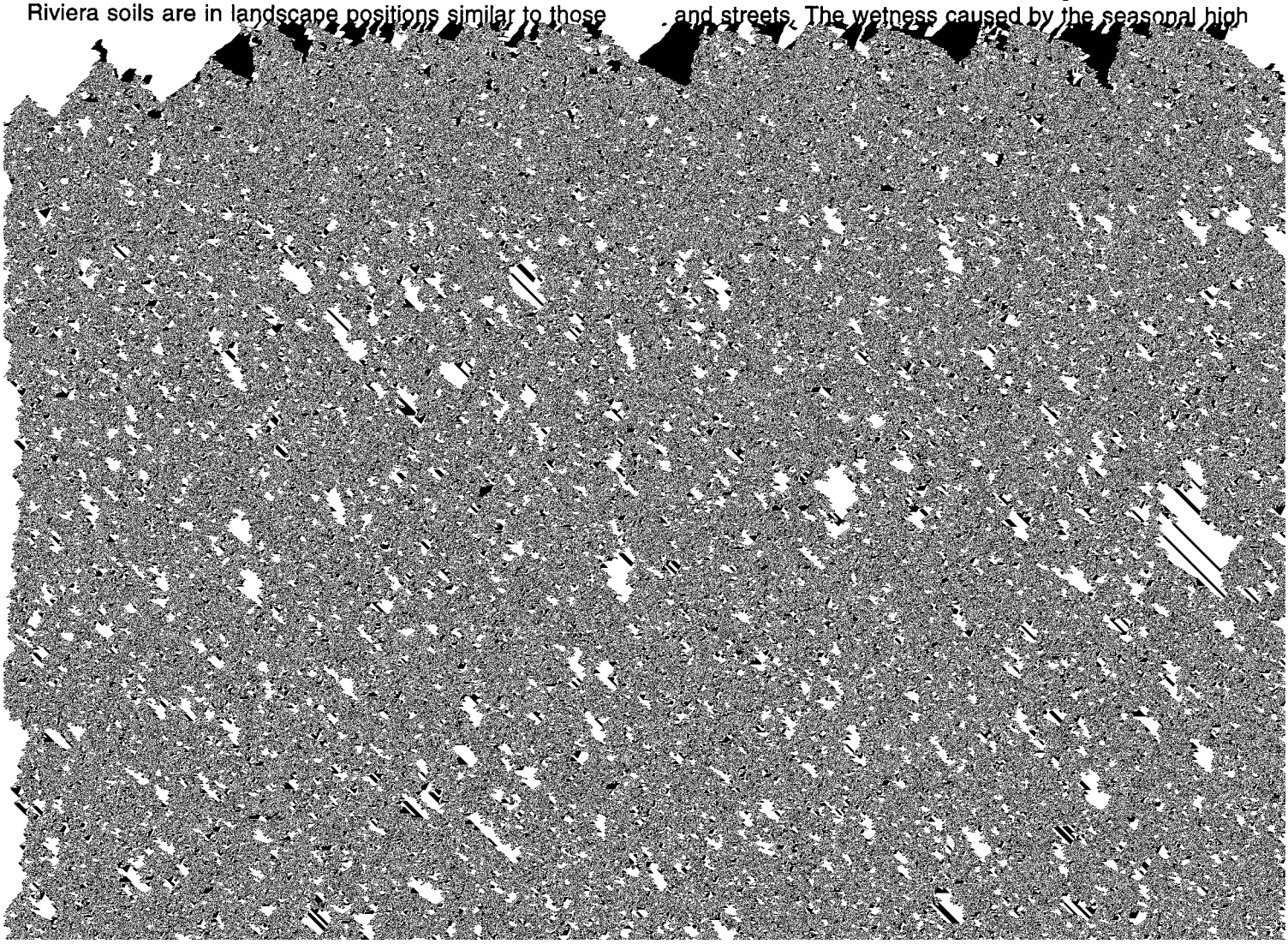
Typically, the surface layer is dark gray fine sand about 6 inches thick. The subsurface layer is light gray fine sand about 11 inches thick. The subsoil is brownish yellow and yellow fine sand to a depth of about 38 inches. The underlying layer is gray fine sand to a depth of 80 inches or more. Some areas contain soils that are similar to the Valkaria soil but have a loamy subsoil layer below a depth of 60 inches. Also included in mapping are some soils that are similar to the Valkaria soil but have a dark sandy layer below the subsoil, do not have a subsoil, or have a loamy sand layer beneath the subsoil.

The dissimilar soils in this map unit include small areas of Pineda, Riviera, and Myakka soils. Pineda and Riviera soils are in landscape positions similar to those

commercial production of pulpwood is 35 cords per acre harvested from a fully stocked stand of trees 25 years old. Seedling mortality, plant competition, and the equipment limitation are management concerns. Site preparation, such as double bedding, helps to establish seedlings and reduces the mortality rate. Planting on beds should be done so that it does not block the natural drainage pattern. Other site preparation, such as chopping and burning, reduces debris and controls competing vegetation. Using low pressure, high-flotation equipment and harvesting during dry periods reduces the soil compaction.

This soil is well suited to range and grazeable woodland. The dominant forage includes maidencane, chalky bluestem, and panicum. The canopy is more open and has fewer trees and shrubs. When well managed, this soil has the potential to produce a large amount of forage. It is in the Slough range site.

This soil has severe limitations for dwellings without basements, small commercial buildings, and local roads and streets. The wetness caused by the seasonal high



good. Areas of this soil provide a good source of food for bobwhite quail, deer, and wading birds. They produce poor cover for most wildlife species, but the adjacent flatwoods produce good escape routes and an edge effect. Other species in areas of this soil include fox, rabbit, opossum, and variety of birds, reptiles, and amphibians.

This Valkaria soil is in capability subclass IVw. The nutrients are leached rapidly. The variety of crops that can be grown without irrigation is limited. Ornamental fern is a crop that is suited to this soil. To achieve maximum yields, an irrigation system should be used to maintain the optimum soil moisture and provide freeze protection during cold periods. Frequent applications of fertilizer and lime are generally needed for the best yields. Soil-improving crops should be used in rotation,

small commercial buildings. Land smoothing can help to overcome the slope. Lawn grasses and landscaping plants require frequent irrigation. Shoring the sidewalls of excavations helps to prevent caving. The limitations are slight for septic tank absorption fields, but the hazard of ground-water contamination exists in areas that have many septic tanks. Lining the trench-type sanitary landfills and sewage lagoons with impervious soil material can reduce the excess seepage.

The sandy surface is a severe limitation for recreational development. Maintaining good trafficability in the loose sandy surface is difficult, and the hazard of blowing sand is present. Establishing a good vegetative cover, planting windbreaks, adding good topsoil, or constructing paved areas can help to overcome the limitation.

The potential of this soil as habitat for openland and woodland wildlife is poor and for wetland wildlife is very good. Although the production of food for wildlife is limited, good escape cover for deer and turkey is present. Other species include gopher, tortoise, raccoon, armadillos, and several kinds of song birds.

This Orsino soil is in capability subclass VIs. The woodland ordination symbol is 4s. The ecological community is Sand Pine Scrub.

21—Smyrna fine sand. This very deep, nearly level, poorly drained soil is on the flatwoods. Individual areas are broad to narrow and irregular in shape. They range from 4 to 400 acres in size. Slopes are smooth and range from 0 to 2 percent.

In 95 percent of the areas mapped as Smyrna fine sand, Smyrna and similar soils make up 80 to 99 percent of the map unit. Dissimilar soils make up 1 to 20 percent.

Typically, the surface layer is black fine sand about 4 inches thick. The subsurface layer is gray and light gray fine sand about 9 inches thick. The subsoil is dark reddish brown fine sand to a depth of 21 inches. The next layer, to a depth of 50 inches, is brown fine sand. Gray fine sand extends to a depth of 70 inches, and very dark gray fine sand extends to a depth of 80 inches or more. Some areas contain soils that are

Also included are areas of soils that have a loamy layer within a depth of 40 inches.

A seasonal high water table is at a depth of 6 to 18 inches for 1 to 4 months during wet seasons in most years. It is at a depth of 10 to 40 inches for more than 6 months. Permeability is moderate or moderately rapid. Available water capacity is low.

The natural vegetation consists of slash pine and longleaf pine. The understory vegetation consists of saw palmetto, pineland threeawn, bluestem, and panicum. Most areas of this soil are used for the commercial production of pine trees and as improved pasture for cattle. A large acreage is being developed for residential and commercial uses.

This soil is moderately suited to cultivated crops. The main limitations are excessive wetness and poor soil quality. By using a good water-control system, Irish potatoes and a variety of cabbage and vegetable crops can be grown. Proper row management, lateral ditches or tiles, and well constructed outlets help to remove the excess surface water. A furrow irrigation system is suited to this soil. Land grading and smoothing improve the surface drainage, allow a more uniform application of irrigation water, and permit the more efficient use of farm equipment. Returning all of the crop residue to the soil and including grasses, legumes, or grass-legume mixtures in the crop rotation help to conserve moisture, maintain fertility, and control erosion. Frequent applications of fertilizer and lime are generally needed to improve soil quality.

With good water-control management, this soil is well suited to pasture. The main limitations are a result of the wetness. Excessive water can be removed by using field ditches and tile drains. Grasses and legumes grow well if adequate fertilizer is used. The low available water capacity limits the production of plants during extended dry periods. Deep-rooted plants, such as coastal bermudagrass and bahiagrass, tolerate droughty conditions better if they are properly fertilized and limed. Proper stocking rates, a system of pasture rotation, and the timely deferment of grazing help to keep the pasture in good condition.

Most areas support the natural vegetation. A few areas are used as improved pasture. The natural

preparation is not adequate, competition from undesirable plants can prevent or prolong the natural or artificial reestablishment of trees. Planting on beds helps to overcome the limitations caused by the excessive wetness. Although conventional methods of harvesting timber generally can be used, their use can be limited during rainy periods, which are generally from June to December. The use of equipment during wet periods can cause soil compaction. Soil compaction results in less infiltration and aeration and restricted root growth. Site preparation, such as chopping, burning, applying herbicide, and bedding, reduces debris, reduces immediate plant competition, and facilitates hand and mechanical planting. Using a nitrogen fertilizer combined with phosphorus, based on a soil test or tissue analysis, at mid-rotation can provide an excellent growth response. Other good management practices include the selection of appropriate species, restricted burning, and a harvesting system that leaves debris onsite to conserve organic matter.

This soil is well suited to range and grazeable [illegible] cover, adding mulch or suitable topsoil, or constructing paved areas can help to overcome the limitations caused by the sandy surface layer.

The potential of this soil as habitat for all forms of wildlife is fair. Areas of this soil provide good food and cover, nesting sites, and den sites for a diverse and numerous wildlife population. The species generally include deer, quail, turkey, feral hog, raccoon, opossum, and a variety of birds.

This Smyrna soil is in capability subclass IVw. The woodland ordination symbol is 10w. The ecological community is North Florida Flatwoods.

22—Astatula fine sand, 0 to 8 percent slopes. This very deep, nearly level to sloping, excessively drained soil is on ridges and knolls on the flatwoods and coastal ridges near the Atlantic Ocean. Individual areas are oval to irregular in shape. They range from 5 to 100 acres in size. Slopes are convex and range from 0 to 8 percent.

In 95 percent of areas mapped as Astatula fine sand,

if fertilizer is used. The very low natural fertility and the available water capacity are limitations.

This soil is moderately suited to the production of sand pine. Based on a 50-year site curve, the mean site index for sand pine is 60. The potential for commercial production of pulpwood is 12 cords per acre from a fully stocked stand of trees 25 years old. The equipment limitation and the seedling mortality rate are the main management concerns. Using specialized equipment, such as high-flotation, oversized tires, reduces the damage to roots and minimizes soil compaction during thinning and harvesting activities. Planting special oversized or containerized stock can reduce the seedling mortality rate that results from the droughtiness. Road construction, logging, and site preparation should include the stabilization of roads and trails. Using culverts and bridges over drainageways and other maintenance measures prevent soil erosion and water flow problems. A preferred harvesting system leaves residual biomass distributed over the site.

This soil is poorly suited to range or grazeable woodland. The dominant preferred forage includes indiangrass, low panicum, bluestem, paspalum, greenbrier, and perennial legumes. Livestock will not use this soil if other range sites are available. The soil furnishes winter protection. It is in the Sand Pine Scrub range site.

This soil has slight limitations for building site development. The soil properties are favorable for dwellings without basements and for local roads and streets. The limitations for small commercial buildings are slight in areas where the slope is less than 4 percent and are moderate in areas where the slope is more than 4 percent. Some land smoothing may be needed to overcome the slope. The cutbanks of shallow excavations are unstable and are subject to slumping. Shoring the sidewalls of excavations helps to prevent caving. The limitations are slight for septic tank absorption fields, but the hazard of ground-water contamination exists because of rapid filtration of

limitations. Land smoothing may be required in the steeper areas.

The potential of this soil as habitat for openland and woodland wildlife is poor and for wetland wildlife is very poor. Although the production of food for wildlife is limited, good escape cover for deer and turkey is present. Other species include gopher tortoise, raccoon, armadillos, and several kinds of songbirds.

This Astatula soil is in capability subclass VIs. The woodland ordination symbol is 3s. The ecological community is Sand Pine Scrub.

23—Adamsville fine sand, 0 to 3 percent slopes. This very deep, nearly level to gently sloping, somewhat poorly drained soil is on low knolls, broad elevated flats, and side slopes of ridges on the flatwoods and coastal areas adjacent to the Atlantic Ocean. Individual areas are irregular in shape. They range from 5 to 100 acres in size. Slopes are short and convex and range from 0 to 3 percent.

In 95 percent of the areas mapped as Adamsville fine sand, 0 to 3 percent slopes, Adamsville and similar soils make up 83 to 99 percent of the map unit. Dissimilar soils make up 1 to 17 percent.

Typically, the surface layer is grayish brown fine sand about 7 inches thick. Very pale brown fine sand extends to a depth of 34 inches, and light gray fine sand that has brown mottles extends to a depth of 80 inches or more. Some areas contain soils that are more brownish in the substratum than the Adamsville soil and are better drained. Other areas contain soils that have a weakly developed layer darkened by accumulations of organic material.

The dissimilar soils in this map unit include small areas of Myakka and Smyrna soils. These soils have an organic-stained layer in the subsoil. They also are in lower positions on the landscape than the Adamsville soil and are more poorly drained.

A seasonal high water table is at a depth of 24 to 42 inches for 2 to 6 months in most years. Permeability is

soil is suited to some vegetable crops. Good management includes water-control measures and a crop rotation that has a close-growing crop on the land at least two-thirds of the time. Soil-improving crops and

absorption fields. Using suitable soil material to mound the septic tank absorption field can help to overcome these limitations. The seepage is a severe limitation for sewage lagoons and trench type sanitary landfills.

the Placid soil but have a thin layer of muck on the surface.

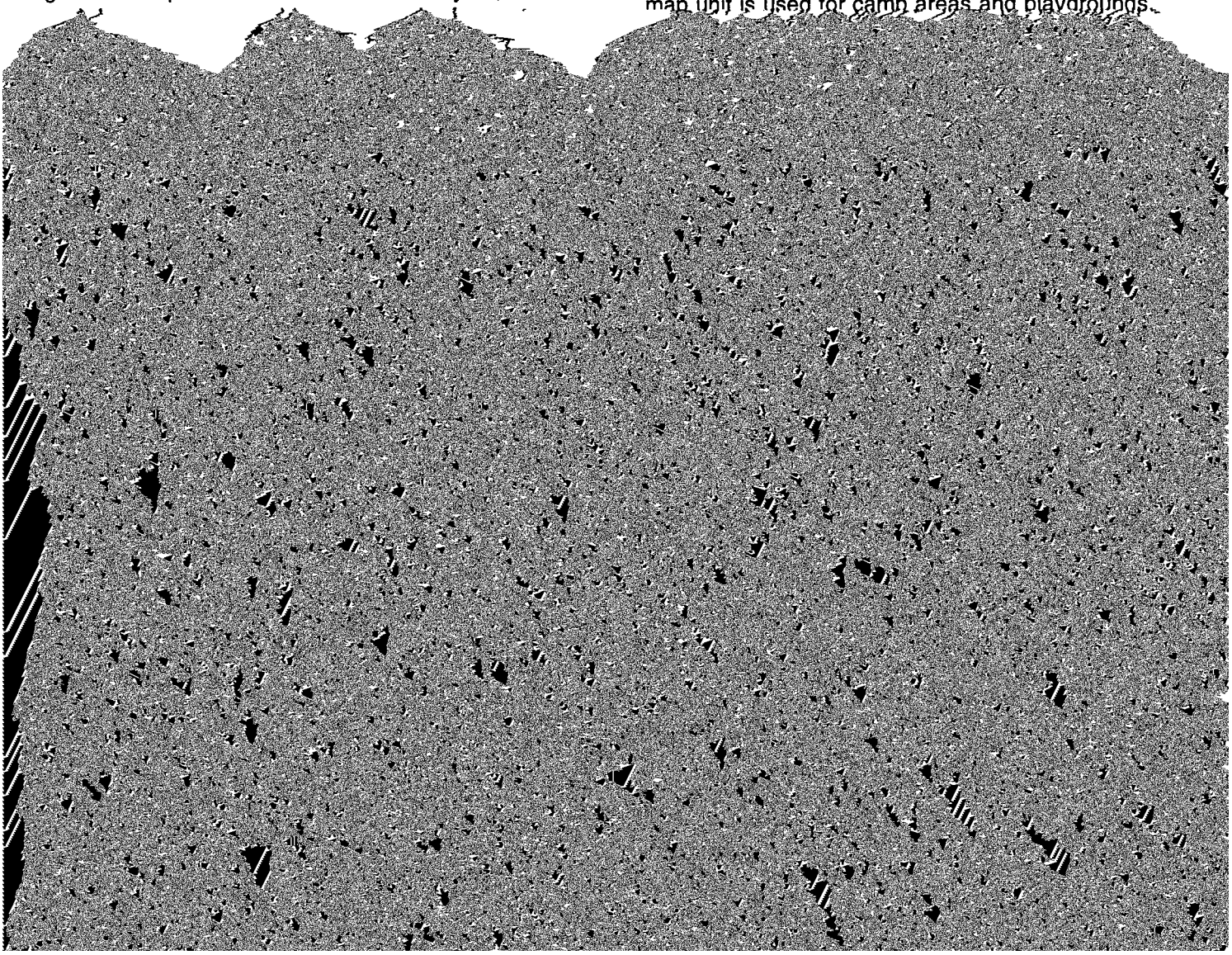
The dissimilar soils in this map unit include small areas of sandy soils that have several layers or strata of muck and loamy sediments of varying thickness and at varying depths. They are in landscape positions similar to those of the Samsula and Placid soils.

In most years, this map unit is flooded for 1 month or more during periods of high rainfall. The water table is within 6 inches of the surface for 6 months or more in most years. The permeability of the Samsula and Placid soils is rapid. The available water capacity is moderate in the Samsula soil and low to moderate in the Placid soil.

Most areas of this map unit support the natural vegetation, which includes red maple, sweetgum, water oak, cabbage palm, and baldcypress. The understory vegetation is sparse and consists of waxmyrtle, for shade during the summer months. This map unit is not assigned to a range site.

This map unit has severe limitations for urban development. The main limitations are the flooding and the excessive wetness. Also, the Samsula soil has a very low bearing strength for building foundations and roads. Major flood control structures and an extensive local drainage system are needed to protect this map unit from flooding. Roads, streets, and building sites should be elevated with fill material to overcome the wetness. The organic layers should be removed and replaced with suitable fill. Septic tank absorption fields need to be mounded to overcome the wetness.

If this map unit is used for recreational development, the flooding and the excessive wetness are the main limitations. Good drainage is needed to keep the water table from rising above a depth of about 2 to 2½ feet. Protection from flooding is needed in areas where this map unit is used for camp areas and playgrounds.



mapping are some soils that are not as well drained as the Tavares soil.

The dissimilar soils in this map unit include small areas of Astatula and Candler soils and other soils that

include the selection of appropriate species, restricted burning, and a harvesting system that leaves debris onsite to conserve organic matter. Based on a 50-year

mapped as Turnbull and Pellicer soils, tidal. Dissimilar soils make up 1 to 16 percent.

Generally, the mapped areas are about 52 percent Turnbull and similar soils and about 43 percent Pellicer and similar soils. Each of the soils is not present in every mapped area, and the relative proportion of the soils is variable. Although individual areas of the soils are large enough to map separately, they were mapped as one unit based upon the present and predicted uses.

Typically, the surface layer of the Turnbull soil is very dark gray muck about 8 inches thick. The underlying material is olive gray clay to a depth of 42 inches and gray loamy fine sand to a depth of 80 inches. Some areas contain soils that are similar to the Turnbull soil but have more than 16 inches of muck on the surface, have a clayey surface layer, or have a dark sandy layer content of clay, and the low strength severely restrict the use of this soil for agricultural purposes. The soil becomes extremely acid when dried. The low soil strength will not support grazing cattle or equipment.

This map unit has severe limitations for building site development. The hazard of flooding, the excessive wetness, the low strength, and the seepage make this map unit poorly suited to dwellings, small commercial buildings, local roads and streets, and sanitary facilities. Overcoming these limitations is impractical.

This map unit has severe limitations for recreational development. Tidal flooding, wetness, and low soil strength are severe limitations that are difficult to overcome.

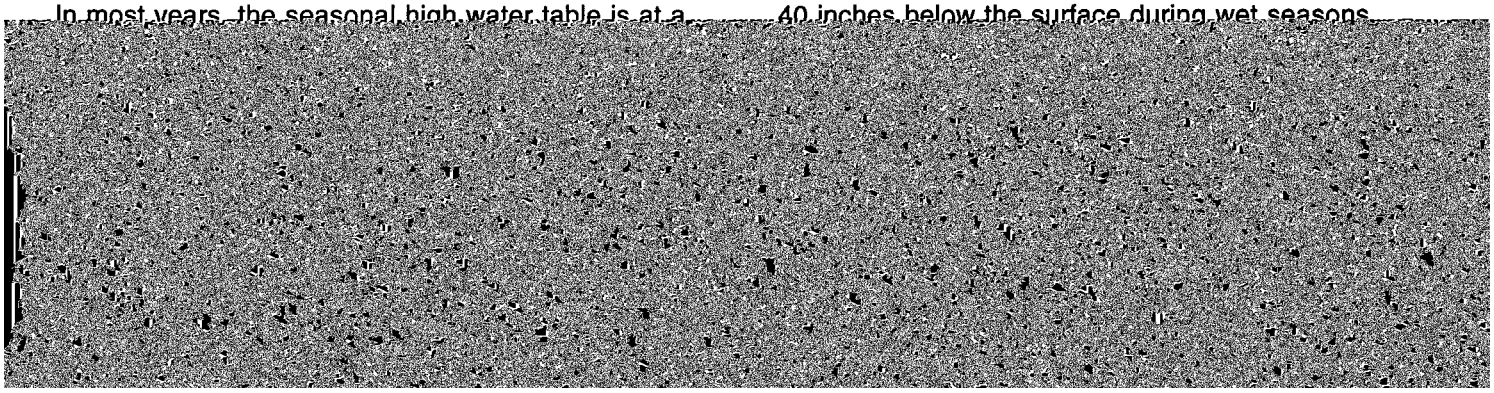
The potential of this map unit as habitat for openland and woodland wildlife is very poor and for wetland

Figure 7.—Needlegrass rush in an area of Turnbull and Pellicer soils, tidal. These soils are frequently flooded by tidal water.

Myakka soils are in lower positions on the landscape and are poorly drained.

In most years, the seasonal high water table is at a

Under natural conditions, this soil is poorly suited to cultivated crops. The shallow water table, which is 15 to 40 inches below the surface during wet seasons,



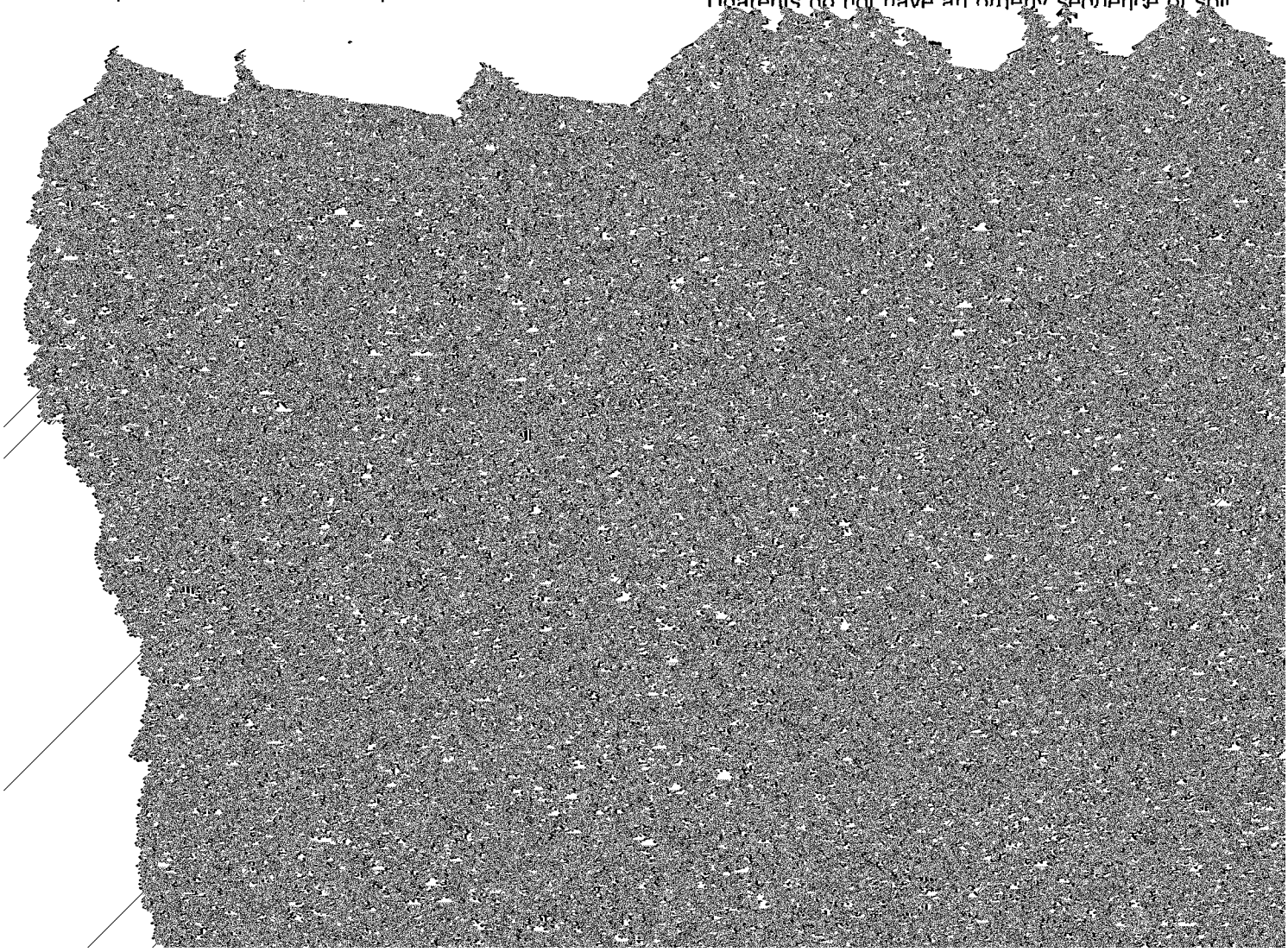
plants, such as coastal bermudagrass and bahiagrass, tolerate droughty conditions better if they are properly fertilized and limed. Proper stocking rates, a system of pasture rotation, and the timely deferment of grazing help to keep the pasture in good condition.

This soil is moderately suited to the production of pine trees. Because this soil has a sandy surface, is very droughty, and has a low natural fertility, unsatisfactory seedling survival rates can be expected during dry years. If site preparation is not adequate, competition from undesirable plants can prevent or prolong the natural or artificial establishment of trees. Site preparation, such as chopping, burning, applying herbicide, and bedding, reduces debris, reduces immediate plant competition, and facilitates planting. Using a nitrogen fertilizer combined with phosphorus, based on a soil test or tissue analysis, at mid-rotation can provide an excellent growth response. Based on a 50-year site curve, the mean site index for slash pine is 70. The potential for commercial production of bobcat, skunks, raccoons, and a variety of song birds. The habitat for wildlife can be improved by controlled burning and by planting supplemental food plots.

This Cassia soil is in capability subclass VIs. The woodland ordination symbol is 8s. The ecological community is Sand Pine Scrub.

29—Udarents, moderately wet. This map unit consists of heterogeneous soil material that was removed from other soils and used in land-leveling operations, as fill material, or as a cover for sanitary landfills. The material is a mixture of fine sand or of sand and fragments of loamy subsoil material. Individual areas are throughout the county, but most areas are west of Interstate Highway 95 and are used for urban development. The mapped areas are square or rectangular or are irregular in shape. They range from 3 to 200 acres in size. Slopes are smooth and range from 0 to 2 percent.

Udarents do not have an orderly sequence of soil

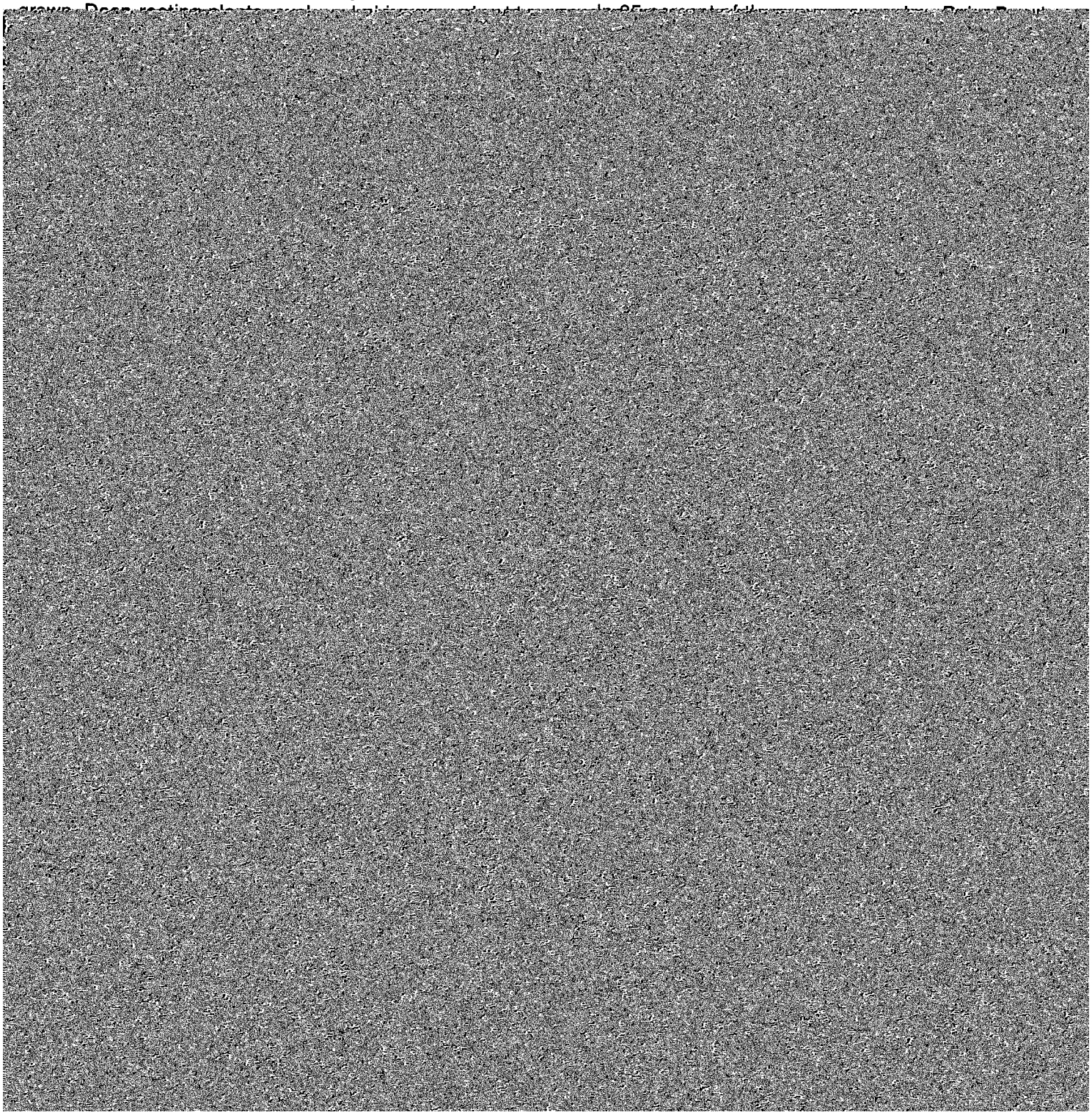


inkberry, saw palmetto, longleaf pine, and slash pine. The understory vegetation consists of bluestem, panicum, and pineland threeawn.

This map unit generally is not suited to vegetable crops because of the extreme variability of the soil properties and the poor soil quality.

In some areas, improved pasture grasses can be grown. Deep rooting plants [illegible]

31—Palm Beach gravelly sand, 0 to 8 percent slopes. This very deep, nearly level to sloping, well drained to excessively drained soil is on primary dune ridges parallel to the Atlantic Coast. Individual areas are irregular to elongated in shape. They range from 20 to over 200 acres in size. Slopes are convex and range from 0 to 8 percent.



have many septic tanks. The excess seepage is a severe limitation for sewage lagoons and trench-type sanitary landfills. Lining the lagoons and trenches with imperious soil material can help to reduce the excess seepage.

The sandy surface is a severe limitation for recreational development. The slope is an additional limitation in some areas. The trafficability is difficult to maintain in areas of heavy traffic. Blowing sand is a hazard during periods of high wind. The surface should be stabilized by planting a vegetative cover, adding suitable topsoil, or constructing paved areas. Areas that have slopes of more than 6 percent should be smoothed if they are to be used for playgrounds.

The potential of this soil for use as wildlife habitat is poor or very poor. The native vegetation provides very limited food sources, but the dense growth of shrubs provides good travel routes and escape cover. Because of intense urban development, the numbers of wildlife are low. Wildlife species include foxes, raccoons, armadillos, mice, and a variety of birds.

This Palm Beach soil is in capability subclass VIIs. It has not been assigned a woodland ordination symbol. The ecological community is North Florida Coastal Strand.

32—Narcoossee, shell substratum-Welaka complex, 0 to 5 percent slopes. The very deep, nearly level, somewhat poorly drained Narcoossee soil and the very deep, well drained, gently sloping Welaka soil are on the Coastal Strand, between the Atlantic Ocean and the intercoastal waterway. The soils occur in a regular, repeating pattern. The Welaka soil is on the lower back slopes of primary sand dunes, on the lower relic secondary and tertiary sand dunes, and on high knolls in the areas between the sand dunes and the salt marshes. The Narcoossee soil is in swales between sand dunes and on low knolls between dunes and the salt marshes.

Narcoossee, Welaka, and similar soils make up 83 to 99 percent of the map unit in 95 percent of the areas mapped as Narcoossee, shell substratum-Welaka complex, 0 to 5 percent slopes. Dissimilar soils make up 1 to 17 percent.

Generally, the mapped areas are about 61 percent Narcoossee and similar soils and about 29 percent Welaka and similar soils. The components of this map unit are so intricately intermingled that they could not be mapped separately at the scale used. However, the proportions and patterns of the soils are relatively consistent in most delineations of the map unit.

Typically, the surface layer of the Narcoossee soil is very dark gray fine sand about 3 inches thick. The subsurface layer is fine sand about 14 inches thick. It is gray in the upper 2 inches and light gray in the lower 12 inches. The subsoil extends to a depth of 41 inches. The upper part is dark brown fine sand about 6 inches thick. The upper 3 inches of the subsoil is weakly expressed and is discontinuous in 20 to 25 percent of the pedons. The lower part of the subsoil is brown fine sand about 18 inches thick. The underlying material is light gray extremely gravelly fine sand and gravelly fine sand. It is stratified with layers of light gray fine sand to a depth of more than 80 inches. Some areas contain soils that are similar to the Narcoossee soil but have a more strongly expressed and continuous subsoil. Also included in mapping are some soils that are similar to the Narcoossee soil but have weak, discontinuous organic-stained layers in the subsoil and other soils that contain about 75 percent, by volume, shell fragments at a depth of about 32 inches.

Typically, the surface layer of Welaka soil is dark gray fine sand about 3 inches thick. The subsurface layer is light gray fine sand about 9 inches thick. The subsoil is brownish yellow fine sand to a depth of about 42 inches. The underlying material is very pale brown gravelly fine sand to a depth of 50 inches and light gray very gravelly fine sand to a depth of 80 inches. Some areas contain soils that are similar to the Welaka soil but do not have the light gray subsurface layer. Also included in mapping are some soils that are similar to the Welaka soil but are in lower positions on the landscape and are moderately well drained.

The dissimilar soils in this map unit include small areas of Myakka soils. Myakka soils are in lower positions on the landscape than the soils in this map unit. They are also poorly drained.

In most years, the seasonal high water table in the Narcoossee soil is at a depth of 24 to 42 inches for 4 to 6 months. During extended dry periods, the water table recedes to a depth of more than 42 inches. The seasonal high water table in the Welaka soil is generally at a depth of more than 80 inches. Permeability is very rapid in the Welaka soil and rapid and very rapid in the Narcoossee soil. The available water capacity is low in the Narcoossee soil and very low in the Welaka soil.

A few small areas of this map unit support the natural vegetation. Most areas have been subdivided and are used for urban development. The natural vegetation on the Narcoossee soil consists of sand live oak, longleaf pine, and slash pine. The understory vegetation on the Narcoossee soil consists of yaupon holly, saw palmetto, bluestem, panicum, waxmyrtle, and pineland threeawn. The vegetation on the Welaka soil consists of sand pine, dwarf live oak, and scrub oak and scattered areas of rosemary, saw palmetto, and pineland threeawn.

The Narcoossee soil is poorly suited to cultivated

crops, and the Welaka soil is very poorly suited. The poor soil quality is a limitation. The soils have a low available water capacity and low natural fertility, and they are droughty. In some areas, periodic salt spray from the Atlantic Ocean limits plant growth.

This map unit is poorly suited to improved pasture. The poor soil quality, the low available water capacity, the droughtiness, and the salt spray from the ocean limit the production of plants suitable for pastures. Deep-rooted plants that are drought- and salt-tolerant, when properly fertilized, produce the best forage.

This map unit is not used for the commercial production of pine trees. The competition from undesirable plants and the salt spray from the ocean severely limit tree growth.

This map unit is poorly suited to range or grazeable woodland. It is not generally used for these purposes and is not assigned to a range site.

The wetness is a moderate limitation for dwellings without basements, small commercial buildings, and local roads and streets in the Narcoossee soil. It is [illegible] for various mammals, such as rabbits, raccoons, and armadillos.

The Narcoossee soil is in capability subclass IIIw. The woodland ordination symbol is 10w, and the ecological community is North Florida Coastal Strand. The Welaka soil is in capability subclass VIs. The woodland ordination symbol is 3s, and the ecological community is North Florida Coastal Strand.

33—Beaches. This map unit consists of nearly level to sloping, narrow strips of tide- and surf-washed areas that are adjacent to the Atlantic Ocean. These areas commonly are a mixture of moderately alkaline sand and shell fragments. Exposures of coquina limestone, washed by ocean tides, are with the sand and shell fragments along the beaches in the northern part of Flagler County. Slopes range from 1 to 3 percent.

Beaches range in width from less than 100 feet to about 200 feet. About 50 percent of the beach area can be flooded daily by high tides, and all of the beaches [illegible]

and similar soils. The components of this map unit are so small or so intricately intermingled that they could not be mapped separately at the scale used. However, the proportions and patterns of the soils are relatively consistent in most delineations of this map unit.

Typically, the Cocoa soil has a surface layer of grayish brown sand about 3 inches thick. The subsurface layer is pale brown sand 13 inches thick. The upper part of the subsoil is reddish yellow sand to a depth of 29 inches. The lower part of the subsoil is yellowish red loamy sand to a depth of 35 inches. Coquina limestone is at a depth of about 35 inches, but the depth varies from 20 to 40 inches within a short distance. Some areas contain soils that are similar to the Cocoa soil but have a lower subsoil of sandy loam or sandy clay loam.

Typically, the Bulow soil has a surface layer of dark grayish brown sand about 5 inches thick. The subsurface layer is very pale brown sand about 15 inches thick. The upper part of the subsoil is reddish yellow sand to a depth of 50 inches. The lower part of the subsoil is yellowish red sandy clay loam to a depth of 59 inches. Coquina limestone is at a depth of about 59 inches. Some areas contain soils that are similar to the Bulow soil but have coquina rock at a depth of more than 80 inches, do not have a lower subsoil, or have a coquina limestone. The soils require intensive management practices. Droughtiness and the rapid leaching of plant nutrients are the main limitations. The variety of crops that produce good yields without irrigation is limited. Soil-improving cover crops should be used in rotation, and all of the crop residue should be left on the land or plowed under the surface.

This map unit is poorly suited to pasture. The available moisture limits the growth of plants, and the plant nutrients leach rapidly from the root zone. Deep-rooted species, such as bahiagrass and bermudagrass, can be used with high levels of fertilizer to maintain the potential production. Periodic mowing helps to maintain uniform growth and discourages selective grazing. Proper stocking rates, a system of pasture rotation, and the timely deferment of grazing help to keep the pasture in good condition.

This map unit is moderately suited to the production of slash pine. Based on a 50-year site curve, the mean site index for slash pine is 80. The potential for commercial production of pulpwood is 42 cords per acre from a fully stocked stand of trees 25 years old. The main management concerns are the equipment limitation, the seedling mortality rate, and plant competition. Using specialized equipment, such as high-flotation, oversized tires, reduces the damage to roots

slope. Lawn grasses and landscaping plants require frequent irrigation during dry seasons. Shoring the sidewalls of shallow excavations helps to prevent caving. The depth to rock and the poor filtering qualities are severe limitations for septic tank absorption fields on the Cocoa soil. Removing the rock and unsuitable material, backfilling with suitable material, and mounding the absorption field can help to overcome these limitations. The seepage is a severe limitation for trench-type sanitary landfills and sewage lagoons on both soils. Cocoa soils also have a severe limitation because of the shallow rock. Removing the rock and lining the trenches and lagoons with impervious soil material can help to overcome these limitations.

This map unit has severe limitations for recreational development. The main limitation is the loose sandy surface. Maintaining good trafficability in high usage areas is difficult. Soil blowing is also a hazard. Establishing a good vegetative cover, establishing windbreaks, and adding suitable topsoil or another surface stabilizer can help to overcome the limitations.

The potential as habitat for wildlife habitat for openland and woodland wildlife is fair or poor and for wetland wildlife is very poor. The hardwoods and shrubs provide fair sources of food and shelter for deer, turkey, squirrel, raccoon, opossum, and many types of birds.

Both soils are in capability subclass IVs. The woodland ordination symbol is 10s. The ecological community is Upland Hardwood Hammock.

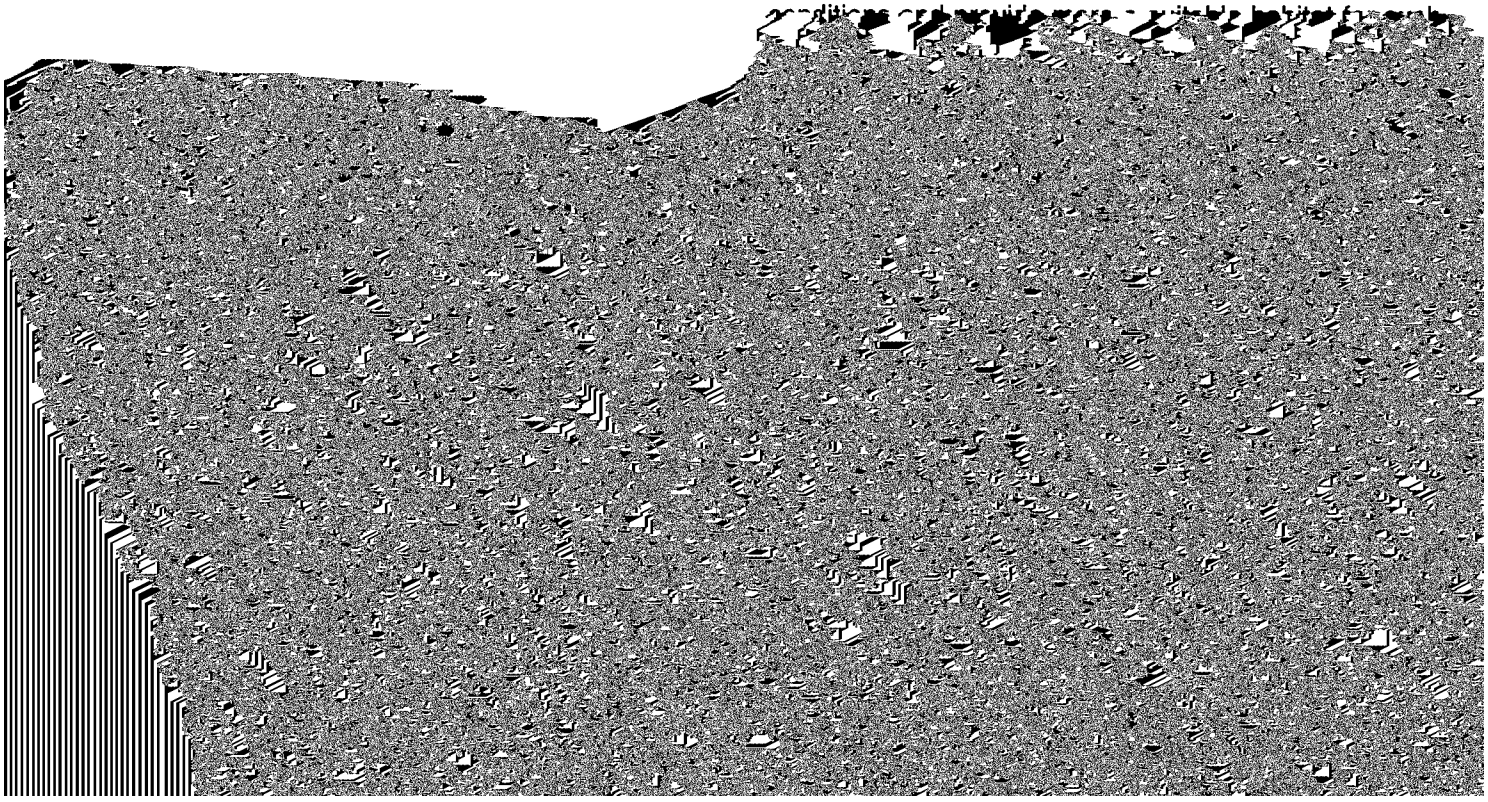
The existing vegetation consists of a few areas of slash pine, southern red cedar, cabbage palm, and wax myrtle. The understory vegetation consists of prickly pear, dog fennel, and other weeds.

This map unit is not suited to crops or pasture because of the poor soil quality. It is droughty, and plant nutrients leach rapidly. Many areas are near salty or brackish water bodies and receive some wind-borne salt spray during stormy weather conditions.

The map unit has a very low suitability for pine trees. The suitability for range or grazeable woodland is also very low. This map unit is well suited to urban development. The limitations are slight for homes, small commercial buildings, local roads and streets, or septic tank absorption fields. However, the hazard of ground-water contamination exists because of poor filtration of effluent in areas that have a concentration of septic tanks.

This map unit has severe limitations for recreational development. Because of the loose sandy surface, maintaining good trafficability is difficult. Soil blowing is a hazard. Establishing and maintaining a good vegetative cover or windbreaks or adding suitable topsoil or another surface stabilizer helps to overcome these limitations.

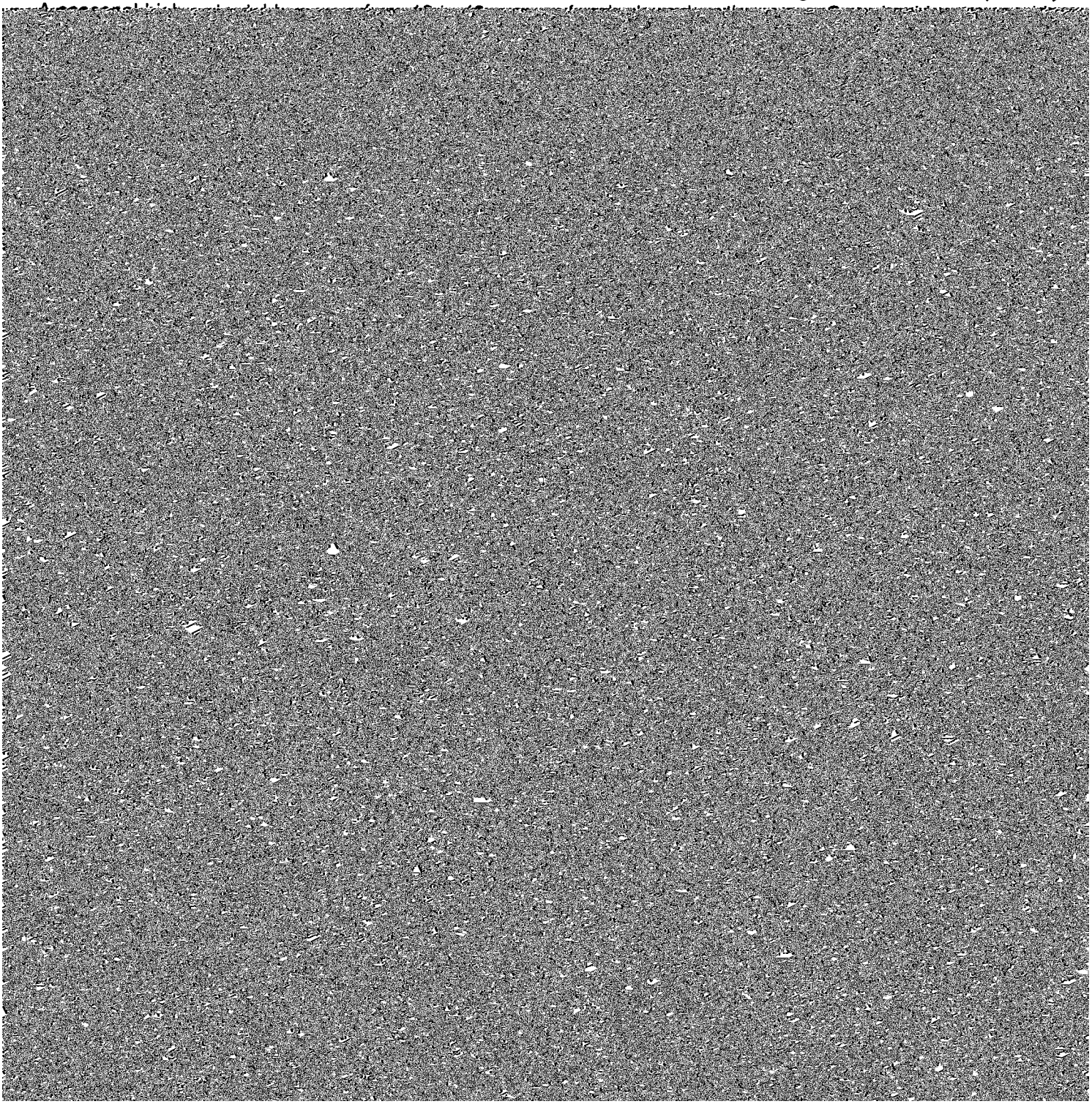
The potential of this soil as habitat for all forms of wildlife is very poor. The sparse vegetation on this soil produces little food or cover. Planting adapted varieties of trees, shrubs, and food-producing plants can improve [illegible]



The dissimilar soils in this map unit include small areas of Bulow, Cocoa, and Placid soils. Bulow and Cocoa soils are in landscape positions similar to those of the Bimini soil and are underlain by limestone bedrock within a depth of 68 inches. Placid soils are in lower areas and are more poorly drained than the Bimini soil.

drainageways and other maintenance measures prevent soil erosion and water flow problems. A preferred harvesting system leaves residual biomass distributed over the site.

This soil is poorly suited to range and grazeable woodland. Because of the unusually dense canopy cover, the soil is used as grazeable woodland primarily



inches thick. The subsurface layer is dark gray fine sand about 7 inches thick. The upper part of the subsoil

Based on a 50-year site curve, the mean site index for slash pine is 88. The potential for commercial

limitations for recreational development. Installing water-control measures, which help to maintain the water table at a suitable depth, can help to overcome the wetness. The trafficability of the sandy surface layer is poor in areas of high use as a result of the loose sand. The surface can be stabilized by planting a

of prickly pear cacti, dog fennell, panicum, bluestem, and rosemary and scattered areas of saw palmetto.

This soil is generally unsuited to most cultivated crops because of the low natural fertility and the droughtiness. The low available water capacity in the root zone, the low content of organic matter, and the

moderate or high, a community sewage system is needed to prevent the possible contamination of ground water as a result of seepage. Sealing or lining sewage lagoons and trench-type sanitary landfills with impervious soil material can reduce the excess seepage. The cutbanks are not stable and should be shored to prevent caving.

This soil is poorly suited to recreational development. It has severe limitations for this use. Because of the loose sandy soil surface, trafficability is poor and soil blowing is a hazard. The sandy surface can be stabilized by adding suitable topsoil, seeding, mulching, or constructing paved areas for walkways and parking areas.

The potential of this soil as wildlife habitat is very poor or poor. The soil provides minimal habitat for deer, squirrels, gopher turtles, turkeys, quail, and several

moderately wet, soils. Other similar soils are soils that do not have the loamy or clayey fragments and are sandy throughout and some soils that have less than 30 inches of fill. A few areas have continuous loamy or clayey layers at a depth of more than 50 inches.

A seasonal high water table is at a depth of 36 to 48 inches, depending upon the thickness of the fill. It recedes to depth of more than 60 inches during dry seasons. Available water capacity is low. Permeability is moderately rapid and rapid.

Most areas of these soils are used for urban development. The natural vegetation is variable. The vegetative growth is very sparse in some areas, but a good growth of shrubs and grasses is present in others. The natural vegetation consists mostly of waxmyrtle, southern red cedar, inkberry, and saw palmetto. Some areas have a few areas of slash pine, longleaf pine, and

Individual areas are irregular in shape. They range from 80 to 400 acres in size. Slopes are smooth and range from 0 to 2 percent.

In 95 percent of the areas mapped as Pomona fine sand, Pomona and similar soils make up 92 to 99 percent of the map unit. Dissimilar soils make up 1 to 8 percent.

Typically, the surface layer is black fine sand about 4 inches thick. The subsurface layer is gray fine sand about 17 inches thick. The upper part of the subsoil is black loamy fine sand to a depth of about 28 inches and dark reddish brown fine sand to a depth of about 50 inches. The lower part of the subsoil is grayish brown fine sandy loam to a depth of about 63 inches. The underlying material is dark grayish brown fine sandy loam to a depth of 80 inches or more.

The dissimilar soils in this map unit include small areas of soils that are in depressions and have water standing above the surface for 6 to 9 months of the year.

The seasonal high water table is at a depth of 6 to 18 inches for 1 to 3 months and is at a depth of 10 to 40 inches for more than 6 months in most years. Available water capacity is low. The permeability is moderate to moderately slow.

Most areas support the native vegetation, which consists of slash pine and longleaf pine. The understory vegetation consists of saw palmetto, gallberry, threeawn, bluestem, and lopsided indiangrass. Large areas are used for the commercial production of slash pine, and some areas are used for vegetable crops.

This soil is moderately suited to cultivated crops. The main limitations are the seasonal wetness and the poor soil quality. Unless intensive management is applied, the number of adapted crops is limited. By using an adequate water-control system, this soil is well suited to a number of vegetable crops, including cabbage and Irish potatoes. The water-control system removes excess surface water after heavy rainfalls and provides subirrigation during dry seasons (fig. 8). Close-growing cover crops should be grown when the soil is not used for cultivated crops. Returning all of the crop residue to the soil and using a system of conservation tillage minimize the hazard of wind erosion and maintain soil

index of 80 for slash pine, the yield from an even-aged, fully stocked stand of trees 25 years old is 42 cords per acre. The main management concerns are the restricted use of equipment and the seedling mortality that results from the seasonal wetness and periods of droughtiness. Plant competition also is a management concern. Site preparation, such as harrowing and bedding, helps to establish seedlings, reduces the seedling mortality rate, and increases early plant growth. Chopping and bedding reduce debris, control competing vegetation, and facilitate planting operations. Using field machinery equipped with high-flotation rubber tires or using tracked vehicles reduces the equipment limitation, soil compaction, and the damage to roots during thinning operations. Site preparation, planting, and harvesting during drier periods help to overcome the equipment limitation. A logging system that leaves residual biomass well distributed over the site will increase the content of organic matter and the residual fertility of the soil. Applications of a fertilizer that has nitrogen and phosphorous can provide excellent growth response.

This soil has good suitability for range and grazeable woodland. The dominant forage includes pineland threeawn, bluestem, and panicum. This soil is in the North Florida Flatwoods range site.

The wetness is a severe limitation for dwellings and local roads and streets. The wetness is a severe limitation for septic tank absorption fields. Installing water-control measures or elevating the building sites, roadways, and septic tank absorption fields is necessary to help overcome the wetness.

The main limitations for recreational areas are the high water table and the sandy surface layer. A water-control system is needed to help overcome the wetness. Trafficability is poor, and blowing sand is a hazard. Maintaining a good vegetative cover or windbreaks or adding suitable topsoil or another surface stabilizer helps to overcome these limitations.

This soil provides wildlife habitat for deer, red fox, turkey, quail, armadillos, and several species of birds. The potential as habitat for openland and wetland wildlife is fair and for woodland wildlife is poor. The habitat can be improved by improving the cover and planting food plots.

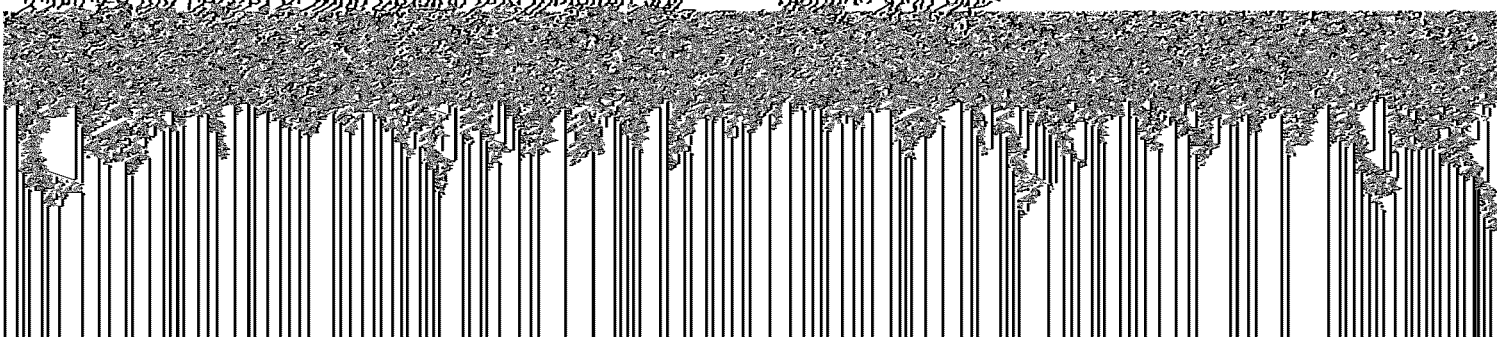


Figure 8.—Subsurface irrigation on a field of Irish potatoes in an area of Pomona fine sand.

In 90 percent of the areas mapped as Terra Ceia muck, frequently flooded, Terra Ceia and similar soils make up 83 to 99 percent of the map unit. Dissimilar soils make up 1 to 17 percent.

Typically, the surface soil is more than 80 inches thick. The upper 25 inches is dark reddish brown muck. It is underlain by black muck to a depth of 80 inches or more. Some areas contain soils that are similar to the

Terra Ceia soil, but they have a muck surface soil about 30 inches thick and are underlain by a mineral soil.

The dissimilar soils in this map unit include small areas of Favoretta and Placid soils. They are in landscape positions similar to those of the Terra Ceia soil. They formed in clayey and sandy mineral material.

The seasonal high water table is within a depth of 6 inches, except during long, dry seasons. The soil is flooded during rainy seasons. Available water capacity is very high. Permeability is rapid.

Most areas support the native vegetation, which consists of sweetgum, red maple, cypress, bay, and cabbage palm. The understory vegetation is sparse. Some areas do not have trees, and they support a dense marsh vegetation that mostly consists of sawgrass.

This soil is generally unsuited to cultivated crops because of the wetness and the flooding. The root zone is limited by the high water table and the water that covers the surface during rainy seasons.

By using proper water-control measures, improved pasture grasses and clover grow well on this soil. The water table should be maintained close to the surface to prevent the excessive oxidation of the organic soil layers. Applications of fertilizers with minor elements are needed. Controlled grazing allows the best yields.

The potential productivity for pine trees is very low. This soil is not suited to the commercial production of trees. Flooding and the excessive wetness cause a high seedling mortality rate. The low strength of the organic layers result in a hazard of windthrow. The equipment limitation is also a management concern.

This soil has a very low suitability for range or grazeable woodland. The flooding, the excessive wetness, and the low strength for the support of grazing animals are the main limitations. The growth of understory plants suitable for forage is minimal. Open areas are dominated by a dense growth of sawgrass. This map unit is not assigned to a range site.

This soil has severe limitations for use as septic tank absorption fields, dwellings without basements, and local roads and streets. It is frequently flooded and is saturated with water for long periods. The organic materials do not provide adequate filtration for septic tank absorption fields because the water runs through the soil too rapidly. Flooding, excessive wetness, and the low strength of the organic materials are limitations for the use of this soil as a building site for dwellings or for local roads and streets. Removing the organic layers and elevating the building sites and roadbeds are necessary to overcome the limitations. This soil is not suited to trench-type sanitary landfills or sewage lagoons because of the hazard of flooding, the excessive wetness, and the high content of organic matter. Overcoming these limitations is impractical.

This soil has severe limitations for recreational development. Flooding, the high water table at the surface of the soil, and the organic surface layer are limitations. The soil is in low areas, and water-control measures, which include flood control and lower the high water table to a necessary depth of 2 to 2½ feet, are difficult to establish. The surface layer has poor trafficability because of the low strength of the organic material. During dry seasons, soil blowing will occur.

In areas where this soil supports a good growth of hardwoods, it provides habitat for deer, gray squirrel, otter, turkey, and raccoon. The potential as habitat for wetland wildlife is good and for openland and woodland wildlife is poor. It can be improved by planting food plots.

This Terra Ceia soil is in capability subclass VIIw. It is not assigned to a woodland ordination group. The ecological community is Swamp Hardwoods.

Use and Management of the Soils

This soil survey is an inventory and evaluation of the best suited to the soils, including some not commonly

Figure 9.—Blueberries in an area of Wabasso fine sand. Water-control measures and an irrigation system are needed to overcome the limitations of this soil for growing crops.

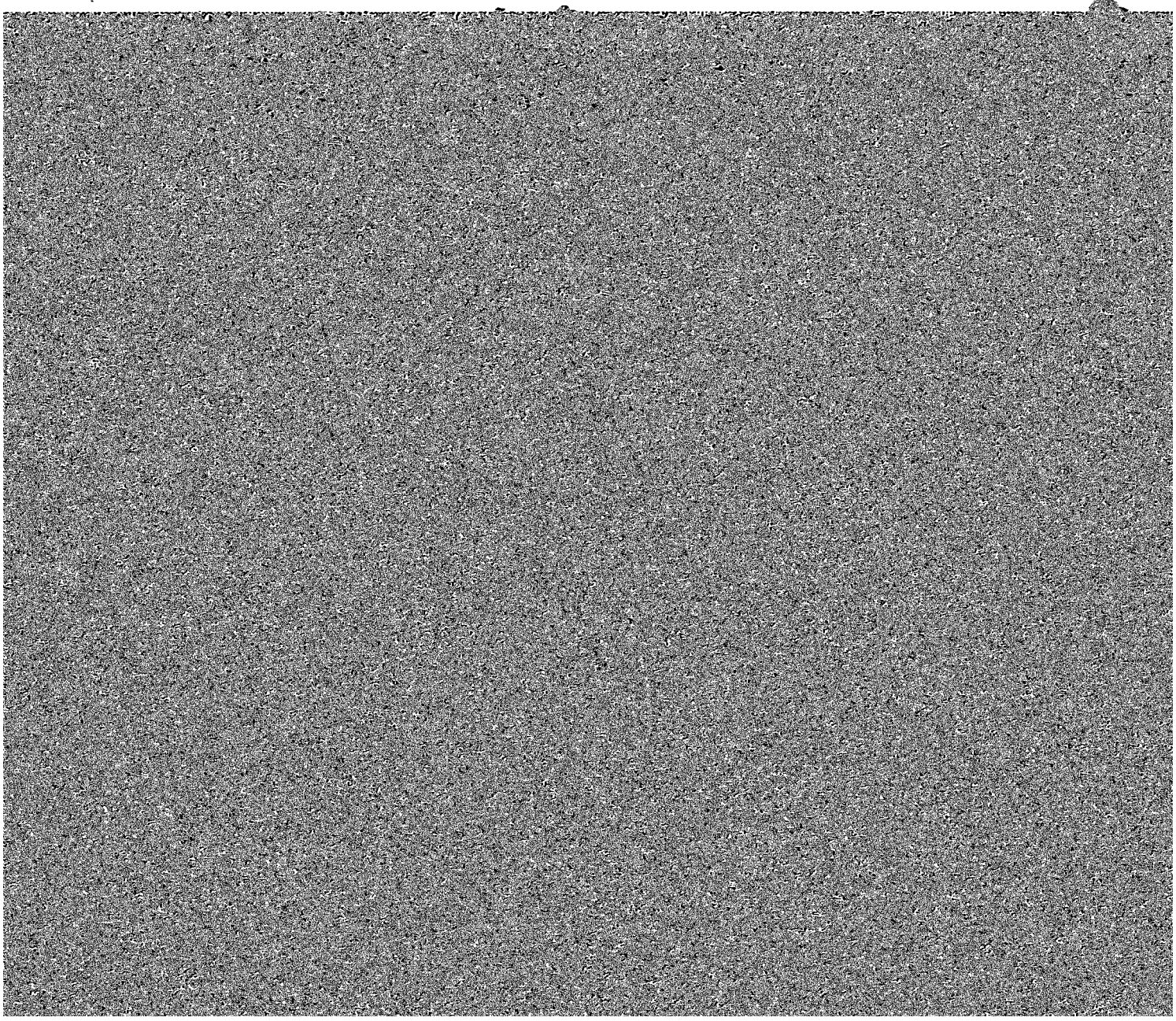
summer, following the harvest of cabbage or Irish potatoes. The corn uses residual fertilizer from the vegetable crops and requires few or no additions of fertilizer. On other cultivated land, a close-growing crop of sweet sorghum or a sorghum-sudan grass hybrid is usually planted after the cash crop is harvested to help to prevent the leaching of residual fertilizer, to add organic matter to the soil, and to protect the soil from erosion.

The potential of the soils in Flagler County for the increased production of food is high. About 253,000 acres of potentially good cropland is currently used as woodland, and about 5,000 acres is used as improved pasture. Food production could also be increased considerably by applying the latest technology to all of the cropland in the county. The use of this soil survey can greatly facilitate the application of such technology. The acreage used as woodland in the county has decreased as more land is used for farming and urban uses. Food production can also be increased by growing crops that are not presently grown commercially. If water is adequately controlled, soils that are poorly drained and very poorly drained and that warm up early in the spring are well suited to many

vegetable crops and small fruits, such as grapes, blueberries, and strawberries (fig. 9). Other crops, such as sweet potatoes and tomatoes, can be grown if economic conditions are favorable. 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. As a result, water must be maintained at the level required for the crops during the growing season and then raised during other times of the year to minimize the oxidation and subsidence.

Although the soils in Flagler County have the potential for increased food production, other factors sandblasting the leaves of young plants. Cover crops, regularly spaced strips of small grain aligned at right angles to the prevailing winds, and windbreaks of adapted trees and shrubs, such as slash pine, sand pine, and waxmyrtle, also effectively reduce wind erosion and the subsequent crop damage. Wind erosion can also spread plant diseases, insects, and weed seeds and can create a health hazard and present cleaning problems.

Water control is a major management concern in areas used for crops and pasture. About 85 percent of the soils in the county are poorly drained or very poorly drained. In most years, these soils are too wet for the



Soil structure can be improved by the regular addition of organic material, such as crop residue and manure. Soils that have a light-colored surface also are low in organic matter. Adding organic matter also increases the fertility and water-holding capacity.

The pastures in the survey area produce forage and hay crops for beef cattle and horses. The main cattle enterprises are beef cattle cow-calf operations. No dairy farms are in the county. Occasionally, sod is harvested from some areas of pasture. Bahiagrass, coastal bermudagrass, and Alicia bermudagrass are the main pasture plants. Extensive areas of pasture are throughout the county, mostly on soils in the flatwoods.

Differences in the amount and kind of pasture yields are related closely to the differences among the soils. Pasture management is based upon the relationship between soils, pasture plants, lime, fertilizer, moisture, and grazing systems. In many parts of the county, pasture has been greatly depleted by continuous excessive grazing. Yields can be increased by using a management system that includes grass-legume mixtures, controlled grazing, and applications of lime and fertilizer.

If drained, the poorly drained soils of the flatwoods, such as EauGallie, Myakka, Riviera, Smyrna, and Winder soils, are moderately suited to well suited to use as 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 poorly drained soils are well suited to white clover and other legumes. If adequately limed and fertilized, the well drained and moderately well drained Astatula and Tavares soils are moderately suited to improved bahiagrass and bermudagrass. Irrigation is needed for the best possible production levels.

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 4. 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.

The yields are based mainly on the experience and records of farmers, conservationists, and extension agents. Available yield data from nearby counties and results of field trials and demonstrations are also considered.

The management needed to obtain the indicated yields of the various crops depends on the kind of soil and the crop. Management can include drainage, erosion control, and protection from flooding; the proper planting and seeding rates; suitable high-yielding crop varieties; appropriate and timely tillage; 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 residue, barnyard manure, and green manure crops; and harvesting that ensures the smallest possible loss.

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 as needed, and that tillage is kept to a minimum.

The estimated yields reflect the productive capacity of each soil 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 4 are grown in the survey area, but estimated yields are not listed because the acreage of such crops is small. The local office of the Natural Resources Conservation Service or of the Cooperative Extension Service can provide information about the management and productivity of the soils for those crops.

Land Capability Classification

Land capability classification shows, in a general way, the suitability of soils for use as cropland. Crops that require special management are excluded. The soils are grouped according to their limitations for field crops, the risk of damage if they are used for crops, and the way they respond to management. The criteria used in grouping the soils do not include major and generally expensive landforming that would change slope, depth, or other characteristics of the soils, nor do they include possible but unlikely major reclamation projects. Capability classification is not a substitute for interpretations designed to show suitability and limitations of groups of soils for woodland or for engineering purposes.

In the capability system, soils are generally grouped at three levels—capability class, subclass, and unit. Only class and subclass are used in this survey.

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 they 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 miscellaneous areas 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,*

A *range site* is a distinctive kind of rangeland that produces a characteristic natural plant community that differs from natural plant communities on other range sites in kind, amount, and proportion of range plants. The relationship between soils and vegetation was established during this survey; thus, range sites generally can be determined directly from the soil map. Soil properties that affect the moisture supply and plant nutrients have the greatest influence on the productivity of range plants. Soil reaction, salt content, and the seasonal high water table also are important.

Total production is the amount of vegetation that can be expected to grow annually on well managed rangeland that supports the potential natural plant community. Total production includes all vegetation, whether or not it is palatable to grazing animals. It includes the current year's growth of leaves, twigs, and fruits of woody plants, but it does not include the

• Fair condition—Sites that produce 25 to 50 percent of their potential

• Poor condition—Sites that produce less than 26 percent of their potential

Potential production refers to the amount of herbage that can be expected to grow on a well-managed range site. Yields are expressed in terms of pounds of airdry herbage per acre. Herbage refers to total vegetation produced and does not reflect forage value or grazing potentials. Favorable years are those in which climatic factors, such as rainfall and temperature, are favorable for plant growth. The productivity of range sites is closely related to the natural drainage of the soil. The wettest soils, such as those soils in marshes, produce the greatest amount of vegetation, while the deep, droughty sandhill areas generally produce the least amount of herbage annually.

Manipulations of a range site often involve mechanical brush control, controlled burning, and, most importantly, controlled livestock grazing. Predicting the effects of these practices on range sites is of utmost importance. Without exception, proper management of the native range plant community will result in maximum [illegible] period of higher forage production further into the tree rotation; however, this usually results in some reduction in wood production. Managers should consider alternate spacings and planting configurations. Before planting, they should determine what, if any, reduction in wood production is acceptable in order to extend the period of higher forage production.

Another factor to consider in managing grazeable woodland is restricting the use of burning in the early years of the rotation. Young slash pine do not tolerate fire until they are 12 to 15 feet tall. On wet, loamy or clayey soils that support native plant communities with a dense hardwood overstory, woody invader species begin to reestablish themselves within one year after the final site preparation. They are difficult to control. Thorough site preparation and mechanical brush control are essential if sustained woodland grazing is planned on these soils.

Management for woodland grazing should also include such practices as maintaining proper stocking rates, cross fencing to allow the rotation and timing of grazing in different areas, and prescribed burning in established stands. Careful management and planning

weight, is approximately 65 percent grasses and grasslike plants, 10 percent forbs, and 25 percent woody plants and trees when the site is in excellent range condition. EauGallie, Holopaw, Immokalee, Myakka, Pomona, Smyrna, and Wabasso soils are in this range site.

The *Longleaf Pine-Turkey Oak Hills* range site is generally on nearly level to gently rolling, well drained to excessively drained soils. It generally consists of a sparse to fairly dense stand of longleaf pine, turkey oak, bluejack oak, and myrtle oak. Creeping bluestem, indiangrass, green silkyscale, and various other bluestem grasses represent the major desirable native forage species growing on this site when the site is in excellent condition. Uncontrolled grazing tends to reduce the availability of desirable forage species. Unpalatable species, such as pineland threeawn, prickly pear, saw palmetto, Lyonia species, sedges, and rushes become dominant on sites that are in poor condition. The total annual production is 4,000 pounds of air-dry material per acre in favorable growth years and 2,000 pounds of air-dry material per acre in unfavorable

generally consists of a mostly herbaceous ecosystem and a few scattered trees. Blue maidencane, chalky bluestem, and toothachegrass represent the major desirable native forage species growing on this site when the site is in excellent condition. Uncontrolled grazing tends to reduce the availability of desirable forage species. Unpalatable species, such as pineland threeawn, bottlebrush threeawn, sloughgrass, and sand cordgrass, become dominant on sites that are in poor condition. The total annual production is 8,000 pounds of air-dry material per acre in favorable growth years and 4,000 pounds of air-dry material per acre in unfavorable growth years when the site is in excellent range condition. The relative percentage of annual vegetative production, by weight, is approximately 90 percent grasses and grasslike plants, 10 percent forbs, and trace amounts of woody plants and trees when the site is in excellent range condition. Malabar, Pineda, and Valkaria soils are in this range site.

The *Freshwater Marshes and Ponds* range site is generally on nearly level, very poorly drained soils. It generally consists of a treeless, herbaceous ecosystem

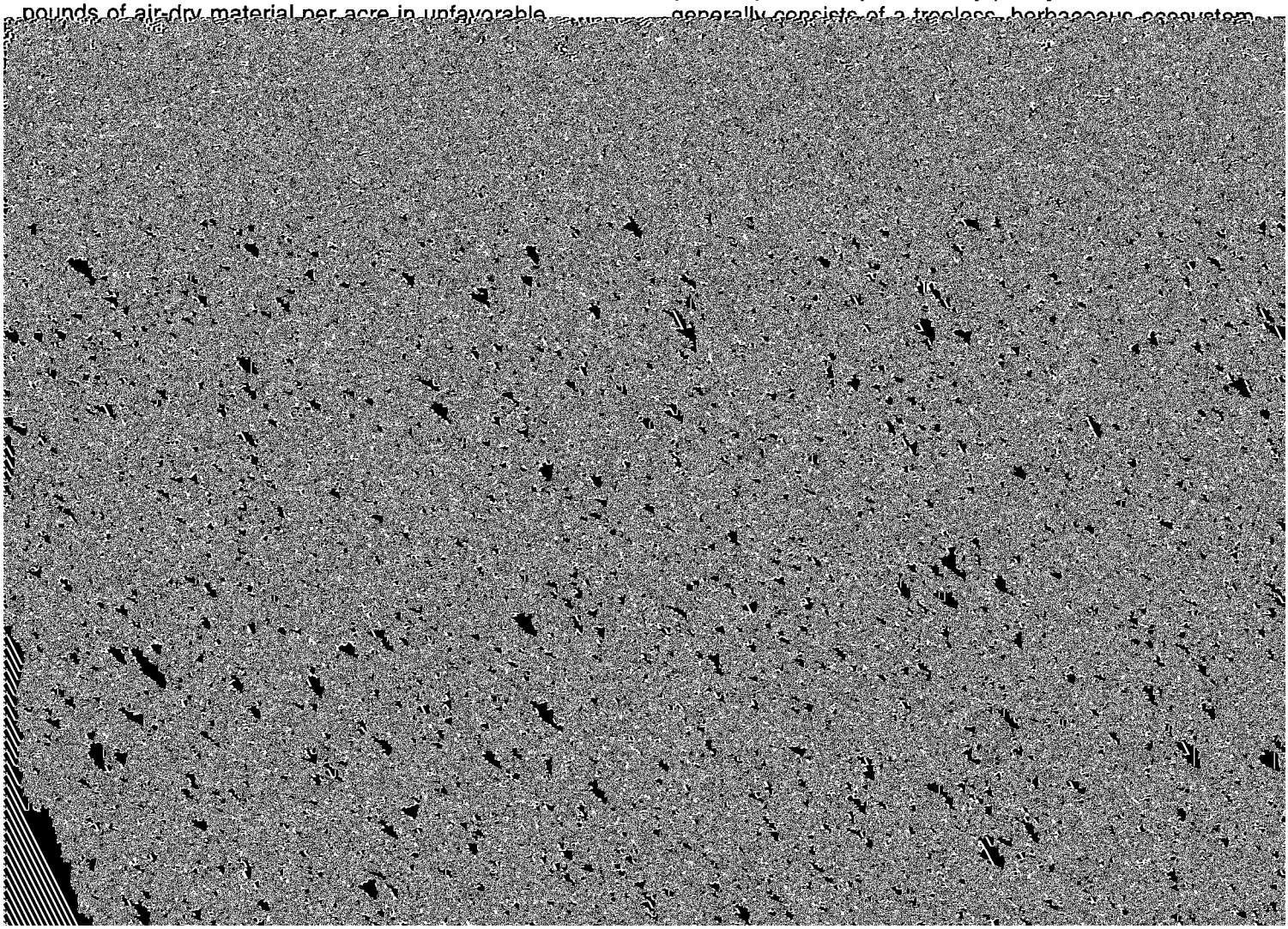
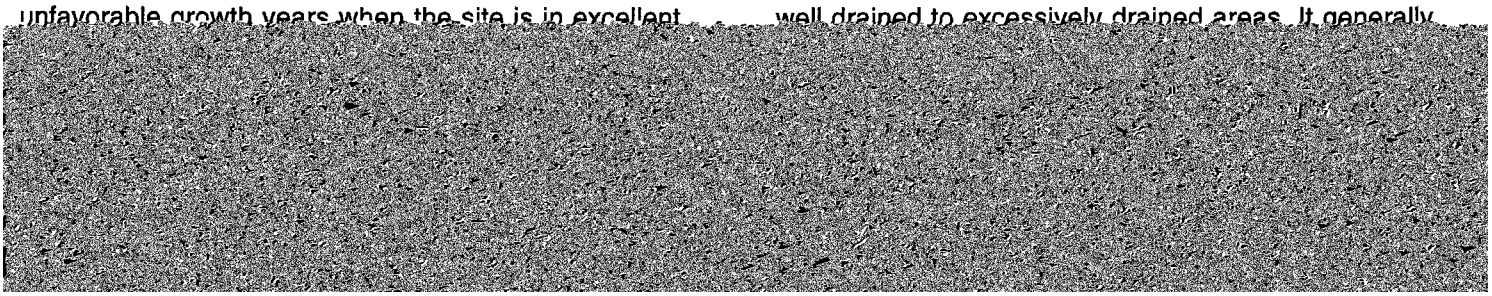


Figure 10.—An area of Tuscawilla fine sand in the Wetland Hardwood Hammock range site.

unfavorable growth years when the site is in excellent well drained to excessively drained areas. It generally



broomsedge, pineland threeawn, blackberry, and sedges, become dominant on sites that are in poor condition. The total annual production is 4,500 pounds of air-dry material per acre in favorable growth years.

soils. Loblolly pine, however, is also planted, especially in areas of soils that have a shallow, loamy or clayey subsoil. Longleaf pine also occurs naturally in the flatwoods. It was once the dominant species but now it

Figure 11.—A slash pine plantation in an area of Valkaria-Smyrna complex. These 15-year old trees, which remain after the area was thinned for pulpwood, will be harvested for plywood veneer.

that influence the soil productivity include the ability of the soil to provide water and nutrients and the amount of root development allowed by the physical qualities of the soil and the depth to the water table. A consideration of these soil factors will provide a fundamental basis for many of the timber management decisions facing the woodland owner and manager. These factors are further examined for each woodland grouping in the following paragraphs. Additional

Division of Forestry, and the Florida Cooperative Extension Service.

This soil survey can be used by woodland managers planning ways to increase the productivity of forest land. Some soils respond better to applications of fertilizer than others, and some are more susceptible to landslides and erosion after roads are built and timber is harvested. Some soils require special reforestation efforts. In the section "Detailed Soil Map Units," the

productivity, limitations in harvesting timber, and management concerns in producing timber. The common forest understory plants also are listed. Table 5 summarizes this forestry information and rates the soils for a number of factors to be considered in management. *Slight, moderate,* and *severe* are used to indicate the degree of the major soil limitations to be considered in forest management.

Table 5 lists the *ordination symbol* for each soil. The first part of the ordination symbol, a number, indicates the potential productivity of a soil for the indicator species in cubic meters per hectare. The larger the number, the greater the potential productivity. Potential productivity is based on the site index and the point where mean annual increment is the greatest.

The second part of the ordination symbol, a letter, indicates the major kind of soil limitation affecting use and management. The letter *W* indicates a soil in which excessive water, either seasonal or year-round, causes a significant limitation. The letter *T* indicates a soil that has, within the root zone, excessive alkalinity or acidity, sodium salts, or other toxic substances that limit the development of desirable trees. The letter *D* indicates a soil that has a limitation because of a restricted rooting depth, such as a shallow soil that is underlain by hard bedrock, a hardpan, or other layers that restrict roots. The letter *S* indicates a dry, sandy soil. The letter *A* indicates a soil that has no significant limitations affecting forest use and management. If a soil has more than one limitation, the priority is as follows: W, T, D, and S.

Ratings of the *erosion hazard* indicate the probability that damage may occur if site preparation or harvesting activities expose the soil. The risk is *slight* if no particular preventive measures are needed under ordinary conditions; *moderate* if erosion-control measures are needed for particular silvicultural activities; and *severe* if special precautions are needed to control erosion for most silvicultural activities. Ratings of moderate or severe indicate the need for construction of higher standard roads, additional maintenance of roads, additional care in planning harvesting and reforestation activities, and the use of special equipment.

Ratings of *equipment limitation* indicate limits on the use of forest managment equipment, year-round or seasonal, because of such soil characteristics as slope, wetness, stoniness, and susceptibility of the surface layer to compaction. As slope gradient and length increase, it becomes more difficult to use wheeled equipment. On the steeper slopes, tracked equipment is needed. On the steepest slopes, even tracked equipment cannot be operated and more sophisticated

use is restricted by wetness for less than 2 months and if special equipment is not needed. The rating is *moderate* if slopes are so steep that wheeled equipment cannot be operated safely across the slope, if wetness restricts equipment use from 2 to 6 months per year, if stoniness restricts the use of ground-based equipment, or if special equipment is needed to prevent or minimize compaction. The rating is *severe* if slopes are so steep that tracked equipment cannot be operated safely across the slope, if wetness restricts equipment for more than 6 months per year, if stoniness restricts the use of ground-based equipment, or if special equipment is needed to prevent or minimize compaction. Ratings of moderate or severe indicate a need to choose the best suited equipment and to carefully plan the timing of harvesting and other management activities.

Ratings of *seedling mortality* refer to the probability of the death of naturally occurring or properly planted seedlings of good stock in periods of normal rainfall, as influenced by kinds of soil or topographic features. Seedling mortality is caused primarily by too much water or too little water. The factors used in rating a soil for seedling mortality are texture of the surface layer, depth to a seasonal high water table and the length of the periods when the water table is high, rock fragments in the surface layer, rooting depth, and the aspect of the slope. The mortality rate generally is highest on soils that have a sandy or clayey surface layer. The risk is *slight* if, after site preparation, expected mortality is less than 25 percent; *moderate* if expected mortality is between 25 and 50 percent; and *severe* if expected mortality exceeds 50 percent. Ratings of moderate or severe indicate that it may be necessary to use containerized or larger than usual planting stock or to make special site preparations, such bedding, furrowing, installing a surface drainage system, and providing artificial shade for seedlings. Reinforcement planting is often needed if the risk is moderate or severe.

Ratings of *windthrow hazard* indicate the likelihood that trees will be uprooted by the wind. A restricted rooting depth is the main reason for windthrow. The rooting depth can be restricted by a high water table, a fragipan, or bedrock or by a combination of such factors as wetness, texture, structure, and depth. The risk is *slight* if strong winds cause trees to break but do not uproot them; *moderate* if strong winds cause an occasional tree to be blown over and many trees to break; and *severe* if moderate or strong winds commonly blow trees over. Ratings of moderate or severe indicate that care is needed in thinning or that the stand should not be thinned at all. Special equipment may be needed to prevent damage to

plan for the periodic removal of windthrown trees and the maintenance of a road and trail systems may be needed.

Ratings of *plant competition* indicate the likelihood of the growth or invasion of undesirable plants. Plant competition is more severe on the more productive soils, on poorly drained soils, and on soils having a restricted root zone that holds moisture. The risk is *slight* if competition from undesirable plants hinders adequate natural or artificial reforestation but does not necessitate intensive site preparation and maintenance. The risk is *moderate* if competition from undesirable plants hinders natural or artificial reforestation to the extent that intensive site preparation and maintenance are needed. The risk is *severe* if competition from undesirable plants prevents adequate natural or artificial reforestation unless the site is intensively prepared and maintained. A moderate or severe rating indicates the need for site preparation to ensure the development of an adequately stocked stand. Managers must plan site preparation measures to ensure reforestation without delays.

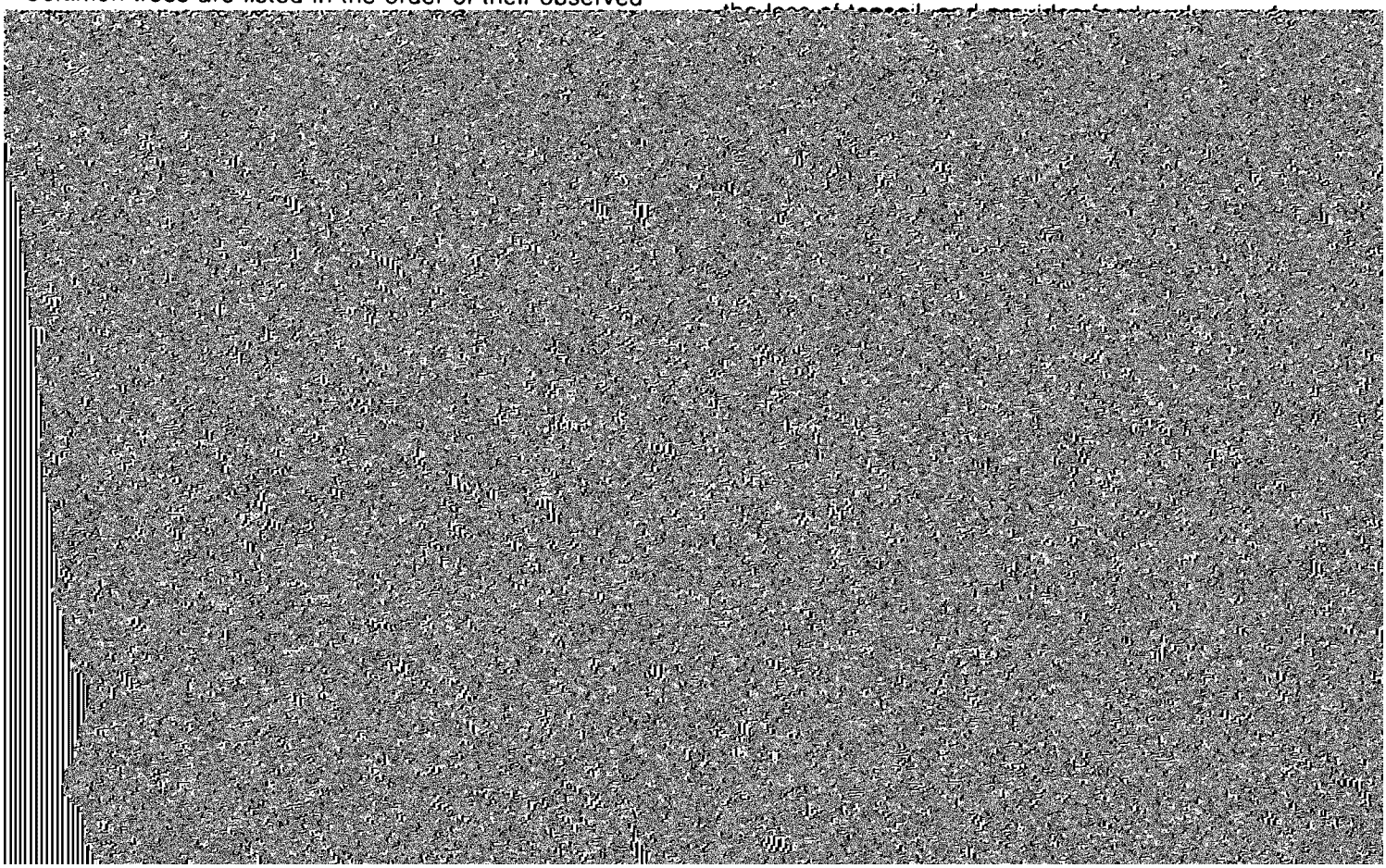
The *potential productivity* of *common trees* on a soil is expressed as a *site index* and a *volume* number. Common trees are listed in the order of their observed

personal preference are three factors among many that can influence the choice of trees for use in reforestation.

Windbreaks and Environmental Plantings

Windbreaks protect crops, livestock, buildings, and yards from wind and blowing sand. They also protect fruit trees and gardens, and they furnish habitat for wildlife. Planting several rows of low- and high-growing broadleaf and coniferous trees and shrubs around field borders and planting intermittent rows of small grain among crops provide the most protection from the wind.

Field windbreaks and field windstrips are narrow plantings made at right angles to the prevailing wind and at specific intervals across the field. Windbreaks generally consist of two to four rows of slash pine, loblolly pine, or redcedar trees that are planted around field borders. Field windstrips generally consist of intermittent rows of rye or sorghum that are planted among row crops, such as watermelons and tobacco. The interval depends on the erodibility of the soil and the crop being grown. The combination of field wind rows and windstrips helps to protect young crops from the sandblasting effects of blowing topsoil, minimizes



Hunting is a very popular activity, not only for local enthusiasts but also for sportsmen who travel great distances to hunt in the county. Also, the hunters often camp in the area, and numerous hunting camps and privately operated campgrounds are maintained throughout the county. Sport-fishing, both for freshwater and saltwater species, is very popular. The numerous creeks, ponds, and shallow lakes and the Atlantic Ocean provide a diversity of opportunities for anglers. The Atlantic Ocean and the Inland Waterway support saltwater fishing, while Dead Lake and Crescent Lake are noted for their freshwater fishing opportunities. Boating is a common activity in the county.

In table 6, the soils of the survey area are rated according to the limitations that affect their suitability for recreation. The ratings are based on restrictive soil features, such as wetness, slope, and texture of the

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 campsites.

Picnic areas are subject to heavy foot traffic. Most vehicular traffic is confined to access roads and parking areas. The best soils for 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, stones, or boulders that 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 and boulders, is firm after rains, and is not dusty when dry. If grading is needed, the depth of the soil over bedrock or a hardpan should

county except for those intensively developed areas. Relay Wildlife Management Area, located in the south-central part of Flagler County, includes 25,463 acres of mostly poorly drained flatwoods. This public hunting area is corporately owned by a major wood products company and is jointly managed for wildlife by the owner and the Florida Game and Freshwater Fish Commission. The salt marshes of the county are a particularly valuable part of the marine ecosystem.

Flagler County has numerous endangered or threatened species, ranging from the rare red-cockaded woodpecker and the indigo snake to more commonly known species, such as the alligator and wood stork. A complete list of such species, with detailed information on range and habitat, can be obtained from the local office of Natural Resources Conservation Service.

Soils affect the kind and amount of vegetation that is available to wildlife as food and cover. They also affect the construction of water impoundments. The kind and abundance of wildlife depend largely on the amount and distribution of food, cover, and water. Wildlife habitat

producing herbaceous plants. Soil properties and features 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 flooding. Soil temperature and soil moisture are also considerations. Examples of grain and seed crops are corn, wheat, oats, and barley.

Grasses and legumes are domestic perennial grasses and herbaceous legumes. Soil properties and features 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, flooding, and slope. Soil temperature and soil moisture are also considerations. Examples of grasses and legumes are bahiagrass, lovegrass, white clover, sweet clover, sesbania, and hairy vetch.

Wild herbaceous plants are native or naturally established grasses and forbs, including weeds. Soil properties and features that affect the growth of these plants are depth of the root zone, texture of the surface

sawgrass, saltgrass, cordgrass, rushes, sedges, and

certain land uses or impose specific design criteria were

site features are so unfavorable or so difficult to overcome that special design, significant increases in construction costs, and possibly increased maintenance are required. Special feasibility studies may be required where the soil limitations are severe.

Shallow excavations are trenches or holes dug to a maximum depth of 5 or 6 feet for basements, graves, utility lines, open ditches, and other purposes. The ratings are based on soil properties, site features, and observed performance of the soils. The ease of digging, filling, and compacting is affected by the depth to bedrock, stone content, soil texture, and slope. The time of the year that excavations can be made is

slope, stoniness, and the amount of sand, clay, or organic matter in the surface layer affect trafficability after vegetation is established.

Sanitary Facilities

Table 9 shows the degree and the kind of soil limitations that affect septic tank absorption fields, sewage lagoons, and sanitary landfills. The limitations are considered *slight* if soil properties and site features are generally favorable for the indicated use and limitations are minor and easily overcome; *moderate* if soil properties or site features are not favorable for the indicated use and special planning, design, or

level floor surrounded by cut slopes or embankments of during wet and dry periods. Loamy soils that are free of

10. They have a moderate shrink-swell potential, slopes of 15 to 25 percent, or many stones. Depth to the water table is 1 to 3 feet. Soils rated *poor* have a plasticity index of more than 10, a high shrink-swell potential, or many stones. They are wet and have a water table at a depth of less than 1 foot. They may have layers of suitable material, but the material is less than 3 feet thick.

Sand and *gravel* are natural aggregates suitable for commercial use with a minimum of processing. They are used in many kinds of construction. Specifications for each use vary widely. In table 10, only the probability of finding material in suitable quantity is evaluated. The suitability of the material for specific purposes is not evaluated, nor are factors that affect excavation of the material.

The properties used to evaluate the soil as a source of sand or gravel are gradation of grain sizes (as indicated by the engineering classification of the soil), the thickness of suitable material, and the content of rock fragments. Kinds of rock, acidity, and stratification are given in the soil series descriptions. Gradation of grain sizes is given in the table on engineering index properties.

A soil rated as a probable source has a layer of clean sand or gravel or a layer of sand or gravel that is up to 12 percent silty fines. This material must be at least 3 feet thick and less than 50 percent, by weight, large stones. All other soils are rated as an improbable

The soils are not so wet that excavation is difficult.

Soils rated *poor* are very sandy or clayey, have less than 20 inches of suitable material, have a large amount of gravel, stones, or soluble salts, or have a seasonal high water table at or near the surface.

The surface layer of most soils is generally preferred for topsoil because of its organic matter content. Organic matter greatly increases the absorption and retention of moisture and releases a variety of plant nutrients as it decomposes.

Water Management

Table 11 gives information on the soil properties and site features that affect water management. The degree and kind of soil limitations are given for pond reservoir areas; embankments, dikes, and levees; and aquifer-fed excavated ponds. The limitations are considered *slight* if soil properties and site features are generally favorable for the indicated use and limitations are minor and are easily overcome; *moderate* if soil properties or site features are not favorable for the indicated use and special planning, design, or maintenance is needed to overcome or minimize the limitations; and *severe* if soil properties or site features are so unfavorable or so difficult to overcome that special design, significant increase in construction costs, and possibly increased maintenance are required.

This table also gives the restrictive features that affect each soil for drainage, irrigation, terraces and

include less than 5 feet of suitable material and a high content of stones or boulders, organic matter, or salts or sodium. A high water table affects the amount of usable material. It also affects trafficability.

Aquifer-fed excavated ponds are pits or dugouts that extend to a ground-water aquifer or to a depth below a permanent water table. Excluded are ponds that are fed

Irrigation is the controlled application of water to supplement rainfall and support plant growth. The design and management of an irrigation system are affected by depth to the water table, the need for drainage, flooding, available water capacity, intake rate, permeability, erosion hazard, and slope. The

Soil Properties

Data relating to soil properties are collected during the course of the soil survey. The data and the estimates of soil and water features, listed in tables, are explained on the following pages.

Soil properties are determined by field examination of the soils and by laboratory index testing of some benchmark soils. Established standard procedures are followed. During the survey, many shallow borings are made and examined to identify and classify the soils and to delineate them on the soil maps. Samples are taken from some typical profiles and tested in the laboratory to determine grain-size distribution, plasticity, and compaction characteristics. These results are reported in table 19.

Estimates of soil properties are based on field examinations, on laboratory tests of samples from the survey area, and on laboratory tests of samples of similar soils in nearby areas. Tests verify field observations, verify properties that cannot be estimated accurately by field observation, and help to characterize key soils.

The estimates of soil properties shown in the tables include the range of grain-size distribution and Atterberg limits, the engineering classification, and the physical and chemical properties of the major layers of each soil. Pertinent soil and water features also are given.

Engineering Index Properties

Table 12 gives estimates of the engineering classification and of the range of index properties for the major layers of each soil in the survey area. Most soils have layers of contrasting properties within the upper 5 or 6 feet.

Depth to the upper and lower boundaries of each layer is indicated. The range in depth and information on other properties of each layer are given for each soil series under the heading "Soil Series and Their Morphology."

Texture is given 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 the fraction of the soil that is less than 2 millimeters in diameter. "Loam," for example, is soil that is 7 to 27 percent clay, 28 to 50 percent silt, and less than 52 percent sand. If the content of particles coarser than sand is as much as 15 percent, an appropriate modifier is added, for example, "gravelly." Textural terms are defined in the Glossary.

Classification of the soils is determined according to the Unified soil classification system *(2)* and the system adopted by the American Association of State Highway and Transportation Officials *(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 and according to plasticity index, liquid limit, and organic matter content. Sandy and gravelly soils are identified as GW, GP, GM, GC, SW, SP, SM, and SC; silty and clayey soils as ML, CL, OL, MH, CH, and OH; and highly organic soils as PT. Soils exhibiting engineering properties of two groups can have a dual classification, for example, SP-SM.

The AASHTO system classifies soils according to those properties that affect roadway construction and maintenance. In this system, the fraction of a mineral soil that is less than 3 inches in diameter is classified in one of seven groups 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 (silt and clay). At the other extreme, soils in group A-7 are fine grained. Highly organic soils are classified in group A-8 on the basis of visual inspection.

If laboratory data are available, the A-1, A-2, and A-7 groups are further classified as A-1-a, A-1-b, A-2-4, A-2-5, A-2-6, A-2-7, A-7-5, or A-7-6. As an additional refinement, the suitability of a soil as subgrade material can be indicated by a group index number. Group index numbers range from 0 for the best subgrade material to 20, or higher, for the poorest.

Rock fragments 3 to 10 inches in diameter are indicated as a percentage of the total soil on a dry-weight basis. The percentages are estimates determined mainly by converting volume percentage in the field to weight percentage.

Percentage (of soil particles) passing designated

sieves is the percentage of the soil fraction less than 3 inches in diameter based on an ovendry weight. The sieves, numbers 4, 10, 40, and 200 (USA Standard Series), have openings of 4.76, 2.00, 0.420, and 0.074 millimeters, respectively. Estimates are based on laboratory tests of soils sampled in the survey area and in nearby areas and on estimates made in the field.

Liquid limit and *plasticity index* (Atterberg limits) indicate the plasticity characteristics of a soil. The estimates are based on test data from the survey area or from nearby areas and on field examination.

Physical and Chemical Properties

Table 13 shows estimates of some characteristics and features that affect soil behavior. These estimates are given for the major layers of each soil in the survey area. The estimates are based on field observations and on test data for these and similar soils.

Clay as a soil separate, or component, consists of mineral soil particles that are less than 0.002 millimeter in diameter. In this table, the estimated clay content of each major soil layer is given as a percentage, by weight, of the soil material that is less than 2 millimeters in diameter.

The amount and kind of clay greatly affect the fertility

drainage systems and septic tank absorption fields.

Available water capacity refers to the quantity of water that the soil is capable of storing for use by plants. The capacity for water storage in each major soil layer is stated in inches of water per inch of soil. The capacity varies, depending on soil properties that affect the retention of water and the depth of the root zone. The most important properties are the content of organic matter, soil texture, bulk density, and soil structure. Available water capacity is an important factor in the choice of plants or crops to be grown and in the design and management of irrigation systems. Available water capacity is not an estimate of the quantity of water actually available to plants at any given time.

Soil reaction is a measure of acidity or alkalinity and is expressed as a range in pH values. The range in pH of each major horizon is based on many field tests. For many soils, values have been verified by laboratory analyses. Soil reaction is important in selecting crops and other plants, in evaluating soil amendments for fertility and stabilization, and in determining the risk of corrosion.

Salinity is a measure of soluble salts in the soil at saturation. It is expressed as the electrical conductivity of the saturation extract, in millimhos per centimeter at 25 degrees C. Estimates are based on field and

classes are *low*, a change of less than 3 percent; *moderate*, 3 to 6 percent; and *high*, more than 6

are very slightly erodible. Crops can be grown if ordinary measures to control wind erosion are used

of water transmission. Some soils in the survey area are assigned to two hydrologic soil groups. The dual grouping is used if the soils have a seasonal high water table and if the intake of water improves with drainage by at least 2 classes. The first letter in the dual grouping refers to the drained condition and the second letter to the undrained condition. Since management practices differ from site to site, it is recommended that site-specific investigations be made to determine the proper hydrologic group.

Flooding, the temporary covering of the soil surface by flowing water, is caused by overflowing streams, by runoff from adjacent slopes, or by inflow from high tides. Shallow water standing or flowing for short periods after rainfall is not considered flooding. Standing water in swamps and marshes or in a closed depression is considered ponding.

Table 14 gives the frequency and duration of flooding and the time of year when flooding is most likely.

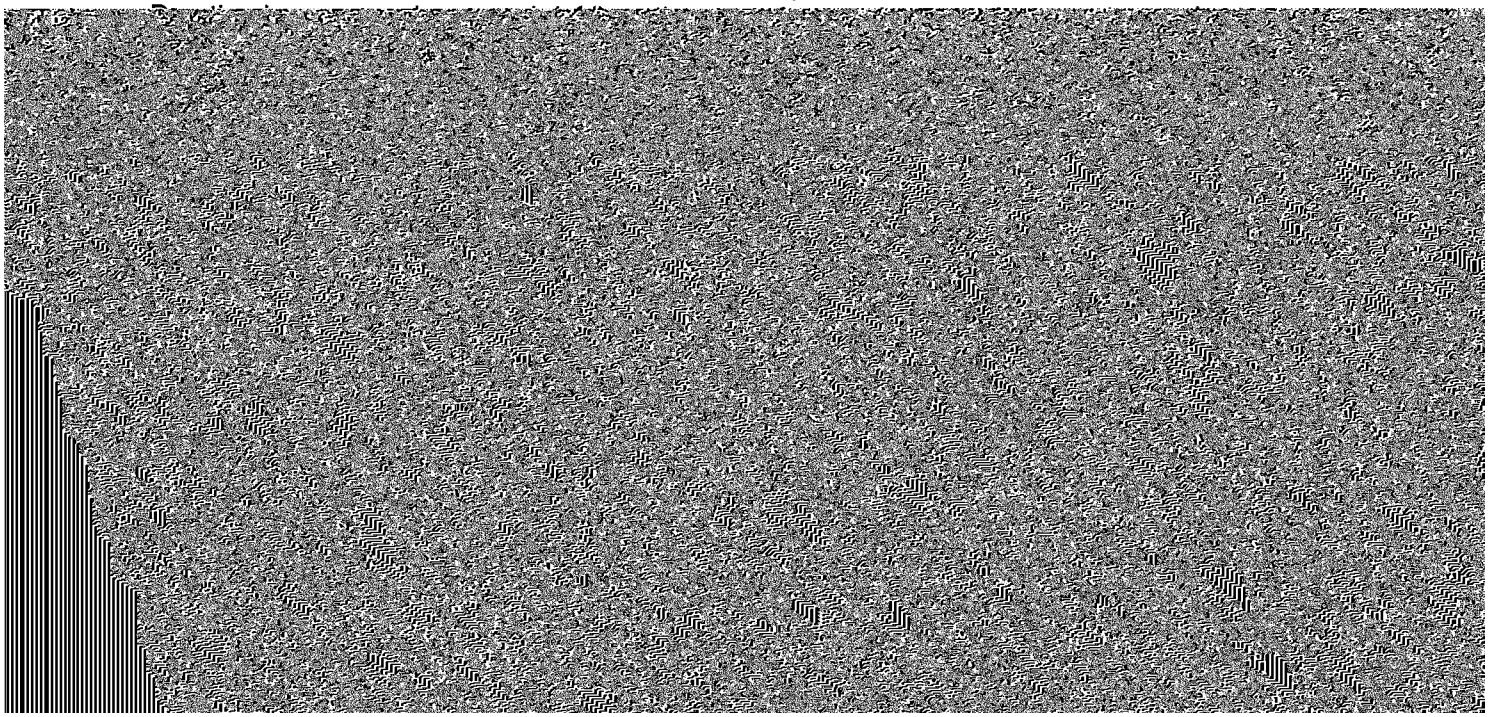
Frequency, duration, and probable dates of occurrence are estimated. Frequency generally is expressed as *none, rare, occasional,* or *frequent. None* means that flooding is not probable. *Rare* means that flooding is unlikely but possible under unusual weather conditions (the chance of flooding is nearly 0 percent to 5 percent in any year). *Occasional* means that flooding occurs infrequently under normal weather conditions (the chance of flooding is 5 to 50 percent in any year). *Frequent* means that flooding occurs often under normal weather conditions (the chance of flooding is more than a 50 percent in any year). *Common* is used when the occasional and frequent classes are grouped for certain

table in seven pedons, representing seven soil series, was measured twice a month during the course of the soil survey. The pedons were selected because they are typical of the series mapped in the county. They were as far removed as possible from any source of artificial drainage. Indicated in table 14 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 highest. A water table that is seasonally high for less than 1 month is not indicated in table 14. Table 15 shows the depth to the water table in selected soils.

An *apparent* water table is a thick zone of free water in the soil. It is indicated by the level at which water stands in an uncased borehole after adequate time is allowed for adjustment in the surrounding soil. A *perched* water table is water standing above an unsaturated zone. In places an upper, or perched, water table is separated from a lower one by a dry zone.

Two numbers in the column showing depth to the water table indicate the normal range in depth to a saturated zone. Depth is given to the nearest half foot. The first numeral in the range indicates the highest water level. A plus sign preceding the range in depth indicates that the water table is above the surface of the soil. "More than 6.0" indicates that the water table is below a depth of 6 feet or that it is within a depth of 6 feet for less than a month.

Depth to bedrock is given if bedrock is within a depth of 5 feet. The depth is based on many soil borings and on observations during soil mapping. The rock is specified as either soft or hard. If the rock is soft or



needed if the combination of factors results in a severe hazard of corrosion. The steel in installations that intersect soil boundaries or soil layers is more susceptible to corrosion than steel in installations that are entirely within one kind of soil or within one soil layer.

For uncoated steel, the risk of corrosion, expressed as *low, moderate*, or *high*, is based on soil drainage class, total acidity, electrical resistivity near field capacity, and electrical conductivity of the saturation extract.

For concrete, the risk of corrosion is also expressed

Extractable bases were determined by leaching the samples with 1.0 Normal ammonium acetate buffered at pH 7.0. Sodium and potassium in the extract obtained were determined by flame emission. Calcium and magnesium were determined by atomic absorption spectrophotometry. Extractable acidity was determined using the 0.5 Normal barium chloride - 0.2 Normal triethanolamine buffered at pH 8.2. Cation-exchange capacity was calculated by summation of extractable bases and extractable acidity. Base saturation is expressed as a percentage, using the ratio of extractable bases to cation-exchange capacity. The pH,

Pineda, Pomona, Riviera, and Wabasso soils. Most of the finer textured material was found in the deeper horizons, with the exception of the Favoretta soils, where the content of clay was greater than 40 percent throughout the entire soil. Bulow, Favoretta, Gator, and Riviera soils were the only soils that have greater than 20 percent clay in one or more horizons.

The content of clay in these soils generally is less than 5 percent. The content of clay in the deeper argillic horizons ranges from 12.4 percent in the Pineda soils to

Chemical Properties

Chemical analyses, presented in table 17, indicate that most of the soils in the county have a relatively low amount of extractable bases. The sum of extractable calcium, magnesium, sodium, and potassium exceeds 3 milliequivalents per 100 grams in only two of the surface horizons sampled. These horizons were found to be in the only two surface horizons sampled. They were found in the Favoretta and Gator series. The sum

exchange capacity ranged from 10.41 to 36.15 milliequivalents per 100 grams in the Smyrna soils. Those soils that have a very low cation-exchange capacity, such as Adamsville sand, require only a small amount of lime to alter the base status of the soil and the soil reaction in the surface horizon. Soils that have low soil fertility generally have low values for extractable bases and a low cation-exchange capacity. Fertile soils generally have a high extractable base value, a high cation-exchange capacity, and a high percent base saturation.

percent in the Pomello soils to 0.22 percent in the Smyrna soils. Sodium pyrophosphate extractable carbon ranged from 0.90 percent in the Bimini soils to 3.34 percent in the Pomona soils. The ratio of sodium pyrophosphate extractable carbon and aluminum to clay in the Bh horizons of the Myakka, Pomello, Pomona, Smyrna, and Wabasso soils is sufficient to meet the chemical criteria for spodic horizons. Pyrophosphate extractable iron and aluminum were insufficient to meet the spodic horizon criteria for Bimini and Cassia soils. Iron extracted by citrate-dithionite ranged from 0.02

more prevalent in moderately acidic, relatively well drained conditions, although it occurs in a variety of soil environments. Generally, this mineral is mainly in the clay fractions of sand-grain coatings, whereas montmorillonite and kaolinite are more prevalent in finer textured argillic horizons. Kaolinite was likely inherited from the parent material as a colloidal component; however, it may have formed as a weathering product of other minerals. Kaolinite is relatively stable in the acidic environment of the soils in the county. The clay

sieve and hydrometer method. In this method, the various grain-size fractions are calculated on the basis of all the material in the soil sample, including that material coarser than 2 millimeters in diameter. The mechanical analyses used in this method should not be used in naming textural classes of soils.

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

Classification of the Soils

The system of soil classification used by the National Cooperative Soil Survey has six categories *(20)*. Beginning with the broadest, these categories are the order, suborder, great group, subgroup, family, and series. Classification is based on soil properties observed in the field or inferred from those observations or on laboratory measurements. Table 20 shows the classification of the soils in the survey area. The categories are defined in the following paragraphs.

ORDER. Eleven soil orders are recognized. The differences among orders reflect the dominant soil-forming processes and the degree of soil formation. Each order is identified by a word ending in *sol*. An example is Entisol.

SUBORDER. Each order is divided into suborders, primarily on the basis of properties that influence soil genesis and are important to plant growth or properties that reflect the most important variables within the orders. The last syllable in the name of a suborder indicates the order. An example is Aquod (*Aqu*, meaning water, plus *od*, from Spodosol).

GREAT GROUP. Each suborder is divided into great

on the basis of physical and chemical properties and other characteristics that affect management. Generally, the properties are those of horizons below plow depth where there is much biological activity. Among the properties and characteristics considered are particle-size class, mineral content, temperature regime, depth of the root zone, consistence, moisture equivalent, slope, and permanent cracks. A family name consists of the name of a subgroup preceded by terms that indicate soil properties. An example is sandy, siliceous, hyperthermic Typic Haplaquods.

SERIES. The series consists of soils that have similar horizons in their profile. The horizons are similar in color, texture, structure, reaction, consistence, mineral and chemical composition, and arrangement in the profile. There can be some variation in the texture of the surface layer or of the substratum within a series.

Soil Series and Their Morphology

In this section, each soil series recognized in the

broad elevated flats, and lower ridge slopes in the flatwoods. Slopes range from 0 to 3 percent. Adamsville soils are hyperthermic, uncoated Aquic Quartzipsamments.

Adamsville soils are geographically associated with Astatula, Cassia, Orsino, and Tavares soils. Astatula soils are excessively drained. Cassia soils have a spodic horizon. Orsino soils have a high-chroma Bw horizon. Orsino and Tavares soils are moderately well drained. Astatula, Orsino, and Tavares soils generally are in higher positions on the landscape.

Typical pedon of Adamsville fine sand, 0 to 3 percent slopes, about 1,200 feet north and 500 feet west of the southeast corner of sec. 9, T. 10 S., R. 30 E.

A—0 to 7 inches; grayish brown (10YR 5/2) fine sand; single grained; loose; common fine and medium roots; many uncoated sand grains; very strongly acid; abrupt wavy boundary.

C1—7 to 22 inches; very pale brown (10YR 7/4) fine sand; single grained; loose; few fine, medium, and

Astatula soils are geographically associated with Adamsville, Paola, Pomello, and Tavares soils. Adamsville soils are in lower positions on the landscape and are somewhat poorly drained. Paola soils have a light-colored E horizon. Tavares soils are in lower positions on the landscape and are moderately well drained. Pomello soils are in lower positions on the landscape, have a spodic horizon, and are moderately well drained.

Typical pedon of Astatula fine sand, 0 to 8 percent slopes, about 1,200 feet north and 600 feet west of the southeast corner of sec. 9, T. 10 S., R. 30 E.

A—0 to 7 inches; dark grayish brown (10YR 4/2) fine sand; single grained; loose; common fine and medium and few coarse roots; few pockets of gray (10YR 6/1) uncoated sand grains; very strongly acid; clear wavy boundary.

C1—7 to 29 inches; very pale brown (10YR 7/4) fine sand; single grained; loose; few fine and medium roots; many uncoated sand grains; pockets of

have a spodic horizon. Additionally, Immokalee, Myakka, and Smyrna soils are in higher positions in the landscape. Placid soils have a dark A horizon that is 10 or more inches thick.

Typical pedon of Basinger fine sand, in an area of Placid, Basinger, and St. Johns soils, depressional; 1.4 miles east of the intersection of State Road 100 and County Road 205, 1.3 miles north of State Road 100, about 2,000 feet south and 100 feet west of the northeast corner of sec. 1, T. 12 S., R. 29 E.

A—0 to 2 inches; black (10YR 2/1) fine sand; weak fine granular structure; very friable; few fine, medium, and coarse roots; very strongly acid; clear smooth boundary.

E1—2 to 15 inches; light gray (10YR 7/1) fine sand; single grained; loose; few medium and coarse roots; strongly acid; gradual wavy boundary.

E2—15 to 29 inches; grayish brown (10YR 5/2) fine sand; single grained; loose; strongly acid; gradual wavy boundary.

Bh/E—29 to 50 inches; dark yellowish brown (10YR 4/4) (Bh) and grayish brown (10YR 5/2) (E) fine sand; single grained; loose; strongly acid; gradual wavy boundary.

C—50 to 80 inches; pale brown (10YR 6/3) fine sand; single grained; loose; strongly acid.

Reaction of this soil ranges from extremely acid to strongly acid in the A and E horizons, from extremely acid to moderately acid in the Bh/E horizon, and from very strongly acid to moderately acid in the C horizon.

The A horizon has hue of 10YR, value of 2 to 4, and chroma of 1 or 2. Thickness ranges from 2 to 8 inches.

The E horizon and the E part of the Bh/E horizon have hue of 10YR, value of 5 to 7, and chroma of 1 to 3. Thickness ranges from 7 to 29 inches. The texture is sand or fine sand.

The Bh part of the Bh/E horizon has hue of 10YR, value of 3, and chroma of 1 to 4 or has value of 4 and chroma of 3 or 4. Thickness ranges from 6 to 23 inches. The texture is sand or fine sand.

The C horizon has hue of 10YR, value of 5 to 7, and chroma of 1 to 4. The texture is sand or fine sand.

Bimini Series

Bulow, Cocoa, EauGallie, Narcoossee, Pellicer, Pomello, Turnbull, Wabasso, and Welaka soils. Bulow, Cocoa, Pomello, and Welaka soils are in higher positions on the landscape, are better drained, and, except for the Pomello soils, do not have a spodic horizon. Pomello soils do not have shells in the substratum. Narcoossee soils have a thin, discontinuous spodic horizon. EauGallie and Wabasso soils are poorly drained and do not have shells in the substratum. Pellicer and Turnbull soils are very poorly drained soils in the salt marsh, and they are subject to tidal flooding.

Typical pedon of Bimini sand, 2 miles north of the intersection of State Road 100 and Roberts Road, 25 feet west of Roberts Road, 2,800 feet south and 3,000 feet east of the northwest corner of sec. 35, T. 11 S., R. 31 E.

A—0 to 6 inches; gray (10YR 5/1) sand; single grained; loose; many fine, medium, and coarse roots; extremely acid; gradual wavy boundary.

E—6 to 28 inches; light gray (10YR 7/1) sand; single grained; loose; common fine and medium roots; very dark grayish brown (10YR 3/2) stains along root channels; extremely acid; gradual wavy boundary.

BE—28 to 32 inches; dark grayish brown (10YR 4/2) sand; single grained; loose; few fine and medium roots; very dark grayish brown (10YR 3/2) stains along root channels; extremely acid; clear wavy boundary.

Bh—32 to 41 inches; very dark brown (10YR 2/2) sand; moderate medium granular structure; friable; very weakly cemented in about 60 percent of the lower third of the horizon; very strongly acid; clear wavy boundary.

Bt—41 to 46 inches; dark brown (10YR 3/3) sandy loam; common medium distinct reddish brown (2.5YR 4/4) and common medium distinct olive (5Y 5/4) mottles; moderate medium subangular blocky structure; friable; very strongly acid; abrupt wavy boundary.

2C—46 to 80 inches; light gray (10YR 7/2) gravelly coarse sand containing about 30 percent coquina shell fragments up to ¼ inch in diameter; single grained; loose; neutral.

chroma of 1 or 2. The texture is sand or fine sand.

The BE horizon, if it occurs, has hue of 10YR, value of 3 to 5, and chroma of 1 to 4. It does not meet the requirements for a spodic horizon. The texture is sand, fine sand, or loamy fine sand.

The Bh horizon has hue of 5YR to 10YR, value of 2 or 3, and chroma of 1 to 3. The texture is sand, fine sand, or loamy fine sand.

The Bt horizon has hue of 10YR, value of 3 or 4, and chroma of 3 or 4; hue of 10YR, value of 5, and chroma of 2 to 6; hue of 7.5YR, value of 6, and chroma of 6; or hue of 5YR, value of 4, and chroma of 4. The texture is sandy loam, fine sandy loam, or sandy clay loam.

The 2C horizon has hue of 10YR, value of 6 to 8, and chroma of 1 to 3. The texture is gravelly coarse sand, sand, or fine sand. In some pedons the shell fragments and sand are stratified.

Bulow Series

The Bulow series consists of deep, well drained soils that formed in sandy and loamy marine sediments that are underlain by coquina limestone. These soils are on discontinuous, narrow coastal ridges parallel to the Atlantic Ocean. Slopes range from 0 to 5 percent. Bulow soils are loamy, siliceous, hyperthermic Arenic Hapludalfs.

Bulow soils are geographically associated with Astatula, Bimini, Cocoa, Orsino, Paola, and Tuscawilla soils. Astatula, Paola, and Orsino soils are sandy to a depth of 80 inches or more. Orsino soils are moderately well drained. Bimini soils are somewhat poorly drained, are in lower positions on the landscape, and have a

single grained; loose; few fine, medium, and coarse roots; strongly acid; abrupt irregular boundary.

Bt—50 to 59 inches; yellowish red (5YR 4/6) sandy clay loam; medium coarse subangular blocky structure; friable; few fine and medium roots; few loose shells in the lower 2 inches of the horizon; slightly acid; abrupt irregular boundary.

2R—59 inches; coquina limestone that is pitted with solution holes.

The depth to limestone ranges from 40 to 60 inches but is more than 80 inches in the cavities of the solution holes. The depths vary within a short distance. Reaction ranges from very strongly acid to neutral in the A and E horizons and from strongly acid to neutral in the Bw and Bt horizons.

The A horizon has hue of 10YR, value of 3 to 5, and chroma of 1 or 2. Thickness ranges from 2 to 5 inches.

The E horizon has hue of 10YR, value of 5 to 8, and chroma of 1 or 2. The texture is sand or coarse sand. Thickness ranges from 9 to 25 inches.

The Bw horizon has hue of 7.5YR, value of 5 or 6, and chroma of 4 to 8. The texture is sand or coarse sand. Thickness ranges from 15 to 45 inches.

The Bt horizon has hue of 5YR, value of 4 to 6, and chroma of 6 to 8. The texture is sandy loam or sandy clay loam. Thickness ranges from 3 to 20 inches.

The 2R horizon is coquina rock, which consists of porous limestone. The rock is pitted at irregular intervals by vertical solution chambers and relic tree and root cavities. The horizons are often broken and irregular over these cavities. Sandy soil material from

A—0 to 5 inches; very dark gray (10YR 3/1) fine sand; weak medium granular structure; very friable; few fine and medium roots; extremely acid; clear wavy boundary.

E1—5 to 12 inches; gray (10YR 5/1) fine sand; single grained; loose; few fine and medium roots; very strongly acid; abrupt smooth boundary.

E2—12 to 26 inches; white (10YR 8/1) fine sand; single grained; loose; common fine and medium roots; very strongly acid; abrupt smooth boundary.

Bh1—26 to 36 inches; very dark brown (10YR 2/2) fine sand; massive; firm; sand grains coated with organic matter; extremely acid; gradual irregular boundary.

Bh2—36 to 42 inches; dark yellowish brown (10YR 3/4) fine sand; weak fine granular structure; friable; few fine roots; sand grains coated with organic matter; extremely acid; gradual irregular boundary.

These soils are in narrow to broad drainageways and on flood plains. These soils are frequently flooded for brief to very long periods during wet seasons. Slopes are dominantly less than 1 percent but range to 2 percent. Chobee soils are fine-loamy, siliceous, hyperthermic Typic Argiaquolls.

Chobee soils are geographically associated with Favoretta, Pineda, Riviera, Terra Ceia, Wabasso, and Winder soils. Favoretta and Winder soils are in similar positions in drainageways. Terra Ceia soils are on flood plains. Pineda, Riviera, and Winder soils are in higher positions on the landscape. Favoretta soils are clayey throughout. None of the other associated soils have a mollic epipedon. Pineda and Riviera soils have an argillic horizon below a depth of 20 inches. Wabasso soils have a spodic horizon. Terra Ceia soils formed in organic material.

Typical pedon of Chobee loamy fine sand, in an area

chroma of 1. Thickness ranges from 4 to 18 inches.

The upper part of the Btg horizon has hue of 10YR and value of 2 to 6. The lower part has hue of 10YR, value of 4 to 6, and chroma of 1 or 2 or has hue of 5Y, value of 5 or 6, and chroma of 2. The 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 2 or has hue of 5Y, value of 4 or 5, and chroma of 1 or 2. The texture is loamy sand, loamy fine sand, fine sandy loam, or sandy loam.

Cocoa Series

The Cocoa series consists of moderately deep, well drained soils that formed in fine marine eolian sediments and are underlain by coquina limestone. These soils are on discontinuous, narrow coastal ridges that are parallel to the Atlantic Ocean. Slopes range from 0 to 5 percent. Cocoa soils are sandy, siliceous, hyperthermic Psammentic Hapludalfs.

Cocoa soils are associated with Astatula, Bimini, Bulow, Orsino, Paola, and Tuscawilla soils. Astatula, Orsino, and Paola soils are sandy to a depth of 80 inches or more. Orsino soils are moderately well drained. Bimini soils are somewhat poorly drained, are in lower positions on the landscape, and have a spodic horizon. Bulow soils have coquina limestone at a depth of more than 40 inches. Tuscawilla soils are in lower positions on the landscape and are poorly drained.

Typical pedon of Cocoa sand, in an area of Cocoa-Bulow complex, 0 to 5 percent slopes; 1 mile north and 1,600 feet east of the intersection of Old Kings Road (County Road 2001) and the entrance road to Bulow Ruins State Historic Site, about 1,800 feet north and 4,600 feet east of the southwest corner of sec. 22, T. 12 S., R. 31 E.

A—0 to 3 inches; grayish brown (10YR 5/2) sand; single grained; loose; many fine and medium roots; slightly acid; abrupt wavy boundary.

E—3 to 16 inches; pale brown (10YR 6/3) sand; single grained; common fine and few medium roots; slightly acid; gradual wavy boundary.

Bw1—16 to 22 inches; reddish yellow (7.5YR 6/6) sand; single grained; loose; common coated sand grains; slightly acid; gradual wavy boundary.

Bw2—22 to 29 inches; reddish yellow (7.5YR 6/8) sand; single grained; loose; common coated sand grains; slightly acid; gradual wavy boundary.

Bt—29 to 35 inches; yellowish red (5YR 5/8) loamy sand; weak medium granular structure; very friable; sand grains coated and bridged with clay; neutral; abrupt irregular boundary.

R—35 inches; hard pale brown (10YR 6/3) coquina limestone pitted with solution chambers.

The depth to limestone ranges from 20 to 40 inches. The depths vary within a short distance. Reaction ranges from very strongly acid to neutral in the A and E horizons and from moderately acid to neutral in the Bw and Bt horizons.

The A horizon has hue of 10YR, value of 3 to 5, and chroma of 1 to 3. Thickness ranges from 4 to 12 inches.

The E horizon has hue of 10YR, value of 5 to 8, and chroma of 1 to 4. It is sand, fine sand, or loamy sand. Thickness ranges from 7 to 16 inches.

The Bw horizon has hue of 5YR, value of 4 to 7, and chroma of 6 to 8. It is sand, fine sand, or loamy sand. Thickness ranges from 4 to 14 inches.

The Bt horizon has hue of 5YR or 7.5YR, value of 4 or 5, and chroma of 6 to 8. The texture is sand or loamy sand. Thickness ranges from 6 to 16 inches. Some pedons have carbonate nodules and shell fragments within this horizon.

The 2R horizon is coquina limestone. The rock is pitted at irregular intervals by vertical solution chambers and relict tree and root cavities. The horizons are often broken and irregular over these cavities.

EauGallie Series

The EauGallie series consists of very deep, poorly drained soils that formed in sandy and loamy marine sediments. These soils are in the flatwoods. Slopes are smooth and range from 0 to 2 percent. EauGallie soils are sandy, siliceous, hyperthermic Alfic Haplaquods.

EauGallie soils are geographically associated with Holopaw, Malabar, Pineda, Riviera, and Wabasso soils. Holopaw and Malabar soils do not have a spodic horizon. Pineda and Riviera soils do not have a spodic horizon and have an argillic horizon above a depth of 40 inches. Pineda soils have a Bw horizon. Wabasso soils have an argillic horizon above a depth of 40 inches.

Typical pedon of EauGallie fine sand, about 3,100 feet west and 1,200 feet north of the southeast corner of sec. 1, T. 12 S., R. 28 E.

A—0 to 6 inches; black (10YR 2/1) fine sand; weak medium granular structure; very friable; many fine and medium roots; many uncoated sand grains mixed with black organic matter; very strongly acid; clear smooth boundary.

E—6 to 22 inches; light gray (10YR 7/1) fine sand; few fine and medium roots; single grained; loose; very strongly acid; abrupt wavy boundary.

Bh1—22 to 28 inches; black (10YR 2/1) fine sand; weak medium subangular blocky structure; friable; sand grains coated with organic matter; moderately acid; gradual wavy boundary.

Bh2—28 to 33 inches; dark reddish brown (5YR 3/2)

fine sand; weak medium granular structure; very friable; sand grains coated with organic matter;

drainageways and on flood plains. They are subject to rare to frequent flooding. Slopes are dominantly less

films along the vertical faces of peds; slightly acid.

The thickness of the solum ranges from 45 to more than 80 inches. Soil reaction ranges from strongly acid to mildly alkaline in the A horizon and from moderately acid to moderately alkaline in the Btg horizon. The weighted average silt content in the particle-size control section ranges from 20 to 28 percent. The weighted average content of clay ranges from 35 to 49 percent.

The A horizon has hue of 10YR, value of 2 or 3, and chroma of 1 or is neutral and has value of 2 or 3. Thickness ranges from 12 to 21 inches.

The upper part of the Btg horizon has hue of 10YR, value of 3 to 5, and chroma of 1 or 2 or is neutral and has value of 4. If the value is 3 or less, the combined thickness of the A horizon and the upper part of the Btg horizon is less than 24 inches. The lower part of the Btg horizon has hue of 10YR, value of 4 to 7, and chroma of 1 or 2; hue of 2.5Y, value of 4 to 6, and chroma of 2; hue of 5Y, value of 4 to 6, and chroma of 1; or is neutral and has value of 4 or 5. The texture is sandy clay, clay loam, or clay.

the landscape and have an argillic horizon within a depth of 40 inches.

Typical pedon of Gator muck, in an area of Hicoria, Riviera, and Gator soils, depressional; 2.5 miles north of the intersection of County Roads 305 and 304, about 1,200 feet east of County Road 305, about 100 feet north and 4,300 feet west of the southeast corner of sec. 11, T. 13 S., R. 29 E.

Oa1—0 to 9 inches; black (5YR 2/1) muck; about 20 percent fiber, less than 15 percent rubbed; weak medium granular structure; friable; few fine, medium, and coarse roots; few uncoated sand grains; very strongly acid in 0.01M calcium chloride; clear wavy boundary.

Oa2—9 to 26 inches; very dark gray (10YR 3/1) muck; about 15 percent fiber, less than 10 percent rubbed; moderate medium subangular blocky structure; many fine, medium, and coarse roots; few pockets of pale brown (10YR 6/3) fine sand; strongly acid in 0.01M calcium chloride; clear wavy boundary.

Cg1—26 to 29 inches; dark grayish brown (10YR 4/2)

sand, less than 12 inches thick, that underlies the Oa horizon. Some pedons have a Cg4 horizon that is sand, fine sand, or loamy fine sand.

Hicoria Series

The Hicoria series consists of very deep, very poorly drained soils that formed in sandy and loamy marine sediments. These soils are in depressions in the flatwoods. Slopes are less than 1 percent. Hicoria soils are loamy, siliceous, hyperthermic Arenic Umbraqualfs.

Hicoria soils are geographically associated with Gator, Hontoon, Pineda, Riviera, and Wabasso soils. Gator and Hontoon soils have a histic epipedon. Pineda, Riviera, and Wabasso soils have an ochric epipedon and are in higher positions on the landscape. Additionally, Pineda soils have a Bw horizon and Wabasso soils have a spodic horizon.

Typical pedon of Hicoria mucky fine sand, in an area of Hicoria, Riviera, and Gator soils, depressional; 4,000 feet east and 1,300 feet north of the southwest corner of sec. 35, T. 10 S., R. 29 E.

A1—0 to 10 inches; black (10YR 2/1) mucky fine sand; moderate medium granular structure; friable; common medium and few coarse roots; strongly acid; gradual wavy boundary.

A2—10 to 20 inches; very dark gray (10YR 3/1) fine sand; few medium distinct gray (10YR 5/1) mottles; moderate medium granular structure; friable; few medium and coarse roots; strongly acid; clear smooth boundary.

Eg—20 to 32 inches; dark gray (10YR 4/1) fine sand; single grained; loose; few medium and coarse roots; neutral; clear smooth boundary.

Btg—32 to 55 inches; gray (10YR 5/1) sandy clay loam; few medium distinct light olive brown (2.5Y 5/4) mottles; moderate medium subangular blocky structure; friable; neutral; gradual wavy boundary.

BCg—55 to 80 inches; gray (10YR 5/1) fine sandy loam; weak medium subangular blocky structure; friable; few white calcium carbonate accumulations; neutral.

The thickness of solum ranges from 40 to more than 80 inches. Soil reaction is strongly acid to moderately acid in the A horizon. The Btg and BCg horizons are very strongly acid to neutral.

The A horizon has hue of 7.5YR or 10YR, value of 1 to 3, and chroma of 1 or 2. The texture is fine sand or mucky fine sand. Thickness ranges from 10 to 20 inches.

The Eg horizon has hue of 10YR, value of 4 to 6, and chroma of 1 or 2. The texture is sand, fine sand, or loamy fine sand. Thickness ranges from 5 to 25 inches.

The Btg horizon has hue of 10YR, value of 4 to 7, and chroma of 1 or 2 or has hue of 5GY, value of 5 or 6, and chroma of 1. The texture is sandy loam, fine sandy loam, or sandy clay loam. Thickness ranges from 10 to 34 inches.

The BCg horizon, if it occurs, has hue of 10YR, value of 4 to 6, and chroma of 1 or 2. The texture is sandy loam, fine sandy loam, or sandy clay loam.

Some pedons have a Cg horizon below a depth of 60 inches. It has hue of 10YR, value of 5 or 6, and chroma of 1 or has hue of 5GY, value of 5, and chroma of 1. The texture is fine sand or loamy fine sand.

Holopaw Series

The Holopaw series consists of very deep, poorly drained soils that formed in stratified sandy and loamy marine sediments. These soils are in low, broad to narrow areas in the flatwoods. Slopes range from 0 to 2 percent. Holopaw soils are loamy, siliceous, hyperthermic Grossarenic Ochraqualfs.

Holopaw soils are geographically associated with EauGallie, Malabar, Riviera, Pineda, Wabasso, and Valkaria soils. EauGallie soils have a spodic horizon at a depth of less than 30 inches and an argillic horizon at a depth of more than 40 inches. Malabar and Valkaria soils have a high-chroma Bw horizon. Valkaria soils are sandy throughout. Pineda, Riviera, and Wabasso soils have an argillic horizon at a depth of 20 to 40 inches below the surface. Wabasso soils have a spodic horizon.

Typical pedon of Holopaw fine sand, about 200 feet south and 400 feet east of the northwest corner of sec. 24, T. 10 S., R. 28 E.

A—0 to 4 inches; very dark gray (10YR 3/1) fine sand; weak medium granular structure; very friable; many fine and medium roots; slightly acid; gradual wavy boundary.

E1—4 to 15 inches; light gray (10YR 6/1) fine sand; few medium distinct dark gray (10YR 4/1) mottles; single grained; loose; common fine and medium roots; slightly acid; gradual wavy boundary.

E2—15 to 45 inches; gray (10YR 5/1) fine sand; many coarse distinct very dark gray (10YR 3/1) and very dark grayish brown (10YR 3/2) mottles; single grained; loose; few fine roots; slightly acid; abrupt wavy boundary.

Btg—45 to 55 inches; light gray (5Y 6/1) fine sandy loam; few coarse distinct dark gray (10YR 4/1) mottles; weak coarse subangular blocky structure; friable; few pockets of fine sand; clay bridges between sand grains; mildly alkaline; gradual wavy boundary.

Cg—55 to 80 inches; light gray (5Y 6/1) loamy fine

sand; common fine distinct olive (5Y 5/4) mottles; massive; very friable; few pockets of fine sandy loam; few pockets of fine sand; neutral.

The thickness of the solum ranges from 46 to more than 80 inches. Reaction is strongly acid to slightly acid in the A and E horizons and is strongly acid to moderately alkaline in the Btg and Cg horizons.

The A horizon has hue of 10YR, value of 2 to 4, and chroma of 1 or 2. Thickness ranges from 3 to 7 inches.

The E horizon has hue of 10YR, value of 4 to 7, and chroma of 1 to 3. The texture is sand or fine sand. Thickness ranges from 36 to 56 inches.

The Btg horizon has hue of 10YR to 5Y, value of 4 to 7, and chroma of 1 or 2. The texture is sandy loam, fine sandy loam, or sandy clay loam. Thickness ranges from 5 to 18 inches.

The Cg horizon has hue of 10YR to 5Y, value of 5 to 7, and chroma of 1. The texture is fine sand or loamy fine sand.

Hontoon Series

The Hontoon series consists of very deep, very poorly drained soils that formed in thick beds of well decomposed hydrophytic, nonwoody plant remains. These soils are in depressions in the flatwoods. Slopes are less than 2 percent. Hontoon soils are dysic, hyperthermic Typic Medisaprists.

Hontoon soils are geographically associated with Gator, Hicoria, Immokalee, Myakka, Riviera, Samsula, Smyrna, St. Johns, and Wabasso soils. All of the associated soils, except for the Gator and Samsula soils, are mineral soils. Gator and Samsula soils have an organic layer less than 52 inches thick. Gator, Hicoria, Riviera, Samsula, and St. Johns soils are in depressions. Immokalee, Myakka, and Smyrna soils are in broad areas on the flatwoods.

Typical pedon of Hontoon muck, in an area of Samsula and Hontoon soils, depressional; 1,600 feet north and 2,400 feet west of the southeast corner of sec. 10, T. 12 S., R. 30 E.

Oa1—0 to 25 inches; dark reddish brown (5YR 3/3) muck; about 20 percent fiber, 5 percent rubbed; weak medium subangular blocky structure; friable; color of sodium pyrophosphate extract is dark grayish brown (10YR 4/2); extremely acid; clear wavy boundary.

Oa2—25 to 80 inches; black (N 2/0) muck; about 15 percent fiber, 5 percent rubbed; weak coarse subangular blocky structure; friable; color of sodium pyrophosphate is brown (10YR 4/3); extremely acid.

Reaction is less than 4.5 in 0.01M calcium chloride. It is extremely acid to strongly acid in 1:1 water.

The Oa horizon has hue of 5YR or 10YR, value of 2 or 3, and chroma of 1 to 3. The fiber content is less than 33 percent, unrubbed. Thickness ranges from 65 to 80 inches or more. The sodium pyrophosphate extract of the Oa horizon has hue of 10YR, value of 2 to 4, and chroma of 4 or less.

Some pedons have an AC horizon at a depth of 65 inches or more. If it occurs, the AC horizon has hue of 10YR, value of 2 or 3, and chroma of 1 or 2. The texture is sand or fine sand.

Immokalee Series

The Immokalee series consists of very deep, poorly drained soils that formed in thick deposits of sandy marine sediments. These soils are on broad flats and low knolls in the flatwoods. Slopes are less than 2 percent. Immokalee soils are sandy, siliceous, hyperthermic Arenic Haplaquods.

Immokalee soils are geographically associated with Basinger, Hontoon, Myakka, Placid, Pomona, St. Johns, and Samsula soils. Basinger soils have a grayish brown to dark brown, weakly developed subsoil and are in depressions. Myakka soils have a spodic horizon with an upper boundary less than 30 inches. Hontoon and Samsula soils have a histic epipedon and are in depressions. Placid and St. Johns soils have an umbric epipedon and are in depressions. Additionally, St. Johns soils have a spodic horizon at a depth of less than 30 inches. Pomona soils have an argillic horizon.

Typical pedon of Immokalee fine sand, about 400 feet north and 800 feet west of the southeast corner of sec. 4, T. 11 S., R. 30 E.

A—0 to 5 inches; black (10YR 2/1) fine sand; weak medium granular structure; very friable; common fine and medium roots; extremely acid; common uncoated light gray sand grains; gradual wavy boundary.

E—5 to 39 inches; light brownish gray (10YR 6/2) fine sand; single grained; loose; few medium and coarse roots; very strongly acid; abrupt wavy boundary.

Bh1—39 to 47 inches; very dark gray (10YR 3/1) fine sand; weak medium granular structure; very friable; few fine roots; extremely acid; gradual wavy boundary.

Bh2—47 to 60 inches; dark brown (10YR 3/3) fine sand; weak fine subangular blocky structure; friable; extremely acid; gradual wavy boundary.

C—60 to 80 inches; dark grayish brown (10YR 4/2) fine sand; single grained; loose; extremely acid.

The thickness of the solum ranges from 40 to more than 80 inches. Soil reaction ranges from extremely acid to moderately acid.

The A horizon has hue of 10YR, value of 2 to 4, and chroma of 1 or 2. Thickness ranges from 5 to 10 inches.

The E horizon has hue of 10YR, value of 5 to 7, and chroma of 1 or 2. The texture is sand or fine sand. Thickness ranges from 30 to 42 inches.

The Bh horizon has hue of 5YR to 10YR, value of 2 or 3, and chroma of 1 to 3. The texture is sand, fine sand, or loamy fine sand. Thickness ranges from 10 to 30 inches.

Some pedons have a BC horizon. It has hue of 10YR, value of 3 to 5, and chroma of 3 or 4. The texture is sand or fine sand.

The C horizon has hue of 10YR, value of 4 to 6, and chroma of 1 or 2. The texture is sand or fine sand.

Malabar Series

The Malabar series consists of very deep, poorly drained soils that formed in sandy and loamy marine sediments. These soils are in low, narrow to broad areas on the flatwoods. Slope ranges from 0 to 2

Btg—60 to 80 inches; grayish brown (10YR 5/2) sandy clay loam; moderate medium subangular blocky structure; friable; sand grains coated and bridged with clay; slightly acid.

The thickness of the solum ranges from 50 to more than 80 inches. Reaction ranges from strongly acid to moderately acid in the A and E horizons, from strongly acid to slightly acid in the Bw and E′ horizons, and from strongly acid to moderately alkaline in the Bt horizon.

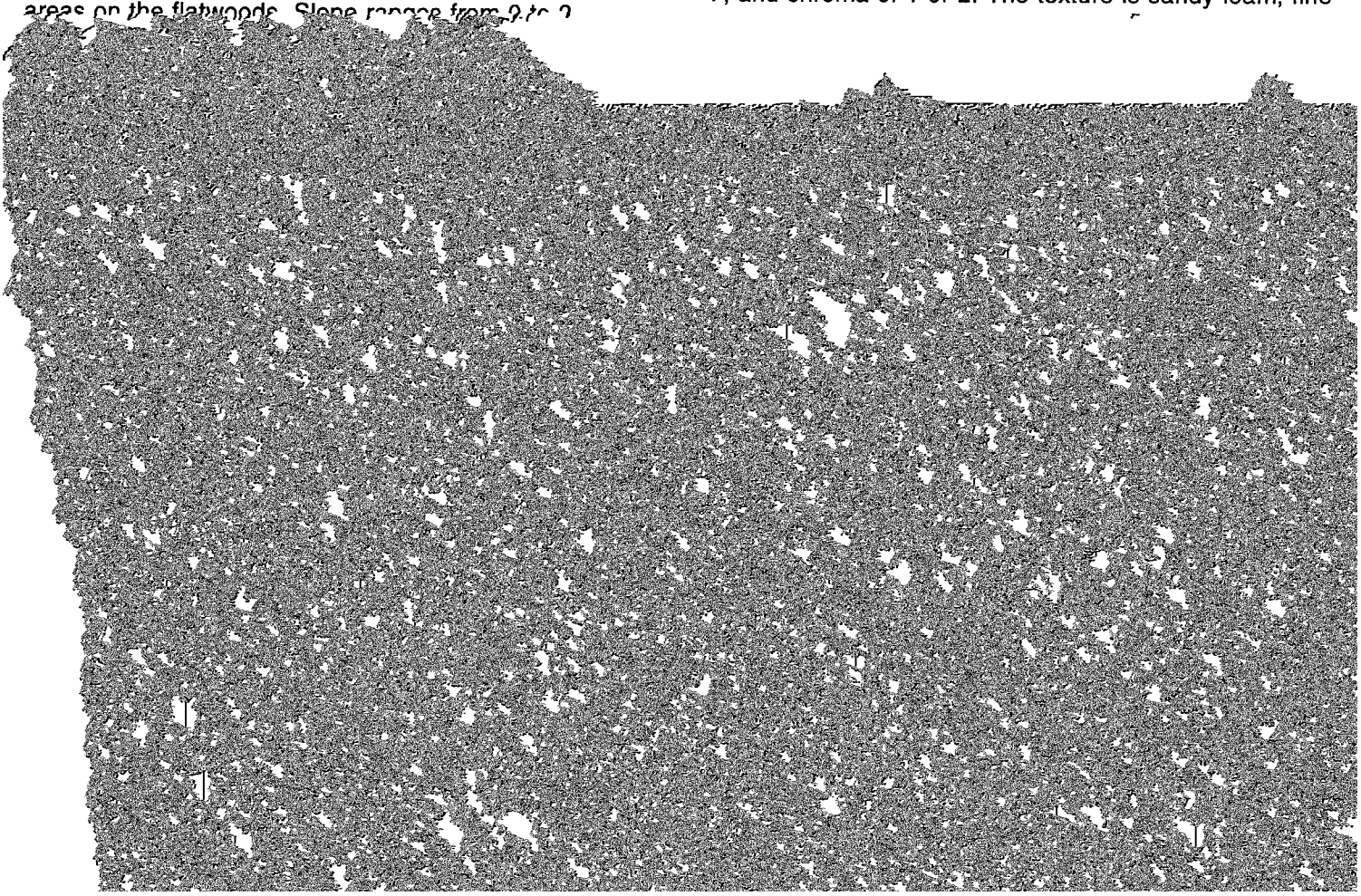
The A horizon has hue of 10YR, value of 2 to 4, and chroma of 1 or 2. Thickness ranges from 2 to 6 inches.

The E horizon has hue of 10YR, value of 5 to 7, and chroma of 1 to 3. The texture is sand or fine sand. Thickness ranges from 5 to 32 inches.

The Bw horizon has hue of 10YR, value of 5 to 7, and chroma of 3 to 8. The texture is sand or fine sand. Thickness ranges from 5 to 33 inches.

The E′ horizon has hue of 10YR, value of 5 to 7, and chroma of 1 to 3. The texture is sand or fine sand. Thickness ranges from 5 to 30 inches.

The Btg horizon has hue of 10YR, value of 4 to 7, and chroma of 1 or 2 or has hue of 2.5Y, value of 5 to 7, and chroma of 1 or 2. The texture is sandy loam, fine



medium roots; extremely acid; clear smooth boundary.

E—6 to 25 inches; gray (10YR 5/1) fine sand; common medium distinct very dark gray (10YR 3/1) mottles; single grained; loose; common fine and medium roots; extremely acid; clear wavy boundary.

Bh1—25 to 29 inches; black (10YR 2/1) fine sand; moderate medium subangular blocky structure; friable; common fine, medium, and coarse roots; strongly acid; clear wavy boundary.

Bh2—29 to 31 inches; dark reddish brown (5YR 3/2) fine sand; weak fine subangular blocky structure; common fine, medium, and coarse roots; extremely acid; clear wavy boundary.

BC—31 to 40 inches; dark yellowish brown (10YR 4/4) fine sand; single grained; loose; extremely acid; clear wavy boundary.

C1—40 to 50 inches; brown (10YR 5/3) fine sand; single grained; loose; extremely acid; clear smooth boundary.

C2—50 to 80 inches; light gray (10YR 7/1) fine sand; single grained; loose; extremely acid.

The thickness of the solum ranges from 30 to 80 inches or more. Soil reaction ranges from extremely acid to moderately acid.

The A horizon has hue of 10YR, value of 2 to 4, and chroma of 1. Thickness ranges from 4 to 8 inches.

The E horizon has hue of 10YR, value of 4 to 7, and chroma of 1 or 2. The texture is sand or fine sand. Thickness ranges from 12 to 24 inches.

The Bh horizon has hue of 5YR to 10YR, value of 2 or 3, and chroma of 1 to 3 or is neutral and has value

Narcoossee soils are geographically associated with Palm Beach, Pellicer, Turnbull, and Welaka soils. All of the associated soils do not have a spodic horizon. Palm Beach soils are excessively drained and are on primary oceanfront dunes. Pellicer and Turnbull soils are in tidal salt marshes and are flooded by normal high tides. Welaka soils are well drained and are on relict secondary and tertiary dunes. They have a high-chroma Bw horizon at a depth of less than 30 inches.

Typical pedon of Narcoossee fine sand, shell substratum, in an area of Narcoossee, shell substratum-Welaka complex, 0 to 5 percent slopes; about 2 miles south of State Highway 100, 500 feet west of State Highway A1A in the northeastern quadrant of the intersection of 27th Street and South Daytona Avenue, about 2,000 feet east and 900 feet south of the northwest corner of sec. 19, T. 12 N., R. 32 E.

A—0 to 3 inches; very dark gray (10YR 3/1) fine sand; weak fine granular structure; very friable; many fine and few medium and coarse roots; many uncoated sand grains; very strongly acid; clear wavy boundary.

E1—3 to 5 inches; gray (10YR 5/1) fine sand; single grained; loose; few fine, medium, and coarse roots; strongly acid; gradual wavy boundary.

E2—5 to 17 inches; light gray (10YR 7/1) fine sand; single grained; loose; few medium and coarse roots; strongly acid; abrupt wavy boundary.

Bh1—17 to 19 inches; dark brown (7.5YR 3/2) fine sand; common coarse distinct reddish brown (5YR 4/3) mottles; moderate coarse granular structure; friable; few medium and coarse roots; few shell

sand; single grained; loose; about 15 percent, by volume, sand-sized shell fragments up to 1 inch in diameter; strong effervescence; moderately alkaline.

Soil reaction ranges from very strongly acid to slightly acid in the A and E horizons. It is moderately acid to mildly alkaline in the Bh horizon and is neutral to moderately alkaline in the C horizon.

The A horizon has hue of 10YR, value of 3, and chroma of 1 or 2. Thickness ranges from 2 to 7 inches.

The E horizon has hue of 10YR, value of 4 to 8, and chroma of 1 or 2. The texture is fine sand or sand. Thickness ranges from 7 to 20 inches.

The Bh1 horizon has hue of 7.5YR, value of 2 or 3, and chroma of 2 or has hue of 10YR, value of 2, and chroma of 1 to 3. The texture is sand or fine sand. Thickness ranges from 2 to 4 inches and is discontinuous in about 25 to 50 percent of the pedons. The Bh2 horizon has hue of 7.5YR, value of 3 or 4, and chroma of 2 to 4. The texture is sand or fine sand. Thickness ranges from 1 to 6 inches.

The BC horizon has hue of 10YR, value of 4 or 5, and chroma of 2 to 4. Mottles are in shades of yellow and brown. Thickness ranges from 6 to 9 inches. The texture is sand or fine sand. The content of shells and shell fragments ranges from 0 to 5 percent.

The color of the C horizon depends largely upon the color of the shells. The fine sand portion of the C horizon has hue of 10YR, value of 5 to 7, and chroma of 1 or 2. The texture is gravelly to extremely gravelly fine sand. The content of shells and shell fragments, which are sand-sized to ½ inch in diameter, ranges from 15 to 75 percent, by volume. The C horizon extends to a depth of 80 inches or more.

Orsino Series

The Orsino series consists of very deep, moderately well drained soils that formed in thick beds of sandy marine or eolian deposits. They are on low to moderately high ridges and knolls in the flatwoods and along dunes. Slopes range from 0 to 5 percent. Orsino soils are hyperthermic, uncoated Spodic Quartzipsamments.

Orsino soils are geographically associated with Adamsville, Cassia, Palm Beach, Pomello, and Tavares soils. Adamsville and Cassia soils are somewhat poorly drained and are slightly lower on the landscape. Adamsville and Tavares soils do not have a B horizon. Cassia and Pomello soils have a spodic horizon. Palm

about 1,000 feet north and 2,200 feet east of the southwest corner of sec. 24, T. 11 S., R. 29 E.

A—0 to 3 inches; grayish brown (10YR 5/2) fine sand; single grained; loose; few fine, medium, and coarse roots; extremely acid; gradual wavy boundary.

E—3 to 12 inches; white (10YR 8/1) fine sand; single grained; loose; few fine, medium, and coarse roots; extremely acid; abrupt irregular boundary.

B/E and Bh—12 to 17 inches; brown (7.5YR 5/4) fine sand; single grained; loose; few fine and medium roots; common tongues of white (10YR 8/1) fine sand 1 to 4 inches in diameter with very dark grayish brown (10YR 3/2) stains at the upper contact with the E horizon; very strongly acid; gradual wavy boundary.

Bw—17 to 49 inches; pale brown (10YR 6/3) fine sand; common fine distinct yellowish brown (10YR 5/6) and common coarse distinct light gray (10YR 7/2) mottles; single grained; loose; few fine roots; very strongly acid; gradual wavy boundary.

C—49 to 80 inches; light gray (10YR 7/2) fine sand; few coarse prominent strong brown (7.5YR 5/6) and dark yellowish brown (10YR 4/4) mottles; single grained; loose; few fine roots; very strongly acid.

Soil reaction is extremely acid or very strongly acid in the A and E horizons and ranges from very strongly acid to moderately acid in the other horizons.

The A horizon has hue of 10YR, value of 4 or 5, and chroma of 1 or 2. Thickness ranges from 2 to 5 inches.

The E horizon and the E part of the B/E and Bh horizons has hue of 10YR, value of 7 or 8, and chroma of 1 or 2. The texture is sand or fine sand. Thickness ranges from 3 to 32 inches.

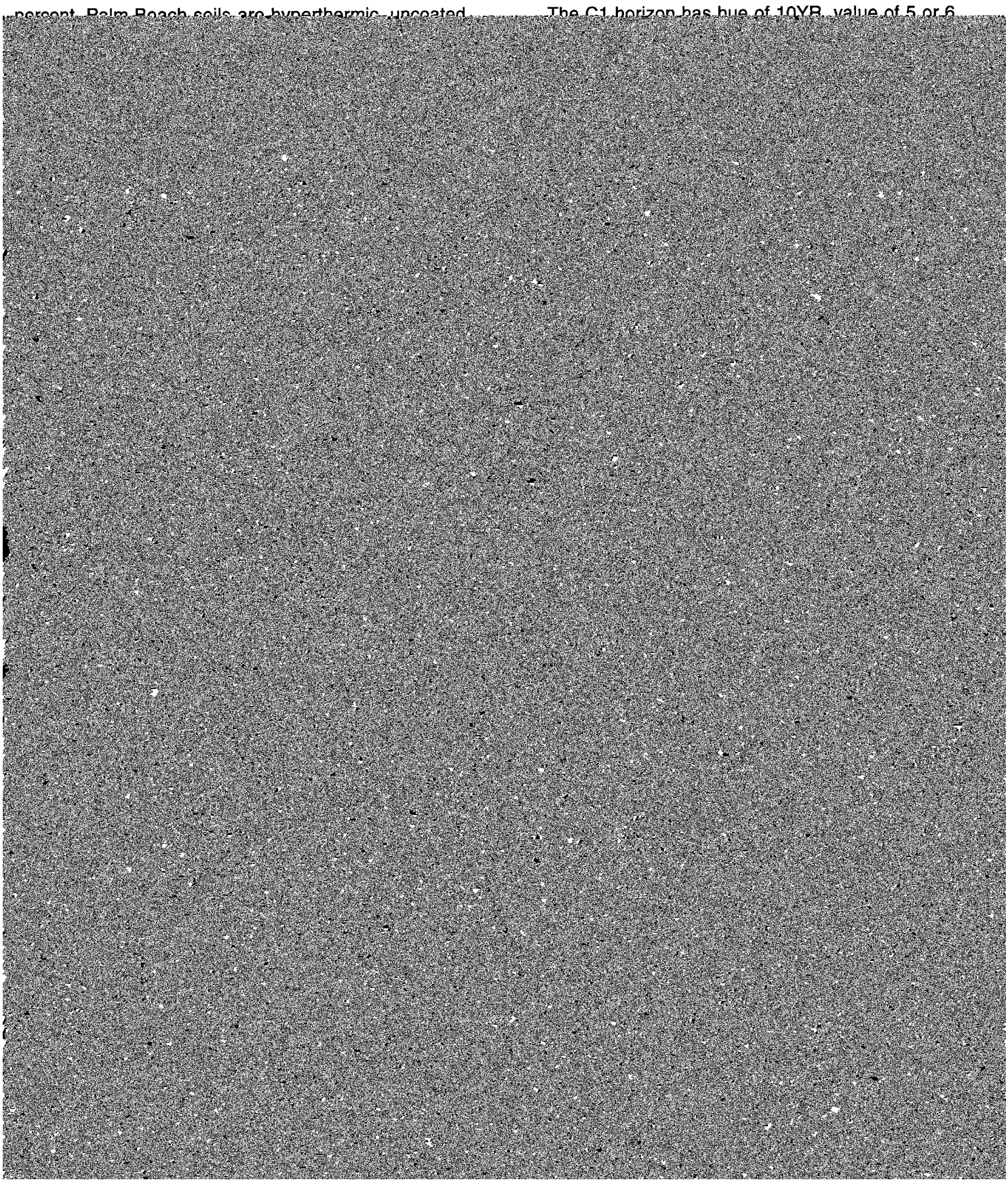
The B/E and Bh horizon is thin and discontinuous. The Bh part has hue of 10YR, value of 2 or 3, and chroma of 2. The Bw part has hue of 10YR, value of 5 to 7, and chroma of 3 to 6 or has hue of 7.5YR, value of 5, and chroma of 3 or 4. The E part has the same colors as those of the E horizon. The texture is sand or fine sand. Thickness ranges from 5 to 20 inches.

The Bw horizon has colors similar to those of the Bw part of the B/E and Bh horizon. The texture is sand or fine sand. Thickness ranges from 3 to 32 inches.

The C horizon has hue of 10YR, value of 5 to 7, and chroma of 2 to 4. The texture is sand or fine sand.

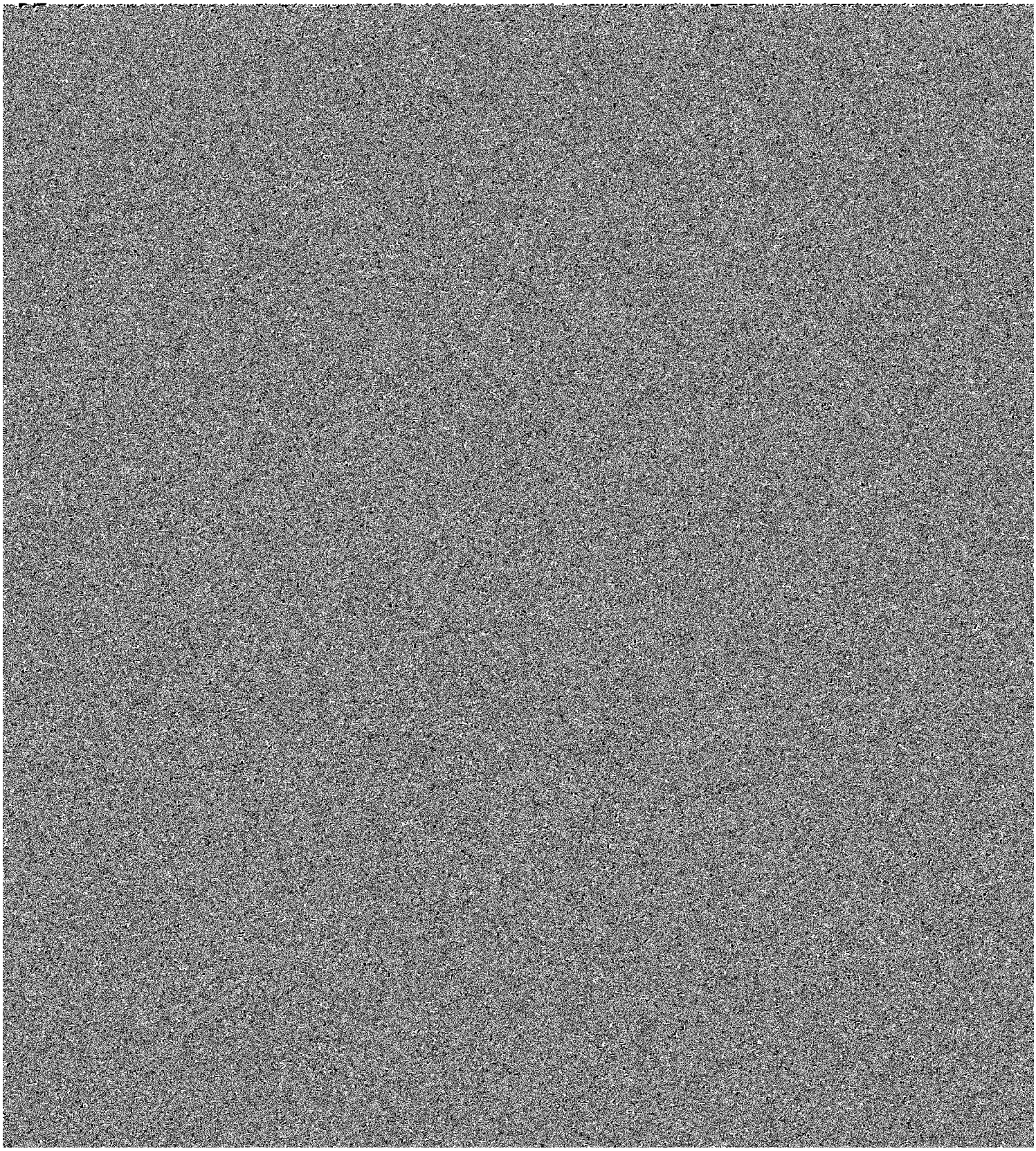
Palm Beach Series

The Palm Beach series consists of very deep, well



sand-sized to ¼ inch in diameter; strongly acid; clear irregular boundary.

formed in muck overlying clayey and sandy estuary deposits. They contain less than 1 percent sulfur.



and chroma of 1. The texture is fine sand, loamy fine sand, or fine sandy loam.

Pineda Series

The Pineda series consists of very deep, poorly drained soils that formed in thick beds of sandy and loamy marine sediments. These soils are in sloughs

common coarse distinct reddish yellow (5YR 5/4) mottles; moderate medium subangular blocky structure; friable; few gray (10YR 6/1) pockets of fine sand; olive brown (2.5Y 4/4) clay films on faces of peds; strongly acid; gradual wavy boundary.

Cg1—40 to 47 inches; dark gray (5Y 4/1) loamy fine sand; common medium distinct dark gray (5Y 5/1) and olive (5Y 4/4) mottles; massive; very friable;

5YR to 10YR, value of 3 to 5, and chroma of 3 or 4. The texture is sand or fine sand.

The C horizon has hue of 10YR, value of 5 to 7, and chroma of 1 to 4. The texture is sand or fine sand.

Pomona Series

The Pomona series consists of very deep, poorly drained soils that formed in sandy and loamy marine sediments. These soils are in the flatwoods. Slopes range from 0 to 2 percent. Pomona soils are sandy, siliceous, hyperthermic Ultic Haplaquods.

Pomona soils are geographically associated with Immokalee, Malabar, Myakka, and Smyrna soils. These soils are in landscape positions similar to those of the Pomona soils. All of the associated soils, except for the Malabar soils, do not have an argillic horizon. Malabar

Reaction of the soil ranges from extremely acid to moderately acid in all horizons.

The A horizon has hue of 10YR, value of 2 to 4, and chroma of 1. Thickness ranges from 4 to 6 inches.

The E horizon has hue of 10YR, value of 5 to 7, and chroma of 1 or 2. Thickness ranges from 9 to 23 inches.

The Bh horizon has hue of 5YR to 10YR, value of 2 or 3, and chroma of 1 or 2. Thickness ranges from 6 to 30 inches.

The E′ horizon, if it occurs, has hue of 10YR, value of 5 to 7, and chroma of 1 to 3. Thickness ranges from 0 to 10 inches.

The Btg horizon has hue of 10YR, value of 5 to 7, and chroma of 1 or 2. Some pedons have a Bt horizon that has chroma of 3 or 4. This horizon has none to common mottles in shades of yellow, brown, and gray.

and medium and few coarse roots; many uncoated sand grains; very strongly acid; gradual wavy boundary.

E1—6 to 17 inches; gray (10YR 5/1) fine sand; single grained; loose; few fine and medium roots; very strongly acid; gradual wavy boundary.

E2—17 to 25 inches; light gray (10YR 7/1) fine sand; few medium distinct yellowish brown (10YR 5/6) mottles; single grained; loose; very strongly acid; abrupt irregular boundary.

E3—25 to 28 inches; grayish brown (10YR 5/2) fine sand; few medium distinct brownish yellow (10YR 6/6) mottles; single grained; loose; light gray (10YR 7/1) fine sand tongues extending through the horizon; strongly acid; abrupt irregular boundary.

B/E—28 to 35 inches; gray (5Y 5/1) fine sandy loam (Btg); common coarse distinct brownish yellow (10YR 6/6) and few coarse distinct light olive brown (2.5Y 5/6) mottles; weak coarse subangular blocky structure; friable; massive; light gray (10YR 7/1) fine sand tongues 4 inches wide and 2 to 15 inches deep from the E horizon extend into the Btg horizon; moderately acid; gradual wavy boundary.

Btg—35 to 51 inches; gray (5Y 5/1) sandy clay loam; 4 to 6, and chroma of 1. The texture ranges from fine sandy loam to a mixture of sand and shell fragments or marl.

Samsula Series

The Samsula series consists of very deep, very poorly drained soils that formed in moderately thick beds of hydrophytic nonwoody plant remains. These soils are in depressions in the flatwoods and long narrow drainageways in the uplands. The soils in the drainageways are frequently flooded. Slopes are concave and are less than 2 percent. Samsula soils are sandy or sandy-skeletal, siliceous, euic, hyperthermic Terric Medisaprists.

Samsula soils are geographically associated with Adamsville, Astatula, Basinger, Hontoon, Immokalee, Myakka, Placid, Smyrna, St. Johns, and Tavares soils. All of the associated soils are mineral soils except for the Hontoon soils. Hontoon soils have an organic layer more than 52 inches thick. Adamsville, Astatula, and Tavares soils are in higher positions and are better drained. Basinger, Placid, and St. Johns soils are in landscape positions similar to those of the Samsula

Soil reaction of the organic material is less than 4.5 in 0.01M calcium chloride and ranges from less than 4.5 to 5.5 in 1:1 water. The mineral material ranges from extremely acid to moderately acid. Thickness of the organic material ranges from 25 to 45 inches.

The Oa horizons have hue of 10YR or 5YR, value of 2 or 3, and chroma of 1 or 2 or have hue of 5YR, value of 3, and chroma of 3. The fiber content ranges from 10 to 75 percent unrubbed and from 5 to 16 percent rubbed. The sodium pyrophosphate extract has hue of 10YR, value of 2 to 4, and chroma of 1 to 4 or has value of 5 or 6 and chroma of 3 to 7.

The 2Cg1 horizon has hue of 10YR, value of 2 to 4, and chroma of 1 or 2. The texture is sand or fine sand. Thickness ranges from 5 to 17 inches.

The 2Cg2 and 2Cg3 horizons have hue of 10YR, value of 5 to 7, and chroma of 1 or 2. Some pedons have mottles in shades of gray and brown. The texture is sand or fine sand.

Smyrna Series

The Smyrna series consists of very deep, poorly drained soils that formed in thick deposits of sandy marine sediments. These soils are in broad areas on the flatwoods. Slopes range from 0 to 2 percent. Smyrna soils are sandy, siliceous, hyperthermic Aeric Haplaquods.

Smyrna soils are geographically associated with Basinger, Hontoon, Myakka, Placid, Pomona, St. Johns, Samsula, and Valkaria soils. Basinger, Hontoon, Placid, Samsula, and St. Johns soils are in depressions. Basinger and Placid soils do not have a spodic horizon, and Placid and St. Johns soils have an umbric epipedon. Hontoon and Samsula soils formed in organic material. Myakka and Pomona soils have a spodic horizon at a depth of 20 to 30 inches. Valkaria soils have a high-chroma Bw horizon.

Typical pedon of Smyrna fine sand, about 900 feet east and 600 feet south of the northwest corner of sec. 32, T. 12 S., R. 31 E.

A—0 to 4 inches; black (10YR 2/1) fine sand; moderate medium granular structure; very friable; many fine

Bh1—13 to 18 inches; dark reddish brown (5YR 3/2) fine sand; strong coarse subangular blocky structure; firm; many fine, medium, and coarse roots in the upper part of the horizon; about 30 percent orstein in the lower part of the horizon; extremely acid; clear wavy boundary.

Bh2—18 to 21 inches; dark reddish brown (5YR 3/3) fine sand; moderate medium subangular blocky structure; friable; few medium roots; extremely acid; gradual wavy boundary.

BE—21 to 50 inches; brown (10YR 5/3) fine sand; few coarse distinct dark brown (10YR 3/3) mottles; single grained; loose; few fine and medium roots; extremely acid; gradual wavy boundary.

E′—50 to 70 inches; gray (10YR 6/1) fine sand; few medium distinct light yellowish brown (10YR 6/4) mottles; single grained; loose; extremely acid; gradual wavy boundary.

B′h—70 to 80 inches; very dark gray (10YR 3/1) fine sand; moderate medium granular structure; very friable; few medium roots; few pockets of light gray (10YR 7/1) fine sand; very strongly acid.

Soil reaction is extremely acid to moderately acid in all horizons.

The A horizon has hue of 10YR, value of 2 to 4, and chroma of 1 or 2. Thickness ranges from 3 to 6 inches.

The E horizon has hue of 10YR, value of 5 to 8, and chroma of 1 or 2. The texture is sand or fine sand. Thickness ranges from 4 to 14 inches.

Some pedons have a BE horizon that has hue of 10YR, value of 4 or 5, and chroma of 3. The texture is sand or fine sand. Thickness ranges from 0 to 2 inches.

The Bh horizon has hue of 5YR to 10YR, value of 2 or 3, and chroma of 1 to 3. Some pedons have vertical to horizontal tongues extending into the Bh horizon from the E horizon. The texture is sand or fine sand. Thickness ranges from 5 to 18 inches.

The E′ and B′h horizons have colors and textures similar to the overlying E and Bh horizons.

Some pedons have a C horizon that has hue of 10YR, value of 4 to 8, and chroma of 2 or 4. The texture is sand or fine sand.

spodic horizon. Hontoon and Samsula soils formed in organic material. Immokalee and Myakka soils are in higher positions on the landscape and are better drained.

Typical pedon of St. Johns fine sand, in an area of Placid, Basinger, and St. Johns soils, depressional; 2.0 miles northwest of the intersection of County Road 205 and an abandoned railroad grade, about 0.6 mile south of the abandoned railroad grade, about 1,200 feet south and 200 feet east of the northwest corner of sec. 25, T. 11 S., R. 29 E.

A—0 to 10 inches; black (10YR 2/1) fine sand; moderate medium granular structure; friable; common fine roots; strongly acid; gradual smooth boundary.

E—10 to 25 inches; gray (10YR 5/1) fine sand; single grained; loose; few fine roots; very strongly acid; abrupt wavy boundary.

Bh1—25 to 34 inches; very dark grayish brown (10YR 3/2) fine sand; strong medium subangular blocky structure; friable; common fine and medium roots; few pockets of dark gray (10YR 4/1) fine sand; very strongly acid; gradual smooth boundary.

Bh2—34 to 39 inches; very dark grayish brown (10YR 3/2) fine sand; moderate medium subangular blocky structure; friable; common fine and medium roots; very strongly acid; gradual wavy boundary.

BC—39 to 54 inches; dark yellowish brown (10YR 4/4) fine sand; single grained; loose; strongly acid; gradual wavy boundary.

C—54 to 80 inches; dark gray (10YR 4/1) fine sand; single grained; loose; strongly acid.

Soil reaction ranges from extremely acid to strongly acid in all horizons.

The A horizon has hue of 10YR, value of 2 or 3, and chroma of 1 or 2 or is neutral and has value of 2. Thickness ranges from 8 to 18 inches.

The E horizon has hue of 10YR, value of 5 to 7, and chroma of 1 or 2. The texture is sand or fine sand. Thickness ranges from 7 to 19 inches.

The Bh horizon has hue of 5YR to 10YR, value of 2 or 3, and chroma of 1 or 2. The texture is sand, fine

Tavares Series

The Tavares series consists of moderately well drained soils that formed in thick beds of sandy marine or eolian deposits. These soils are on narrow to broad ridges and knolls in the flatwoods and on upland sand ridges near drains and streams. Slopes range from 0 to 5 percent. Tavares soils are hyperthermic, uncoated Typic Quartzipsamments.

Tavares soils are geographically associated with Adamsville, Astatula, Cassia, Immokalee, Myakka, Orsino, and Paola soils. Adamsville soils are somewhat poorly drained and are slightly lower on the landscape. Astatula soils are in higher positions on the landscape and are excessively drained. Cassia soils are in slightly lower positions in the landscape and have a Bh horizon. Immokalee and Myakka soils are in lower positions in the landscape, are poorly drained, and have a Bh horizon. Orsino and Paola soils have an E horizon over a high-chroma Bw horizon. Paola soils are excessively drained and are in higher positions on the landscape.

Typical pedon of Tavares fine sand, 0 to 5 percent slopes, about 4,800 feet west and 3,300 feet north of the southeast corner of sec. 17, T. 10 S., R. 30 E.

A—0 to 5 inches; gray (10YR 5/1) fine sand; weak medium granular structure; very friable; few fine and common coarse roots; few common pockets of dark gray (10YR 4/1) sand grains; very strongly acid; gradual wavy boundary.

C1—5 to 32 inches; pale brown (10YR 6/3) fine sand; few medium distinct yellowish brown (10YR 5/6) mottles; single grained; loose; few fine, medium, and coarse roots; few pockets of light gray (10YR 7/2) sand grains; very strongly acid; gradual smooth boundary.

C2—32 to 46 inches; very pale brown (10YR 7/3) fine sand; few medium distinct brownish yellow (10YR 6/6) mottles; single grained; loose; few medium and coarse roots; many pockets of white (10YR 8/1) sand grains; very strongly acid; gradual wavy boundary.

C3—46 to 80 inches; white (10YR 8/1) fine sand;

5 to 8, and chroma of 3 to 8. The C3 and C4 horizons have hue of 10YR, value of 6 to 8, and chroma of 1 to 4. The horizons have none to common mottles in shades of yellow or brown. The texture is sand or fine sand.

Terra Ceia Series

The Terra Ceia series consists of very poorly drained, rapidly permeable soils that formed in nonwoody hydrophytic plant remains. These soils are on flood plains and are frequently flooded. Slopes are less than 1 percent. Terra Ceia soils are euic, hyperthermic Typic Medisaprists.

Terra Ceia soils are geographically associated with Chobee, Favoretta, Placid, and Winder soils. All of the associated soils are mineral and are in landscape positions similar to those of the Terr Ceia soils. Winder soils are also in slightly higher positions on the landscape.

Typical pedon of Terra Ceia muck, frequently flooded, about 500 feet southeast of the intersection of the Volusia County Line and Haw Creek, about 1,000 feet north and 300 feet east of the southwest corner of sec. 6, T. 13 S., R. 28 E.

Oa1—0 to 25 inches; dark reddish brown (5YR 3/2)

remains overlying clayey and sandy estuary deposits. These soils are in broad to narrow tidal marshes and are frequently flooded. Slopes are less than 1 percent. Turnbull soils are clayey over sandy or sandy-skeletal, montmorillonitic, nonacid, hyperthermic Typic Hydraquents.

Turnbull soils are geographically associated with Bimini, Narcoossee, Pellicer, Palm Beach, and Welaka soils. All of the associated soils are mineral and, except for the Pellicer soils, are in higher positions on the landscape and are better drained. Bimini soils have a spodic horizon and have coquina shell or rock below a depth of 40 inches. Narcoossee soils have a thin discontinuous spodic horizon at a depth of less than 30 inches and have mixed sand and shell below the spodic horizon. Palm Beach soils are on primary dunes along the Atlantic Coast. Palm Beach soils are excessively drained and have stratifications of mixed sand and shell. Welaka soils are on the back slopes of primary, secondary, and tertiary dunes. They are sandy throughout and have a seasonal high water table at a depth of 60 to 80 inches. They also have stratifications of mixed sand and shell.

Typical pedon of Turnbull muck, in an area of Turnbull and Pellicer soils, tidal; 4,000 feet east and 500 feet north of the intersection of County Road 2001

6, and chroma of 1. The texture is loamy fine sand or fine sand that has pockets or thin strata of fine sandy loam to clay.

Tuscawilla Series

The Tuscawilla series consists of very deep, poorly drained soils that formed in sandy and loamy marine sediments deposited over stratified layers of sand, marl, and shell. These soils are on broad hammocks. Slopes range from 0 to 2 percent. Tuscawilla soils are fine-loamy, siliceous, hyperthermic Typic Ochraqualfs.

moderately alkaline; clear wavy boundary.

Cg1—45 to 60 inches; gray (5Y 7/1) loamy fine sand; many coarse prominent greenish gray (5GY 5/1) and few fine distinct yellow (2.5Y 7/6) mottles; massive; friable; few medium roots; many fine and medium calcium carbonate nodules throughout the horizon; few oyster shells throughout the horizon; mildly alkaline; clear wavy boundary.

2Cg2—60 to 80 inches; light gray (5Y 7/1) gravelly fine sandy loam; massive; many fine calcium carbonate nodules throughout the horizon; about 20 percent

Typical pedon of Valkaria fine sand, in an area of Valkaria-Smyrna complex; 800 feet south and 900 feet east of the northwest corner of sec. 8, T. 14 S., R. 30 E.

A—0 to 6 inches; dark gray (10YR 4/1) fine sand; many coarse distinct gray (10YR 6/1) and many medium distinct yellowish red (5YR 4/6) and yellowish brown (10YR 5/8) mottles; single grained; loose; few fine, medium, and coarse roots; very strongly acid; gradual wavy boundary.

E1—6 to 12 inches; light gray (10YR 7/1) fine sand; common coarse distinct dark grayish brown (10YR 4/2) and few medium distinct dark brown (7.5YR 4/4) mottles; single grained; loose; few fine and medium roots; moderately acid; gradual wavy boundary.

E2—12 to 17 inches; light gray (10YR 7/2) fine sand; many coarse distinct very pale brown (10YR 8/4) mottles; single grained; loose; moderately acid; gradual wavy boundary.

Bw1—17 to 28 inches; brownish yellow (10YR 6/8) fine sand; few medium distinct light gray (10YR 7/2) mottles; single grained; loose; sand grains well coated with iron oxides; discontinuous layers of reddish brown (5YR 4/3) weakly cemented sand at irregular intervals at the contact between E and Bw horizon; moderately acid; gradual wavy boundary.

Bw2—28 to 38 inches; yellow (10YR 7/6) fine sand; common medium distinct light gray (10YR 7/2) mottles; single grained; loose; sand grains coated with iron oxides; moderately acid; gradual wavy boundary.

Cg—38 to 80 inches; gray (10YR 5/1) fine sand; few coarse faint light gray (10YR 7/1) mottles; single grained; loose; moderately acid.

Soil reaction ranges from very strongly acid to slightly acid in the A horizon, from strongly acid to slightly acid in the E horizon, from strongly acid to neutral in the Bw horizon, and from strongly acid to mildly alkaline in the underlying material.

The A horizon has hue of 10YR, value of 2 to 4, and chroma of 1 or 2. Thickness ranges from 4 to 7 inches.

The E horizon has hue of 10YR, value of 5 to 7, and chroma of 1 or 2. The texture is sand or fine sand. Thickness ranges from 9 to 27 inches.

Some pedons have a BE horizon. If it occurs, the BE horizon has hue of 10YR, value of 5 to 7, and chroma of 3 or 4. The texture is sand or fine sand. Thickness ranges from 0 to 10 inches.

The Bw1 horizon has hue of 10YR, value of 5 to 7, and chroma of 4 to 8. The texture is sand or fine sand. Thickness ranges from 5 to 17 inches.

The Bw2 and Bw3 horizons have hue of 10YR, value of 5 to 7, and chroma of 3 to 8. The texture is sand or fine sand. Thickness ranges from 5 to 23 inches. Some pedons do not have a Bw3 horizon. Mottles in the Bw horizons have hue of 10YR, value of 5 to 7, and chroma of 1 or 2.

The Cg horizon has hue of 10YR, value of 4 to 8, and chroma of 1 to 3 or has hue of 2.5Y or 5Y, value of 6 or 7, and chroma of 1 or 2. The texture is sand or fine sand.

Wabasso Series

The Wabasso series consists of very deep, poorly drained soils that formed in thick beds of sandy and loamy marine sediments. These soils are on broad flatwoods. Slopes are less than 2 percent. Wabasso soils are sandy, siliceous, hyperthermic Alfic Haplaquods.

Wabasso soils are geographically associated with Chobee, EauGallie, Favoretta, Hicoria, Holopaw, Pineda, and Riviera soils. Chobee soils have a mollic epipedon and are in lower positions in the drainageways. EauGallie soils have an argillic horizon below a depth of 40 inches. Favoretta soils are clayey throughout and are in lower areas near drainageways and on flood plains. Hicoria soils are in lower positions in the drainageways. Hicoria, Holopaw, and Riviera soils do not have a spodic horizon. Pineda soils have a high-chroma Bw horizon.

Typical pedon of Wabasso fine sand, about 1,100 feet north and 1,500 feet east of the southwest corner of sec. 25, T. 11 S., R. 28 E.

A—0 to 4 inches; very dark gray (10YR 3/1) fine sand; weak medium granular structure; very friable; common fine and medium roots; many uncoated sand grains; extremely acid; gradual wavy boundary.

E1—4 to 15 inches; light gray (10YR 7/1) fine sand; few medium distinct dark grayish brown (10YR 4/2) mottles; single grained; loose; few fine and medium roots; dark reddish brown (5YR 3/2) stains along root channels; very strongly acid; gradual wavy boundary.

E2—15 to 22 inches; gray (10YR 6/1) fine sand; single grained; loose; few fine and medium roots; common medium distinct dark brown (7.5YR 3/2) stains along root channels; strongly acid; abrupt irregular boundary.

Bh—22 to 30 inches; black (5YR 2/1) fine sand; weak medium subangular blocky structure; friable; few fine roots; strongly acid; gradual wavy boundary.

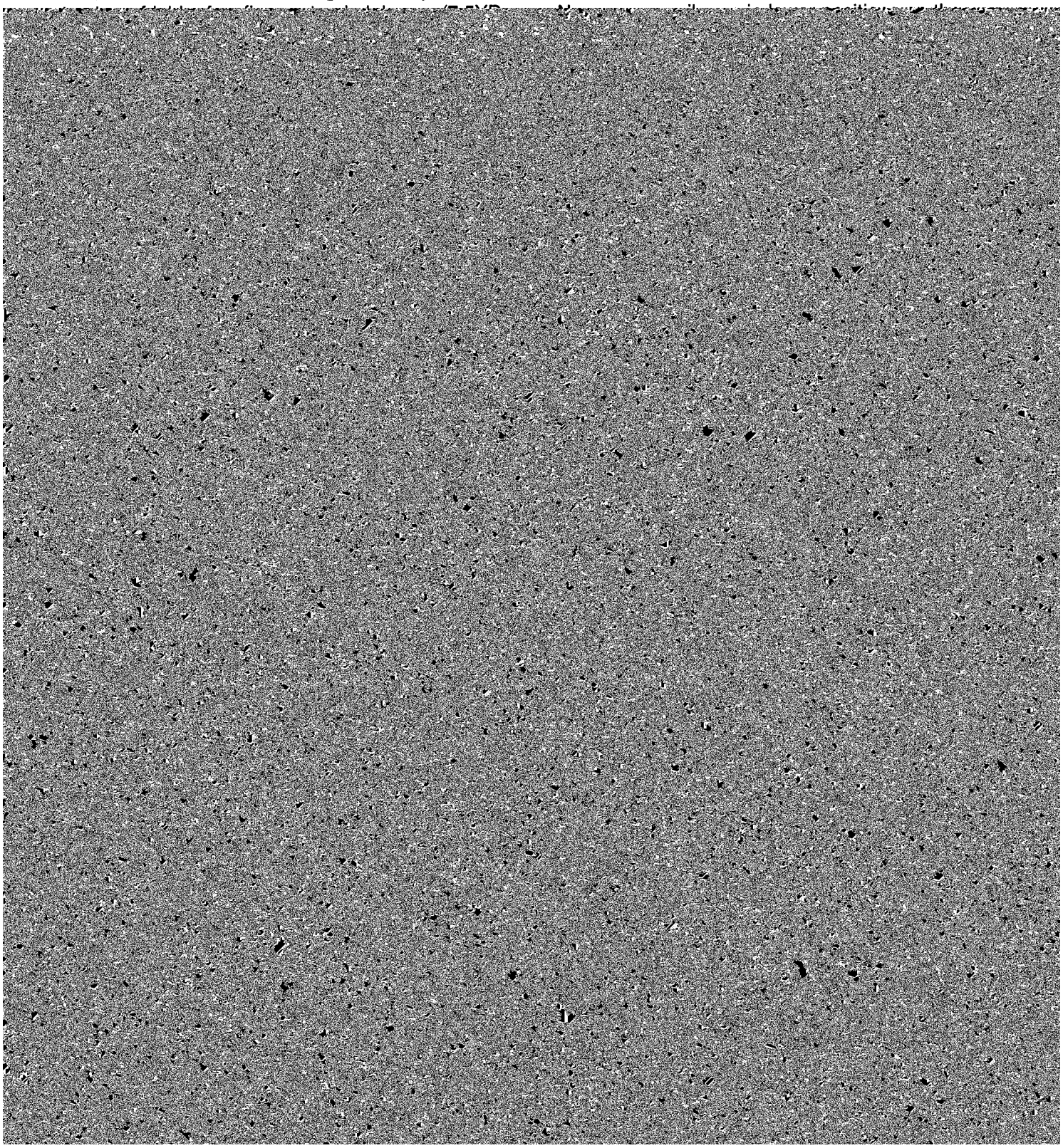
Btg1—30 to 35 inches; dark gray (10YR 4/1) fine sandy loam; moderate medium subangular blocky structure; friable; few medium roots; few pockets of

very dark grayish brown (10YR 3/2) fine sand; strongly acid; gradual wavy boundary.

Btg2—35 to 47 inches; gray (10YR 5/1) fine sandy loam; moderate medium subangular blocky

Welaka soils are hyperthermic, uncoated Spodic Quartzipsamments.

Welaka soils are geographically associated with Narcoossee, Palm Beach, Pellicer, and Turnbull soils.



gravelly fine sand, very gravelly sand, or very gravelly fine sand. The content of shell and shell fragments, which are sand-sized to ½ inch in diameter, ranges from 15 to 45 percent, by volume.

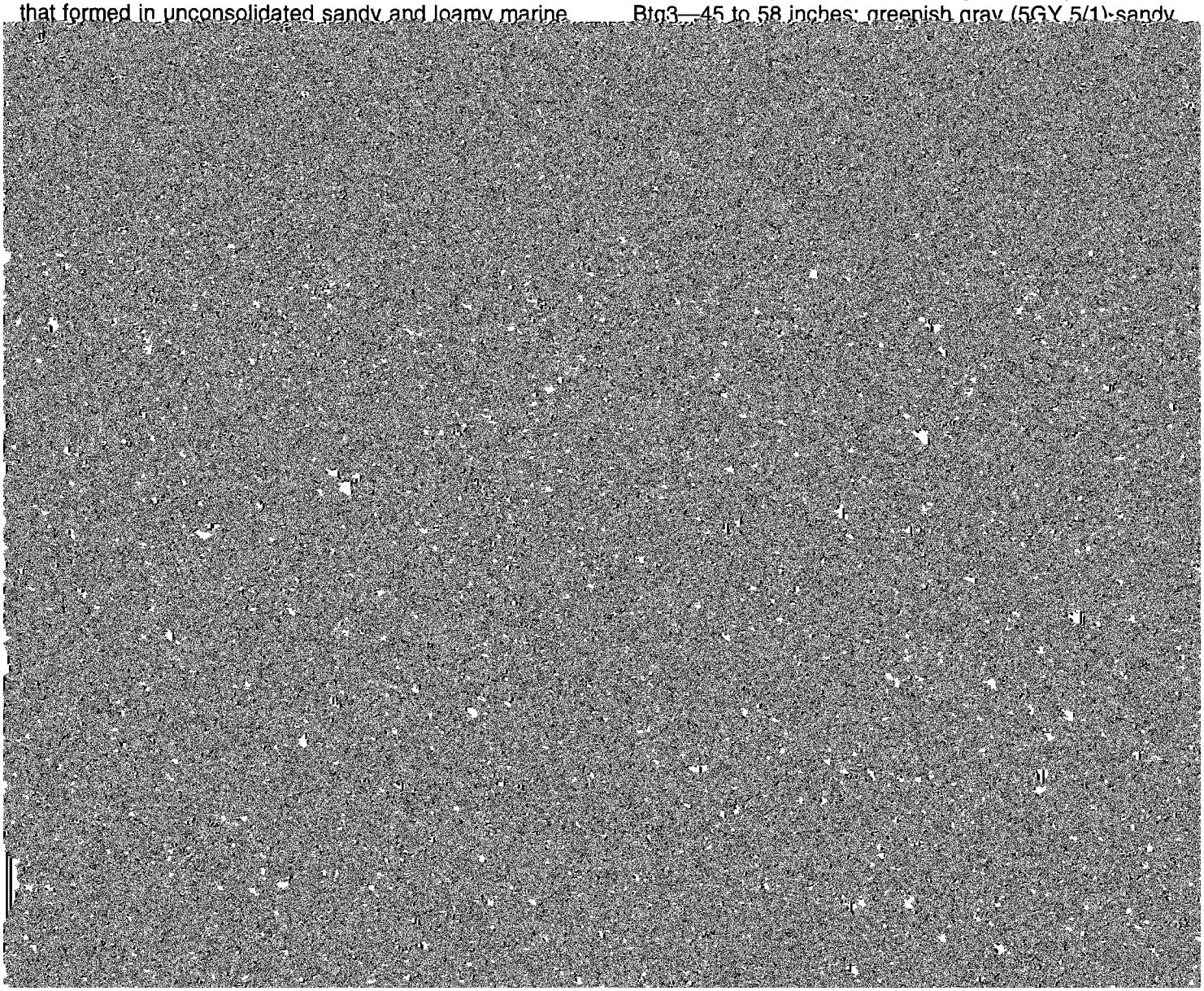
Winder Series

The Winder series consists of poorly drained soils that formed in unconsolidated sandy and loamy marine

structure; sand grains coated and bridged with clay; moderately acid; gradual wavy boundary.

Btg2—34 to 45 inches; light gray (10YR 7/1) sandy clay loam; many coarse prominent brownish yellow (10YR 6/8), few fine prominent yellowish red (5YR 5/8), and few fine faint dark gray mottles; moderate medium subangular blocky structure; friable; moderately acid; gradual wavy boundary.

Btg3—45 to 58 inches; greenish gray (5GY 5/1) sandy



Formation of the Soils

In this section, the factors and processes of soil formation are discussed and related to the soils in the survey area.

Factors of Soil Formation

Soil is produced by forces of weathering acting on the parent material that has been deposited or accumulated by geologic agencies. The kind of soil that develops depends on five major factors. These factors are—

- the type of parent material
- the climate under which soil material has existed since accumulation
- the plant and animal life in and on the soil
- the relief, or lay of the land
- the length of time the forces of soil formation have acted on the soil material

The five soil-forming factors are interdependent; each modifies the effect of the others. Any one of the five factors can have more influence than the others on the formation of a soil and can account for most of its properties. For example, if the parent material is quartz sand, the soil generally has weakly expressed horizons. In some places, the effect of the parent material is modified greatly by the effects of climate, relief, and plants and animals in and on the soil. Similarly, if a soil

The parent material of the soils in Flagler County consists of various-aged marine sediments. The youngest marine sediments consist of beds of sandy and loamy materials that were transported by the sea during the Pleistocene epoch and subsequently were deposited to form marine terraces. Some of this material is actually reworked sediments that were deposited during the Miocene and Pliocene epochs.

In many areas, the sediments have been reworked by relict rivers and streams, shallow ocean currents, or by the wind. The parent material on the flood plains along rivers and streams and in the tidal marshes consists of Holocene-aged, alluvial sand and clay.

Climate

The climate of Flagler County generally is warm and humid. Temperature extremes are moderated somewhat by the proximity to the Atlantic Ocean. The average temperature is about 56 degrees F from December through February and about 80 degrees F from June through August. The average annual rainfall is about 53 inches, and most of the rain falls from June through September.

Few differences among soils in the survey area are caused by the climate; however, the climate encourages the rapid decomposition of organic matter and hastens chemical reactions in the soil. The heavy rainfall leaches the soils of most plant nutrients and produces

amount of organic matter, nitrogen, and nutrients in the soil and cause differences in soil structure and porosity. For example, some soils, such as Terra Ceia and Gator soils, have an upper layer that is composed almost entirely of partially decomposed plant remains.

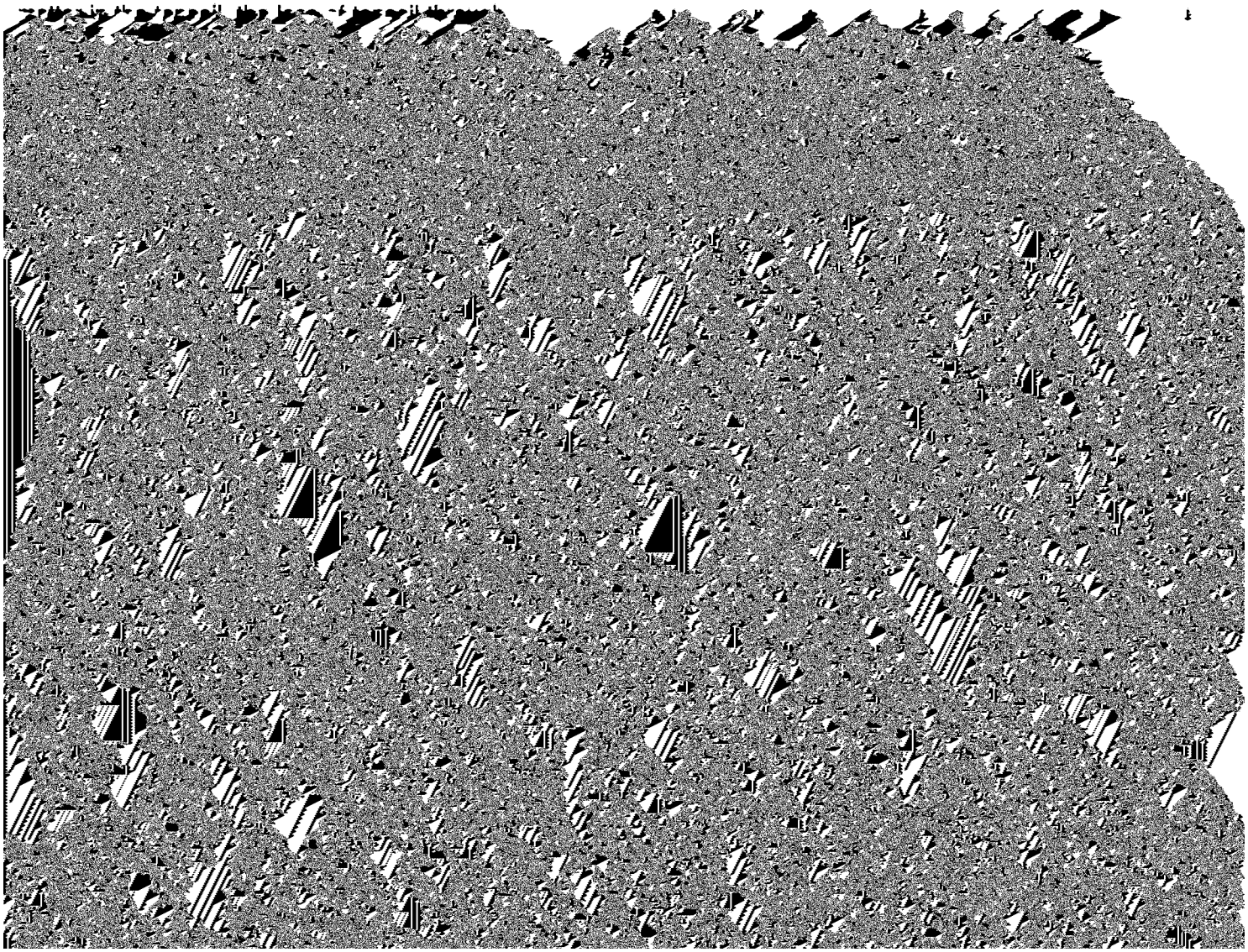
Microorganisms, including bacteria and fungi, help to weather and break down minerals and to decompose organic matter. These organisms are most numerous in the upper few inches of the soil. Earthworms and other small animals inhabit the soil, alter its chemical composition, and mix it with other soil material.

Humans have influenced the formation of soils by clearing forests, cultivating the soils, draining wet areas, and introducing different kinds of plants. The complex interactions of living organisms that affect soil formation have been drastically altered in many areas because of human activities. In many areas, these activities have resulted in a general decrease in the content of organic

Coastal Wetlands, where the water is above the surface, muck accumulates under the marsh or swamp vegetation. As plants die, they accumulate in the water. Oxygen is excluded, and plant decay is only partial and is slow. The amount of muck that accumulates depends largely upon the depth of the standing water and its duration. In some wet areas, accumulations of organic matter have formed a thick black topsoil on the mineral soil instead of a surface layer of muck.

Time

Time is an important factor in soil formation. The physical and chemical changes brought about by climate, living organisms, and relief are slow. The length of time needed to convert raw geological material into soil varies according to the nature of the geological material and the interaction of the other factors. Some basic minerals from which soils are formed weather



leaching permitted the subsequent translocation of silicate clay material.

The reduction and transfer of iron and the leaching of sandy soils. Leached colloidal organic matter, iron, and aluminum accumulate as dark, weakly cemented layers in many of the wetter soils, such as Smyrna, Cassia,

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Glossary

ABC soil. A soil having an A, a B, and a C horizon.

AC soil. A soil having only an A and a C horizon. Commonly, such soil formed in recent alluvium or on steep, rocky slopes.

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.

Area reclaim (in tables). An area difficult to reclaim after the removal of soil for construction and other uses. Revegetation and erosion control are extremely difficult.

Association, soil. A group of soils geographically associated in a characteristic repeating pattern and defined and delineated as a single map 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:

Very low	0 to 3
Low	3 to 6
Moderate	6 to 9
High	9 to 12
Very high	more than 12

Base saturation. The degree to which material having cation-exchange properties is saturated with exchangeable bases (sum of Ca, Mg, Na, and K), expressed as a percentage of the total cation-other unconsolidated material or that is exposed at the surface.

Bisequum. Two sequences of soil horizons, each of which consists of an illuvial horizon and the overlying eluvial horizons.

Boulders. Rock fragments larger than 2 feet (60 centimeters) in diameter.

Calcareous soil. A soil containing enough calcium carbonate (commonly combined with magnesium carbonate) to effervesce visibly when treated with cold, dilute hydrochloric acid.

California bearing ratio (CBR). The load-supporting capacity of a soil as compared to that of standard crushed limestone, expressed as a ratio. First standardized in California. A soil having a CBR of 16 supports 16 percent of the load that would be supported by standard crushed limestone, per unit area, with the same degree of distortion.

Capillary water. Water held as a film around soil particles and in tiny spaces between particles. Surface tension is the adhesive force that holds capillary water in the soil.

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.

Clastic. Rock or sediment that is composed mainly of fragments derived from pre-existing rocks or minerals and was moved from its place of origin.

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

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. If round, mineral or rock particles 2

among different kinds of soil, but for many it is that part of the soil profile between depths of 10 inches and 40 or 80 inches.

Coquina. A clastic sedimentary rock that consists mainly of marine shells cemented by a siliceous

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

The soil is not a source of gravel or sand for construction purposes.

Excess sulfur (in tables). An excessive amount of sulfur is in the soil. The sulfur causes extreme acidity if the soil is drained, and the growth of most plants is restricted.

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. In the identification of soil horizons, an uppercase letter represents the major horizons. Numbers or lowercase letters that follow represent subdivisions of the major horizons. An explanation of the subdivisions is given in the "Soil Survey Manual." The major horizons of mineral soil are as follows:

O horizon.—An organic layer of fresh and decaying plant residue at the surface of a mineral soil.

A horizon.—The mineral horizon 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.

E horizon.—The mineral horizon in which the main feature is loss of silicate clay, iron, aluminum, or some combination of these.

B horizon.—The mineral horizon below an O, A, or E horizon. The B horizon is, in part, a layer of transition from the overlying horizon to the underlying C horizon. The B horizon also has distinctive characteristics, such as accumulation of clay, sesquioxides, humus, or a combination of these; prismatic or blocky structure; redder or browner colors than those in the A horizon; or a combination of these. The combined A and B horizons are generally called the solum, or true soil. If a soil does not have 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 in which the solum formed. If the material is known to differ from that in the solum, an Arabic numeral, commonly a 2, precedes the letter C.

Cr horizon.—Soft, consolidated bedrock beneath the soil.

R layer.—Consolidated rock (unweathered bedrock) beneath the soil. The bedrock 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.

Illuviation. The movement of soil material from one horizon to another in the soil profile. Generally, material is removed from an upper horizon and deposited in a lower horizon.

Impervious soil. A soil through which water, air, or roots penetrate slowly or not at all. No soil is absolutely impervious to air and water all the time.

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 plants that are the less palatable to livestock.

Infiltration. The downward entry of water into the immediate surface of soil or other material. This contrasts 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.

Intake rate. The average rate of water entering the soil under irrigation. Most soils have a fast initial rate; the rate decreases with application time. Therefore, intake rate for design purposes is not a constant but is a variable depending on the net irrigation application. The rate of water intake, in inches per hour, is expressed as follows:

Less than 0.2	very low
0.2 to 0.4	low
0.4 to 0.75	moderately low
0.75 to 1.25	moderate
1.25 to 1.75	moderately high
1.75 to 2.5	high

Invaders. On range, plants that encroach into an area and grow after the climax vegetation has been reduced by grazing. Generally, invader plants follow disturbance of the surface.

Irrigation. Application of water to soils to assist in production of crops. Methods of irrigation are:

Basin.—Water is applied rapidly to nearly level plains surrounded by levees or dikes.

Border.—Water is applied at the upper end of a strip in which the lateral flow of water is controlled by small earth ridges called border dikes, or borders.

Controlled flooding.—Water is released at intervals from closely spaced field ditches and distributed uniformly over the field.

Corrugation.—Water is applied to small, closely spaced furrows or ditches in fields of close-growing crops or in orchards so that it flows in only one direction.

Drip (or trickle).—Water is applied slowly and under low pressure to the surface of the soil or into the soil through such applicators as emitters, porous tubing, or perforated pipe.

Furrow.—Water is applied in small ditches made

Miscellaneous area. An area that has little or no natural soil and supports little or no vegetation.

Moderately coarse textured soil. Coarse sandy loam, sandy loam, or fine sandy loam.

Moderately fine textured soil. Clay loam, sandy clay loam, or 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, finely divided, well decomposed organic

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."

or subsurface drainage outlets are difficult or expensive to install.

Productivity, soil. The capability of a soil for producing

mounted on a tractor with a 200-300 drawbar horsepower rating.

Rock fragments. Rock or mineral fragments having a diameter of 2 millimeters or more; for example, pebbles, cobbles, stones, and boulders.

Rooting depth (in tables). Shallow root zone. The soil is shallow over a layer that greatly restricts roots.

Root zone. The part of the soil that can be penetrated by plant roots.

Runoff. The precipitation discharged into stream channels from an area. The water that flows off the surface of the land without sinking into the soil is called surface runoff. Water that enters the soil before reaching surface streams is called ground-water runoff or seepage flow from ground water.

Saline soil. A soil containing soluble salts in an amount

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.

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

Solum. The upper part of a soil profile, above the C horizon, in which the processes of soil formation are active. The solum in soil consists of the A, E, and B horizons. Generally, the characteristics of the material in these horizons are unlike those of the underlying material. The living roots and plant and animal activities are largely confined to the solum.

Stones. Rock fragments 10 to 24 inches (25 to 60 centimeters) in diameter if rounded or 15 to 24 inches (38 to 60 centimeters) in length if flat.

Stony. Refers to a soil containing stones in numbers that interfere with or prevent tillage.

Stripcropping. Growing crops in a systematic arrangement of strips or bands that provide vegetative barriers to wind erosion and water erosion.

Structure, soil. The arrangement of primary soil particles into compound particles or 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).

Stubble mulch. Stubble or other crop residue left on the soil or partly worked into the soil. It protects the soil from wind erosion and water erosion after harvest, during preparation of a seedbed for the next crop, and during the early growing period of the new crop.

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 E horizon. Generally refers to a leached horizon lighter in color and lower in organic matter content than the overlying surface layer.

Surface layer. 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 (geologic). An old alluvial plain, ordinarily flat or undulating, bordering a river, a lake, or 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 loam, silt, 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 (in tables). An otherwise suitable soil material that is too thin for the specified use.

Tilth, soil. The physical condition of the soil as related to tillage, seedbed preparation, seedling emergence, and root penetration.

Topsoil. The upper part of the soil, which is the most favorable material for plant growth. It is ordinarily rich in organic matter and is used to topdress roadbanks, lawns, and land affected by mining.

Trace elements. Chemical elements, such as zinc, cobalt, manganese, copper, and iron, in soils in extremely small amounts. They are essential to plant growth.

Unstable fill (in tables). There is a risk of caving or sloughing on banks of fill material.

Upland (geology). Land at a higher elevation, in general, than the alluvial plain or stream terrace; land above the lowlands along streams.

Weathering. All physical and chemical changes produced by atmospheric agents in rocks or other deposits at or near the earth's surface. These changes result in disintegration and decomposition of the material.

Well graded. Refers to soil material consisting of coarse grained particles that are well distributed over a wide range in size or diameter. Such soil normally can be easily increased in density and bearing properties by compaction. Contrasts with poorly graded soil.

Wilting point (or permanent wilting point). The moisture content of soil, on an ovendry basis, at which a plant (specifically a sunflower) wilts so much that it does not recover when placed in a humid, dark chamber.

Tables

TABLE 1.--TEMPERATURE AND PRECIPITATION

(Recorded in the period 1952-87 at Hastings, Florida)

Month	Temperature					Precipitation		
	Average daily	Average daily maximum	Average daily minimum	Average number of days with temperatures of-- 90 °F or higher	32 °F or lower	Average total	Average number of days with rainfall of-- 0.10 inch or more	0.50 inch or more
	°F	°F	°F			In		
January-----	53.3	64.4	42.3	0	5	2.59	3	2
February----	58.7	68.8	47.8	0	3	3.85	5	2
March-------	61.9	74.2	51.2	0	2	3.80	5	2
April-------	66.3	78.6	54.2	1	0	2.30	3	1
May---------	72.8	84.9	60.3	6	0	3.60	5	2
June--------	78.7	89.3	69.3	15	0	5.85	8	5
July--------	80.6	90.5	70.0	18	0	6.37	9	4
August------	80.1	90.0	70.4	17	0	7.20	10	5
September---	77.4	86.4	69.2	8	0	7.26	8	4
October-----	73.0	82.5	64.5	2	0	4.03	5	2
November----	67.6	76.4	58.3	0	1	2.29	4	1
December----	57.0	68.5	48.0	0	4	2.78	5	2
Total-------	68.9	79.5	58.8	67	16	53.19	70	33

TABLE 2.--FREEZE DATES IN SPRING AND FALL

Freeze threshold temperature	Mean date of last spring occurrence	Mean date of first spring occurrence	Mean number of days between dates	Years of record, spring	Number of occurrences in spring	Years of record, fall	Number of occurrences in fall
32 °F---	Feb. 21	Dec. 10	293	35	74	35	36
28 °F---	Jan. 25	Dec. 26	335	35	35	35	19

TABLE 3.--ACREAGE AND PROPORTIONATE EXTENT OF THE SOILS

Map symbol	Soil name	Acres	Percent
2	Riviera fine sand	12,441	3.8
3	Samsula and Hontoon soils, depressional	18,729	5.8
4	Wabasso fine sand	19,482	6.0
5	Pineda-Wabasso complex	13,615	4.2
6	Favoretta clay	8,627	2.6
7	Favoretta, Chobee, and Winder soils, frequently flooded	16,643	5.1
8	Hicoria, Riviera, and Gator soils, depressional	36,036	11.1
9	Eaugallie fine sand	15,918	4.9
10	Winder fine sand	19,473	6.0
11	Myakka fine sand	18,499	5.7
12	Placid, Basinger, and St. Johns soils, depressional	17,638	5.4
13	Immokalee fine sand	9,914	3.1
14	Pineda fine sand	17,065	5.3
15	Pomello fine sand, 0 to 5 percent slopes	4,691	1.4
16	Malabar fine sand	7,272	2.2
17	Holopaw fine sand	780	0.2
18	Valkaria-Smyrna complex	4,544	1.4
19	Valkaria fine sand	10,141	3.1
20	Orsino fine sand, 0 to 5 percent slopes	2,009	0.6
21	Smyrna fine sand	14,927	4.6
22	Astatula fine sand, 0 to 8 percent slopes	1,277	0.4
23	Adamsville fine sand, 0 to 3 percent slopes	1,292	0.4
24	Samsula and Placid soils, frequently flooded	2,049	0.6
25	Tavares fine sand, 0 to 5 percent slopes	1,013	0.3
26	Turnbull and Pellicer soils, tidal	3,828	1.2
27	Cassia fine sand	3,821	1.2
29	Udarents, moderately wet	5,876	1.8
30	Pits	942	0.3
31	Palm Beach gravelly sand, 0 to 8 percent slopes	887	0.3
32	Narcoossee, shell substratum-Welaka complex, 0 to 5 percent slopes	493	0.2
33	Beaches	335	0.1
34	Cocoa-Bulow complex, 0 to 5 percent slopes	1,484	0.5
35	Quartzipsamments,dredged	922	0.3
36	Bimini sand	660	0.2
37	Tuscawilla fine sand	2,700	0.8
38	Paola fine sand, 0 to 8 percent slopes	829	0.3
39	Udarents, smoothed	919	0.3
40	Pomona fine sand	11,593	3.6
41	Terra Ceia muck, frequently flooded	3,598	1.1
	Areas of water less than 40 acres	1,138	0.3

TABLE 4.--LAND CAPABILITY CLASSES AND 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 that the crop generally is not grown on the soil)

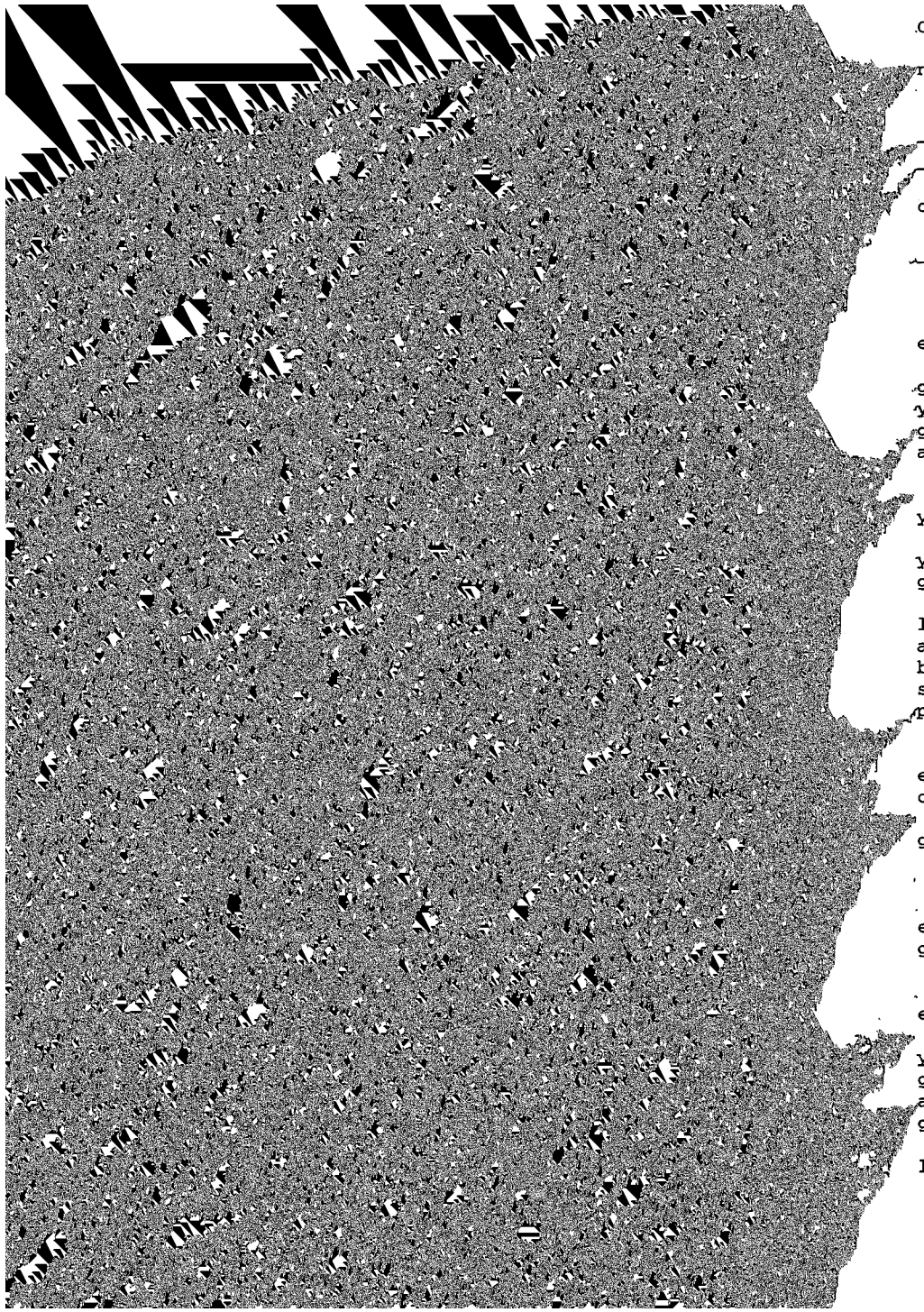
Soil name and map symbol	Land capability	Potatoes, irish	Cabbage	Bahiagrass
		Cwt	Crates	AUM*
2---------- Riviera	IIIw	250	400	8.0
3---------- Samsula and Hontoon	VIIw	---	---	---
4---------- Wabasso	IIIw	240	400	8.0
5---------- Pineda-Wabasso	IIIw	240	250	8.0
6---------- Favoretta	IIIw	210	---	12.0
7---------- Favoretta, Chobee and Winder	VIw	---	---	---
8---------- Hicoria, Riviera and Gator	VIIw	---	---	---
9---------- Eaugallie	IVw	185	---	8.0
10---------- Winder	IIIw	240	300	9.0
11---------- Myakka	IVw	180	320	9.0
12----------	VIIw			

TABLE 4.--LAND CAPABILITY CLASSES AND YIELDS PER ACRE OF CROPS AND PASTURE--Continued

Soil name and map symbol	Land capability	Potatoes, irish	Cabbage	Bahiagrass
		Cwt	Crates	AUM*
41---------- Terra Ceia	VIIw	---	---	---

* 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.



ODUCTIVITY

nce of an entry indicates that information was not

	Potential productivity		
ommon trees	Site index	Productivity class*	Trees to plant
pine----------	80	10	Slash pine.
eaf pine-------	70	6	
oak----------	---	---	
ge palm--------	---	---	
ypress---------	---	---	
gum----------	---	---	
aple----------	---	---	
ypress---------	100	6	
ypress---------	100	6	
gum----------	---	---	
ash----------	---	---	
llybay gordonia	---	---	
aple----------	---	---	
bay----------	---	---	
ss----------	---	---	
pine----------	---	---	
pine----------	80	10	Slash pine, longleaf pine.
eaf pine-------	65	5	
oak----------	---	---	
oak----------	---	---	
ge palm--------	---	---	
pine----------	80	10	Slash pine, South Florida slash pine.
eaf pine-------	70	6	
ge palm--------	---	---	
pine----------	80	10	Slash pine.
eaf pine-------	65	5	
ypress---------	100	6	
ge palm--------	---	---	
aple----------	---	---	
gum----------	---	---	
oak----------	---	---	
l oak----------	---	---	

TABLE 5.--WOODLAND MANAGEMENT AND PRODUCTIVITY--Continued

di-tion mbol	Management concerns: Erosion hazard	Equipment limitation	Seedling mortality	Windthrow hazard	Plant competition	Potential productivity: Common trees	Site index	Productivity class*	Trees to plant
12W	Slight	Moderate	Severe	Severe	Severe	Baldcypress	100	6	
						Cabbage palm	---	---	
						Red maple	---	---	
						Sweetgum	---	---	
						Water oak	---	---	
						Laurel oak	---	---	
6W	Slight	Severe	Moderate	Slight	Severe	Baldcypress	100	6	
						Red maple	---	---	
						Sweetgum	---	---	
						Blackgum	---	---	
11W	Slight	Moderate	Moderate	Moderate	Moderate	Slash pine	90	11	Slash pine.
2W	Slight	Severe	Severe	Moderate	Severe	Pondcypress	75	2	
						Baldcypress	---	---	
						Blackgum	---	---	
						Red maple	---	---	
						Sweetbay	---	---	
						Redbay	---	---	
						Water oak	---	---	
3W	Slight	Severe	Severe	Moderate	Severe	Pondcypress	75	3	
						Baldcypress	---	---	
						Blackgum	---	---	
						Cabbage palm	---	---	
						Pond pine	---	---	
						Loblollybay gordonia	---	---	
						Red maple	---	---	
						Sweetbay	---	---	
2W	Slight	Severe	Severe	Severe	Severe	Pondcypress	75	2	
						Red maple	---	---	
						Pond pine	---	---	
						Cabbage palm	---	---	
						Baldcypress	---	---	
.0W	Slight	Moderate	Moderate	Slight	Moderate	Slash pine	80	10	Slash pine.
						Cabbage palm	---	---	
1W	Slight	Moderate	Moderate	Moderate	Moderate	Slash pine	90	11	Slash pine.

d of table.

TABLE 5.--WOODLAND MANAGEMENT AND PRODUCTIVITY--Continued

Soil name and map symbol	Ordination symbol	Management concerns: Erosion hazard	Equipment limitation	Seedling mortality	Windthrow hazard	Plant competition	Potential productivity: Common trees	Site index	Productivity class*	Trees to plant
11 Myakka	8W	Slight	Moderate	Moderate	Moderate	Moderate	Slash pine	70	8	Slash pine.
							Longleaf pine	60	4	
12**:										
Placid	2W	Slight	Severe	Severe	Moderate	Severe	Pondcypress	75	2	
Basinger	2W	Slight	Severe	Severe	Moderate	Severe	Pondcypress	75	2	
							Loblollybay gordonia	---	---	
							Red maple	---	---	
							Sweetbay	---	---	
St. Johns	2W	Slight	Severe	Severe	Moderate	Severe	Pondcypress	75	2	
							Loblollybay gordonia	---	---	
							Red maple	---	---	
							Sweetbay	---	---	
13 Immokalee	8W	Slight	Moderate	Moderate	Moderate	Moderate	Slash pine	70	8	Slash pine.
							Longleaf pine	65	5	
14 Pineda	10W	Slight	Moderate	Severe	Slight	Moderate	Slash pine	80	10	Slash pine, South Florida slash pine.
							Cabbage palm	---	---	
							Water oak	---	---	
							Sweetgum	---	---	
15 Pomello	8S	Slight	Moderate	Severe	Moderate	Moderate	Slash pine	70	8	Sand pine, slash pine.
							Longleaf pine	60	4	
							Live oak	60	3	
							Laurel oak	35	3	
16 Malabar	10W	Slight	Moderate	Severe	Slight	Moderate	Slash pine	80	10	Slash pine.
							Cabbage palm	---	---	
							Water oak	---	---	
							Red maple	---	---	
							Sweetgum	---	---	
17 Holopaw	10W	Slight	Moderate	Severe	Slight	Moderate	Slash pine	80	10	Slash pine.
							Longleaf pine	70	6	
							Cabbage palm	---	---	
							Sweetgum	---	---	
							Red maple	---	---	
							Water oak	---	---	

See footnotes at end of table.

TABLE 5.--WOODLAND MANAGEMENT AND PRODUCTIVITY--Continued

Soil name and map symbol	Ordination symbol	Management concerns: Erosion hazard	Equipment limitation	Seedling mortality	Windthrow hazard	Plant competition	Potential productivity: Common trees	Site index	Productivity class*	Trees to plant
18**:										
Valkaria	8W	Slight	Severe	Moderate	Slight	Moderate	Slash pine	70	8	Slash pine.
							Longleaf pine	60	4	
							Water oak	---	---	
							Sweetgum	---	---	
							Red maple	---	---	
Smyrna	10W	Slight	Moderate	Moderate	Slight	Moderate	Slash pine	80	10	Slash pine.
							Longleaf pine	70	6	
19 Valkaria	8W	Slight	Severe	Moderate	Slight	Moderate	Slash pine	70	8	Slash pine.
20 Orsino	4S	Slight	Moderate	Severe	Slight	Moderate	Sand pine	70	4	Sand pine.
							Longleaf pine	60	4	
							Sand live oak	---	---	
							Turkey oak	---	---	
21 Smyrna	10W	Slight	Moderate	Moderate	Slight	Moderate	Slash pine	80	10	Slash pine.
22 Astatula	3S	Slight	Severe	Moderate	Slight	Slight	Sand pine	60	3	Sand pine.
							Turkey oak	---	---	
							Scrub live oak	---	---	
23 Adamsville	10W	Slight	Moderate	Moderate	Slight	Moderate	Slash pine	80	10	Slash pine.
							Live oak	---	---	
							Turkey oak	---	---	
24**:										
Samsula	6W	Slight	Severe	Severe	Severe	Severe	Baldcypress	100	6	
							Sweetgum	---	---	
							Cabbage palm	---	---	
							Red maple	---	---	
							Pond pine	---	---	
Placid	6W	Slight	Severe	Severe	Moderate	Moderate	Baldcypress	100	6	
							Sweetgum	---	---	
							Water oak	---	---	
							Red maple	---	---	
25 Tavares	10S	Slight	Moderate	Moderate	Slight	Moderate	Slash pine	80	10	Slash pine.
							Longleaf pine	70	6	
							Turkey oak	---	---	
							Bluejack oak	---	---	

See footnotes at end of table.

IVITY--Continued

Potential productivity			
Common trees	Site index	Productivity class*	Trees to plant
h pine----------	70	8	Sand pine.
leaf pine-------	60	4	
pine----------	---	---	
h pine----------	80	10	Slash pine.
leaf pine-------	70	6	
pine----------	60	3	Sand pine.
live oak-------	---	---	
h pine----------	80	10	Slash pine.
leaf pine-------	70	6	
pine----------	60	3	
age palm--------	---	---	
h pine----------	80	10	Slash pine, sand pine.
leaf pine-------	70	6	
pine----------	70	4	
hern magnolia---	---	---	
oak----------	---	---	
el oak----------	---	---	
h pine----------	70	8	Slash pine, sand pine.
ory----------	---	---	
age palm--------	---	---	
leaf pine-------	65	5	
el oak----------	---	---	
oak----------	---	---	
h pine----------	90	11	Slash pine.
oak----------	---	---	
el oak----------	---	---	
ut hickory------	---	---	
hern magnolia---	---	---	
tgum----------	---	---	
age palm--------	---	---	
pine----------	50	2	Sand pine.
live oak-------	---	---	
ey oak----------	---	---	
h pine----------	80	10	Slash pine.
leaf pine-------	70	6	

alculated at the age of culmination of mean annual

ristics of the map unit.

TABLE 6.--RECREATIONAL DEVELOPMENT

TABLE 6.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
8*:					
Riviera	Severe: ponding, percs slowly, too sandy.	Severe: ponding, too sandy, percs slowly.	Severe: too sandy, ponding, percs slowly.	Severe: ponding, too sandy.	Severe: ponding.
Gator	Severe: ponding, percs slowly, excess humus.	Severe: ponding, excess humus, percs slowly.	Severe: excess humus, ponding, percs slowly.	Severe: ponding, excess humus.	Severe: ponding, excess humus.
9 Eaugallie	Severe: wetness, too sandy.	Severe: wetness, too sandy.	Severe: too sandy, wetness.	Severe: wetness, too sandy.	Severe: wetness.
10 Winder	Severe: wetness, percs slowly, too sandy.	Severe: wetness, too sandy, percs slowly.	Severe: too sandy, wetness, percs slowly.	Severe: wetness, too sandy.	Severe: wetness.
11 Myakka	Severe: wetness, too sandy.	Severe: wetness, too sandy.	Severe: too sandy, wetness.	Severe: wetness, too sandy.	Severe: wetness.
12*:					
Placid	Severe: ponding, too sandy.	Severe: ponding, too sandy.	Severe: too sandy, ponding.	Severe: ponding, too sandy.	Severe: ponding.
Basinger	Severe: ponding.	Severe: ponding, too sandy.	Severe: too sandy, ponding.	Severe: ponding, too sandy.	Severe: ponding.
St. Johns	Severe: ponding, too sandy.	Severe: ponding, too sandy.	Severe: too sandy, ponding.	Severe: ponding, too sandy.	Severe: ponding.
13 Immokalee	Severe: wetness, too sandy.	Severe: wetness, too sandy.	Severe: too sandy, wetness.	Severe: wetness, too sandy.	Severe: wetness, droughty.
14 Pineda	Severe: wetness, percs slowly, too sandy.	Severe: wetness, too sandy, percs slowly.	Severe: too sandy, wetness, percs slowly.	Severe: wetness, too sandy.	Severe: wetness, droughty.
15 Pomello	Severe: too sandy.	Severe: too sandy.	Severe: too sandy.	Severe: too sandy.	Severe: droughty.
16 Malabar	Severe: wetness, too sandy.	Severe: wetness, too sandy.	Severe: too sandy, wetness.	Severe: wetness, too sandy.	Severe: wetness, droughty.
17 Holopaw	Severe: wetness, too sandy.	Severe: wetness, too sandy.	Severe: too sandy, wetness.	Severe: wetness, too sandy.	Severe: wetness.
18*:					
Valkaria	Severe: wetness, too sandy.	Severe: wetness, too sandy.	Severe: wetness, too sandy.	Severe: wetness, too sandy.	Severe: wetness, droughty.

See footnote at end of table.

TABLE 6.--RECREATIONAL DEVELOPMENT--Continued

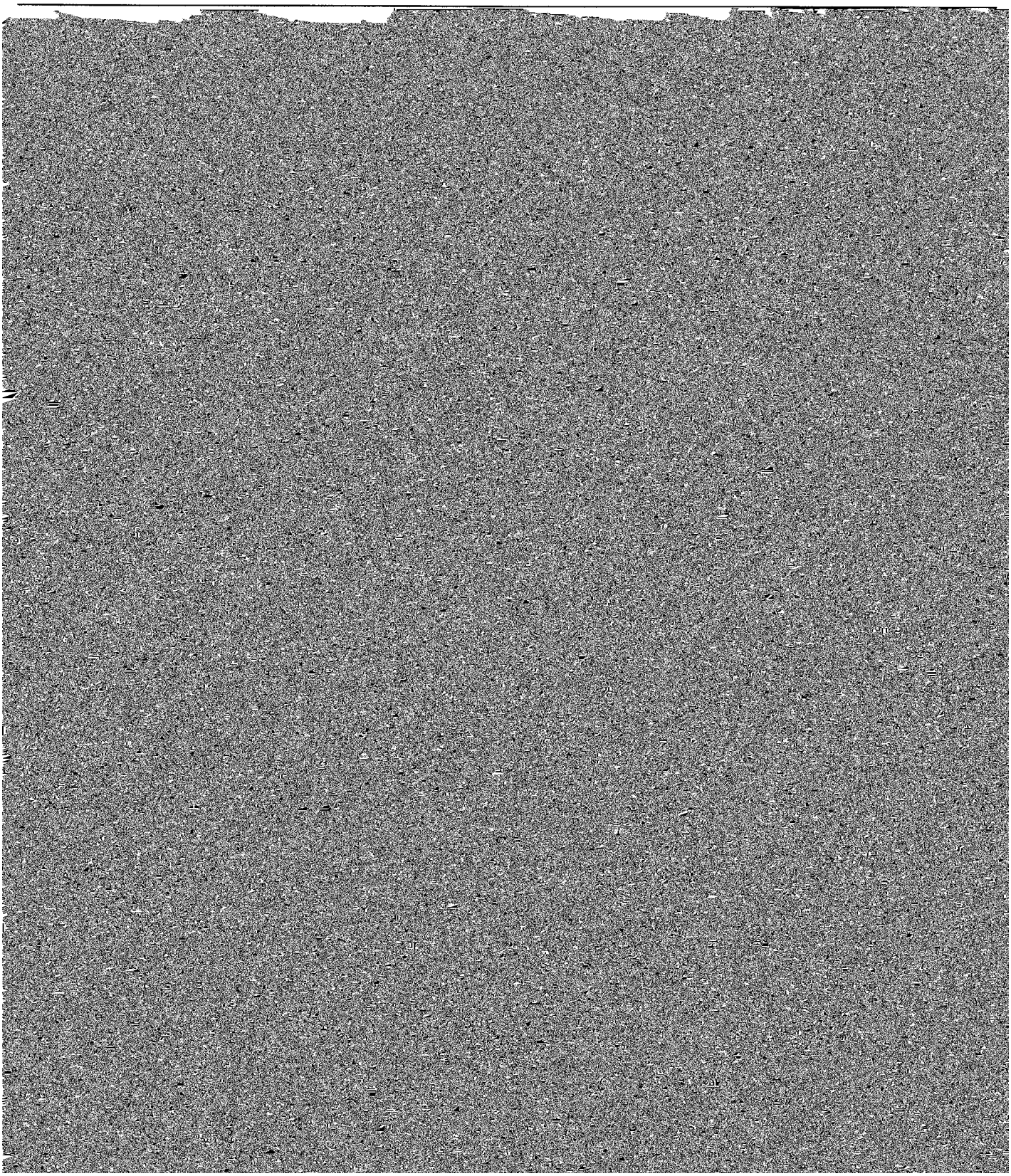


TABLE 6.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
32*:					
Narcoossee	Severe: too sandy.	Severe: too sandy.	Severe: too sandy.	Severe: too sandy.	Moderate: droughty.
Welaka	Severe: too sandy.	Severe: too sandy.	Severe: small stones, too sandy.	Severe: too sandy.	Severe: droughty.
33*	Severe:	Severe:	Severe:	Severe:	Severe:

TABLE 7.--WILDLIFE HABITAT

(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								Potential as habitat for--			
	Grain and seed	Grasses and	Wild herba-ceous	Hard-wood	Conif-erous	Shrubs	Wetland plants	Shallow water	Open-land wild-	Wood-land wild-	Wetland wild-	Range-land wild-

TABLE 7.--WILDLIFE HABITAT--Continued

Soil name and map symbol	Potential for habitat elements								Potential as habitat for--			
	Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood trees	Coniferous plants	Shrubs	Wetland plants	Shallow water areas	Openland wildlife	Woodland wildlife	Wetland wildlife	Rangeland wildlife
13---------- Immokalee	Poor	Poor	Fair	Poor	Poor	---	Fair	Poor	Poor	Poor	Poor	---

TABLE 7.--WILDLIFE HABITAT--Continued

	Potential for habitat elements	Potential as habitat for--

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. The information in this table indicates the dominant soil condition but does not eliminate the need for onsite investigation)

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
2---------- Riviera	Severe: cutbanks cave, wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.
3*:						
Samsula----------	Severe: cutbanks cave, excess humus, ponding.	Severe: subsides, ponding, low strength.	Severe: subsides, ponding.	Severe: subsides, ponding, low strength.	Severe: subsides, ponding.	Severe: ponding, excess humus.
Hontoon----------	Severe: excess humus, ponding.	Severe: subsides, ponding, low strength.	Severe: subsides, ponding.	Severe: subsides, ponding, low strength.	Severe: subsides, ponding.	Severe: too acid, ponding, excess humus.
4---------- Wabasso	Severe: cutbanks cave, wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.
5*:						
Pineda----------	Severe: cutbanks cave, wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness, droughty.
Wabasso----------	Severe: cutbanks cave, wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.
6---------- Favoretta	Severe: wetness.	Severe: flooding, wetness, shrink-swell.	Severe: flooding, wetness, shrink-swell.	Severe: flooding, wetness, shrink-swell.	Severe: shrink-swell, low strength, wetness.	Severe: wetness, too clayey.
7*:						
Favoretta----------	Severe:	Severe:	Severe:	Severe:	Severe:	Severe:

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
8*:						
Gator	Severe: cutbanks cave, excess humus, ponding.	Severe: subsides, ponding, low strength.	Severe: subsides, ponding.	Severe: subsides, ponding, low strength.	Severe: subsides, ponding.	Severe: ponding, excess humus.
9 Eaugallie	Severe: cutbanks cave, wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.
10 Winder	Severe: cutbanks cave, wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.
11 Myakka	Severe: cutbanks cave, wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.
12*:						
Placid	Severe: cutbanks cave, ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.
Basinger	Severe: cutbanks cave, ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.
St. Johns	Severe: cutbanks cave, ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.
13 Immokalee	Severe: cutbanks cave, wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness, droughty.
14 Pineda	Severe: cutbanks cave, wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness, droughty.
15 Pomello	Severe: cutbanks cave, wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.	Moderate: wetness.	Severe: droughty.
16 Malabar	Severe: cutbanks cave, wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness, droughty.
17 Holopaw	Severe: cutbanks cave, wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.
18*:						
Valkaria	Severe: cutbanks cave, wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness, droughty.
Smyrna	Severe: cutbanks cave, wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.

See footnote at end of table.

TABLE 8.--BUILDING SITE DEVELOPMENT--Continued

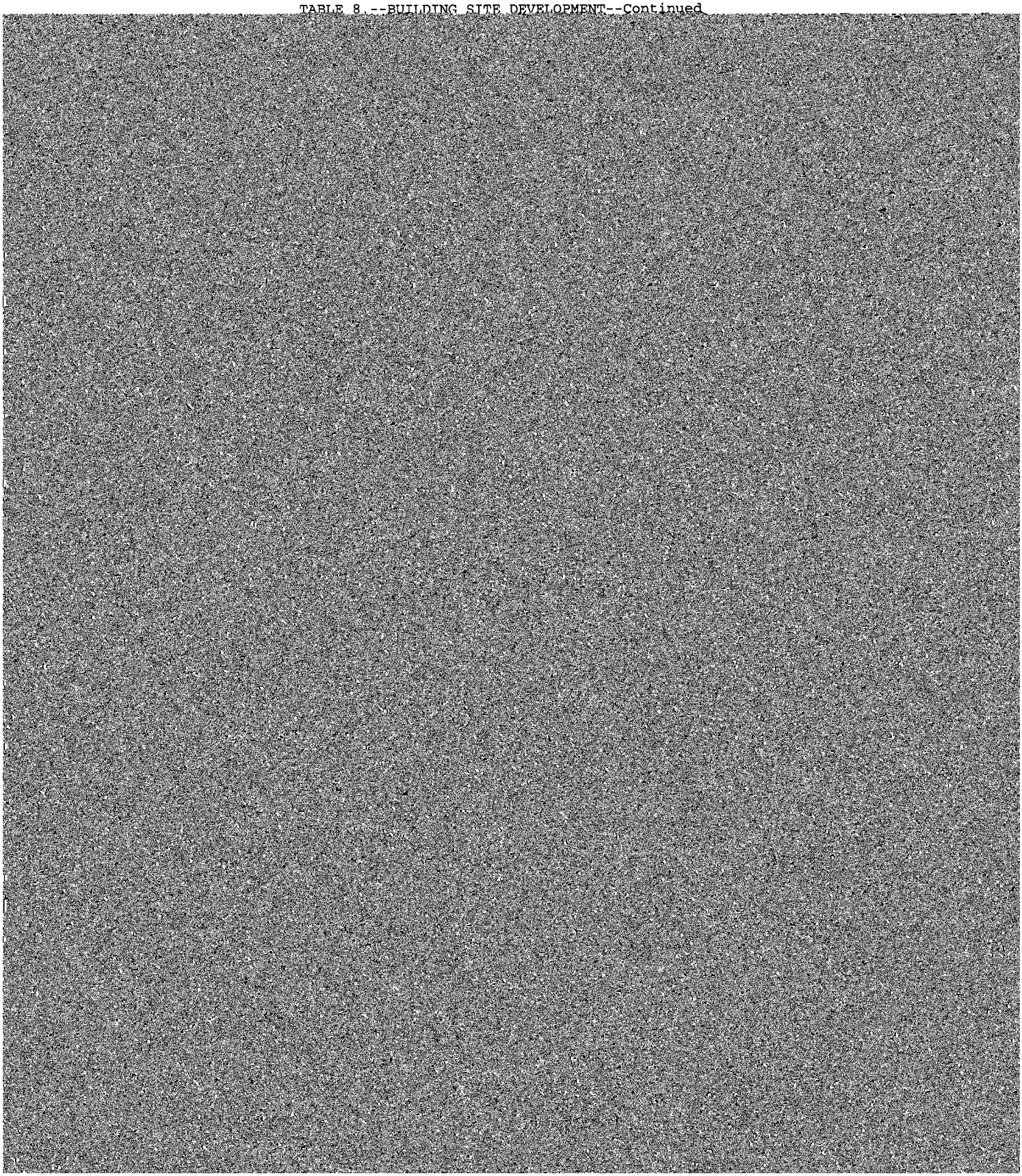


TABLE 8.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
32*:						
Welaka	Severe: cutbanks cave.	Slight	Slight	Slight	Slight	Severe: droughty.
33* Beaches	Severe: cutbanks cave, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: wetness, flooding.	Severe: excess salt, wetness, droughty.
34*:						
Cocoa	Severe: depth to rock, cutbanks cave.	Moderate: depth to rock.	Severe: depth to rock.	Moderate: depth to rock.	Moderate: depth to rock.	Severe: droughty.
Bulow	Severe: cutbanks cave.	Slight	Slight	Slight	Slight	Severe: droughty.
35 Quartzipsamments	Severe: cutbanks cave, wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.	Moderate: wetness.	Severe: droughty.
36 Bimini	Severe: cutbanks cave, wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.	Moderate: wetness.	Severe: droughty.
37 Tuscawilla	Severe: cutbanks cave, wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.
38 Paola	Severe: cutbanks cave.	Slight	Slight	Moderate: slope.	Slight	Severe: droughty.
39 Udarents	Severe: cutbanks cave, wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.	Moderate: wetness.	Severe: droughty.
40 Pomona	Severe: cutbanks cave, wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.
41 Terra Ceia	Severe: excess humus, wetness.	Severe: subsides, flooding, wetness.	Severe: subsides, flooding, wetness.	Severe: subsides, flooding, wetness.	Severe: subsides, wetness, flooding.	Severe: wetness, flooding, excess humus.

* 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," "good," and other terms. Absence of an entry indicates that the soil was not rated. The information in this table indicates the dominant soil condition but does not eliminate the need for onsite investigation)

TABLE 9.--SANITARY FACILITIES--Continued

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
16	Severe:	Severe:	Severe:	Severe:	Poor:

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
26*:					
Turnbull	Severe: flooding, ponding, percs slowly.	Severe: seepage, flooding, excess humus.	Severe: flooding, seepage, ponding.	Severe: flooding, seepage, ponding.	Poor: too clayey, hard to pack, ponding.
Pellicer	Severe: flooding, wetness, percs slowly.	Severe: flooding.	Severe: flooding, seepage, wetness.	Severe: flooding, wetness.	Poor: too clayey, hard to pack, wetness.
27 Cassia	Severe: wetness.	Severe: seepage, wetness.	Severe: seepage, wetness, too sandy.	Severe: seepage, wetness.	Poor: seepage, too sandy.
29 Udarents	Severe: wetness, poor filter.	Severe: seepage, wetness.	Severe: seepage, wetness, too sandy.	Severe: seepage, wetness.	Poor: seepage, too sandy.
30* Pits	Variable	Variable	Variable	Variable	Variable.
31 Palm Beach	Slight	Severe: seepage.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy.
32*:					
Narcoossee	Severe: wetness, poor filter.	Severe: seepage, wetness.	Severe: seepage, wetness, too sandy.	Severe: seepage, wetness.	Poor: seepage, too sandy.
Welaka	Slight	Severe:	Severe:	Severe:	Poor:

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
36---------- Bimini	Severe: wetness, percs slowly, poor filter.	Severe: seepage, wetness.	Severe: wetness, too sandy.	Severe: seepage, wetness.	Poor: seepage, too sandy.
37---------- Tuscawilla	Severe: wetness.	Severe: seepage, wetness.	Severe: seepage, wetness.	Severe: wetness.	Poor: wetness, thin layer.
38---------- Paola	Slight----------	Severe: seepage.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy.
39---------- Udarents	Severe: wetness, poor filter.	Severe: seepage, wetness.	Severe: seepage, wetness, too sandy.	Severe: seepage, wetness.	Poor: seepage, too sandy.
40---------- Pomona	Severe: wetness, percs slowly, poor filter.	Severe: seepage, wetness.	Severe: wetness, too sandy.	Severe: seepage, wetness.	Poor: seepage, too sandy, wetness.
41---------- Terra Ceia	Severe: subsides, flooding, wetness.	Severe: seepage, flooding, excess humus.	Severe: flooding, seepage, wetness.	Severe: flooding, seepage, wetness.	Poor: wetness, excess humus.

* 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 other terms. Absence of an entry indicates that the soil was not rated. The information in this table indicates the dominant soil condition but does not eliminate the need for onsite investigation)

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
2 Riviera	Poor: wetness.	Probable	Probable	Poor: too sandy, wetness.
3*:				
Samsula	Poor: wetness.	Probable	Improbable: too sandy.	Poor: excess humus, wetness.
Hontoon	Poor: wetness.	Improbable: excess humus.	Improbable: excess humus.	Poor: excess humus, wetness, too acid.
4 Wabasso	Poor: wetness.	Probable	Improbable: too sandy.	Poor: too sandy, wetness.
5*:				
Pineda	Poor: wetness.	Probable	Improbable: too sandy.	Poor: too sandy, wetness.
Wabasso	Poor: wetness.	Probable	Improbable: too sandy.	Poor: too sandy, wetness.
6 Favoretta	Poor: shrink-swell, low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, wetness.
7*:				
Favoretta	Poor: shrink-swell, low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, wetness.
Chobee	Poor: wetness.	Probable	Improbable: too sandy.	Poor: wetness.
Winder	Poor: wetness.	Probable	Probable	Poor: wetness.
8*:				
Hicoria	Poor: wetness.	Probable	Improbable: too sandy.	Poor: thin layer, wetness.
Riviera	Poor: wetness.	Probable	Probable	Poor: too sandy, wetness.

See footnote at end of table.

TABLE 10.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
8*:				
Gator	Poor: wetness.	Probable	Improbable: too sandy.	Poor: excess humus, wetness.
9 Eaugallie	Poor: wetness.	Probable	Improbable: too sandy.	Poor: too sandy, wetness.
10 Winder	Poor: wetness.	Probable	Probable	Poor: wetness.
11 Myakka	Poor: wetness.	Probable	Improbable: too sandy.	Poor: too sandy, wetness.
12*:				
Placid	Poor: wetness.	Probable	Improbable: too sandy.	Poor: too sandy, wetness.
Basinger	Poor: wetness.	Probable	Improbable: too sandy.	Poor: too sandy, wetness.
St. Johns	Poor: wetness.	Probable	Improbable: too sandy.	Poor: too sandy, wetness.
13 Immokalee	Poor: wetness.	Probable	Improbable: too sandy.	Poor: too sandy, wetness.
14 Pineda	Poor: wetness.	Probable	Improbable: too sandy.	Poor: too sandy, wetness.
15 Pomello	Fair: wetness.	Probable	Improbable: too sandy.	Poor: too sandy.
16 Malabar	Poor: wetness.	Probable	Improbable: too sandy.	Poor: too sandy, wetness.
17 Holopaw	Poor: wetness.	Probable	Improbable: too sandy.	Poor: too sandy, wetness.
18*:				
Valkaria	Poor:	Probable	Improbable:	Poor:

TABLE 10.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
20 Orsino	Good	Probable	Improbable: too sandy.	Poor: too sandy.
21 Smyrna	Poor: wetness.	Probable	Improbable: too sandy.	Poor: too sandy, wetness.
22 Astatula	Good	Probable	Improbable: too sandy.	Poor: too sandy.
23 Adamsville	Fair: wetness.	Probable	Improbable: too sandy.	Poor: too sandy.
24*:				
Samsula	Poor: wetness.	Probable	Improbable: too sandy.	Poor: too sandy, wetness.
Placid	Poor: wetness.	Probable	Improbable: too sandy.	Poor: wetness, too sandy.
25	Good	Probable	Improbable:	Poor:

TABLE 10.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
34*:				
Cocoa	Poor: depth to rock.	Improbable: thin layer.	Improbable: too sandy.	Poor: too sandy.
Bulow	Fair: depth to rock, thin layer.	Improbable: thin layer.	Improbable: too sandy.	Poor: too sandy.
35 Quartzipsamments	Fair: wetness.	Probable	Improbable: too sandy.	Poor: too sandy.
36 Bimini	Fair: thin layer, wetness.	Improbable: thin layer.	Improbable: too sandy.	Poor: too sandy.
37 Tuscawilla	Poor: wetness.	Probable	Improbable: too sandy.	Poor: small stones, wetness.
38 Paola	Good	Probable	Improbable: too sandy.	Poor: too sandy.
39 Udarents	Fair: wetness.	Probable	Improbable: thin layer.	Poor: too sandy, small stones.
40 Pomona	Poor: wetness.	Improbable: thin layer.	Improbable: too sandy.	Poor: too sandy, wetness.
41 Terra Ceia	Poor: wetness.	Improbable: excess humus.	Improbable: excess humus.	Poor: excess humus, wetness.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 11.--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. The information in this table indicates the dominant soil condition but does not eliminate the need for onsite investigation)

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
2 Riviera	Severe: seepage.	Severe: seepage, piping, wetness.	Severe: slow refill, cutbanks cave.	Percs slowly, cutbanks cave.	Wetness, droughty, fast intake.	Wetness, too sandy, soil blowing.	Wetness, droughty, percs slowly.
3*:							
Samsula	Severe: seepage.	Severe: excess humus, ponding.	Severe: cutbanks cave.	Ponding, subsides, too acid.	Ponding, soil blowing, too acid.	Ponding, soil blowing.	Wetness.
Hontoon	Severe: seepage.	Severe: excess humus, ponding.	Severe: cutbanks cave.	Ponding, subsides, too acid.	Ponding, soil blowing, too acid.	Ponding, soil blowing.	Wetness.
4 Wabasso	Severe: seepage.	Severe: thin layer, wetness.	Severe: slow refill, cutbanks cave.	Percs slowly	Wetness, droughty, fast intake.	Wetness, soil blowing, percs slowly.	Wetness, droughty, rooting depth.
5*:							
Pineda	Severe: seepage.	Severe: seepage, piping, wetness.	Severe: slow refill, cutbanks cave.	Percs slowly, cutbanks cave.	Wetness, droughty, fast intake.	Wetness, too sandy, soil blowing.	Wetness, droughty, percs slowly.
Wabasso	Severe: seepage.	Severe: thin layer, wetness.	Severe: slow refill, cutbanks cave.	Percs slowly	Wetness, droughty, fast intake.	Wetness, soil blowing, percs slowly.	Wetness, droughty, rooting depth.
6 Favoretta	Slight	Severe: hard to pack, wetness.	Severe: slow refill.	Percs slowly, flooding.	Wetness, slow intake, percs slowly.	Erodes easily, wetness, percs slowly.	Wetness, erodes easily, percs slowly.
7*:							
Favoretta	Slight	Severe: hard to pack, wetness.	Severe: slow refill.	Percs slowly	Wetness, slow intake, percs slowly.	Erodes easily, wetness, percs slowly.	Wetness, erodes easily, percs slowly.
Chobee	Slight	Severe: wetness.	Severe: slow refill, cutbanks cave.	Percs slowly, flooding.	Wetness, fast intake, soil blowing.	Wetness, soil blowing, percs slowly.	Wetness, rooting depth, percs slowly.

See footnote at end of table.

TABLE 11.--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
7*:							
Winder	Severe: seepage.	Severe: seepage, wetness.	Severe: slow refill, cutbanks cave.	Percs slowly, flooding.	Wetness, droughty, fast intake.	Wetness, soil blowing, percs slowly.	Wetness, droughty, percs slowly.
8*:							
Hicoria	Severe: seepage.	Severe: piping, ponding.	Severe: slow refill, cutbanks cave.	Ponding, percs slowly.	Ponding, fast intake.	Ponding, soil blowing, percs slowly.	Wetness, rooting depth.
Riviera	Severe: seepage.	Severe: seepage, piping, ponding.	Severe: slow refill, cutbanks cave.	Ponding, percs slowly, cutbanks cave.	Ponding, droughty, fast intake.	Ponding, too sandy, soil blowing.	Wetness, droughty, percs slowly.
Gator	Severe: seepage.	Severe: piping, ponding.	Severe: slow refill, cutbanks cave.	Ponding, percs slowly, subsides.	Ponding, soil blowing, percs slowly.	Ponding, soil blowing, percs slowly.	Wetness, percs slowly.
9 Eaugallie	Severe: seepage.	Severe: seepage, piping, wetness.	Severe: slow refill, cutbanks cave.	Cutbanks cave	Wetness, droughty, fast intake.	Wetness, too sandy, soil blowing.	Wetness, droughty.
10 Winder	Severe: seepage.	Severe: seepage, wetness.	Severe: slow refill, cutbanks cave.	Percs slowly	Wetness, droughty, fast intake.	Wetness, soil blowing, percs slowly.	Wetness, droughty, percs slowly.
11 Myakka	Severe: seepage.	Severe: seepage, piping, wetness.	Severe: cutbanks cave.	Cutbanks cave	Wetness, droughty.	Wetness, too sandy, soil blowing.	Wetness, droughty.
12*:							
Placid	Severe: seepage.	Severe: seepage, piping, ponding.	Severe: cutbanks cave.	Ponding, cutbanks cave.	Ponding, fast intake, soil blowing.	Ponding, too sandy, soil blowing.	Wetness.
Basinger	Severe: seepage.	Severe: seepage, piping, ponding.	Severe: cutbanks cave.	Ponding, cutbanks cave.	Ponding, droughty, fast intake.	Ponding, too sandy, soil blowing.	Wetness, droughty.

See footnote at end of table.

TABLE 11.--WATER MANAGEMENT--Continued

ons for--		Features affecting--			
ments, , and ees	Aquifer-fed excavated ponds	Drainage	Irrigation	Terraces and diversions	Grassed waterways
e, , g.	Severe: slow refill, cutbanks cave.	Ponding, cutbanks cave.	Ponding, droughty, fast intake.	Ponding, too sandy, soil blowing.	Wetness, droughty.
e, , s.	Severe: cutbanks cave.	Cutbanks cave	Wetness, droughty.	Wetness, too sandy, soil blowing.	Wetness, droughty.
e, , s.	Severe: slow refill, cutbanks cave.	Percs slowly, cutbanks cave.	Wetness, droughty, fast intake.	Wetness, too sandy, soil blowing.	Wetness, droughty, percs slowly.
re, .	Severe: cutbanks cave.	Cutbanks cave	Wetness, droughty.	Wetness, too sandy, soil blowing.	Droughty.
e, , s.	Severe: slow refill, cutbanks cave.	Cutbanks cave	Wetness, droughty, fast intake.	Wetness, too sandy, soil blowing.	Wetness, droughty.
e, , ss.	Severe: slow refill, cutbanks cave.	Cutbanks cave	Wetness, droughty, fast intake.	Wetness, too sandy, soil blowing.	Wetness, droughty.
de, , s.	Severe: cutbanks cave.	Cutbanks cave	Wetness, droughty, fast intake.	Wetness, too sandy, soil blowing.	Wetness, droughty.
e, , ss.	Severe: cutbanks cave.	Cutbanks cave	Wetness, droughty, fast intake.	Wetness, too sandy, soil blowing.	Wetness, droughty.
e, , ss.	Severe: cutbanks cave.	Cutbanks cave	Wetness, droughty, fast intake.	Wetness, too sandy, soil blowing.	Wetness, droughty.

ng--	
races and rsions	Grassed waterways
ndy, plowing.	Droughty.
s, andy, plowing.	Wetness, droughty.
ndy, plowing.	Droughty.
s, andy, plowing.	Droughty.
s, andy.	Wetness.
s, andy, plowing.	Wetness, droughty.
ndy, plowing.	Droughty.
g, plowing, slowly.	Wetness, excess salt, percs slowly.
s, slowly.	Wetness, excess salt, percs slowly.

TABLE 11.--WATER MANAGEMENT--Continued

ons for--	Features affecting--				
ments, , and ees	Aquifer-fed excavated ponds	Drainage	Irrigation	Terraces and diversions	Grassed waterways
e, , s.	Severe: cutbanks cave.	Cutbanks cave	Wetness, droughty, fast intake.	Wetness, too sandy, soil blowing.	Droughty.
e, , s.	Severe: cutbanks cave.	Cutbanks cave	Wetness, droughty.	Wetness, too sandy, soil blowing.	Droughty.
e-------	Variable-------	Variable-------	Variable-------	Variable-------	Variable.
e, .	Severe: no water.	Deep to water	Slope, droughty, fast intake.	Too sandy, soil blowing.	Droughty.
e.	Severe: cutbanks cave.	Cutbanks cave	Wetness, droughty, fast intake.	Wetness, too sandy, soil blowing.	Droughty.
e, .	Severe: no water.	Deep to water	Droughty, fast intake.	Too sandy, soil blowing.	Droughty.
e, , s.	Severe: salty water, cutbanks cave.	Flooding, cutbanks cave.	Wetness, droughty.	Wetness, too sandy, soil blowing.	Wetness, excess salt, droughty.
e, .	Severe: no water.	Deep to water	Droughty, fast intake.	Depth to rock, too sandy, soil blowing.	Droughty, depth to rock.
e, .	Severe: no water.	Deep to water	Droughty, fast intake.	Too sandy, soil blowing.	Droughty.
e, .	Severe: cutbanks cave.	Cutbanks cave	Wetness, droughty.	Wetness, too sandy, soil blowing.	Droughty.

TABLE 11.--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
36---------- Bimini	Severe: seepage.	Severe: seepage, piping, wetness.	Severe: slow refill, cutbanks cave.	Cutbanks cave	Wetness, droughty, fast intake.	Wetness, too sandy, soil blowing.	Droughty, rooting depth.
37---------- Tuscawilla	Severe: seepage.	Severe: wetness.	Severe: cutbanks cave.	Favorable------	Wetness, droughty, fast intake.	Wetness, soil blowing.	Wetness, droughty.
38---------- Paola	Severe: seepage.	Severe: seepage, piping.	Severe: no water.	Deep to water	Slope, droughty, fast intake.	Too sandy, soil blowing.	Droughty.
39---------- Udarents	Severe: seepage.	Severe: seepage, piping.	Severe: cutbanks cave.	Cutbanks cave	Wetness, droughty, fast intake.	Wetness, too sandy, soil blowing.	Droughty, rooting depth.
40---------- Pomona	Severe: seepage.	Severe: seepage, piping, wetness.	Severe: slow refill, cutbanks cave.	Cutbanks cave	Wetness, droughty, fast intake.	Wetness, too sandy, soil blowing.	Wetness, droughty.
41---------- Terra Ceia	Severe: seepage.	Severe: excess humus, wetness.	Slight---------	Flooding, subsides.	Wetness, soil blowing, flooding.	Wetness, soil blowing.	Wetness.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 12.--ENGINEERING INDEX PROPERTIES

(The symbol < means less than; > means more than. Absence of an entry indicates that data were not estimated)

			Classification		Frag-	Percentage passing			

TABLE 12.—ENGINEERING INDEX PROPERTIES.—Continued

TABLE 12.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Frag-ments 3-10 inches	Percentage passing sieve number--: 4	10	40	200	Liquid limit	Plas-ticity index
	In				Pct					Pct	
10---------- Winder	0-12	Fine sand--------	SP, SP-SM	A-3, A-2-4	0	100	100	80-100	2-12	---	NP
	12-58	Sandy loam, fine sandy loam, sandy clay loam.	SM, SC, SC-SM	A-2-4, A-2-6	0	100	100	80-100	15-35	<35	NP-20
	58-80	Sandy loam, fine sandy loam, sandy clay loam.	SM, SC-SM, SC	A-2-4	0	60-80	50-75	40-70	15-35	<35	NP-20
11---------- Myakka	0-6	Fine sand--------	SP, SP-SM	A-3	0	100	100	85-100	2-10	---	NP
	6-25	Sand, fine sand	SP, SP-SM	A-3	0	100	100	85-100	2-10	---	NP
	25-31	Sand, fine sand, loamy fine sand.	SM, SP-SM	A-3, A-2-4	0	100	100	85-100	5-20	---	NP
	31-80	Sand, fine sand	SP, SP-SM	A-3	0	100	100	85-100	2-10	---	NP
12*:											
Placid----------	0-15	Fine sand--------	SP, SP-SM, SM	A-3, A-2-4	0	100	100	90-100	1-20	---	NP
	15-80	Sand, fine sand	SP, SP-SM, SM	A-3, A-2-4	0	100	100	90-100	1-20	---	NP
Basinger--------	0-2	Fine sand--------	SP	A-3	0	100	100	85-100	1-4	---	NP
	2-29	Sand, fine sand	SP, SP-SM	A-3, A-2-4	0	100	100	85-100	2-12	---	NP
	29-50	Sand, fine sand	SP, SP-SM	A-3, A-2-4	0	100	100	85-100	2-12	---	NP
	50-80	Sand, fine sand	SP, SP-SM	A-3, A-2-4	0	100	100	85-100	2-12	---	NP
St. Johns-------	0-10	Fine sand--------	SP, SP-SM	A-3	0	100	100	75-95	3-10	---	NP
	10-25	Sand, fine sand	SP, SP-SM	A-3	0	100	100	85-95	3-10	---	NP
	25-39	Sand, fine sand, loamy fine sand.	SM, SP-SM	A-3, A-2-4	0	100	100	85-95	5-20	---	NP
	39-80	Sand, fine sand	SP, SP-SM	A-3	0	100	100	80-90	2-10	---	NP
13---------- Immokalee	0-5	Fine sand--------	SP, SP-SM	A-3	0	100	100	70-100	2-10	---	NP
	5-39	Fine sand, sand	SP, SP-SM	A-3	0	100	100	70-100	2-10	---	NP
	39-60	Fine sand, sand	SP-SM, SM	A-3, A-2-4	0	100	100	70-100	5-21	---	NP
	60-80	Fine sand, sand, loamy fine sand.	SP, SP-SM	A-3	0	100	100	70-100	2-10	---	NP
14---------- Pineda	0-3	Fine sand--------	SP, SP-SM	A-3	0	100	100	80-95	2-8	---	NP
	3-26	Sand, fine sand	SP, SP-SM	A-3	0	100	100	80-95	2-10	---	NP
	26-40	Sandy loam, fine sandy loam, sandy clay loam.	SC, SC-SM, SM	A-2-4, A-2-6	0	100	95	65-95	15-35	<35	NP-20
	40-80	Loamy fine sand, fine sandy loam,	SP-SM, SM, SP, SC-SM	A-3, A-2-4,	0	95-100	90-100	80-95	20-35	<35	NP-20

TABLE 12.--ENGINEERING INDEX PROPERTIES--Continued

TABLE 12.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag- ments	Percentage passing sieve number--				Liquid limit	Plas- ticity index
			Unified	AASHTO	3-10 inches	4	10	40	200		
	In				Pct					Pct	
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

TABLE 12.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag- ments 3-10 inches	Percentage passing sieve number--				Liquid limit	Plas- ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
32*:											

TABLE 12.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag- ments	Percentage passing sieve number--				Liquid limit	Plas- ticity index
			Unified	AASHTO	3-10 inches	4	10	40	200		
	In				Pct					Pct	
40---------- Pomona	0-4	Fine sand--------	SP, SP-SM	A-3, A-2-4	0	100	100	85-100	2-12	---	NP
	4-21	Sand, fine sand	SP, SP-SM	A-3, A-2-4	0	100	100	85-100	2-12	---	NP
	21-28	Sand, loamy fine sand.	SP-SM, SM	A-3, A-2-4	0	100	100	85-100	5-15	---	NP
	28-50	Sand, fine sand	SP, SP-SM	A-3, A-2-4	0	100	100	85-100	2-12	---	NP
	50-80	Sandy clay loam, fine sandy loam, sandy loam.	SC, SC-SM, SM	A-2, A-4, A-6	0	100	95-100	85-100	25-50	<40	NP-16
41---------- Terra Ceia	0-80	Muck----------	PT	A-8	---	---	---	---	---	---	---

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 13.--PHYSICAL AND CHEMICAL PROPERTIES OF THE 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	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/cc	In/hr	In/in	pH	mmhos/cm					Pct
2---------- Riviera	0-28	1-6	1.40-1.65	6.0-20	0.05-0.08	4.5-7.3	<2	Low--------	0.10	4	2	.1-2
	28-35	12-25	1.50-1.70	<0.2	0.10-0.14	5.6-8.4	<2	Low--------	0.24			
	35-51	15-25	1.50-1.70	<0.2	0.12-0.15	6.1-8.4	<2	Low--------	0.24			
	51-80	1-8	1.40-1.65	0.6-6.0	0.05-0.08	6.1-8.4	<2	Low--------	0.15			
3*:												
Samsula----------	0-31	---	0.10-0.50	6.0-20	0.20-0.25	<4.5	<2	Low--------	----	2	2	>20
	31-80	1-14	1.35-1.55	6.0-20	0.02-0.05	3.6-6.0	<2	Low--------	0.17			
Hontoon----------	0-80	---	0.20-0.40	6.0-20	0.30-0.50	<4.5	<2	Low--------	----	2	2	75-85
4---------- Wabasso	0-4	1-5	1.25-1.50	6.0-20	0.03-0.08	3.6-6.5	<2	Low--------	0.10	5	2	1-4
	4-22	0-5	1.35-1.70	6.0-20	0.02-0.05	3.6-6.5	<2	Low--------	0.10			
	22-30	1-12	1.50-1.75	0.6-2.0	0.10-0.15	4.5-7.3	<2	Low--------	0.15			
	30-47	12-30	1.60-1.85	<0.2	0.10-0.15	5.1-8.4	<2	Low--------	0.24			
	47-80	2-12	1.40-1.70	6.0-20	0.05-0.10	5.1-8.4	<2	Low--------	0.10			
5*:												
Pineda----------	0-3	1-6	1.25-1.60	6.0-20	0.05-0.10	4.5-7.3	<2	Low--------	0.10	5	2	.5-6
	3-32	1-8	1.40-1.70	6.0-20	0.02-0.05	4.5-7.3	<2	Low--------	0.10			
	32-80	10-25	1.50-1.70	<0.2	0.10-0.15	5.1-8.4	<2	Low--------	0.24			
Wabasso----------	0-7	1-5	1.25-1.50	6.0-20	0.03-0.08	3.6-6.5	<2	Low--------	0.10	5	2	1-4
	7-19	0-5	1.35-1.70	6.0-20	0.02-0.05	3.6-6.5	<2	Low--------	0.10			
	19-36	1-12	1.50-1.75	0.6-2.0	0.10-0.15	4.5-7.3	<2	Low--------	0.15			
	36-63	12-30	1.60-1.85	<0.2	0.10-0.15	5.1-8.4	<2	Low--------	0.24			
	63-80	2-12	1.40-1.70	6.0-20	0.05-0.10	5.1-8.4	<2	Low--------	0.10			
6---------- Favoretta	0-12	40-50	1.55-1.65	<0.2	0.10-0.20	5.1-7.8	<2	High-------	0.37	5	4	1-4
	12-80	35-65	1.55-1.65	<0.06	0.10-0.20	5.6-8.4	<2	High-------	0.37			
7*:												
Favoretta--------	0-10	30-50	1.55-1.65	<0.2	0.10-0.20	5.1-7.8	<2	High-------	0.37	5	4	1-4
	10-80	35-65	1.55-1.65	<0.06	0.10-0.20	5.6-8.4	<2	High-------	0.37			
Chobee----------	0-10	7-15	1.45-1.50	2.0-6.0	0.10-0.15	5.6-7.3	<2	Low--------	0.10	5	2	2-7
	10-55	18-35	1.55-1.75	<0.2	0.12-0.17	6.1-8.4	<2	Moderate	0.32			
	55-80	7-30	1.60-1.75	0.2-6.0	0.06-0.10	7.4-8.4	<2	Low--------	0.20			
Winder----------	0-10	6-8	1.45-1.65	6.0-20	0.06-0.10	5.6-7.8	<2	Low--------	0.15	5	2	.5-3
	10-25	10-18	1.45-1.65	0.2-0.6	0.06-0.10	5.6-7.8	<2	Low--------	0.20			
	25-50	20-30	1.60-1.70	<0.2	0.10-0.15	5.6-8.4	<2	Low--------	0.24			
	50-80	15-30	1.50-1.70	<0.2	0.06-0.12	5.6-8.4	<2	Low--------	0.24			
8*:												
Hicoria----------	0-10	7-8	1.80-1.75	6.0-20	0.15-0.20	3.6-5.5	<2	Low--------	0.10	5	2	10-20

TABLE 13.--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS--Continued

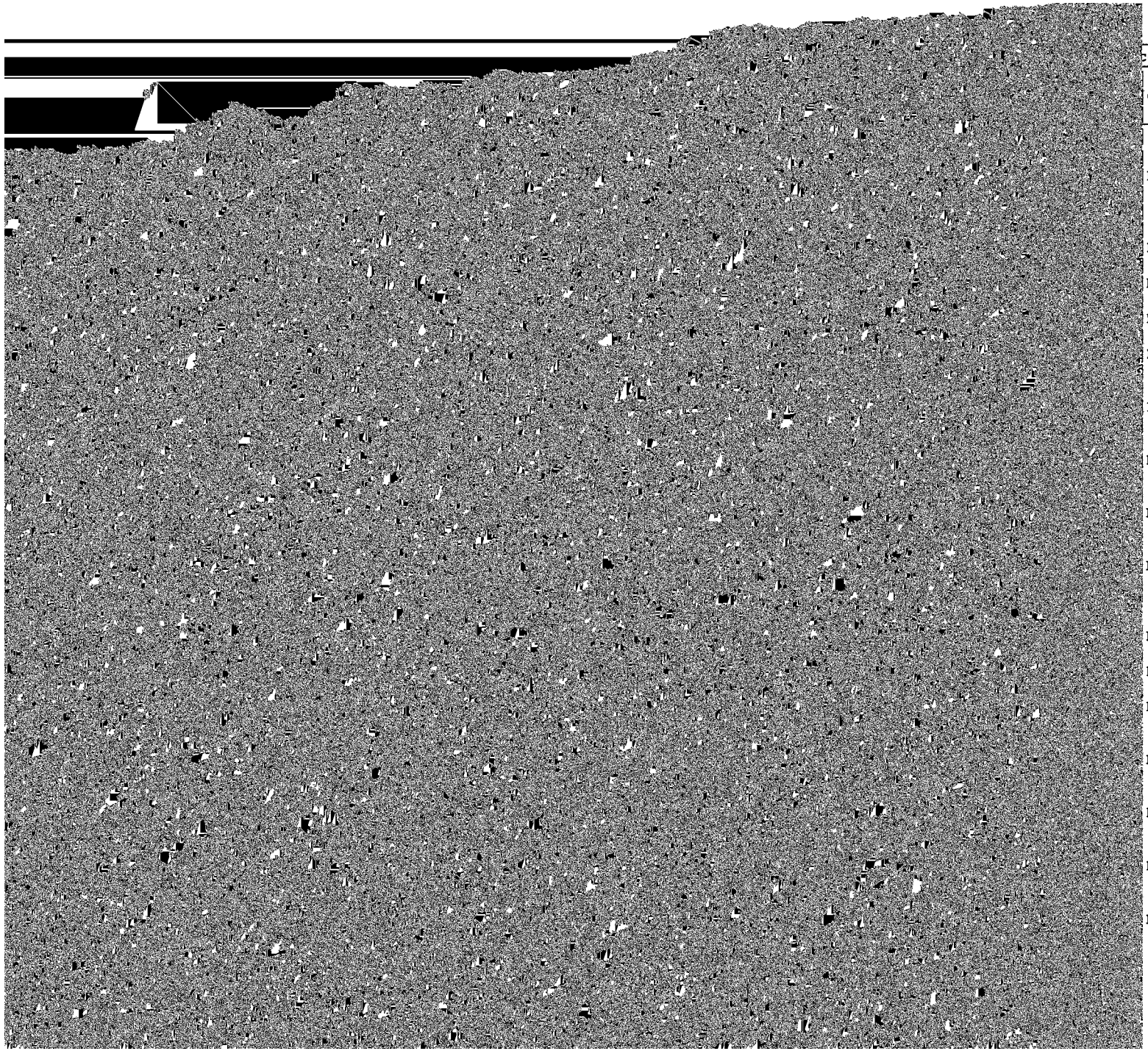
Soil name and map symbol	Depth	Clay	Moist bulk density	Permea- bility	Available water capacity	Soil reaction	Salinity	Shrink- swell potential	Erosion factors K	Erosion factors T	Wind erodi- bility group	Organic matter
	In	Pct	g/cc	In/hr	In/in	pH	mmhos/cm					Pct
8*:												
Gator----------	0-26	---	0.10-0.30	6.0-20	0.30-0.40	3.6-6.0	<2	Low--------	----	2	2	55-85
	26-80	13-25	1.60-1.70	<0.2	0.10-0.15	4.5-8.4	<2	Low--------	0.32			
9---------- Eaugallie	0-22	<5	1.25-1.50	6.0-20	0.02-0.07	4.5-6.0	<2	Low--------	0.10	5	2	2-8
	22-33	1-8	1.45-1.60	0.6-6.0	0.15-0.25	4.5-6.5	<2	Low--------	0.15			
	33-56	1-5	1.45-1.65	6.0-20	0.02-0.05	4.5-7.8	<2	Low--------	0.10			
	56-70	13-31	1.55-1.70	0.06-2.0	0.10-0.20	4.5-7.8	<2	Low--------	0.20			
	70-80	1-13	1.45-1.55	0.6-6.0	0.05-0.15	4.5-7.8	<2	Low--------	0.15			
10---------- Winder	0-12	1-6	1.40-1.65	6.0-20	0.03-0.08	5.6-7.8	<2	Low--------	0.10	5	2	.1-2
	12-58	7-30	1.45-1.65	0.2-0.6	0.06-0.10	5.6-7.8	<2	Low--------	0.20			
	58-80	15-30	1.50-1.70	<0.2	0.06-0.12	5.6-8.4	<2	Low--------	0.24			
11---------- Myakka	0-6	1-3	1.25-1.45	6.0-20	0.05-0.15	3.6-6.5	<2	Low--------	0.10	5	2	2-5
	6-25	0-2	1.45-1.60	6.0-20	0.02-0.05	3.6-6.5	<2	Low--------	0.10			
	25-31	1-8	1.45-1.60	0.6-6.0	0.10-0.20	3.6-6.5	<2	Low--------	0.15			
	31-80	0-2	1.48-1.70	6.0-20	0.02-0.10	3.6-6.5	<2	Low--------	0.10			
12*:												
Placid----------	0-15	<10	1.20-1.40	6.0-20	0.15-0.20	3.6-5.5	<2	Low--------	0.10	5	2	2-10
	15-80	<10	1.30-1.60	6.0-20	0.05-0.08	3.6-6.0	<2	Low--------	0.10			
Basinger---------	0-2	0-4	1.40-1.55	6.0-20	0.05-0.10	3.6-7.3	<2	Low--------	0.10	5	2	1-8
	2-29	0-4	1.40-1.55	6.0-20	0.05-0.10	3.6-7.3	<2	Low--------	0.10			
	29-50	1-3	1.40-1.65	6.0-20	0.10-0.15	3.6-7.3	<2	Low--------	0.10			
	50-80	1-3	1.50-1.70	6.0-20	0.05-0.10	3.6-7.3	<2	Low--------	0.10			
St. Johns--------	0-10	1-4	1.30-1.50	6.0-20	0.10-0.15	3.6-5.5	<2	Low--------	0.10	5	2	2-4
	10-25	1-3	1.50-1.70	6.0-20	0.03-0.08	3.6-5.5	<2	Low--------	0.10			
	25-39	2-6	1.50-1.58	0.2-2.0	0.10-0.30	3.6-5.5	<2	Low--------	0.15			
	39-80	1-4	1.50-1.65	6.0-20	0.03-0.08	3.6-5.5	<2	Low--------	0.10			
13---------- Immokalee	0-5	1-5	1.20-1.50	6.0-20	0.05-0.10	3.6-6.0	<2	Low--------	0.10	5	2	1-2
	5-39	1-5	1.45-1.70	6.0-20	0.02-0.05	3.6-6.0	<2	Low--------	0.10			
	39-60	2-7	1.30-1.70	0.6-2.0	0.10-0.25	3.6-6.0	<2	Low--------	0.15			
	60-80	1-5	1.40-1.70	6.0-20	0.02-0.05	3.6-6.0	<2	Low--------	0.10			
14---------- Pineda	0-3	1-6	1.25-1.60	6.0-20	0.05-0.10	4.5-7.3	<2	Low--------	0.10	5	2	.5-6
	3-26	1-8	1.40-1.70	6.0-20	0.02-0.05	4.5-7.3	<2	Low--------	0.10			
	26-40	10-25	1.50-1.70	<0.2	0.10-0.15	5.1-8.4	<2	Low--------	0.24			
	40-80	3-25	1.45-1.60	2.0-6.0	0.02-0.05	5.6-8.4	<2	Low--------	0.10			
15----------	0-41	<2	1.35-1.65	>20	0.02-0.05	3.6-6.0	<2	Low--------	0.10	5	1	<1

TABLE 13.--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS--Continued

TABLE 13.--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS--Continued

Soil name and map symbol	Depth	Clay	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/cc	In/hr	In/in	pH	mmhos/cm					Pct
32*:												
Narcoossee------	0-3	1-5	1.40-1.50	>20	0.03-0.10	3.6-6.0	<2	Low--------	0.10	5*	2	.5-1
	3-17	1-5	1.40-1.60	>20	0.02-0.05	3.6-6.0	<2	Low--------	0.10			
	17-41	2-6	1.45-1.60	>20	0.05-0.10	5.1-6.5	<2	Low--------	0.10			
	41-80	1-5	1.40-1.50	>6.0	0.05-0.10	6.6-8.4	<2	Low--------	0.10			
Welaka----------	0-12	2-4	1.30-1.45	>20	0.02-0.05	4.5-7.8	<2	Low--------	0.10	5	1	1-4
	12-42	<2	1.40-1.60	>20	0.02-0.05	4.5-7.8	<2	Low--------	0.10			
	42-80	<3	1.45-1.70	>20	0.02-0.05	7.4-8.4	<2	Low--------	0.10			
33*----------	0-6	0-1	1.35-1.85	>6.0	0.03-0.05	5.1-7.8	>4	Low--------	0.05	5	1	<.1
Beaches	6-60	0-1	1.35-1.85	>6.0	0.03-0.05	5.1-7.8	>4	Low--------	0.05			
34*:												
Cocoa----------	0-29	2-5	1.35-1.60	6.0-20	0.02-0.05	4.5-7.8	<2	Low--------	0.10	2	2	1-3
	29-35	4-10	1.45-1.65	6.0-20	0.05-0.10	5.6-7.8	<2	Low--------	0.15			
	35-80	---	---	2.0-20.0	---	---	---	----------	----			
Bulow----------	0-5	1-3	1.30-1.40	6.0-20	0.05-0.07	4.5-7.3	<2	Low--------	0.10	3	2	.5-1
	5-20	1-3	1.30-1.45	6.0-20	0.02-0.05	5.1-7.3	<2	Low--------	0.10			
	20-50	1-3	1.40-1.60	6.0-20	0.02-0.05	6.1-7.3	<2	Low--------	0.10			
	50-59	15-30	1.55-1.65	2.0-6.0	0.10-0.15	6.1-7.3	<2	Low--------	0.24			
	59-80	---	---	2.0-20.0	---	---	---	----------	----			
35---------- Quartzipsamments	0-80	1-3	1.50-1.65	6.0-20	0.03-0.05	4.5-7.3	<2	Low--------	0.10	5	2	<.5
36---------- Bimini	0-6	1-5	1.40-1.55	6.0-20	<0.05	3.6-5.5	<2	Low--------	0.10	5	1	1-4
	6-28	1-5	1.45-1.70	6.0-20	<0.05	3.6-5.5	<2	Low--------	0.10			
	28-41	1-12	1.50-1.75	0.6-2.0	0.10-0.15	3.6-5.5	<2	Low--------	0.15			
	41-46	18-34	1.60-1.75	0.06-0.2	0.10-0.15	4.5-7.3	<2	Low--------	0.28			
	46-80	1-5	1.60-1.75	2.0-20.0	<0.05	6.6-7.8	<2	Low--------	0.28			
37---------- Tuscawilla	0-12	1-5	1.10-1.40	6.0-20	0.05-0.10	5.6-8.4	<2	Low--------	0.10	5	1	1-3
	12-45	18-30	1.25-1.55	0.6-2.0	0.08-0.12	6.6-9.0	<2	Low--------	0.24			
	45-60	1-7	1.55-1.70	6.0-20	0.03-0.08	7.4-9.0	<2	Low--------	0.10			
	60-80	1-20	1.55-1.70	0.6-20	0.03-0.12	7.4-9.0	<2	Low--------	0.17			
38---------- Paola	0-6	0-2	1.20-1.45	>20	0.02-0.05	3.6-7.3	<2	Low--------	0.10	5	1	<.5
	6-80	0-2	1.45-1.60	>20	0.02-0.05	3.6-7.3	<2	Low--------	0.10			
39---------- Udarents	0-41	3-8	1.65-1.75	2.0-6.0	0.05-0.08	5.6-8.4	<2	Low--------	0.10	5	2	---
	41-80	1-2	1.50-1.65	6.0-20	0.03-0.05	5.6-7.3	<2	Low--------	0.17			
40---------- Pomona	0-4	1-6	1.10-1.50	>6.0	0.05-0.15	3.6-6.0	<2	Low--------	0.10	5	1	1-4
	4-21	1-6	1.45-1.70	6.0-20	0.03-0.08	3.6-6.0	<2	Low--------	0.10			
	21-28	2-7	1.30-1.60	0.6-6.0	0.10-0.20	3.6-6.0	<2	Low--------	0.15			
	28-50	1-6	1.40-1.65	2.0-20	0.03-0.15	3.6-6.0	<2	Low--------	0.10			
	50-80	13-35	1.50-1.80	0.2-2.0	0.10-0.17	3.6-6.0	<2	Low--------	0.20			
41---------- Terra Ceia	0-80	---	0.15-0.35	6.0-20	0.30-0.50	4.5-8.4	<2	Low--------	----	2	2	>60

* See description of the map unit for composition and behavior characteristics of the map unit.



corrosion
Concrete
High.
High.
Moderate.
High.
High.
Low.
High.
Moderate.
Moderate.
Moderate.
High.
Moderate.
Moderate.
High.
High.
Moderate.

TABLE 14.--SOIL AND WATER FEATURES--Continued

Flooding		High water table			Bedrock		Subsidence		Risk of corrosion	
Duration	Months	Depth	Kind	Months	Depth	Hard-ness	Ini-tial	Total	Uncoated steel	Concrete
		Ft			In		In	In		
Very long	Mar-Sep	0-0.5	Apparent	Jun-Apr	>60	---	4-8	10-18	High-----	Moderate.
Brief-----	Jun-Nov	0-0.5	Apparent	Jun-Nov	>60	---	---	---	High-----	High.
---	---	4.0-6.0	Apparent	Jun-Dec	>60	---	---	---	Low------	High.
Very long	Jan-Dec	+2-0	Apparent	Jan-Dec	>60	---	12-14	14-24	High-----	High.
Very long	Jan-Dec	0-0.5	Apparent	Jan-Dec	>60	---	---	---	High-----	High.
---	---	1.5-3.5	Apparent	Jul-Jan	>60	---	---	---	Moderate	High.
---	---	1.5-3.0	Apparent	Jun-Nov	>60	---	---	---	High-----	Moderate.
---	---	>6.0	---	---	>60	---	---	---	---	---
---	---	>6.0	---	---	>60	---	---	---	Low------	Low.
---	---	2.0-3.5	Apparent	Jun-Nov	>60	---	---	---	Moderate	Low.
---	---	>6.0	---	---	>60	---	---	---	High-----	High.
Very brief to long.	Jan-Dec	0-6.0	Apparent	Jan-Dec	>60	---	---	---	High-----	High.
---	---	>6.0	---	---	20-40	Hard	---	---	Low------	Low.
---	---	>6.0	---	---	40-60	Hard	---	---	Low------	Low.
---	---	2.0-8.0	Apparent	---	>60	---	---	---	Low------	High.
---	---	1.5-3.5	Apparent	Jul-Oct	>60	---	---	---	Moderate	High.

WATER FEATURES--Continued

High water table			Bedrock		Subsidence		Risk of corrosion	
Depth	Kind	Months	Depth	Hard-ness	Ini-tial	Total	Uncoated steel	Concrete
Ft			In		In	In		
.5-1.5	Apparent	Jun-Sep	>60	---	---	---	High-----	Low.
6.0	---	---	>60	---	---	---	Low------	High.
0-4.0	Apparent	Jun-Oct	>60	---	---	---	High-----	Low.
.5-1.5	Apparent	Jun-Sep	>60	---	---	---	High-----	High.
0-0.5	Apparent	Jun-Apr	>60	---	16-20	50-60	Moderate	Moderate.

vior characteristics of the map unit.

TABLE 15.--DEPTH TO WATER TABLE IN SELECTED SOILS

(Measurements of water table depths are in inches. The monthly readings were based on the average of two readings, taken on the first and fifteenth of each month. An entry of "---" indicates that readings were not taken that month)

Soil name and year	January	February	March	April	May	June	July	August	September	October	November	December
Adamsville:												
1986	---	---	---	---	---	---	62	40	46	51	55	54
1987	48	41	33	23	51	60	70	70	69	62	61	62
1988	57	36	24	34	51	58	67	67	58	64	70	45
1989	62	45	60	57	---	---	---	---	---	---	---	---
Bimini:												
1986	---	---	---	---	---	---	---	---	---	---	---	---
1987	---	---	---	---	---	53	38	37	43	32	28	25
1988	34	32	27	36	40	43	40	46	42	45	44	31
1989	40	38	41	42	---	---	---	---	---	---	---	---
Pineda:												
1986	---	---	---	28	30	16	12	4	5	21	26	18
1987	12	6	2	3	28	26	30	31	30	29	28	26
1988	2	0	6	16	28	20	26	22	20	23	29	14
1989	24	10	23	30	---	---	---	---	---	---	---	---
Pomello:												
1986	---	---	---	---	---	---	---	---	---	61	47	---
1987	42	40	33	28	37	48	53	55	44	42	49	58
1988	60	46	30	33	43	54	61	65	52	51	54	40
1989	49	37	44	46	---	---	---	---	---	---	---	---
Valkaria:												
1986	---	---	---	---	---	---	---	---	---	19	22	3
1987	2	1	5	2	28	28	21	14	16	17	18	6
1988	6	0	3	11	27	28	28	12	1	5	20	8
1989	16	6	11	15	---	---	---	---	---	---	---	---
Wabasso:												
1986	---	---	---	28	31	22	23	6	10	23	27	19
1987	17	10	7	5	31	37	59	41	32	30	32	26
1988	27	6	7	10	29	23	28	29	23	25	30	16
1989	27	20	27	31	---	---	---	---	---	---	---	---

TABLE 16.--PHYSICAL PROPERTIES OF SELECTED SOILS

(Absence of an entry indicates that data were not available)

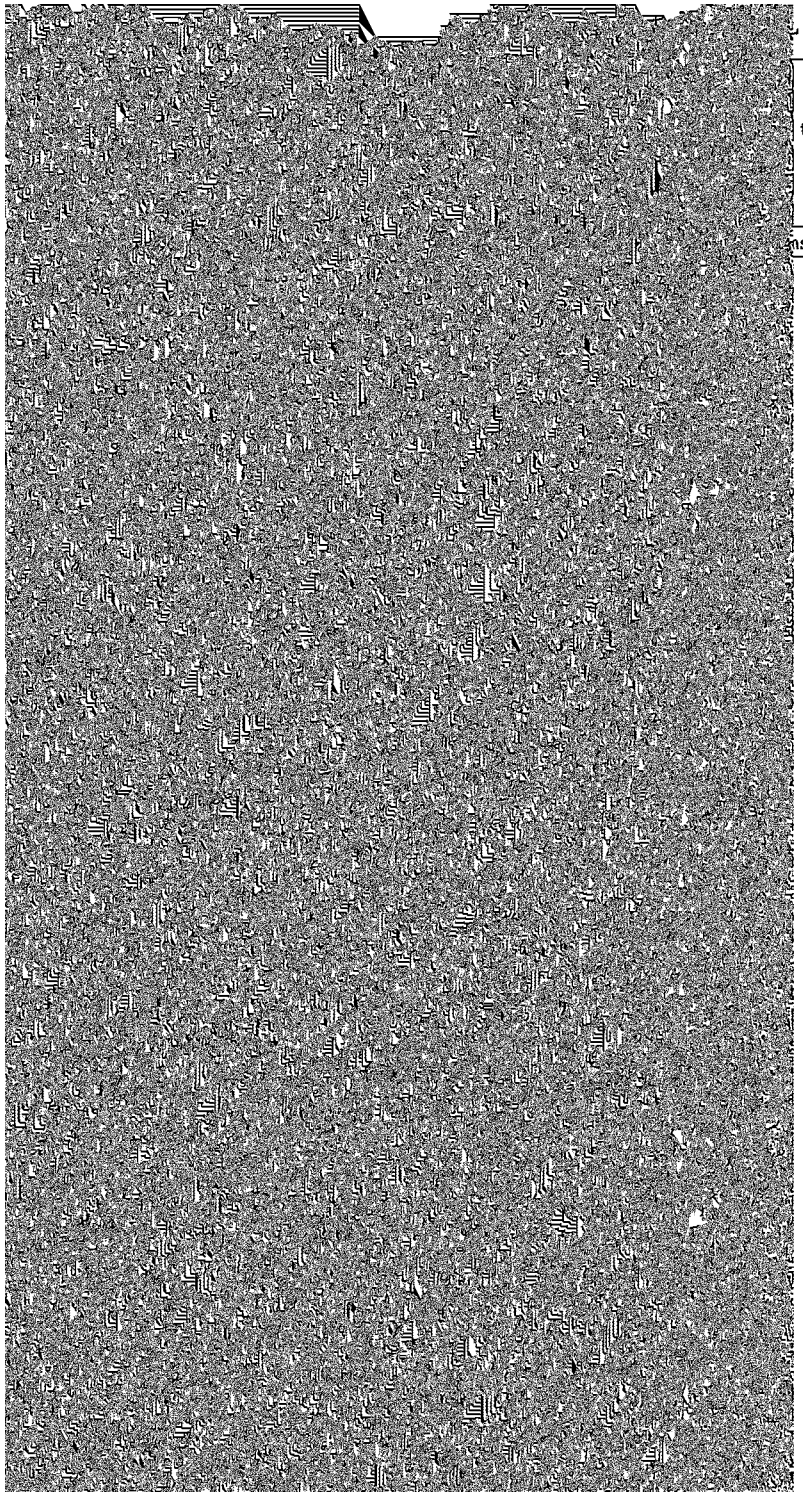
pth	Hori-zon	Particle-size distribution: Sand: Very coarse (2-1 mm)	Coarse (1-0.5 mm)	Medium (0.5-0.25 mm)	Fine (0.25-0.1 mm)	Very fine (0.1-0.05 mm)	Total (2-0.05 mm)	Silt (0.05-0.002 mm)	Clay (<0.002 mm)	Hydraulic conduc-tivity*	Bulk density (field moist)*	Water content: 1/10 bar	1/3 bar	15 bar
n		Pct	Pct	Pct	Pct	Pct	Pct	Pct	Pct	Cm/hr	g/cm^3	----Pct (wt)-----		
-7	A	0.0	0.2	5.1	90.6	2.7	98.6	0.8	0.6	49.7	1.40	5.6	3.4	1.2
-22	C1	0.0	0.2	5.7	90.3	2.2	98.4	0.9	0.7	46.5	1.48	3.9	2.0	0.4
-34	C2	0.0	0.2	5.5	90.6	2.2	98.5	0.8	0.7	64.6	1.41	3.6	1.8	0.4
-57	C3	0.0	0.2	5.3	90.3	2.2	98.0	1.4	0.6	42.5	1.50	4.1	1.8	0.4
-80	C4	0.0	0.2	5.0	91.3	2.2	98.8	1.0	0.2	46.5	1.49	3.2	1.5	0.2
-7	A	0.0	0.2	5.8	89.8	3.2	98.9	0.9	0.2	35.1	1.48	4.7	2.1	0.6
-29	C1	0.0	0.3	5.8	89.4	2.9	98.4	1.5	0.1	60.7	1.44	3.4	1.7	0.4
-54	C2	0.0	0.3	6.3	89.4	2.8	98.8	0.1	0.8	65.3	1.44	3.3	1.4	0.4
-80	C3	0.0	0.4	7.8	88.7	2.6	99.5	0.1	0.4	61.4	1.44	2.8	1.1	0.3
-6	A	0.4	11.6	44.8	39.5	1.2	97.5	1.5	1.0	69.7	1.29	9.2	6.1	1.8
-28	E	0.5	12.4	45.4	38.5	1.1	97.9	1.6	0.5	82.8	1.50	3.5	2.2	0.1
-32	EB	0.6	12.1	38.9	42.2	1.4	95.2	3.0	1.8	27.8	1.59	6.3	4.5	0.4
-41	Bh	0.7	12.6	38.8	39.6	1.1	92.8	2.5	4.7	9.4	1.47	16.4	12.8	3.0
-46	Btg	0.2	10.4	36.6	29.7	0.8	77.7	4.1	18.2	1.3	1.49	24.2	20.0	7.2
-80	2C	15.0	25.5	27.9	23.5	1.6	93.5	3.6	2.9	62.6	1.40	13.2	10.4	4.2
-5	A	0.6	15.0	48.9	30.6	1.6	96.7	2.3	1.0	103.0	1.27	8.9	6.5	2.5
-20	E	1.3	18.1	53.6	24.1	1.0	98.1	1.0	0.9	116.0	1.54	3.6	2.3	0.3
-50	Bw	1.4	16.4	53.0	24.8	0.9	96.5	2.2	1.3	114.0	1.58	2.9	1.9	0.3
-68	Bt	0.6	12.1	39.4	23.3	0.9	76.3	3.0	20.7	12.0	1.61	10.3	8.3	3.9
-5	Ap	0.0	0.6	10.6	85.5	1.3	98.1	1.3	0.6	59.4	1.19	12.6	8.2	3.0
-12	E1	0.0	0.6	10.2	81.9	1.3	94.0	5.4	0.6	41.9	1.42	6.5	3.6	1.5
-26	E2	0.0	0.4	8.8	87.9	1.5	98.6	1.1	0.3	64.4	1.49	3.1	1.9	0.4
-36	Bh	0.0	0.3	8.2	82.8	1.6	92.8	3.0	4.2	4.4	1.27	26.1	19.4	4.7
-42	C1	0.0	0.4	8.6	84.2	1.4	94.7	1.7	3.6	24.6	1.37	13.8	10.1	2.6
-69	C1	0.0	0.4	8.3	86.0	1.1	95.8	1.7	2.5	1.0	1.67	13.1	9.1	3.1
-80	C2	0.0	0.2	7.3	86.2	0.7	94.4	1.5	4.1	7.4	1.59	13.6	9.6	2.9
-8	A	0.0	0.3	3.0	17.5	8.4	29.1	30.7	40.2	0.5	1.33	34.3	30.0	18.7
-21	BA	0.0	0.2	2.4	14.2	6.4	23.2	30.6	46.2	0.1	1.46	30.4	28.3	18.3
-36	Bg1	0.0	0.2	2.2	12.2	5.4	20.0	29.8	50.2	0.1	1.38	34.6	31.8	20.8
-66	Bg2	0.0	0.2	2.2	11.2	4.2	17.8	26.4	55.8	0.1	1.40	33.8	31.4	21.4
-80	Bg3	0.0	0.0	1.2	8.4	14.2	23.8	33.1	43.1	0.3	1.35	35.8	31.3	20.4

ulic uc- ty*	Bulk density (field moist)*	Water content 1/10 bar	1/3 bar	15 bar
hr	g/cm^3	----Pct (wt)-----		
0	0.00	0.0	0.0	0.0
8	0.88	58.4	51.9	18.7
7	1.59	15.5	10.7	3.4
1	1.68	18.7	13.8	6.2
0	1.74	20.1	18.3	10.9
0	1.65	23.4	20.3	10.9
8	1.23	12.1	7.9	3.2
9	1.40	4.2	2.2	0.4
5	1.41	3.4	2.0	0.4
0	1.33	21.7	15.2	5.1
7	1.47	11.3	8.4	2.7
1	1.64	13.7	9.7	4.8
9	1.58	11.2	8.3	3.7
7	1.59	6.7	3.9	1.0
0	1.39	5.8	4.4	1.8
0	1.54	3.8	2.3	0.7
5	1.43	5.1	3.4	0.7
1	1.42	4.6	2.5	0.5
5	1.47	2.9	1.6	0.2
9	1.39	6.1	4.4	2.3
3	1.48	3.6	2.1	0.3
0	1.46	4.5	3.1	1.3
8	1.54	3.1	1.9	0.6
8	1.57	3.0	1.6	0.6
3	1.50	3.4	2.7	0.4
8	1.59	3.5	2.1	0.1
8	1.62	5.5	2.5	0.6
5	1.63	4.1	2.1	0.5
4	1.63	5.7	3.3	0.6
06	1.62	14.9	11.9	5.1
6	1.66	15.8	12.3	5.3
7	1.62	15.9	12.4	5.0
3	1.54	10.7	7.5	2.6
9	1.50	12.3	9.2	3.2

Water content		
1/10 bar	1/3 bar	15 bar
----Pct (wt)-----		
6.2	3.8	1.3
4.1	3.1	0.8
30.9	19.7	6.3
12.2	8.8	2.4
12.1	7.9	1.5
0.0	0.0	0.0
15.3	9.8	2.8
5.8	3.2	0.6
4.7	2.6	0.1
21.6	15.6	2.9
25.4	19.6	4.1
20.2	16.4	5.5
18.0	14.9	5.4
12.9	7.4	2.1
7.6	3.8	0.5
6.1	2.4	0.3
8.6	4.5	1.7
15.7	11.1	5.0
22.0	16.2	7.4
12.9	8.3	3.1
16.2	9.7	3.9
8.2	4.9	1.2
5.4	2.6	0.4
4.0	2.1	0.4
30.2	22.9	9.3
12.8	9.3	3.4
6.9	4.9	1.2
9.8	5.4	2.0
10.0	6.1	1.7
5.3	2.6	0.7
4.6	2.4	0.3
11.1	1.9	0.2
3.2	1.4	0.1

TABLE 16.--PHYSICAL PROPERTIES OF SELECTED SOILS--Continued

Soil name and sample number	Depth	Horizon	Particle-size distribution: Sand: Very coarse (2-1 mm)	Coarse (1-0.5 mm)	Medium (0.5-0.25 mm)	Fine (0.25-0.1 mm)	Very fine (0.1-0.05 mm)	Total (2-0.05 mm)	Silt (0.05-0.002 mm)	Clay (<0.002 mm)	Hydraulic conductivity*	Bulk density (field moist)*	Water content: 1/10 bar	1/3 bar	15 bar
	In		Pct	Pct	Pct	Pct	Pct	Pct	Pct	Pct	Cm/hr	g/cm^3	----Pct (wt)-----		
Valkaria fine sand:															
S18-20-1	0-6	A	0.0	2.7	22.5	69.8	1.4	96.5	2.2	1.3	51.9	1.43	4.9	2.7	0.4
-2	6-12	E1	0.0	3.5	24.0	70.2	0.8	98.5	1.2	0.3	51.9	1.43	3.2	1.5	0.2
-3	12-17	E2	0.0	3.7	23.2	71.6	0.9	99.4	0.4	0.2	61.8	1.57	2.3	1.0	0.2
-4	17-21	Bw1	0.0	3.1	22.3	68.7	0.9	95.0	2.4	2.6	12.5	1.66	6.2	4.1	1.5
-5	21-25	Bw2	0.0	3.8	23.7	66.4	0.9	94.8	3.1	2.1	20.2	1.63	4.4	2.7	0.8
-6	25-52	C	0.0	2.7	20.3	67.0	0.5	90.5	1.9	7.6	4.0	1.69	9.2	6.3	2.3
-7	52-80	C	0.0	2.4	19.8	69.7	0.4	92.3	1.7	6.0	6.2	1.63	9.4	6.4	2.2
Wabasso fine sand:															
S18-3-1	0-4	A	0.0	1.0	10.0	76.3	3.1	90.4	7.6	2.0	9.3	1.54	12.2	7.9	1.1
-2	4-15	E1	0.0	1.1	10.3	76.3	3.1	90.4	7.6	2.0	28.0	1.54	3.7	2.3	0.7
-3	15-22	E2	0.0	1.3	10.6	84.8	1.9	98.6	0.4	1.0	21.1	1.55	3.0	1.4	0.2
-4	22-30	Bh	0.0	1.1	8.9	80.1	1.6	91.7	3.8	4.5	10.0	1.48	15.2	11.1	1.7
-5	30-35	Btg1	0.0	0.9	8.1	66.3	1.5	76.8	3.4	19.8	7.2	1.65	17.7	14.5	6.0
-6	35-47	Btg2	0.1	1.1	9.2	69.0	1.5	80.9	2.8	16.3	0.7	1.66	15.2	11.8	5.3
-7	47-53	BCg	0.0	0.9	8.7	74.1	1.3	85.0	2.4	12.6	0.8	1.67	13.2	10.3	4.1
-8	53-67	Cg	0.0	0.9	7.9	76.5	1.3	86.6	2.8	10.6	2.1	1.64	11.8	8.9	4.1
-9	67-63	Cg	0.0	1.1	9.3	76.9	1.6	88.9	1.8	9.3	3.4	1.57	9.8	6.5	3.0



PROPERTIES OF SELECTED SOILS

Extractable acidity	Sum of cations	Base saturation	Organic carbon	Electrical conductivity	pH H_2O (1:1)	pH CaCl$_2$ 0.01M (1:2)	pH KCl 1N (1:1)	Pyrophosphate extractable C	Pyrophosphate extractable Fe	Pyrophosphate extractable Al	Citrate-dithionite extractable Fe	Citrate-dithionite extractable Al
ms of soil-----		Pct	Pct	Mmhos/cm				Pct	Pct	Pct	Pct	Pct
2.82	2.95	4	0.49	0.02	4.5	4.1	3.9					
1.42	1.47	3	0.20	0.02	4.7	4.7	4.7					
1.41	1.33	2	0.10	0.01	4.6	4.7	4.7					
1.27	1.33	5	0.11	0.01	4.4	4.6	4.6					
1.36	1.48	8	0.08	0.03	4.6	4.6	4.7					
3.37	3.46	3	0.55	0.02	4.4	4.1	3.9					
1.43	1.47	3	0.52	0.02	4.8	4.8	4.8					
1.52	1.56	3	0.09	0.01	5.0	4.9	4.9					
1.25	1.42	12	0.05	0.02	4.8	5.0	5.0					
6.00	6.50	8	1.35	0.09	3.9	3.1	3.0					
1.51	1.69	11	0.16	0.05	4.3	3.7	3.8					
3.46	3.75	8	0.39	0.07	4.0	3.6	3.6					
11.71	13.36	12	1.21	0.16	4.6	4.2	4.1	0.90	0.20	0.18	0.29	0.15
13.36	22.17	40	0.99	0.80	4.6	4.6	4.4				2.20	0.24
0.61	21.41	97	0.25	0.42	7.0	6.8	7.2					
1.98	2.62	24	0.81	0.04	4.8	4.4	4.4					
1.19	1.38	14	0.10	0.01	5.2	4.7	4.6					
1.11	1.39	20	0.09	0.01	5.2	4.7	4.6					
4.54	15.09	70	0.62	0.07	6.2	6.3	6.0					
7.35	8.26	11	1.88	0.06	3.9	3.1	3.0					
1.58	1.73	9	0.19	0.02	4.3	3.6	3.6					
0.40	0.47	15	0.14	0.01	4.6	4.0	4.0					
19.17	19.35	1	2.64	0.07	3.9	3.9	3.8	1.84	0.00	0.10	0.04	0.21
15.51	15.62	1	1.46	0.04	4.1	3.8	4.0	1.21	0.00	0.10	0.07	0.20
1.12	1.27	12	0.16	0.03	4.3	4.3	4.7					
2.16	2.22	3	0.16	0.02	4.4	4.2	4.5					
12.88	38.38	66	1.86	0.15	5.4	4.7	4.4					
9.95	43.89	78	0.86	0.34	6.3	5.5	5.3					
9.52	46.92	80	0.50	0.60	6.0	6.0	5.9					
10.97	49.42	78	0.30	0.84	6.1	5.9	5.6					
10.79	47.69	78	0.18	0.92	6.3	6.2	5.6					

TABLE 17.--CHEMICAL PROPERTIES OF SELECTED SOILS--Continued

Soil name and sample number	Depth	Horizon	Extractable bases: Ca	Mg	Na	K	Sum	Extractable acidity	Sum of cations	Base saturation	Organic carbon	Electrical conductivity	pH: H_2O (1:1)	$CaCl_2$ 0.01M (1:2)	KCl 1N (1:1)	Pyrophosphate extractable: C	Fe	Al	Citrate-dithionite extractable: Fe	Al
	In		-----Milliequivalents/100 grams of soil-----							Pct	Pct	Mmhos/cm				Pct	Pct	Pct	Pct	Pct
muck:																				
7-1	0-9	Oa1	52.99	16.46	5.39	0.42	75.26	24.96	100.22	75	22.40	0.00	5.5	5.8	5.9					
-2	9-26	Oa2	26.00	7.41	2.41	0.14	35.96	11.03	46.99	77	7.17	0.00	5.8	5.7	6.0					
-3	26-29	Cg1	5.34	1.69	1.00	0.04	8.07	3.50	11.57	70	0.47	0.00	4.7	4.7	4.9					
-4	29-49	Cg2	7.92	2.72	1.35	0.13	12.12	3.48	15.60	78	0.13	0.00	5.5	5.9	5.8					
-5	49-64	Cg3	11.74	5.35	1.85	0.22	18.81	4.74	23.55	80	0.11	0.10	5.9	5.9	6.1					
-6	64-80	Cg4	12.74	4.94	1.67	0.20	19.55	4.59	24.14	81	0.06	0.06	6.1	6.1	6.3					
a fine																				
-1-1	0-5	A	0.53	1.27	0.21	0.08	2.09	25.64	27.73	8	5.66	0.08	3.7	3.1	2.9					
-2	5-14	E1	0.10	0.12	0.03	0.00	0.25	3.07	3.32	8	0.51	0.02	4.3	3.6	3.4					
-3	14-23	E2	0.04	0.05	0.02	0.00	0.11	0.80	0.91	12	0.22	0.01	4.7	4.1	4.0					
-4	23-29	Bh1	0.04	0.49	0.14	0.01	0.68	32.44	33.12	2	3.44	0.04	4.0	3.3	3.3	3.06	0.01	0.20	0.06	0.20
-5	29-41	Bh2	0.03	0.14	0.05	0.00	0.22	23.78	24.00	1	2.50	0.02	4.2	3.9	3.8	1.84	0.00	0.19	0.06	0.24
-6	41-48	BC	0.03	0.19	0.07	0.01	0.30	12.92	13.22	2	0.87	0.03	4.1	4.2	4.4					
-7	48-68	BC/Bh	0.04	0.11	0.05	0.00	0.20	9.83	10.03	2	0.70	0.02	4.4	4.4	4.6					
-8	68-80	C	0.06	0.05	0.03	0.00	0.14	1.38	1.52	9	0.10	0.04	4.4	4.6	4.9					
o fine																				
-10-1	0-3	A	0.24	0.16	0.05	0.03	0.48	7.53	8.01	6	1.53	0.06	3.6	3.1	3.0					
-2	3-12	E	0.02	0.04	0.02	0.00	0.08	0.31	0.39	21	0.18	0.07	3.7	4.7	5.0					
-3	12-17	Bw/Bh	0.01	0.01	0.02	0.00	0.04	2.63	2.67	1	0.34	0.06	4.8	4.5	4.5					
-4	17-49	Bw	0.01	0.01	0.01	0.00	0.03	1.15	1.18	3	0.13	0.03	4.7	4.7	4.8					
-5	49-80	C	0.01	0.00	0.02	0.00	0.03	0.50	0.56	5	0.06	0.02	4.7	4.7	4.9					
fine sand:																				
-16-1	0-6	A	0.96	0.29	0.04	0.02	1.31	5.41	6.72	19	1.41	0.08	5.0	3.8	4.0					
-2	6-16	E	0.28	0.06	0.02	0.00	0.36	1.31	1.67	22	0.24	0.03	5.1	4.3	4.4					
-3	16-31	B/E	0.25	0.09	0.03	0.01	0.38	4.53	4.91	8	0.30	0.04	5.1	4.4	4.5					
-4	31-55	C	0.15	0.10	0.02	0.01	0.28	2.67	2.95	9	0.10	0.03	5.1	4.3	4.5					
-5	55-80	C	0.15	0.09	0.05	0.01	0.30	1.98	2.28	13	0.06	0.05	5.6	4.5	4.7					
la fine																				
-4-1	0-3	A	0.15	0.05	0.03	0.00	0.23	3.06	3.29	7	0.57	0.03	4.5	4.1	4.1					
-2	3-13	E	0.07	0.02	0.01	0.00	0.10	0.45	0.55	18	0.18	0.01	5.1	4.9	4.9					
-3	13-19	Bw1	0.35	0.06	0.05	0.00	0.46	0.58	1.04	44	0.12	0.01	5.2	5.5	5.6					
-4	19-24	Bw2	0.56	0.08	0.03	0.00	0.67	0.88	1.55	43	0.07	0.01	5.4	5.7	5.8					
-5	24-26	E'	0.38	0.05	0.03	0.00	0.46	0.54	1.00	46	0.10	0.01	5.3	5.5	5.5					
-6	26-33	Btg/E	6.42	1.15	0.15	0.06	7.78	3.36	11.14	70	0.27	0.02	5.3	5.3	5.0				0.68	0.08
-7	33-40	Btg1	6.74	1.19	0.17	0.07	8.17	3.46	11.63	70	0.23	0.04	5.4	5.6	5.3				0.26	0.04
-8	40-47	Btg2	5.54	1.07	0.14	0.07	6.82	3.06	9.88	69	0.15	0.02	5.6	5.8	5.5				0.30	0.06
-9	47-63	Cg	5.12	0.82	0.12	0.07	6.13	2.37	8.50	72	0.13	0.02	5.7	6.1	6.0					
-10	63-80	Cg	5.72	0.58	0.14	0.07	6.51	1.76	8.27	79	0.92	0.06	5.9	6.4	6.5					

TED SOILS--Continued

Base sat-ura-tion	Or-ganic car-bon	Electri-cal conduc-tivity	pH H_2O (1:1)	pH $CaCl_2$ 0.01M (1:2)	pH KCl 1N (1:1)	Pyrophosphate extractable C	Pyrophosphate extractable Fe	Pyrophosphate extractable Al	Citrate-dithio-nite extract-able Fe	Citrate-dithio-nite extract-able Al
Pct	Pct	Mmhos/cm				Pct	Pct	Pct	Pct	Pct
8	0.82	0.04	4.2	3.3	3.0					
11	0.15	0.01	4.6	3.8	3.8					
1	1.60	0.06	3.7	3.6	3.6	1.01	0.00	0.06	1.05	0.11
1	1.25	0.03	4.1	3.6	3.7	1.17	0.00	0.04	0.10	0.06
3	0.33	0.02	4.3	3.4	3.5					
1	0.59	0.03	4.0	3.7	3.7					
11	2.67	0.12	3.9	3.1	3.0					
30	0.36	0.06	4.1	3.3	3.4					
18	0.24	0.05	4.2	3.6	3.7					
3	4.18	0.13	3.7	3.1	3.1	3.34	0.03	0.13	0.07	0.09
1	2.41	0.09	3.8	3.5	3.6	2.28	0.01	0.23	0.02	0.16
17	0.42	0.09	4.1	3.8	3.9				0.06	0.07
28	0.36	0.08	4.4	3.8	3.8					
20	2.80	0.18	4.2	4.1	4.1					
12	0.44	0.04	4.8	4.8	4.8					
83	0.20	0.04	5.0	5.3	5.4					
74	0.23	0.05	5.3	5.6	5.5					
76	0.21	0.03	5.7	5.7	5.4					
74	0.14	0.02	5.8	5.9	5.6				0.72	0.14
77	0.04	0.02	5.8	6.2	6.0					
84	0.03	0.04	6.1	6.4	6.5					
12	1.82	0.06	3.7	3.1	3.2					
20	0.50	0.02	4.2	3.3	3.4					
33	0.28	0.02	4.2	3.6	3.7					
1	3.44	0.11	3.3	3.8	3.8	2.55	0.00	0.22	0.18	0.87
1	1.00	0.04	4.1	4.1	4.1	0.82	0.00	0.12	0.06	0.18
1	0.18	0.02	4.3	4.5	4.7					
22	0.08	0.06	4.4	4.1	4.3					
6	0.55	0.03	4.5	4.2	4.4	0.37	0.00	0.04	0.09	0.05

TABLE 17.--CHEMICAL PROPERTIES OF SELECTED SOILS--Continued

Soil name and sample number	Depth	Horizon	Extractable bases: Ca	Mg	Na	K	Sum	Extractable acidity	Sum of cations	Base saturation	Organic carbon	Electrical conductivity	pH: H_2O (1:1)	$CaCl_2$ 0.01M (1:2)	KCl 1N (1:1)	Pyrophosphate extractable: C	Fe	Al	Citrate-dithionite extractable: Fe	Al
	In		-----Milliequivalents/100 grams of soil-----							Pct	Pct	Mmhos/cm				Pct	Pct	Pct	Pct	Pct
Tavares fine sand:																				
S18-12-1	0-5	A	0.07	0.02	0.03	0.00	0.12	2.23	2.35	5	0.44	0.02	4.5	4.2	3.8					
-2	5-32	C1	0.03	0.04	0.02	0.00	0.09	1.18	1.27	7	0.18	0.02	4.4	4.7	4.8					
-3	32-46	C2	0.02	0.03	0.02	0.00	0.07	1.11	1.18	6	0.09	0.02	4.5	4.6	4.7					
-4	46-80	C3	0.05	0.04	0.02	0.00	0.11	0.38	0.49	22	0.12	0.01	4.7	4.8	4.9					
Valkaria fine sand:																				
S18-20-1	0-6	A	0.74	0.06	0.05	0.00	0.85	1.56	2.41	35	0.34	0.08	4.9	4.7	5.0					
-2	6-12	E1	0.48	0.02	0.04	0.00	0.54	0.63	1.17	46	0.12	0.07	5.4	5.5	5.8					
-3	12-17	E2	0.31	0.01	0.02	0.00	0.34	0.77	1.11	31	0.04	0.06	5.5	5.8	6.1					
-4	17-21	Bw1	0.40	0.02	0.04	0.00	0.46	0.53	0.99	46	0.06	0.08	5.6	5.9	6.0					
-5	21-25	Bw2	0.67	0.06	0.04	0.01	0.78	0.60	1.38	57	0.06	0.07	5.6	5.7	5.8					
-6	25-52	C	2.85	0.14	0.11	0.03	3.13	1.27	4.40	71	0.13	0.09	5.7	5.6	5.5					
-7	52-80	C	2.27	0.11	0.09	0.03	2.50	1.17	3.67	68	0.12	0.12	5.7	5.6	5.5					
Wabasso fine sand:																				
S18-3-1	0-4	A	0.40	0.10	0.05	0.02	0.57	9.72	10.29	6	1.53	0.04	4.1	3.7	3.6					
-2	4-15	E1	0.07	0.04	0.02	0.00	0.13	1.75	1.88	7	0.11	0.01	4.8	4.5	4.6					
-3	15-22	E2	0.08	0.02	0.03	0.00	0.13	1.73	1.86	7	0.11	0.01	5.1	4.9	5.0					
-4	22-30	Bh	4.50	0.49	0.12	0.01	5.12	11.55	16.67	31	2.23	0.03	5.1	4.9	5.1	1.36	0.08	0.12	0.16	0.14
-5	30-35	Btg1	6.70	1.40	0.18	0.06	8.34	6.99	15.33	54	0.41	0.03	5.2	5.0	4.8				0.14	0.08
-6	35-47	Btg2	6.72	1.48	0.17	0.05	8.42	4.62	13.04	65	0.32	0.03	5.3	5.0	5.0				0.16	0.06
-7	47-53	BCg	4.84	1.27	0.16	0.05	6.32	3.51	9.83	64	0.23	0.03	5.3	5.0	4.9					
-8	53-67	Cg	4.79	1.07	0.11	0.05	6.02	3.61	9.63	63	0.11	0.03	5.2	5.0	4.8					
-9	67-63	Cg	4.42	0.82	0.11	0.05	5.40	1.90	7.30	74	0.16	0.03	5.2	5.0	4.7					

TABLE 18.--CLAY MINERALOGY OF SELECTED SOILS

Soil name and sample number	Depth	Horizon	Clay minerals: Montmorillonite	14-angstrom intergrade	Kaolinite	Gibbsite	Quartz
	In		Pct	Pct	Pct	Pct	Pct
Adamsville fine sand:							
S18-14-1	0-7	A		48	19		33
-2	7-22	C1					
-3	22-34	C2		46	19		35
-4	34-57	C3					
-5	57-80	C4		45	19		36
Astatula fine sand:							
S18-13-1	0-7	A		40	20		40
-2	7-29	C1					
-3	29-54	C2					
-4	54-80	C3		21	14		65

TABLE 18.--CLAY MINERALOGY OF SELECTED SOILS--Continued

Soil name and sample number	Depth	Horizon	Clay minerals: Montmo-rillonite	14-angstrom intergrade	Kaolinite	Gibbsite	Quartz
	In		Pct	Pct	Pct	Pct	Pct
Orsino fine sand:							
S18-10-1	0-3	A		9	10		81
-2	3-12	E					
-3	12-17	Bw/Bh		33	11		56
-4	17-49	Bw					
-5	49-80	C		27	12		61
Paola fine sand:							
S18-16-1	0-6	A	27	20	12		41
-2	6-16	E					
-3	16-31	B/E	17	45	16		22
-4	31-55	C					
-5	55-80	C	24	46	21		9
Pineda fine sand:							
S18-4-1	0-3	A		38	20		42
-2	3-13	E					
-3	13-19	Bw1					
-4	19-24	Bw2		39	32		29
-5	24-26	E'					
-6	26-33	Btg/E					
-7	33-40	Btg1	50	24	18		8
-8	40-47	Btg2					
-9	47-63	Cg					
-10	63-80	Cg	72	10	14		4
Pomello fine sand:							
S18-11-1	0-5	A					100
-2	5-41	E					
-3	41-55	Bh1	15	15	9		61
-4	55-66	Bh2					
-5	66-75	C1					
-6	75-80	C2					100
Pomona fine sand:							
S18-19-1	0-6	A					100
-2	6-10	E1					
-3	10-21	E2					
-4	21-28	Bh1			11		89
-5	28-50	Bh2					
-6	50-63	Bt	46	15	30		9
-7	63-80	C	41	13	36		10
Riviera fine sand:							
S18-5-1	0-6	A		38	28		34
-2	6-17	E1					
-3	17-25	E2					
-4	25-28	EB					
-5	28-35	Btg/E					

TABLE 18.--CLAY MINERALOGY OF SELECTED SOILS--Continued

Soil name and sample number	Depth	Horizon	Clay minerals: Montmorillonite	14-angstrom intergrade	Kaolinite	Gibbsite	Quartz
	In		Pct	Pct	Pct	Pct	Pct
Tavares fine sand:							
S18-12-1	0-5	A	17	36	12		35
-2	5-32	C1					
-3	32-46	C2					
-4	46-80	C3		45	10		45
Valkaria fine sand:							
S18-20-1	0-6	A	13	14	9		64
-2	6-12	E1					
-3	12-17	E2					
-4	17-21	Bw1	24	39	12		25
-5	21-25	Bw2					
-6	25-52	C	33	15	41		11
-7	52-80	C					
Wabasso fine sand:							
S18-3-1	0-4	A		22	12		66
-2	4-15	E1					
-3	15-22	E2					
-4	22-30	Bh		42	21		37

TABLE 19.--ENGINEERING INDEX TEST DATA

(Tests were 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 Association of State Highway and Transportation Officials (AASHTO). NP means nonplastic)

Soil name, report number, horizon, and depth in inches	FDOT report number	Classification		Mechanical analysis*							Liquid limit	Plasticity index	Moisture density**	
				Percentage smaller than--			Percentage smaller than--						Maximum dry density	Optimum moisture
		AASHTO***	Unified (est.)	No. 10	No. 40	No. 200	.05 mm	.02 mm	.005 mm	.002 mm				
											Pct		Lb/cu ft	Pct
Adamsville fine sand: (S86FL-035-14) C1 ------- 7-22	22	A-3	SP-SM	100	100	3	3	3	2	2	NP	NP	98.9	12.2
Astatula fine sand: (S86FL-035-13) C2 ------- 29-54	21	A-3	SP-SM	100	99	3	3	3	2	1	NP	NP	99.4	16.2
Bimini fine sand: (S87FL-035-18) E -------- 6-28	27	A-3	SP-SM	100	82	3	3	2	1	1	NP	NP	102.3	14.6
Bulow sand: (S86FL-035-15) Bw ------- 20-50	23	A-3	SP-SM	100	72	3	3	3	3	2	NP	NP	107.1	10.5
Cassia fine sand: (S86FL-035-08) E2 ------- 12-26	16	A-3	SP-SM	100	99	2	2	1	1	1	NP	NP	96.2	17.3
Favoretta clay: (S87FL-035-21) Btg2 ----- 21-36	30	A-7-6	CH, CL	100	99	84	80	71	61	55	68	46	102.8	17.5
Gator muck: (S86FL-035-07) Cg2 ------ 29-49	15	A-2-4	SM-SC	100	98	33	29	27	22	19	NP	NP	118.1	12.3

TABLE 19.--ENGINEERING INDEX TEST DATA--Continued

Soil name, report number, horizon, and depth in inches	FDOT report number	Classification		Mechanical analysis*							Liquid limit	Plasticity index	Moisture density**	
				Percentage smaller than--			Percentage smaller than--						Maximum dry density	Optimum moisture
		AASHTO***	Unified (est.)	No. 10	No. 40	No. 200	.05 mm	.02 mm	.005 mm	.002 mm				
											Pct		Lb/cu ft	Pct
Smyrna fine sand: (S86FL-035-09) BE ------- 21-50	17	A-3	SP-SM	100	99	6	6	6	4	4	NP	NP	103.1	11.2
Tavares fine sand: (S86FL-035-12) C1 ------- 5-32	20	A-3	SP-SM	100	99	4	4	4	3	3	NP	NP	99.2	11.0
Valkaria fine sand: (S87FL-035-20) E1 ------- 6-12	29	A-3	SP-SM	100	87	5	5	4	4	4	NP	NP	105.3	12.2
Wabasso fine sand: (S86FL-035-03)														
E1 ------- 4-15	6	A-3	SP-SM	100	97	2	2	2	1	1	NP	NP	96.2	8.8
Bh ------- 22-30	7	A-3	SP-SM	100	98	8	7	6	4	4	NP	NP	103.9	13.8
Btg2 ----- 35-47	8	A-2-4	SM-SC	100	98	21	20	20	18	18	NP	NP	108.3	11.0

* Mechanical analyses according to AASHTO designation T88-78. Results by this procedure differ somewhat from results obtained by the soil survey procedure of the Natural Resources Conservation Service (NRCS). In the AASHTO procedure, the fine material is analyzed by the hydrometer method and the various grain-sized [illegible] calculated on the basis of all the material, including that coarser than 2 millimeters in [illegible]

TABLE 20.--CLASSIFICATION OF THE SOILS

Soil name	Family or higher taxonomic class
Adamsville	Hyperthermic, uncoated Aquic Quartzipsamments
Astatula	Hyperthermic, uncoated Typic Quartzipsamments
Basinger	Siliceous, hyperthermic Spodic Psammaquents
Bimini	Sandy, siliceous, hyperthermic Arenic Ultic Haplohumods
Bulow	Loamy, siliceous, hyperthermic Arenic Hapludalfs
Cassia	Sandy, siliceous, hyperthermic Oxyaquic Alorthods
Chobee	Fine-loamy, siliceous, hyperthermic Typic Argiaquolls
Cocoa	Sandy, siliceous, hyperthermic Psammentic Hapludalfs
Eaugallie	Sandy, siliceous, hyperthermic Alfic Alaquods
Favoretta	Fine, montmorillonitic, hyperthermic Typic Argiaquolls
Gator	Loamy, siliceous, aquic, hyperthermic Terric Medisaprists

NRCS Accessibility Statement

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