Issued June 1966

SOIL SURVEY

SEMINOLE COUNTY FLORIDA

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

Major fieldwork for this survey was done in the period 1955–63. Soil names and descriptions were approved in 1964. Unless otherwise indicated, statements in the publication refer to conditions in the county in 1964. The survey was made as part of the technical assistance furnished to the Seminole Soil and Water Conservation District.

HOW TO USE THIS SOIL SURVEY REPORT

THIS SOIL SURVEY of Seminole County contains information that can be applied in managing farms, ranches, and woodlands; in selecting sites for roads, ponds, buildings, or other structures; and in appraising the value of tracts of land for agriculture, industry, or recreation.

Locating Soils

All the soils of Seminole County are shown on the detailed map at the back of this report. This map consists of many sheets that are made from aerial photographs. Each sheet is numbered to correspond with numbers shown on the Index to Map Sheets.

On each sheet of the detailed map, soil areas are outlined and are identified by symbol. All areas marked with the same symbol are the same kind of soil. The soil symbol is inside the area if there is enough room; otherwise, it is outside and a pointer shows where the symbol belongs.

Finding and Using Information

The "Guide to Mapping Units, Capability Units, and Range Sites" at the back of this report can be used to find information in the report. This guide lists all of the soils of the county in alphabetic order by map symbol. It shows the page where each kind of soil is described, and also the page for the capability unit, and range site in which the soil has been placed.

Individual colored maps showing the relative suitability or limitations of soils for many specific purposes can be developed by using the soil map and information in the text. Interpretations not included in the text can be developed by grouping the soils according to their suitability or limitations for a particular use. Translucent material can be used as an overlay over the soil map and colored to show soils that have the same limitation or suitability. For example, soils that have a slight limitation for a given use can be colored green, those with a moderate limitation can be colored yellow, and those with a severe limitation can be colored red.

Farmers and those who work with farmers can learn about use and management of the soils in the soil descriptions and in the discussions of the interpretative groupings.

Foresters and others can refer to the section "Use of the Soils for Woodland," where the soils of the county are grouped according to their suitability for trees.

Ranchers and others interested in range can find, under "Use of the Soils for Woodland Range," groupings of the soils according to their suitability for range, and also the plants that grow on each range site.

Community planners and others concerned with suburban development can read about the soil properties that affect the choice of homesites, industrial sites, schools, and parks in the section "Nonfarm Uses of Soils."

Engineers and builders will find under "Engineering Properties of Soils" tables that give engineering descriptions of the soils in the county and that name soil features that affect engineering practices and structures.

Scientists and others can read about how the soils were formed and how they are classified in the section "Formation, Classification, and Morphology of Soils."

Students, teachers, and others will find information about soils and their management in various parts of the text.

Newcomers in Seminole County may be especially interested in the section "General Soil Map," where broad patterns of soils are described. They may also be interested in the section "General Nature of the Area," which gives additional information about the county.

Cover picture: Cultivating cabbage on Terra Ceia muck.

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NOTICE TO LIBRARIANS

Series year and series number are no longer shown on soil surveys. See explanation on the next page.

Issued June 1966

EXPLANATION

Series Year and Series Number

Series year and number were dropped from all soil surveys sent to the printer after December 31, 1965. Many surveys, however, were then at such advanced stage of printing that it was not feasible to remove series year and number. Consequently, the last issues bearing series year and number will be as follows:

Series 1957, No. 23, Las Vegas-Eldorado Area, Nev.
Series 1958, No. 34, Grand Traverse County, Mich.
Series 1959, No. 42, Judith Basin Area, Mont.
Series 1960, No. 31, Elbert County, Colo. (Eastern part)
Series 1961, No. 42, Camden County, N.J.
Series 1962, No. 13, Chicot County, Ark.
Series 1963, No. 1, Tippah County, Miss.

Series numbers will be consecutive in each series year, up to and including the numbers shown in the foregoing list. The soil survey for Tippah County, Miss., will be the last to have a series year and series number.

SOIL SURVEY OF SEMINOLE COUNTY, FLORIDA

BY ALBERT L. FURMAN AND HORACE O. WHITE, SOIL CONSERVATION SERVICE[1]

UNITED STATES DEPARTMENT OF AGRICULTURE IN COOPERATION WITH THE UNIVERSITY OF FLORIDA AGRICULTURAL EXPERIMENT STATIONS

SEMINOLE COUNTY is in the east-central part of Florida (fig. 1). It is one of the smallest counties in the State; the total area is 321 square miles. Sanford, the county seat, is on the southern shore of Lake Monroe in the north-central part of the county.

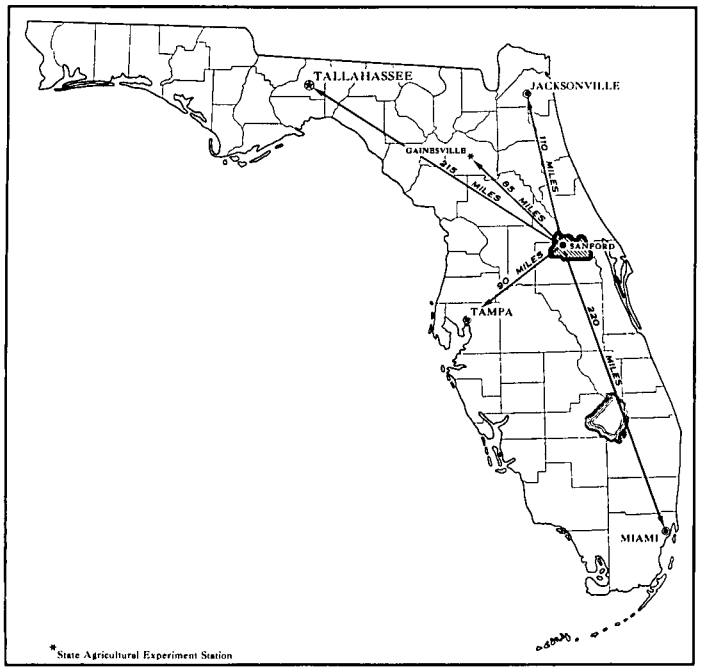

Figure 1.—**Location of Seminole County in Florida.**

The county is 30 feet above sea level at Sanford. The average annual rainfall is about 53 inches, and the average annual temperature is 72°F.

Agriculture is still the principal enterprise and the main source of income in this county. Celery is the chief crop. Other truck crops produced and shipped in large quantities are lettuce, carrots, cucumbers, peppers, string beans, eggplant, cauliflower, watercress, cabbage, and endive. The main general farm crops are corn and forage crops. Oranges and grapefruit; azaleas, camellias, ferns and other nursery plants; sod for landscaping; and amaryllis, gladiola, and caladium bulbs are important special crops. The manufacture of fertilizer and ice and the processing and precooking of fruits and vegetables are associated industries that are also important sources of income.

The raising of beef and dairy cattle is important in this county. Also, at the time this survey was made, there was approximately 95,125 acres of commercial timberland in the county.

This county is rapidly developing a diversified economy. The growth in activities related to the development of the space program has greatly influenced the shift from agricultural uses to nonfarm uses of the soils. Industries are becoming more important to the economic strength of the county.

This county has many large and small lakes, such as Lake Monroe, Lake Jessup, and Lake Harney, and many small manmade lakes. It has other excellent facilities for recreation. Fishing and boating are popular on the winding St. Johns River, and there are several golf courses and racetracks in the county. Two of the major tourist attractions of Florida, the Big Tree, the oldest living cypress in the United States, and Sanlando Springs, are in this county.

General Soil Map

The general soil map at the back of this report shows, in color, the soil associations in Seminole County. A soil association is a landscape that has a distinctive proportional pattern of soils. It normally consists of one or more major soils and at least one minor soil, and it is named for the major soils. The soils in one association may occur in another, but in a different pattern.

A map showing soil associations is useful to people who want a general idea of the soils in a county, who want to compare different parts of a county, or who want to know the location of large tracts that are suitable for a certain kind of farming or other land use. Such a map is not suitable for planning the management of a farm or field, because the soils in any one association ordinarily differ in slope, depth, drainage, and other characteristics that affect management.

The 11 soil associations in Seminole County are described briefly in this section. Two consist of undulating soils that are mainly moderately well drained to excessively drained. The rest consist of nearly level soils that are mainly somewhat poorly drained to very poorly drained. More detailed information about the individual

[1] Others participating in the field survey were DAVID E. PETTRY, ORLANDO E. CRUZ, R. M. CRAIG, and LEON T. STEM, Soil Conservation Service.

soils in each association can be obtained by studying the detailed soil map and by reading the section "Descriptions of the Soils." Use and management of the soils for farming is discussed in the section "Use and Management of Soils." That section also describes uses of the soils for engineering and nonfarm purposes.

1. St. Lucie-Lakewood-Pomello Association

Undulating, excessively drained and slightly wet, deep, sandy soils

This association is made up of undulating areas of low sandhills interspersed with a few lakes, small grassy ponds, and isolated wet areas. The association occupies one large area near the town of Geneva and a small area between Curryville Road and the county line in the southern part of the county. It is undulating, but the slopes are mainly gentle; a few steeper breaks are adjacent to the lakes and shallow depressions. The native vegetation was sandpine, scrub oak, turkey oak, palmetto, and rosemary on the sandhills; cypress and bay and other water-tolerant hardwoods around the lakes; and water-tolerant grasses in the shallow ponds and wet areas. This association covers about 4 percent of the county. The soils are sandy, and their thickness ranges from 42 to more than 72 inches.

The major soils of this association are the St. Lucie, Lakewood, and Pomello. The St. Lucie soils make up about 50 percent of the association. They are light-colored, deep, excessively drained fine sands.

The Lakewood soils, which account for about 25 percent of the total area, are also light colored, deep, and excessively drained. Moderately well drained Pomello soils make up about 20 percent of the association, and somewhat poorly drained to very poorly drained Leon and Plummer soils make up a minor part.

The soils of this association have not been developed for agriculture, except where a field has been squared for a citrus grove. Most areas remain in native vegetation. The St. Lucie and Lakewood soils are too low in fertility and too droughty for cultivation. They are of only limited use for pasture, range, and trees, but they provide protection and limited food for wildlife. The wet areas have little agricultural value.

2. Blanton-Lakeland Association

Undulating, moderately well drained to somewhat excessively drained, sandy soils interspersed with lakes, ponds, and wet depressions

This soil association is made up of undulating sandhills interspersed with many natural lakes, ponds, and wet depressions. The areas are dominant in the western part of the county, and two small areas are near the towns of Geneva and Chuluota. The slopes are mainly gentle, but some steeper breaks are adjacent to most of the natural depressions and lakes. The native vegetation was longleaf pine on the sandhills, cypress and bay and other wetland hardwoods in the swampy areas, and water-tolerant grasses in the shallow ponds. This association covers about 20 percent of the county. The soils are mainly sandy and are more than 42 inches deep.

The major soils in this association are the Blanton and Lakeland. High phases of Blanton soils make up about 50 percent of the association. These are sandy, light-gray or light brownish-gray to very pale brown, well-drained to somewhat excessively drained soils that are strongly acid. They occur in a fairly uniform pattern.

The Lakeland soils, which account for about 30 percent of the total area, are light yellowish-brown to yellowish-brown, well-drained, strongly acid fine sands. Low phases of Blanton soils, which are moderately well drained, make up about 15 percent of this association.

Minor soils of this association are the Leon, Plummer, St. Lucie, and Lakewood. Somewhat poorly drained Leon soils account for about 2 percent of the association; poorly drained Plummer soils, for about another 2 percent; and excessively drained St. Lucie and Lakewood soils, for about 1 percent. The St. Lucie and Lakewood soils are in small areas west of Forest City, just north of Sand Lake, near the town of Altamonte Springs, and northeast of Yankee Lake.

The original pines and commercially valuable hardwoods on this association have been harvested; most of the woodland is now second growth. Scrub oaks grow with scattered pine in most of the undeveloped areas on the well-drained fine sands. About half the acreage of this association in the western part of the county is in highly productive citrus groves, but there is a trend toward urban development. The wetter areas are mostly undeveloped, and they remain under a cover of native trees or grass.

Where the climate is favorable, the well-drained soils of this association are well suited to citrus trees. The soils are somewhat droughty, but irrigation water is available in most areas. These droughty soils are moderately well suited to improved pasture but are poorly suited to general farm crops. Under present conditions the wet areas have little agricultural value. The association has few limitations for urban development.

3. Blanton-Leon-Plummer Association

Nearly level, moderately well drained, sandy soils interspersed with areas of slightly wet and wet soils, and dotted with lakes and ponds

This soil association is made up of low, nearly level to gently undulating sandy ridges or knolls, of wet areas of flatwoods, and of connecting narrow swamps. The areas are mostly in the southern part of the county. The native vegetation was longleaf and slash pine on the better drained areas, wetland hardwoods and cypress in the swamps, and water-tolerant grasses in the shallow intermittent ponds. This association covers about 13 percent of the county. The soils, for the most part, are sandy and more than 42 inches deep.

The major soils of this association are the Blanton, Leon, and Plummer. Low phases of Blanton soils make up about 50 percent of the association. These are light-colored, deep sands that normally have a water table 3 to 6 feet from the surface. They are slightly more elevated than the surrounding soils.

The Leon soils, which account for about 15 percent of the total area, are nearly level, somewhat poorly drained sands; they have a brown, stained pan in the uppermost 30 inches. The high phases of Plummer soils are nearly level, poorly drained sands of light gray to

gray color. They occupy about 15 percent of the association.

Minor soils of this association are the Immokalee, Pomello, Rutlege, Lakeland, and high phases of the Blanton. The poorly drained Immokalee soils account for about 10 percent of the association; the moderately well drained Pomello soils, about 3 percent; the very poorly drained Rutlege soils and the well drained Lakeland soils each about 3 percent; and the high phases of the Blanton, about 1 percent.

The original pines and commercially valuable hardwoods of this association have been harvested; most of the woodland is now second growth. Scrub oaks grow with scattered pines in most of the undeveloped areas on the moderately well drained sands. A small part of the moderately well drained acreage is now cultivated. The wetter areas are mostly undeveloped, and they remain under a cover of native trees or grass.

The moderately well drained soils of the association are well suited to citrus trees, and groves of these trees now occupy most of the warmer sites near lakes. The soils of this association are also suited to improved pasture and special cultivated crops. Under present conditions of artificial water control, some of the poorly drained areas are cultivated.

4. Leon-Immokalee-Plummer Association

Nearly level, somewhat poorly drained, sandy soils underlain by a brown, stained pan, and very poorly drained soils in sloughs, swamps, and ponds

This soil association consists of nearly level tracts, of scattered small sloughs and swamps, and of narrow drainageways that connect some of the swamps. The areas are fairly large and occur throughout the county. The native vegetation was pine and palmetto on the somewhat poorly drained soils, and cypress and bay and other water-tolerant hardwoods in the swampy areas. The association covers about 28 percent of the county. The soils, for the most part, are somewhat poorly drained sands that contain a brown, stained pan, and they occur in a fairly uniform pattern.

The major soils of this association are the Leon, Immokalee, and Plummer. Somewhat poorly drained Leon soils make up about 45 percent of the association. They are gray to dark gray or black and are strongly acid, deep sands. In a few places they have a layer of sandy clay loam at a depth of more than 30 inches. In the Leon soils the water table is normally 2 to 3 feet beneath the surface.

The Immokalee soils account for about 35 percent of the association. Like the Leon soils, they are somewhat poorly drained and have a water table, normally at a depth of 2 to 3 feet. Poorly drained and very poorly drained Plummer soils make up about 15 percent of the association. Very poorly drained Rutlege soils make up most of the remaining 5 percent, but two areas southeast of Chuluota have a fairly high proportion of Pomello soils. In the Plummer and Rutlege soils, the water table is normally at or near the surface.

The original pines on this association have been harvested, and most of the woodland is now second growth. Scattered pines and palmettos grow on most of the undeveloped areas of somewhat poorly drained sands. About 20 percent of the acreage of somewhat poorly drained soils is now cultivated, and about 10 percent is in improved pasture. The wetter areas are mostly undeveloped, and they remain under a cover of native trees or grass.

5. Leon-Delray-St. Johns Association

Nearly level, somewhat poorly drained to very poorly drained soils that are sandy to a depth of more than 30 inches

This soil association consists of nearly level soils mainly in the area called the Celery Delta. One large area is northwest of Lake Jessup, and other areas are south and east of Lake Jessup and in the extreme southeastern part of the county. The native vegetation was pine and palmetto on the somewhat poorly drained soils; cabbage-palms, gum, and bay on the poorly drained soils; and cypress and bay and other wetland hardwoods on the very poorly drained soils. The association covers about 13 percent of the county. The soils generally have a thick, black surface layer, are somewhat poorly drained or poorly drained, and are sandy to a depth of more than 30 inches. Most of them have a pan, stained with organic matter, at a depth of 12 to 48 inches.

The major soils of this association are the Leon, Delray, and St. Johns. The Leon soils make up about 40 percent of the total area, Delray soils about 30 percent, St. Johns soils about 15 percent, and Immokalee soils about 10 percent. The Leon and Immokalee soils are somewhat poorly drained. The rest are poorly drained. Manatee soils, also poorly drained, make up about 2 percent of the association, and very poorly drained Pompano soils make up the remaining 3 percent. The Manatee soils occur in a narrow band around the outer fringes of the Celery Delta and on the flood plains of the St. Johns River. The upper part of their profile is sandy, but loamy material is at a depth of less than 30 inches.

The original pines on this association have been harvested; most of the woodland is now second growth. Scattered pines and palmettos grow in most undeveloped areas on the somewhat poorly drained sands. Cabbage-palms, gum, and bay grow in the areas of poorly drained soils; cabbage-palms grow on the fringes of the sloughs and swamps, where the soils are calcareous; and water-tolerant grasses grow in the shallow ponds.

The soils of this association are well suited to special truck crops and improved pasture, but artificial water control is necessary for best results. About 95 percent of the association is now used for truck crops and pasture. Some areas adjacent to the town of Sanford have been used for housing developments, and housing developments are planned for other areas.

6. Pompano-Delray Association

Nearly level, poorly drained and very poorly drained soils that are sandy to a depth of more than 30 inches

This soil association is made up of low, flat areas and sloughs, waterways, ponds, and swamps. The areas lie mainly south of Lake Harney, adjacent to the flood plains of the St. Johns River, but one area is southeast

of Lake Jessup. The native vegetation was cabbage-palms, cedar, oak, pine, and water-tolerant grasses. The association covers about 5 percent of the county. The soils are mainly deep sands, but some areas have fine sandy clay or fine sandy clay loam of various colors and degrees of mottling below a depth of 30 inches.

The major soils of this association are the Pompano and Delray. The Pompano soils make up about 45 percent of the total area. They are poorly drained or very poorly drained, and they have a surface layer of dark grayish-brown to black fine sand 4 to 8 inches thick. Below their surface layer is light-gray to very pale brown fine sand.

The Delray soils, which account for about 40 percent of the total area, are also poorly drained or very poorly drained. They have a surface layer of very dark gray to black fine sand, 8 to 20 inches thick, and a light-gray to pale-yellow subsoil.

Minor soils of this association are the Leon, Charlotte, and Manatee. Somewhat poorly drained Leon soils account for about 10 percent of the association, poorly drained or very poorly drained Charlotte soils for about 3 percent, and poorly drained or very poorly drained Manatee soils for about 2 percent.

About 15 percent of the total area has been cleared and is used for pasture, but most of the association is covered by the native vegetation and is used for native range and wood products. Just south of Lake Harney, there is a swamp type of vegetation—cypress or mixed hardwoods and cabbage-palms. Most of the area southeast of Lake Jessup has been cleared and planted to citrus trees and truck crops. In most places the soils in that area have been drained and the water artificially controlled. At times, the soils are covered with water for a long period during wet seasons. If they are drained and intensively managed, however, they are well suited to truck crops.

7. Iberia-Manatee-Delray Association

Poorly drained and very poorly drained, dark-colored soils on flood plains; dominated by loamy or clayey surface layer

This soil association is made up of nearly level, low, broad, grassy areas of wet prairies and dense hardwood hammocks on the flood plains of the St. Johns River, in low areas west of Lake Jessup, and west of Lake Monroe. The areas are subject to overflow during seasons of high rainfall. The native vegetation was cabbage-palms and water-tolerant hardwoods on the hammocks and water-tolerant grasses on the prairie. The association covers about 6 percent of the county. The soils are mainly poorly drained or very poorly drained and are slightly acid to neutral. They have a dark-colored surface layer and are underlain by calcareous material.

The dominant soils of the association are the Iberia, Manatee, and Delray on the flood plains of the St. Johns River. Very poorly drained Iberia soils make up about 30 percent of the association. Iberia soils occupy about 95 percent of the total area of this association on the flood plains west of Lake Jessup and west of Lake Monroe. These soils have a very dark gray to black, sandy surface layer, and a mottled, grayish subsoil of sandy clay within 30 inches of the surface.

The Delray soils, which account for about another 30 percent of the St. Johns River area, have a surface layer similar to that of the Iberia soils, but the sandy texture extends to a depth below 30 inches. The Manatee soils make up about 25 percent of the St. Johns River part of this association. They have soil characteristics similar to those of the Iberia soils, but they are more sandy. Minor soils of this association are the Felda, which make up about 10 percent of the association, and the Pompano, which make up about 5 percent.

The soils of this association are limited in their use because they are frequently flooded. Attempts have been made to establish small areas of improved pasture, but most of the areas are used for range.

8. Delray-Manatee-Iberia Association

Poorly drained and very poorly drained soils on flood plains; dominated by dark-colored, sandy surface layer

Most of this association is made up of nearly level areas of hammocks northeast of the town of Oviedo. The soils are on flood plains and are poorly drained and very poorly drained. The native vegetation was a dense hammock growth of bay, magnolia, gum, oak, cypress, cabbage-palm, and maple. This association covers about 2 percent of the county.

The major soils of this association are the Delray, Manatee, and Iberia. Very poorly drained Delray soils make up about 55 percent of the association. These soils have a very dark gray to black, sandy surface layer and a very pale brown or pale brown, sandy subsoil more than 30 inches thick.

The Manatee soils, which account for about 25 percent of the total area, have a surface layer similar to that of the Delray soils, but they have a gray, mottled, loamy subsoil within 30 inches of the surface. The Iberia soils are similar to the Manatee, but they have a finer textured surface layer and a subsoil of sandy clay to clay. They make up about 15 percent of the total area. Minor soils in the association are the Pompano, which make up about 2 percent of the association, and Terra Ceia, which make up about 3 percent.

The soils of this association are highly productive and are well suited to special truck crops. Artificial water control is required, however, for best results. Most of the association has been cleared and is used to grow truck crops.

9. Okeechobee-Terra Ceia Association

Nearly level, very poorly drained muck soils

This soil association occupies a long, narrow area just east of Lake Jessup. The native vegetation was a dense hammock growth of bay, magnolia, gum, oak, cypress, cabbage-palm, and maple. This association covers only about 1 percent of the county. The soils, for the most part, are very dark brown to black mucks.

The major soils of this association are the Okeechobee and Terra Ceia. Okeechobee muck makes up about 50 percent of the association. It has a thick surface layer of black muck and is underlain by brown fibrous peat.

Terra Ceia soils, which make up about 40 percent of the association, also have a thick, black surface layer, but they are underlain by sandy to loamy material. Delray

soils account for the remaining 10 percent of the association. They have a surface layer of mucky fine sand that is 8 to 14 inches thick and a very pale brown or pale brown subsoil that is more than 30 inches thick.

The northern half of this association is treeless, and the vegetation consists of sedges, lilies, flags, and other water-tolerant plants. Except for an area just north of the town of Oviedo, the northern half has not been developed for agriculture, because the soils are subject to frequent flooding. About 50 percent of the association, however, has been cleared and is used for truck crops. These are highly productive soils, but intensive water-control measures are required. The soils are well suited to special truck crops.

10. Istokpoga Association

Nearly level, very poorly drained woody peat soils

This soil association occupies two large depressions southwest of the town of Oviedo. The native vegetation was a dense growth of hammock vegetation consisting of hardwoods and cypress trees. This association covers only about 1 percent of the county.

The major soils of this association are the Istokpoga, and they occupy about 95 percent of the total area. The Istokpoga soils consist of a thick layer of dark-brown to black woody peat underlain by sand.

Rutlege soils account for about 5 percent of the total area. They consist of 8 to 14 inches of black fine sand over light-gray to very pale brown or brown fine sand, and this sandy material is more than 42 inches deep.

Most of this association has been cleared, and the soils are used mainly for special truck crops. The soils are well suited to special truck crops if the water is artificially controlled and good management is practiced.

11. Swamp Association

Nearly level areas of fresh water swamp covered by water most of the time

This association occupies broad areas of swamp adjacent to some of the large lakes. It is also in long, narrow areas along the rivers and creeks of the county. The soils are poorly drained or very poorly drained and have extremely variable characteristics. The association makes up about 7 percent of the county.

Bay and other wetland hardwoods make up the native vegetation in some parts of this association. Cypress grows in the wettest areas. Most of the areas are unimproved and remain in native vegetation, but some areas along the St. Johns River have been improved for pasture. During dry periods cattle find some range forage in the swamps.

Soils of Seminole County

This section tells how the soil survey was made and the methods used in doing the fieldwork on which the survey is based. It also tells briefly how soils are named and classified and what soil properties are significant in determining soil separations that were made on the soil map. More detailed information about soil classification is given in the section "Formation, Classification, and Morphology of Soils."

This section also briefly discusses the soil series and the mapping units in Seminole County. For each soil series, a typical profile is briefly described.

How This Soil Survey Was Made

Soil scientists made this survey to learn what kinds of soils are in Seminole County, where they are located, and how they can be used.

They went into the county knowing they likely would find many soils they had already seen, and perhaps some they had not. As they traveled over the county, they observed steepness, length, and shape of slopes; size and speed of streams; kinds of native plants or crops; and many facts about the soils. They dug many holes to expose soil profiles. A profile is the sequence of natural layers, or horizons, in a soil; it extends from the surface down into the parent material that has not been changed much by leaching or by roots of plants.

The soil scientists made comparisons among the profiles they studied, and they compared these profiles with those in counties nearby and in places more distant. They classified and named the soils according to nationwide, uniform procedures. To use this report efficiently, it is necessary to know the kinds of groupings most used in a local soil classification.

Soils that have profiles almost alike make up a soil series. Except for different texture in the surface layer, all the soils of one series have major horizons that are similar in thickness, arrangement, and other important characteristics. Each soil series is named for a town or other geographic feature near the place where a soil of that series was first observed and mapped. Blanton and Leon, for example, are the names of two soil series. All the soils in the United States having the same series name are essentially alike in those characteristics that go with their behavior in the natural, untouched landscape. Soils of one series can differ somewhat in texture of the surface soil and in slope or some other characteristic that affects use of the soils by man.

Many soil series contain soils that differ in texture of their surface layer. According to such differences in texture, separations called soil types are made. Within a series, all the soils having a surface layer of the same texture belong to one soil type. Leon sand and Leon fine sand are two soil types in the Leon series. The difference in texture of their surface layers is apparent from their names.

Some soil types vary so much in slope, depth, or some other feature affecting their use, that practical suggestions about their management could not be made if they were shown on the soil map as one unit. Such soil types are divided into phases. The name of a soil phase indicates a feature that affects management. For example, Lakeland fine sand, 0 to 5 percent slopes, is one of several phases of Lakeland fine sand, a soil type that ranges from nearly level to gently sloping.

After a guide for classifying and naming the soils had been worked out, the soil scientists drew the boundaries of the individual soils on aerial photographs. These photographs show woodland, buildings, field borders, trees, and other details that greatly help in drawing

boundaries accurately. The soil map in the back of this report was prepared from the aerial photographs.

The areas shown on a soil map are called mapping units. On most maps detailed enough to be useful in planning the management of farms and fields, a mapping unit is nearly equivalent to a soil type or a phase of a soil type. It is not exactly equivalent, because it is not practical to show on such a map all the small, scattered bits of soil of some other kind that have been seen within an area that is dominantly of a recognized soil type or soil phase.

In preparing some detailed maps, the soil scientists have a problem of delineating areas where different kinds of soils are so intricately mixed, and so small in size, that it is not practical to show them separately on the map. Therefore, they show this mixture of soils as one mapping unit and call it a soil complex. Ordinarily, a soil complex is named for the major kinds of soil in it, for example, Manatee-Delray complex, overflow. Also, on most soil maps, areas are shown that are so rocky, so shallow, or so frequently worked by wind and water that they scarcely can be called soils. These areas are shown on a soil map like other mapping units, but they are given descriptive names, such as Sandy alluvial land or Swamp, and are called land types rather than soils. Another kind of mapping unit is the undifferentiated soil group, which consists of two or more soils not separated on the map because differences among them are small, their practical value is limited, or they are too difficult to reach. An example is Rutlege, Plummer, and St. Johns soils.

While a soil survey is in progress, samples of soils are taken, as needed for laboratory measurements and for engineering tests. Laboratory data from the same kinds of soils in other places are assembled. Data on yields of crops under defined practices are assembled from farm records and from field or plot experiments on the same kinds of soils. Yields under defined management are estimated for all the soils.

But only part of a soil survey is done when the soils have been named, described, and delineated on the map, and the laboratory data and yield data have been assembled. The mass of detailed information then needs to be organized in a way that it is readily useful to different groups of readers, among them farmers, ranchers, managers of woodland, engineers, and homeowners. Grouping soils that are similar in suitability for each specified use is the method of organization commonly used in the soil survey reports. On the basis of yield and practice tables and other data, the soil scientists set up trial groups, and test them by further study and by consultation with farmers, agronomists, engineers, and others. Then, the scientists adjust the groups according to the results of their studies and consultation. Thus, the groups that are finally evolved reflect up-to-date knowledge of the soils and their behavior under present methods of use and management.

Descriptions of the Soils

This section describes the soil series and the mapping units in Seminole County. The procedure is first to describe each soil series, and then the mapping units in that series. Thus, to get full information on any one mapping unit, it is necessary to read the description of that unit and also the description of the soil series to which it belongs.

The soil series contains a description of the soil profile, the major layers from the surface downward. This profile is considered typical, or representative, for all the soils of the series. If the profile for a given mapping unit differs from this typical profile, the differences are stated in the description of the mapping unit, or they are apparent in the name of the mapping unit. Some technical terms are used in describing soil series and mapping units, simply because there are no nontechnical terms that convey precisely the same meaning. Many of the more commonly used terms are defined in the Glossary.

The acreage and proportionate extent of the mapping units are shown in table 1. Detailed technical descriptions of soil series are given in the section "Formation, Classification, and Morphology of Soils." At the back of the report is a list of the mapping units in the county and the capability unit and range site each is in. The page where each of these groups is described is also given.

Blanton series

Blanton soils are deep, rapidly permeable sands. They are nearly level to moderately steep and are on both high and low ridges. Large areas of these soils are in the western part of the county, and smaller areas are in other parts. The following describes the main layers in a typical profile:

0 to 4 inches, gray, loose fine sand.
4 to 30 inches, light brownish-gray, loose fine sand.
30 to 60 inches, light-gray or very pale brown, loose fine sand mottled with light yellowish brown and white.
60 to 72 inches +, pale-brown to very dark grayish-brown, mottled, friable sandy clay loam.

The surface layer ranges from gray to dark grayish brown in color and from 3 to 8 inches in thickness. The second layer ranges from light gray or light brownish gray to grayish brown in color and from 24 to 42 inches in thickness. The color of the third layer ranges from white to pale brown or light gray. In some places the fourth layer is at a somewhat greater or much greater depth than 60 inches; this layer is absent in many other places.

The Blanton soils are porous and droughty and are strongly acid and low in natural fertility. Nevertheless, some of these soils are especially well suited to citrus trees, and others are moderately well suited.

Blanton fine sand, low, 0 to 5 percent slopes (BnB).—This is a well drained or moderately well drained, deep, sandy soil on low, gently sloping ridges. In most places the surface layer is gray, loose fine sand about 4 inches thick, but the color of the surface layer ranges from dark gray to very dark grayish brown. Below the surface layer, the color ranges from light gray to pale brown mottled with white and light yellowish brown. The total thickness of the fine sand over finer textured material is more than 42 inches.

Included in the areas mapped as this soil are small areas of a more droughty, higher lying soil and areas of a soil that is more yellowish than the typical Blanton soil. Also included are small areas of a wet, lower lying soil and a few small areas of a soil that has a clayey substratum at a depth between 30 and 42 inches.

This Blanton soil is porous, and as a result, water and air move rapidly through the profile. The available mois-

TABLE 1.—*Approximate acreage and proportionate extent of soils*

Symbol	Soil	Area	Extent	Symbol	Soil	Area	Extent
		Acres	*Percent*			*Acres*	*Percent*
BnB	Blanton fine sand, low, 0 to 5 percent slopes	19,351	9.4	LaD	Lakeland fine sand, 8 to 12 percent slopes	135	0.1
BnC	Blanton fine sand, low, 5 to 8 percent slopes	442	.2	LdB	Lakewood sand, 0 to 5 percent slopes	3,132	1.5
BfB	Blanton fine sand, high, 0 to 5 percent slopes	12,516	6.1	LdC	Lakewood sand, 5 to 8 percent slopes	275	.1
BfC	Blanton fine sand, high, 5 to 8 percent slopes	2,395	1.2	Lo	Leon sand	2,858	1.4
BfD	Blanton fine sand, high, 8 to 12 percent slopes	388	.2	LfA	Leon fine sand, 0 to 2 percent slopes	32,492	15.8
Bo	Borrow pits	589	.3	LfB	Leon fine sand, 2 to 5 percent slopes	250	.1
Bp	Brighton peat	253	.1	Ma	Made land	2,153	1.0
Br	Brighton peat, shallow variant	229	.1	Mb	Manatee fine sand	1,026	.5
Bt	Brighton, Istokpoga, and Okeechobee soils	3,364	1.6	Mc	Manatee loamy fine sand	260	.1
Ch	Charlotte fine sand	1,673	.8	Md	Manatee-Delray complex, overflow	5,697	2.8
De	Delray fine sand	3,720	1.8	Ok	Okeechobee muck	2,145	1.0
Dm	Delray mucky fine sand	1,870	.9	On	Ona fine sand	637	.3
Df	Delray fine sand, high	5,842	2.8	OrB	Orlando fine sand, 0 to 5 percent slopes	404	.2
Dh	Delray fine sand, moderately shallow, high	1,835	.9	OrC	Orlando fine sand, 5 to 8 percent slopes	171	.1
Ff	Felda fine sand	1,938	.9	Pf	Plummer fine sand	1,847	.9
Ib	Iberia clay loam, overflow	6,072	3.0	Ph	Plummer fine sand, high	4,269	2.1
Ik	Iberia mucky loam	264	.1	PmB	Pomello fine sand, 0 to 5 percent slopes	8,323	4.1
Im	Immokalee fine sand	6,697	3.3	Pn	Pompano fine sand	6,451	3.1
In	Immokalee sand	2,839	1.4	Po	Pompano fine sand, moderately shallow	837	.4
Io	Istokpoga peat, deep	710	.3	Rf	Rutlege fine sand	3,404	1.7
Ip	Istokpoga peat, moderately deep	233	.1	Rm	Rutlege mucky fine sand	916	.4
Is	Istokpoga peat, shallow variant	227	.1	Rh	Rutlege fine sand, high	493	.2
LaB	Lakeland fine sand, 0 to 5 percent slopes	8,572	4.2	Rn	Rutlege, Plummer, and St. Johns soils	1,614	.8
LaC	Lakeland fine sand, 5 to 8 percent slopes	1,313	.6	Rp	Rutlege and Pompano soils, ponded	1,297	.6
				Sa	St. Johns fine sand	4,782	2.3
				SfB	St. Lucie fine sand, 0 to 5 percent slopes	6,222	3.0
				Sn	Sandy alluvial land	4,478	2.2
				Sw	Swamp	23,745	11.6
				Tc	Terra Ceia muck	837	.4
				Wa	Wabasso fine sand	958	.5
					Total	205,440	100.0

ture capacity is low, but some crops receive moisture from a water table that fluctuates between a depth of 24 and 72 inches. Shallow-rooted plants may be damaged by shortage of moisture during dry periods. This soil has low natural fertility, is low in content of organic matter, and is strongly acid.

This soil is well suited to citrus trees. The trees respond well to fertilizer, but mineral fertilizer leaches out rapidly. Therefore, fertilizer is best applied frequently and in moderate amounts. (Capability unit IIIse–2, Sandhill range site, woodland suitability group 3)

Blanton fine sand, low, 5 to 8 percent slopes (BnC).—This is a well drained or moderately well drained, deep, sandy soil on low undulating ridges. The surface layer is gray, loose fine sand about 4 inches thick. The material below the surface layer is light gray to pale brown and is mottled with gray and yellow. The total thickness of the fine sand over finer textured material is more than 42 inches.

Included in the areas mapped as this soil are small areas that have slopes of 0 to 5 percent. Also included are areas near Forest City that have clayey material at a depth of 30 to 42 inches. One or the other of these two included soils makes up not more than 5 percent of the area in which it occurs.

This Blanton soil is porous, and air and water can move rapidly through it. The available moisture capacity is low; therefore, shallow-rooted plants grown on this soil may be damaged by shortage of moisture during dry periods. Crops that have a moderately deep root zone receive moisture from a fairly high water table. This soil is low in natural fertility and is strongly acid. The content of organic matter is also low.

This soil is moderately well suited to citrus trees: Where tillage is necessary, however, runoff causes a moderately severe hazard of erosion. Low available moisture capacity, low natural fertility, and the hazard of erosion are the chief management problems. Mineral fertilizer leaches out rapidly, but crops respond to frequent, light applications of fertilizer. (Capability unit IVse–1, Sandhill range site, woodland suitability group 3)

Blanton fine sand, high, 0 to 5 percent slopes (BfB).—This soil is deep and is somewhat excessively drained to well drained. It is on high, gently sloping ridges. The surface layer is generally dark-gray, loose fine sand about 6 inches thick, but it is gray in some places. Below the surface layer is light-gray to grayish-brown, loose fine sand mottled with light gray, white, and yellow. The total thickness of the fine sand over finer textured material is more than 40 inches. In some places sandy clay loam is at a depth of 60 inches or more.

Included in the areas mapped as this soil are small areas of low, wet soils and of soils that have short slopes of 5 to 8 percent. The included soils make up not more than 15 percent of any area of this soil.

This Blanton soil is porous, and water and air move rapidly through the profile. The available moisture is low; therefore, shallow-rooted plants grown on this soil are likely to be damaged by shortage of moisture during short dry periods. Natural fertility and the content of organic matter are low, and this soil is strongly acid.

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This soil is well suited to citrus trees. The trees respond well to fertilizer, but mineral fertilizer rapidly leaches out. (Capability unit IIIse–1, Sandhill range site, woodland suitability group 2)

Blanton fine sand, high, 5 to 8 percent slopes (BfC).—This is a deep, sandy soil that is well drained or somewhat excessively drained. It is on high, undulating ridges. The surface layer is typically dark-gray, loose fine sand about 6 inches thick, but it is gray in some places. Below the surface layer is light-gray to grayish-brown, loose fine sand that is mottled with light gray, white, and yellow. The total thickness of the fine sand over finer textured material is more than 40 inches. In places sandy clay loam is at a depth of 60 to 100 inches.

Included in the areas mapped as this soil are small areas of soils that have slopes of 8 to 12 percent. Each of the included soils makes up not more than 5 percent of any area mapped as this soil.

This Blanton soil is porous, and as a result, water and air move rapidly through the profile. The available moisture capacity is low; therefore, shallow-rooted plants grown on this soil may be damaged by a shortage of moisture during dry periods. Natural fertility and the content of organic matter are low, and this soil is strongly acid.

This soil is moderately well suited to citrus trees. Runoff creates a moderately severe hazard of erosion in the cultivated areas. The low available moisture capacity, the low natural fertility, and the hazard of erosion are the main problems in managing this soil. Mineral fertilizer leaches out rapidly, but crops respond well to frequent, light applications. (Capability unit IVse–2, Sandhill range site, woodland suitability group 2)

Blanton fine sand, high, 8 to 12 percent slopes (BfD).—This is a deep, sandy soil that is well drained or somewhat excessively drained. It occupies high, moderately steep areas. The surface layer is gray, loose fine sand about 6 inches thick. Below the surface layer is light-gray to grayish-brown, loose fine sand mottled with light gray, white, and yellow. The thickness of the fine sand over finer textured material is more than 40 inches. In many places sandy clay loam underlies this soil at a depth of 60 to 100 inches.

Included in the areas mapped as this soil are small areas of soils that have slopes of 12 to 17 percent and of soils that have slopes of 5 to 8 percent. Each of the included soils makes up not more than 10 percent of any area mapped as this soil.

This Blanton soil is porous, and water and air move rapidly through it. The available moisture capacity is low; therefore, shallow-rooted plants are likely to be damaged by a shortage of moisture during short dry periods. Natural fertility and the content of organic matter are low, and this soil is strongly acid.

Rapid runoff creates a severe hazard of erosion where this soil is cultivated. If citrus trees are grown, a good ground cover must be maintained and other practices used intensively to control erosion. Low available moisture capacity, low natural fertility, and the hazard of erosion are the chief management problems. Mineral fertilizer leaches out rapidly, but crops respond fairly well to frequent, light applications. (Capability unit VIse–1, Sandhill range site, woodland suitability group 2)

Borrow pits

Borrow pits (Bo) are manmade excavations from which the soil material and the underlying coarse material have been removed for use in construction. The material removed is used for raising the level of sites for buildings, for road construction and repairs, and for cement mixtures. The areas vary in size and shape, but they are generally small and occupy only a minor acreage throughout the county.

Included in the areas mapped as Borrow pits are narrow bands of spoil. The included areas make up less than 15 percent of the acreage mapped as this land type.

At present this land type has little or no value for agriculture, but some areas can be reforested, either by natural seeding or by planting seedlings. Other pits can be used for irrigation ponds or can be stocked with fish. Some pits near communities are used as dumps for refuse. (Not placed in a capability unit, range site, or woodland suitability group)

Brighton series

Soils of the Brighton series are very poorly drained fibrous peats. They are in marshy areas adjoining or near many of the lakes in the county. The following describes the main layers in a typical profile:

0 to 4 inches, black felty peat.
4 to 40 inches, dark reddish-brown fibrous peat.
40 to 54 inches +, very dark grayish-brown, loose sand.

The surface layer ranges from 2 to 8 inches in thickness. In cultivated areas the peat in the surface layer is more decomposed than in areas that have not been cultivated, and it is somewhat mucky and is slightly thicker than that in the typical profile. The second layer is generally more than 32 inches thick and ranges from brown to dark reddish brown in color. Below that layer is sand that ranges from gray or light gray to dark brown or very dark grayish brown in color.

The Brighton soils are very strongly acid. They are porous and are covered by water most of the year. These soils are well suited to special crops where proper water control has been established.

Brighton peat (Bp).—This is a very poorly drained organic soil that is covered by water most of the year. The surface layer is black, partly decomposed felty peat about 4 inches thick. Immediately below the surface layer is dark grayish-brown peat about 36 to 60 inches thick. The peat is underlain by very dark grayish-brown sand or fine sand.

Included in the areas mapped as this soil are small areas where the surface layer is more decomposed and mucky than that in the typical profile. Also included are areas in the south-central part of the county that have a large amount of diatom remains in the surface layer. Each of the included soils makes up not more than 5 percent of any area of this soil.

This Brighton soil is high in nitrogen but is low in other plant nutrients. In most places it is very strongly acid; however, it is less acid in cultivated areas than in other areas.

Reclaiming this soil for crops is generally not feasible, unless the areas are fairly large. If intensive management is practiced in the large areas, however, this soil is well suited to special crops and to improved pasture. Frequent, large applications of potash, phosphate, and minor

fertilizer elements are needed for successful production of crops. (Capability unit IIIws–5 and Fresh Marsh (Organic) range site; not placed in a woodland suitability group)

Brighton peat, shallow variant (Br).—This is a very poorly drained organic soil that is covered by water most of the year. The surface layer is black felty peat about 6 inches thick. Immediately below the surface layer is dark reddish-brown peat about 10 to 30 inches thick. Very dark grayish-brown sand or fine sand underlies the peat.

Included in the areas mapped as this soil are small areas in which the surface layer is less than 12 inches thick and is underlain by sandy material. Also included are areas in the south-central part of the county that have a large amount of diatom remains in the surface layer. Each of the included soils makes up not more than 10 percent of any area of this soil

This Brighton soil is high in nitrogen. It is low in other plant nutrients.

This soil is well suited to special crops and improved pasture if intensive management is practiced, and if adequate drainage is provided. Frequent, large applications of potash, phosphate, and minor fertilizer elements, however, are needed for production of crops and pasture. Because the layers of organic material are thinner than those in the typical Brighton soil, subsidence is significant. Allowances for subsidence of the peat should be made when drainage or other water control systems are designed. In determining whether reclamation is feasible, the thickness of the peat, as well as the size of the area, should be considered. These factors also influence the design of the drainage system. (Capability unit IIIws–5 and Fresh Marsh (Organic) range site; not placed in a woodland suitability group)

Brighton, Istokpoga, and Okeechobee soils (Bt).—This undifferentiated unit consists of organic soils that are too wet or have too dense a cover of vegetation to be studied and separated on the map. The areas are dominated by Brighton, Istokpoga, and Okeechobee soils, but they vary in composition throughout the county. One or more of these soils makes up at least 80 percent of any area. These soils are on low grassy flats and in wooded depressions, and they are covered by water most of the year, except in periods of extreme drought. The cover of plants consists of water-tolerant grasses and hardwoods, black pine, cypress, cabbage-palm, and shrubs. A representative profile of each of the soils in this unit is described under their respective series.

Included in the areas mapped as this unit are small areas of Rutlege and Delray soils. These are mineral soils that occur in a thin rim, or outer edge, around areas of this unit.

The soils of this unit are not suited to cultivation without major reclamation. After they have been properly drained and a water control system has been established, they can be used for truck crops. (Capability unit IIIws–5 and Fresh Marsh (Organic) range site; not placed in a woodland suitability group)

Charlotte series

The Charlotte soils are deep, poorly drained sands. They are in narrow drainageways and on low, broad flats that have poorly defined drainage outlets. The areas are small and are on the flood plain of the St. Johns River and adjacent to some of the other large streams in the county. They are also in the area called the Celery Delta. The following describes the main layers in a typical profile:

0 to 4 inches, black, very friable fine sand.
4 to 12 inches, grayish-brown, loose fine sand.
12 to 20 inches, dark-brown, loose fine sand mottled with light gray, dark red, and black.
20 to 34 inches, yellowish-brown, loose fine sand mottled with brown, red, and gray.
34 to 52 inches +, gray to grayish-brown, loose fine sand mottled with brown and black.

The surface layer ranges from black to dark gray in color and from 2 to 8 inches in thickness. The color of the second layer ranges from pale brown to grayish brown, and the thickness of that layer ranges from 4 to 10 inches. In some places the second layer is absent. Below the second layer the color ranges from yellow to dark brown, and the degree and intensity of mottling vary greatly.

The Charlotte soils are slightly acid to neutral. They are porous and are low in natural fertility.

Charlotte fine sand (Ch).—This is the only Charlotte soil mapped in the county. It is a deep, poorly drained, sandy soil on low, broad flats. The surface layer is generally black, loose fine sand about 4 inches thick, but it is dark gray in some places. The material below the surface layer is yellow to brown, and it has mottles that vary in degree and intensity.

Included in the areas mapped as this soil are small areas of Pompano and Delray soils. Each of the included soils makes up not more than 5 percent of any area mapped as this soil.

This Charlotte soil is porous; therefore, mineral fertilizer leaches out rapidly. The natural fertility, the content of organic matter, and the available moisture capacity are low. Wetness, however, is the principal management problem.

The water must be controlled before cultivated crops can be grown or improved pasture can be established on this soil. Under intensive management, however, special crops can be grown. Citrus trees are poorly suited, but improved pasture grasses are well suited where water control is adequate and the proper kinds and amounts of fertilizer are applied. (Capability unit IVws–3, Slough range site, woodland suitability group 8)

Delray series

In the Delray series are mainly deep, poorly drained or very poorly drained sands that have a thick, highly organic surface layer. These soils are mainly on broad, low flats in the northeastern, extreme eastern, and northern parts of the county. The following describes the main layers in a typical profile:

0 to 14 inches, very dark gray, very friable fine sand.
14 to 32 inches, very pale brown, loose fine sand that contains a few medium mottles of very dark gray.
32 to 52 inches +, grayish-brown, loose fine sand that contains a few coarse mottles of white and very dark grayish brown.

The surface layer ranges from dark gray to black in color and from 8 to 20 inches in thickness. The color of the second layer ranges from light gray or light grayish brown to very pale brown, and the thickness of that layer ranges from 10 to 30 inches. The soil material below the second layer ranges from pale brown to grayish

brown in color and from 12 to 24 inches in thickness. In some places clayey material is at a depth of 30 to 42 inches.

The Delray soils are slightly acid to mildly alkaline. Their natural fertility is moderately low.

Delray fine sand (De).—This is a very poorly drained, deep, sandy soil of the depressions. Its surface layer is black, friable fine sand that is about 20 inches thick in most places but is thinner in some areas. Below the surface layer is gray to light grayish-brown fine sand that contains a few fine mottles of dark gray and brown. The sandy material is commonly more than 42 inches thick, but clayey material is at a depth of 30 to 42 inches in some places.

Included in the areas mapped as this soil are small areas of a soil that has a surface layer less than 8 inches thick. These areas make up not more than 2 percent of any area mapped as this soil.

This Delray soil is porous, but mineral fertilizer is held fairly well in the surface layer. Natural fertility and the available moisture capacity are moderately high, and the content of organic matter is high. Wetness is the main limitation on the suitability for crops.

Water control must be established before this soil can be used for cultivated crops and improved pasture. However, if water control is established and good management is practiced, this soil is well suited to truck crops, flowers, other special crops, and grasses for improved pasture. The crops respond well to additions of fertilizer. This soil is poorly suited to citrus trees. (Capability unit IIIws–2, Slough range site, woodland suitability group 8)

Delray mucky fine sand (Dm).—This is a deep, very poorly drained soil of depressions. The surface layer is black, friable mucky fine sand that contains a large amount of organic matter and is about 14 inches thick. Below the surface layer is gray to light grayish-brown fine sand that contains a few fine mottles of dark gray and brown. The sandy material is more than 42 inches thick.

This soil is porous, but mineral fertilizer is held in the surface layer. The content of organic matter is high, and the natural fertility and available moisture capacity are moderate. Wetness is the main limitation to suitability for crops.

Water control must be established before this soil can be used for cultivated crops or improved pasture. The soil is poorly suited to citrus trees, but truck crops, cut flowers, other special crops, and grasses for improved pasture are well suited if the water is controlled and good management is practiced. The crops respond well to fertilizer. (Capability unit IIIws–2, Slough range site, woodland suitability group 8)

Delray fine sand, high (Df).—This is a deep, poorly drained soil. It is on broad flats in the Celery Delta in the eastern part of the county and is at a slightly higher elevation than Delray fine sand. The surface layer ranges from dark gray to black in color and from 8 to 24 inches in thickness. Below the surface layer is a layer of very pale brown to grayish-brown fine sand. The sandy material is more than 42 inches thick.

This soil is porous, but mineral fertilizer is held in the surface layer. The content of organic matter is high, and natural fertility and the available moisture capacity are moderately high. The slight wetness somewhat limits the use of this soil for crops.

Water control must be established before this soil can be used for cultivated crops or improved pasture. If water control is adequate and good management is practiced, this soil is moderately well suited to citrus trees and is well suited to special crops. The crops respond well to fertilizer. (Capability unit IIws–2, Slough range site, woodland suitability group 5)

Delray fine sand, moderately shallow, high (Dh).—This is a poorly drained soil on broad flats in the Celery Delta in the eastern part of the county. It is at a slightly higher elevation than Delray fine sand. The surface layer ranges from dark gray to black in color and from 8 to 18 inches in thickness. The second layer ranges from light gray to grayish brown in color and from 12 to 20 inches in thickness. Below the second layer, at a depth of 30 to 42 inches, is gray, mottled fine sandy loam or sandy clay loam. The mottles vary in degree and in intensity.

This soil is porous, but mineral fertilizer is held in the surface layer. The content of organic matter is high, and natural fertility and the available moisture capacity are moderately high.

The slight wetness somewhat limits the suitability of this soil for crops. Water control must be established before cultivated crops can be grown or the soil can be used for improved pasture. If the water is adequately controlled and good management is practiced, however, this soil is suited to citrus trees and is well suited to special crops. The crops respond well to fertilizer. (Capability unit IIws-2, Slough range site, woodland suitability group 5)

Felda series

The Felda series consists of deep, slightly acid or neutral soils that have a sandy surface layer and a loamy subsoil. These soils are mainly in small areas on the flood plain of the St. Johns River, but they are also along the associated chain of lakes and streams. They are poorly drained and are subject to frequent overflow. The following describes the main layers in a typical profile:

0 to 5 inches, very dark gray, very friable fine sand.
5 to 19 inches, gray, loose fine sand.
19 to 29 inches, dark-gray, slightly sticky fine sandy clay loam that contains a few fine mottles of brownish yellow and light gray and a few lenses of sandy material.
29 to 52 inches +, light-gray, friable sandy loam that contains a few, fine, yellow mottles and a few lenses of sandy material.

The color of the surface layer ranges from dark gray to black, and the thickness of that layer ranges from 4 to 7 inches. The layer immediately below the surface layer ranges from light gray to grayish brown in color and from 10 to 26 inches in thickness. The third layer ranges from gray or pale brown to light brownish gray or grayish brown in color, from sandy loam to fine sandy clay loam in texture, and from 8 to 18 inches in thickness. The color of the soil material below the third layer ranges from light gray to gray, and the texture ranges from loamy fine sand to fine sandy clay loam.

Felda fine sand (Ff).—This is the only Felda soil mapped in the county. It is a deep, slightly acid to neutral, poorly drained soil on flood plains. The surface layer is generally very dark gray, very friable fine sand about 5 inches thick, but it is dark gray or black in places. Immediately below the surface layer is loose fine sand.

The subsoil is generally dark-gray, slightly sticky fine sandy clay loam that contains a few fine mottles of brownish yellow. The texture is fine sandy loam, however, in some places. In some areas the lower part of the subsoil contains streaks where calcareous material occurs. The substratum in most places is light-gray, friable sandy loam that contains a few, fine, yellow mottles, but the texture is fine sandy clay loam in some places.

Included in the areas mapped as this soil are areas of a soil in which the sandy layers are more than 30 inches thick. Also included are areas of a soil that has a surface layer 8 to 10 inches thick. Each of the included soils makes up not more than 10 percent of any area mapped as this soil.

The available moisture capacity and natural fertility are moderately low. Wetness and the hazard of overflow are the main limitations to suitability for crops.

This soil is poorly suited to cultivated crops, but pasture of good quality can be produced under good management. The treeless areas make good native range. (Capability unit Vws–1, Fresh Marsh (Mineral) range site, woodland suitability group 7)

Iberia series

In the Iberia series are very poorly drained, nearly level, neutral soils that are medium textured to fine textured. These soils are mainly on flood plains along the St. Johns River and the associated chain of lakes. In some places, however, they occupy slightly higher areas adjacent to the flood plains and are not subject to overflow. The following describes the main layers in a typical profile:

0 to 10 inches, black, sticky clay loam.
10 to 16 inches, very dark gray, very plastic clay mottled with yellow, black, and yellowish brown.
16 to 78 inches +, gray, very plastic, calcareous clay mottled with yellow, dark gray, olive, and black.

The surface layer ranges from very dark gray to black in color, from clay loam to mucky loam in texture, and from 8 to 20 inches in thickness. The second layer ranges from 6 to 26 inches in thickness. It varies widely in the number and contrast of the mottles. The third layer ranges from gray to light gray in color and also varies widely in the number and contrast of the mottles. In places a sandy layer is at a depth of more than 42 inches. In other places a layer of marl is at a depth between 16 and 30 inches. Crystals of gypsum occur in some places in the soil material below the surface layer.

The clayey surface layer, very slow movement of water through the profile, and frequent flooding make some areas of these soils poorly suited to cultivation and suitable only for pasture or range. The areas that have a surface layer of mucky loam are less restricted in use. They can be used for a number of different crops if water control is established.

Iberia clay loam, overflow (Ib).—This soil is moderately deep, very poorly drained, neutral, and fine textured. It is nearly level and is on flood plains along the St. Johns River and the associated chain of lakes. The surface layer is black clay loam about 12 inches thick. Immediately below the surface layer is very dark gray clay that is mottled with yellow and black and is about 16 inches thick. The subsoil is mottled gray clay and is more than 42 inches thick.

The available moisture capacity, the content of organic matter in the surface layer, and the natural fertility are high. Because the surface layer is fine textured, however, this soil can be tilled safely only within a narrow range of moisture content.

This soil is limited by the very slow movement of water through the profile, by the plastic clay in the surface layer, and by the frequency of overflow. Its use is generally limited to pasture, range, or wildlife; it is not suitable for cultivation, because adequate water control is difficult to establish. The marshy places and the treeless areas make good native range. This soil is also suitable for improved pasture if intensive management is used and water control is established. Dikes have been constructed in a few places, and those areas have been converted to paddies for growing watercress (fig. 2). (Capability unit Vws–1, Fresh Marsh (Mineral) range site, woodland suitability group 7)

Iberia mucky loam (Ik).—This is a very poorly drained, moderately deep, neutral soil. It is in depressions that are slightly higher than the level of the flood plain. The surface layer is black mucky loam about 12 inches thick. The content of organic matter in this layer is high. Immediately below the surface layer is very dark gray sandy clay or clay that is mottled with yellow and black and is generally about 20 inches thick. The subsoil is mottled gray clay and is more than 42 inches thick.

Wetness and the fine texture are the chief limitations in the use of this soil. If proper water control is established, however, this soil is suited to a number of different crops. It is well suited to truck crops and flowers and makes good yields under good management. This soil is generally not suited to citrus trees. However, citrus trees can be grown in carefully selected areas if intensive management is used. Under intensive management, pastures of high quality are produced. (Capability unit IIIws–3, Fresh Marsh (Mineral) range site, woodland suitability group 7)

Immokalee series

The soils in the Immokalee series are somewhat poorly drained, coarse textured, and strongly acid. They are in the flatwoods area of the county and occur in narrow bands between the sand ridges and the swamps or marshes. The following describes the main layers in a typical profile:

0 to 5 inches, gray to black, loose sand or fine sand.
5 to 40 inches, light-gray, loose sand or fine sand.
40 to 52 inches, dark-brown or dark yellowish-brown to black, weakly cemented sand or fine sand.
52 to 60 inches +, grayish-brown to light-gray sand or fine sand.

The surface layer ranges from 3 to 8 inches in thickness. The second layer is leached and ranges from white to light gray in color and from 27 to 40 inches in thickness. The thickness of the third layer ranges from 4 to 12 inches.

The Immokalee soils are porous and low in natural fertility. As a result, they are severely limited in suitability for most farm crops and citrus trees. If the water is controlled and intensive management is practiced, however, these soils can be used successfully for improved pasture; also, some areas are moderately well suited to general farm crops.

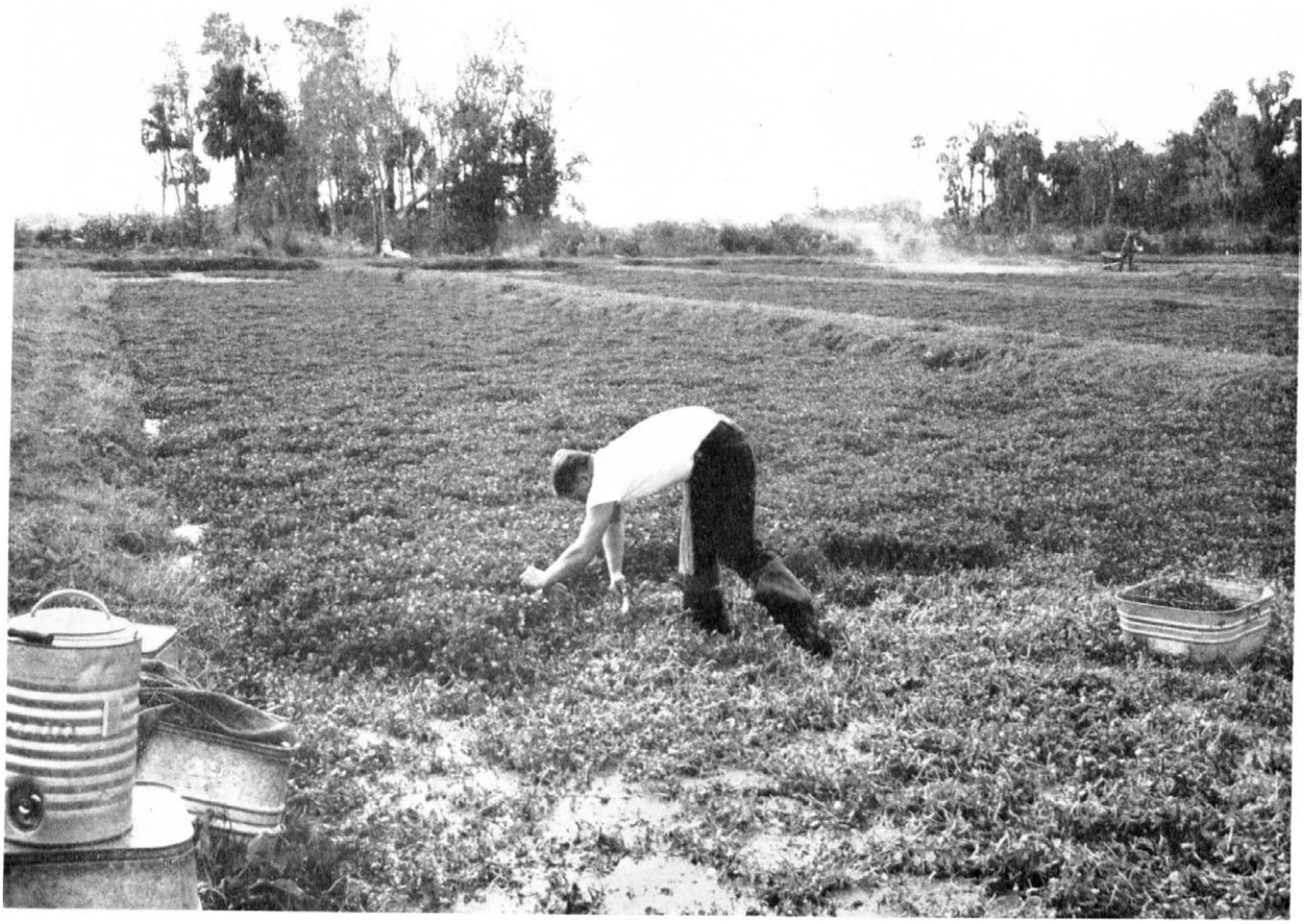

Figure 2.—**Harvesting watercress grown on Iberia clay loam, overflow.**

Immokalee fine sand (Im).—This soil is deep, somewhat poorly drained, and strongly acid or very strongly acid. It is nearly level and is generally in low areas. The surface layer is black to gray fine sand that has weak granular structure and is about 5 inches thick. Below the surface layer is gray or light-gray, loose fine sand about 25 to 42 inches thick. The third layer is weakly cemented and is black because it is stained with organic matter. It ranges from soft to slightly hard.

Included in the areas mapped as this soil are small areas of Leon soils and small areas of soils that have a surface layer more than 8 inches thick. The included soils make up not more than 15 percent of any area mapped as this soil.

Natural fertility, the content of organic matter, and the available moisture capacity are low in this Immokalee soil. This soil is droughty during dry periods and wet during periods of high rainfall.

This soil has severe limitations for citrus trees. Mineral fertilizer rapidly leaches out because of the sandy texture, but this soil is moderately well suited to general farm crops if adequate water control is established and careful management is used. (Capability unit IVsw–1, Acid Flatwood range site, woodland suitability group 4)

Immokalee sand (In).—This soil is somewhat poorly drained and is strongly acid. It occurs in small areas throughout the county. The surface layer is dark-gray to black, loose sand about 3 inches thick. Below the surface layer is gray or light-gray sand about 25 to 42 inches thick. The third layer is firm to weakly cemented and is black because it is stained with organic matter. This layer ranges from 4 to 12 inches in thickness. Below the third layer is light-gray sand at a depth of 36 to 60 inches.

Natural fertility and the content of organic matter are low. This soil is very low in available moisture capacity.

This soil is poorly suited to cultivated crops and citrus trees. It is less well suited to improved pasture, however, than Immokalee fine sand. (Capability unit IVsw–1, Acid Flatwood range site, woodland suitability group 4)

Istokpoga series

The soils of the Istokpoga series are very poorly drained, very strongly acid woody peats. The following describes the main layers in a typical profile:

0 to 8 inches, very dark brown peat that contains woody remains of trees and shrubs.
8 to 84 inches +, dark reddish-brown woody peat.

The surface layer ranges from 5 to 10 inches in thickness. In cultivated areas it is darker colored and more mucky than in areas that have not been cultivated. The second layer ranges from 12 inches to more than 84 inches in thickness.

The Istokpoga soils are porous and are covered by water most of the year. They are moderately well suited to special crops.

Istokpoga peat, deep (Io).—This is a very poorly drained soil that is covered by water most of the year. The surface layer is very dark brown, partly decomposed woody peat about 8 inches thick. The second layer is dark reddish-brown woody peat that is more than 60 inches thick.

Included in the areas mapped as this soil are small areas of Brighton peat. The included soil makes up not more than 3 percent of any area mapped as this soil.

This Istokpoga soil is high in nitrogen. The supply of other plant nutrients is low.

This soil is moderately well suited to special crops if the water is controlled and if intensive management is practiced. If the soil is adequately drained, it is well suited to improved pasture grasses. Crops grown on this soil need frequent applications of potash, phosphate, and minor fertilizer elements. Reclaiming this soil is generally not feasible, unless the areas are fairly large. (Capability unit IVws–1 and Fresh Marsh (Organic) range site; not placed in a woodland suitability group)

Istokpoga peat, moderately deep (Ip).—This is a very poorly drained soil that is covered by water most of the year. It is 36 to 60 inches deep. The surface layer is very dark brown, partly decomposed woody peat that is about 8 inches thick. The second layer is dark reddish-brown woody peat about 30 to 52 inches thick. Below is dark grayish-brown sand or fine sand.

Included in the areas mapped as this soil are small areas where the surface layer is more fibrous and mucky than is typical for this soil. The included areas make up not more than 5 percent of any area mapped as this soil.

This Istokpoga soil is high in nitrogen. The supply of other plant nutrients is low.

This soil is moderately well suited to special crops if the water is controlled and if intensive management is practiced. If the soil is adequately drained, it is well suited to improved pasture grasses. Crops grown on this soil need frequent applications of potash, phosphate, and minor fertilizer elements.

Because the layers of organic material are thinner than those in the typical Istokpoga soil, subsidence is more critical in this soil. Allowances for subsidence of the peat should be made when drainage or other water control systems are designed. In determining whether reclamation is feasible, the thickness of the peat, as well as the size of the area, should be considered. These factors also influence the design of the drainage system. (Capability unit IVws–1 and Fresh Marsh (Organic) range site; not placed in a woodland suitability group)

Istokpoga peat, shallow variant (Is).—This is a wet, very strongly acid woody peat that is 12 to 36 inches thick. The surface layer is dark brown and is about 8 inches thick. The second layer is dark reddish brown and is 5 to 28 inches thick. Below is dark grayish-brown sand or fine sand.

Included in the areas mapped as this soil are small areas of a mineral soil that has a highly organic surface layer less than 12 inches thick. Also included are small areas of a soil that has a mucky surface layer. Each of the included soils make up not more than 15 percent of any area of this soil.

This Istokpoga soil is high in nitrogen. The supply of other plant nutrients is low.

This soil is moderately well suited to special crops if the water is controlled and intensive management is practiced. If this soil is adequately drained, it is well suited to improved pasture grasses. Crops grown on this soil need frequent applications of potash, phosphate, and minor fertilizer elements. They also need large applications of lime.

Because the layers of organic material are thinner than those in the typical Istokpoga soil, subsidence is more critical in this soil. Allowances for subsidence of the peat should be made when drainage or other water control systems are designed. In determining whether reclamation is feasible, the thickness of the peat, as well as the size of the area, should be considered. These factors also influence the design of the drainage system. (Capability unit IVws–1 and Fresh Marsh (Organic) range site; not placed in a woodland suitability group)

Lakeland series

In the Lakeland series are deep, rapidly permeable sands. These soils are nearly level to gently rolling and are on high sand ridges. They occupy large areas in the western part of the county and small areas in other parts. The following describes the main layers in a typical profile:

0 to 5 inches, dark-gray, loose fine sand.
5 to 7 inches, grayish-brown, loose fine sand.
7 to 54 inches, yellow, loose fine sand mottled with very pale brown.
54 inches +, mottled, friable sandy clay loam.

The surface layer ranges from dark gray to grayish brown in color and from 2 to 7 inches in thickness. The thickness of the second layer ranges from 1 to 4 inches. The color of the third layer ranges from yellow to yellowish brown. In many places the layer of sandy clay loam extends to a depth greater than 72 inches.

The Lakeland soils are strongly acid, porous, and droughty, and they have low natural fertility. Most of them are particularly well suited to citrus trees.

Lakeland fine sand, 0 to 5 percent slopes (LaB).—This soil is deep and well drained. It is on high, gently sloping ridges. In most places the surface layer is dark-gray, loose fine sand about 6 inches thick. It is commonly dark gray to grayish brown, but it is black or gray in some places. Below the surface layer is yellow, loose fine sand that is mottled with brown below a depth of about 40 inches or more. In most places sandy clay loam underlies the soil at a depth of 60 inches or more.

Included in the areas mapped as this soil are small areas of a light-colored Blanton soil. Also included, in areas near Forest City, is a soil that is more brownish than the Lakeland soils. Each of the included soils makes up not more than 5 percent of any area mapped as this soil.

This Lakeland soil is porous, and water and air move rapidly through the profile. The available moisture capacity is low. Therefore, shallow-rooted plants grown on

this soil may be damaged by a shortage of moisture during short dry periods. Natural fertility and the content of organic matter are low, and this soil is strongly acid.

This soil is well suited to citrus trees. The trees respond well to frequent, moderate applications of fertilizer because mineral fertilizer leaches out rapidly. (Capability unit IIIse–1, Sandhill range site, woodland suitability group 2)

Lakeland fine sand, 5 to 8 percent slopes (LaC).—This soil is on high ridges. It is deep and is well drained to somewhat excessively drained. In most places the surface layer is dark-gray to grayish-brown, loose fine sand about 6 inches thick, but it is gray or black in places. Below the surface layer is yellow, loose fine sand that contains pale-brown mottles below a depth of about 40 inches. In most places sandy clay loam underlies this soil below a depth of 60 inches.

Included in the areas mapped as this soil are small areas of a Blanton soil that is lighter colored than this soil. Also included are areas of a soil near Forest City that is more brownish. Each of the included soils makes up not more than 5 percent of any area mapped as this soil.

This Lakeland soil is porous, and water and air move rapidly through the profile. The available moisture capacity is low, and shallow-rooted plants may be damaged by a shortage of moisture during short dry periods. Natural fertility and the content of organic matter are low, and this soil is strongly acid. Runoff creates a moderately severe hazard of erosion in cultivated areas if this soil is not protected.

This soil is moderately well suited to citrus trees. Mineral fertilizer leaches out rapidly, and crops respond to frequent, light applications of fertilizer. (Capability unit IVse–2, Sandhill range site, woodland suitability group 2)

Lakeland fine sand, 8 to 12 percent slopes (LaD).—This soil is deep, well drained to excessively drained, and moderately steep. The surface layer is gray, loose fine sand about 6 inches thick. Below the surface layer is yellowish-brown, loose fine sand that is more than 40 inches thick.

Included in the areas mapped as this soil are small areas of a soil that has slopes of 12 to 17 percent and of a soil that has slopes of 5 to 8 percent. Each of the included soils makes up not more than 10 percent of any area mapped as this soil.

This Lakeland soil is porous, and water and air move rapidly through the profile. The available moisture capacity is low. As a result, shallow-rooted plants may be damaged by a shortage of moisture during short dry periods. This soil is strongly acid, and its natural fertility and content of organic matter are low. Rapid runoff creates a severe hazard of erosion if this soil is not protected by a cover of plants.

This soil is only moderately well suited to citrus trees because it erodes badly if it is clean cultivated. If citrus trees or cultivated crops are grown, the soil should be protected by a cover of plants. Mineral fertilizer leaches out rapidly, but crops respond well to frequent, light applications of fertilizer. (Capability unit VIse–1, Sandhill range site, woodland suitability group 2)

Lakewood series

The Lakewood series consists of excessively drained, coarse-textured soils. These soils are on high sand ridges and on low rolling ridges. The main areas are near Geneva, but other small areas are scattered throughout the county. The following describes the main layers in a typical profile:

0 to 6 inches, light-gray, loose sand or fine sand.
6 to 30 inches, white, loose sand or fine sand.
30 to 47 inches, brownish-yellow, loose sand or fine sand.
47 inches +, yellow to light yellowish-brown, loose sand or fine sand.

The surface layer ranges from light gray to dark gray in color and from 2 to 6 inches in thickness. In some places the second layer is light gray, and that layer ranges from 6 to 26 inches in thickness. The color of the third layer ranges from brownish yellow to yellow, and the thickness of that layer ranges from 12 to 30 inches. The underlying material ranges from light yellowish brown to yellow in color; it starts at 47 inches and continues to a depth of more than 70 inches.

The Lakewood soils are very strongly acid, droughty, and low in natural fertility. They are poorly suited to cultivated crops, and only a small acreage has been cultivated.

Lakewood sand, 0 to 5 percent slopes (LdB).—This is an excessively drained, coarse-textured soil on ridges. The surface layer is dark-gray to light-gray, loose fine sand about 3 inches thick. The second layer is light-gray or white, loose fine sand about 6 to 26 inches thick. The third layer is brownish-yellow to yellow, loose fine sand about 12 to 30 inches thick. The underlying material is light yellowish-brown to very pale brown, loose fine sand that continues to a depth of 70 inches or more.

Included in the areas mapped as this soil are small areas of Pomello, Blanton, and St. Lucie soils. Each of the included soils makes up not more than 5 percent of any area mapped as this soil.

This Lakewood soil is very strongly acid and is too low in natural fertility and too droughty for most cultivated crops. If intensive management is practiced, however, this is a fair soil for citrus trees and improved pasture grasses. (Capability unit VIs–1, Sand Scrub range site, woodland suitability group 1)

Lakewood sand, 5 to 8 percent slopes (LdC).—This is an excessively drained, coarse-textured soil on high, rolling ridges. The surface layer is dark-gray to light-gray, loose fine sand about 3 inches thick. The second layer is light-gray to white, loose fine sand 6 to 26 inches thick. The third layer is brownish-yellow to yellow, loose fine sand 12 to 30 inches thick. The underlying material is light yellowish-brown to very pale brown, loose fine sand that continues to a depth of more than 70 inches.

Included in the areas mapped as this soil are small areas of Pomello, Blanton, and St. Lucie soils. Each of the included soils makes up not more than 5 percent of any area mapped as this soil.

This Lakewood soil is very strongly acid. The very low available moisture capacity, very low natural fertility, and steep slopes make the soil poorly suited to cultivated crops, citrus trees, and pasture. (Capability unit VIIs–1, Sand Scrub range site, woodland suitability group 1)

Leon series

The soils in the Leon series are nearly level, somewhat poorly drained, coarse textured, and strongly acid. They occupy a large acreage, mainly in broad areas of the flatwoods or in narrow bands that separate the sand

ridges from the swamps and marshes. The following describes the main layers in a typical profile:

0 to 5 inches, gray to black, loose sand or fine sand.
5 to 24 inches, white to gray, leached, loose sand or fine sand.
24 to 36 inches, dark-brown to black, weakly cemented to strongly cemented sand or fine sand (organic pan).
36 to 40 inches +, brown to pale-brown, loose sand or fine sand.

The surface layer ranges from 2 to 7 inches in thickness; the second layer, from 2 to 20 inches; and the third layer, from 4 to 12 inches. Below the third layer the color ranges from brown to yellowish brown.

These soils have poor soil-moisture relationships. Natural fertility is low.

These soils are poorly suited to general farm crops. If intensive management is practiced and a subirrigation system is installed, however, special crops can be grown and these soils can be used for improved pasture. Most of the acreage is in native vegetation and is used for range.

Leon sand (Lo).—This is a moderately wet soil, mainly in an area south of Oviedo. The surface layer is gray to black, loose sand about 3 inches thick. The second layer is gray to light-gray, loose sand and is at a depth of 4 to 23 inches. The third layer is black to very dark brown sand and is at a depth of 23 to 27 inches. It ranges from 4 to 12 inches in thickness and is weakly cemented to firm. Below the third layer, at a depth of about 35 inches, is brown, loose sand.

This soil has very low available moisture capacity and is droughty during dry periods and wet during rainy periods. It is poorly suited to cultivated crops, citrus trees, and improved pasture. (Capability unit IVsw–1, Acid Flatwood range site, woodland suitability group 4)

Leon fine sand, 0 to 2 percent slopes (LfA).—This is a somewhat poorly drained soil that has a high water table. It is in narrow bands between the sandhills and swamps in the flatwood area of the county. The surface layer is black to dark-gray, loose fine sand about 4 inches thick, and the second layer is white to gray, loose fine sand about 20 inches thick. The third layer, or pan, is very dark brown to black. It is slightly hard to soft and is about 12 inches thick. Below the third layer is brown fine sand at a depth of about 35 inches.

Included in the areas mapped as this soil are small areas of a soil that has slopes of 2 to 5 percent and of a soil that has a surface layer thicker than 7 inches. Also included is a soil that contains an organic pan at a depth below 30 inches. These included soils make up not more than 10 percent of any area mapped as this soil.

This Leon soil is strongly acid and is low in natural fertility. It is droughty during dry periods and wet during rainy periods; shallow-rooted crops are often damaged by a shortage of moisture during dry periods.

This soil is severely limited in its use for cultivated crops, citrus trees, and improved pasture. If intensive management is practiced, however, and a subirrigation system is installed, truck crops and pastures of high quality can be produced. Mineral fertilizer leaches out rapidly because this soil is coarse textured. (Capability unit IVsw–1, Acid Flatwood range site, woodland suitability group 4)

Leon fine sand, 2 to 5 percent slopes (LfB).—This soil is somewhat poorly drained and has a high water table. It occupies narrow strips adjacent to ponds, lakes, or drainageways. The surface layer is black to dark-gray, loose fine sand about 3 inches thick. The second layer is white to gray, loose fine sand about 20 inches thick. The third layer is an organic pan and is at a depth below 24 inches. It consists of black fine sand that is stained with organic matter. Below the third layer is brown fine sand at a depth of about 35 inches.

Included in the areas mapped as this soil are areas of a soil that has a layer stained with organic matter at a depth below about 30 inches and of a soil that has a surface layer thicker than 7 inches. Each of the included soils makes up less than 10 percent of any area mapped as this soil.

This Leon soil is strongly acid and is low in natural fertility. It is droughty during dry periods and wet during rainy periods. During the dry periods, shallow-rooted crops are likely to be damaged by a shortage of moisture.

Erosion is a hazard in the more sloping areas. This soil is generally poorly suited to cultivated crops and citrus trees. If intensive management is practiced, however, special crops and pasture plants can be grown. (Capability unit IVsw–1, Acid Flatwood range site, woodland suitability group 4)

Made land

Made land (Ma) consists of clayey or sandy material, or both, that has been reworked by soil-moving equipment. Some areas consist of raw geologic material, and some areas contain a large amount of organic matter. The areas have been built up by using soil material that was either brought in by truck or was dredged in. Smoothing or leveling has made them suitable for use as building sites, causeways, recreational areas, or other uses. Made land occurs throughout the county in urban areas or close to urban areas.

Because of the wide range of soil characteristics, most of them unfavorable, this land type is generally not suited to cultivated crops. The areas that have been made from sandy soil material, that have a moderately high content of organic matter, that have been leveled, and that are as much as 30 inches above the highest point reached by the water table can be used for improved pasture or to grow citrus trees and pine trees. The dredged material is likely to be highly washed and is poorly suited to plants. Where the slopes are short and steep, the soil material is erodible and measures for controlling erosion are needed.

Included in the areas mapped as this land type are areas that are about 12 feet above the level of the flood plain. These areas, or mounds, consist mainly of shells, but they contain varying amounts of sand. Other soil material has collected in the lower mounds, but no profile development has taken place. These mounds are on the flood plains of the St. Johns River and the associated chain of lakes and streams. Each mound covers an area 3 acres or less in size, and together the mounds occupy an area of not more than 15 acres. Some of the mounds are lower than 12 feet, and those mounds are subject to occasional flooding. They are less droughty than the higher mounds.

None of the areas is well suited to plants, but the lower mounds produce more vegetation than the higher ones. The higher and more droughty areas have only sparse stands of cabbage-palms and other trees. The

mounds are used, to some extent, as a habitat for wildlife and as campsites. (Not placed in a capability unit, range site, or woodland suitability group)

Manatee series

The Manatee series consists of poorly drained or very poorly drained, black or dark-gray sands and loamy sands underlain by neutral, highly mottled, gray sandy clay loam. These soils are in nearly level areas or in slight depressions. The following describes the main layers in a typical profile:

0 to 10 inches, black, very friable fine sand.
10 to 20 inches, mottled light brownish-gray or brown very fine sand.
20 to 48 inches +, mottled light brownish-gray and gray fine sandy clay loam.

The surface layer ranges from very dark gray to black in color, from loamy fine sand or mucky fine sand to fine sand in texture, and from 8 to 14 inches in thickness. The thickness of the second layer ranges from 8 to 25 inches, and the color of that layer ranges from light gray to brown. Below the second layer, the color ranges from light gray or light brownish gray to grayish brown and the texture ranges from fine sandy loam to fine sandy clay loam.

Wetness is the main limitation of these soils. If the soils are properly drained and moderately intensive management is used, they are well suited to cultivated crops. Designing, constructing, and maintaining the drainage system, however, is moderately difficult.

Manatee fine sand (Mb).—This soil is in small areas within low hammocks throughout the Celery Delta. It is neutral to mildly alkaline. The surface layer is porous, but the material below the surface layer is less porous.

A fluctuating high water table makes this soil poorly suited to general farm crops. If proper water control is established and good management is practiced, however, this soil is well suited to improved pasture, and truck crops, cut flowers, and other special crops can be grown. Citrus trees can be grown if this soil is intensively managed and water control is adequate. (Capability unit IIIws–3, Slough range site, woodland suitability group 6)

Manatee loamy fine sand (Mc).—This is a wet, gray, mottled soil in depressions. Its surface layer is black loamy fine sand about 12 inches thick. Below the surface layer is dark-gray sandy clay loam that is mottled with brown and yellow and is about 20 inches thick. The subsoil is gray or dark-gray, calcareous clay mottled with brown and white. This soil is more than 42 inches thick.

The available moisture capacity, natural fertility, and content of organic matter are high, but water moves slowly through the profile. As a result, wetness is the main limitation to the use of this soil.

If proper water control is established and good management is practiced, this soil is well suited to truck crops and flowers. Also pastures of good quality can be produced under intensive management. The soil is generally not suited to citrus trees. Citrus trees can be grown in selected areas under the most favorable conditions, however, if the soil is intensively managed and water control is established. (Capability unit IIIws–3, Slough range site, woodland suitability group 6)

Manatee-Delray complex, overflow (Md).—About 60 percent of this complex consists of very poorly drained Manatee soils, and about 40 percent of very poorly drained Delray soils. These soils are on the flood plain of the St. Johns River; they are so intricately mixed that it was impractical to separate them on the map. The texture of their surface layer is fine sand or mucky fine sand. The Manatee soils are shallower over loamy material than the Delray soils; loamy material is at a depth of less than 30 inches in the Manatee soils but is at a depth of more than 30 inches in the Delray soils. A representative profile of the Delray soils is described under the Delray series.

Because these soils are wet and are subject to frequent overflow, they are severely limited for cultivated crops and improved pasture. During dry periods they are well suited to range. The vegetation is mainly water-tolerant grasses, cabbage-palms, hardwoods, and cypress. (Capability unit Vws–1, Fresh Marsh (Mineral) range site, woodland suitability group 7)

Okeechobee series

The Okeechobee series consists of wet, slightly acid to neutral muck over fibrous peat. These soils are in marshy areas throughout the northern part of the county and are covered by water most of the year. The following describes the main layers in a typical profile:

0 to 30 inches, black, friable muck.
30 to 60 inches +, very dark grayish-brown fibrous peat that contains a few mottles of black muck.

The surface layer ranges from 18 to 34 inches in thickness and from black to very dark brown in color. In areas that have not been cultivated, the surface layer generally contains more peat than in cultivated areas. The color of the second layer ranges from brown to very dark grayish brown. In some areas at a depth of more than 36 inches, the second layer is underlain by neutral to alkaline, gray fine sand or by calcareous material.

These soils are porous. They are well suited to special crops.

Okeechobee muck (Ok).—This soil is wet and is covered by water most of the year. The surface layer is black muck about 30 inches thick. Below the surface layer is very dark grayish-brown fibrous or felty peat about 30 inches or more thick. In places dark grayish-brown sand or fine sand is at a depth of more than 36 inches.

Included in the areas mapped as this soil are small areas of a soil in which muck directly overlies the sandy material. The included soil makes up not more than 5 percent of any area mapped as this soil.

This Okeechobee soil is high in nitrogen. The supply of other plant nutrients is low.

Reclaiming this soil is generally not feasible, unless the areas are fairly large. If the water is controlled and intensive management is practiced, this soil is well suited to special crops. It is also well suited to improved pasture if it is drained and well managed. Crops grown on this soil need frequent applications of potash, phosphate, and minor fertilizer elements. (Capability unit IIIws–5 and Fresh Marsh (Organic) range site; not placed in a woodland suitability group)

Ona series

Ona soils are deep, very strongly acid, somewhat poorly drained or poorly drained sands. They are in small, nearly level, low areas in the eastern and cen-

tral parts of the county. The following describes the main layers in a typical profile:

0 to 6 inches, black, friable fine sand.
6 to 16 inches, dark reddish-brown, friable fine sand.
16 to 48 inches +, light yellowish-brown, loose fine sand that is faintly mottled with very dark grayish brown.

The surface layer ranges from black to very dark gray in color and from 4 to 8 inches in thickness. The second layer ranges from 6 to 14 inches in thickness and from very dark grayish brown to dark reddish brown in color. The color of the third layer ranges from pale brown to light yellowish brown to light gray. In places a dark-brown, brown, or dark grayish-brown layer separates the second and third layers.

Ona fine sand (On).—This is the only Ona soil mapped in this county. It is a somewhat poorly drained, deep, very strongly acid fine sand in small nearly level areas in the eastern and central parts of the county. In most places the surface layer is black fine sand about 6 inches thick. The second layer is generally dark reddish-brown fine sand about 12 inches thick, and it is underlain by light yellowish-brown fine sand. This soil is more than 42 inches thick.

The available moisture capacity and natural fertility are moderately low, and the content of organic matter is moderately high. Wetness is the main limitation to use of this soil for agriculture.

A system for controlling water must be established before this soil can be used for cultivated crops or pasture. Where proper water control has been established and good management is practiced, this is a good soil for citrus trees and special crops. Crops grown on it respond well to fertilizer. Even though this soil is porous, fertilizer is not readily leached out. (Capability unit IIws–1, Acid Flatwood range site, woodland suitability group 5)

Orlando series

In the Orlando series are very dark gray, deep, loose sands. These soils are nearly level to sloping and are on low ridges. The areas are generally small and are mainly in the western part of the county. The following describes the main layers in a typical profile:

0 to 20 inches, very dark gray, loose fine sand.
20 to 54 inches, pale-brown to light yellowish-brown, loose fine sand.
54 to 70 inches +, reddish-brown, very friable fine sand.

The surface layer ranges from dark gray or black to very dark grayish brown or very dark brown in color and from 8 to 24 inches in thickness. The second layer ranges from very pale brown to yellowish brown in color and from 10 to 34 inches in thickness. The third layer ranges from light reddish brown to dark reddish brown in color. That third layer is absent in some areas, but it is normally at a depth of more than 50 inches.

These soils are porous and somewhat droughty, are slighty acid, and have low natural fertility. They are especially well suited to citrus trees.

Orlando fine sand, 0 to 5 percent slopes (OrB).—This is a deep, well drained or moderately well drained soil on low ridges. The surface layer is generally very dark gray, loose fine sand about 20 inches thick, but it is dark grayish brown or very dark grayish brown in places. The second layer is very pale brown to light yellowish-brown, loose fine sand. Below the second layer is reddish-brown, very friable fine sand. The total thickness of the fine sand is more than 42 inches.

Included in the areas mapped as this soil are small, low areas of a soil that is wetter than this soil and generally is more grayish below the surface layer. The included soil makes up not more than 5 percent of any area mapped as this soil.

This Orlando soil is porous, and water and air move rapidly through the profile. The available moisture capacity is low, but crops receive moisture from the water table in the lower part of the root zone. Natural fertility and the content of organic matter are also low, and this soil is strongly acid.

This soil is well suited to citrus trees. The trees respond well to frequent applications of fertilizer because mineral fertilizer leaches out rapidly. (Capability unit IIIse–2, Sandhill range site, woodland suitability group 3)

Orlando fine sand, 5 to 8 percent slopes (OrC).—This is a well drained or moderately well drained, deep soil on low, sloping ridges. The surface layer is very dark gray, very friable fine sand about 18 inches thick. The second layer is pale-brown to light yellowish-brown, loose fine sand. Below the second layer is reddish-brown, very friable fine sand. The total thickness of the fine sand is more than 42 inches.

This soil is porous, and water and air move rapidly through the profile. The available moisture capacity is low, but crops receive moisture from the water table in the lower part of the root zone. Natural fertility and the content of organic matter are moderately low, and this soil is strongly acid. Runoff creates a moderately severe hazard of erosion in cultivated areas.

The moderately low natural fertility and the hazard of erosion are the main management problems. This soil is well suited to citrus trees, and the trees respond well to frequent applications of fertilizer. (Capability unit IVse–1, Sandhill range site, woodland suitability group 3)

Plummer series

The soils of the Plummer series are strongly acid or very strongly acid, deep, poorly drained sands. They occur in small, poorly defined drainageways and in other low areas throughout the county. The following describes the main layers in a typical profile:

0 to 3 inches, black, very friable fine sand.
3 to 52 inches +, light-gray to grayish-brown, loose fine sand that contains medium, faint, light brownish-gray and very dark gray mottles.

The surface layer ranges from gray to black in color and from 2 to 7 inches in thickness. The color of the second layer ranges from white to dark grayish brown.

These soils are porous. They have low natural fertility.

Plummer fine sand (Pf).—This is a deep, poorly drained soil on low, broad flats. The surface layer is black fine sand about 4 inches thick. Below the surface layer is light-gray to grayish-brown, loose fine sand that has medium, faint streaks of light brownish gray and very dark gray. This soil is more than 42 inches thick.

Included in the areas mapped as this soil are small areas of a Rutlege soil. The included soils make up not more than 10 percent of any area mapped as this soil.

This Plummer soil is porous, and as a result, mineral fertilizer leaches out rapidly. The available moisture

capacity, natural fertility, and content of organic matter are low.

This soil is poorly suited to general farm crops and citrus trees. Wetness is the main limitation, but the low natural fertility and the sandy texture also create management problems. Water control must be established before cultivated crops and special crops can be grown or improved pasture established. Good management is required if special crops are grown. Improved pastures need fertilizer as well as adequate water control. (Capability unit IVws–2, Slough range site, woodland suitability group 8)

Plummer fine sand, high (Ph).—This is a deep, poorly drained, nearly level soil in broad areas that are slightly higher than those occupied by Plummer fine sand. The surface layer is fine sand. It ranges from gray to very dark gray in color and from 3 to 8 inches in thickness. Below the surface layer is a layer of fine sand that ranges from very pale brown to white in color and is more than 42 inches thick.

This soil is porous, and as a result, plant nutrients leach out rapidly. The available moisture capacity and natural fertility are low. The sandy texture and wetness limit the use of the soil for crops.

This soil is moderately well suited to only a few special truck crops. Water-control measures and the proper kinds and amounts of fertilizer are needed before the soil can be used successfully for cultivated crops or pasture. If proper water control is established and good management is used, citrus trees can be grown. (Capability unit IVsw–2, Acid Flatwood range site, woodland suitability group 4)

Pomello series

The Pomello soils are moderately well drained, nearly level to very gently sloping, very strongly acid, light-gray sands. They are on low ridges or knolls throughout the flatwoods area of the county. The following describes the main layers in a typical profile:

0 to 4 inches, gray, loose fine sand.
4 to 40 inches, white, loose fine sand.
40 to 50 inches, very dark brown, very firm fine sand.
50 to 72 inches +, brown, loose fine sand.

The color of the surface layer ranges from light gray to gray, and the thickness of that layer ranges from 1 to 7 inches. In the layer immediately below the surface layer, the color ranges from white to light gray and the thickness ranges from 30 to 48 inches. The third layer ranges from very dark brown or dark grayish brown to dark reddish brown or black in color and from 4 to 12 inches in thickness. The color of the fourth layer ranges from brown or very pale brown to yellowish brown or light gray.

These soils are very porous, and water moves rapidly through their profile. As a result, the soils are highly leached and are droughty. Their available moisture capacity is very low. These soils are not suitable for cultivated crops. They are only moderately well suited to improved pasture.

Pomello fine sand, 0 to 5 percent slopes (PmB).—This is the only Pomello soil mapped in the county. It is slightly wet and is very strongly acid. The surface layer is light-gray fine sand about 4 inches thick, and the second layer is white fine sand about 36 inches thick. The third layer is dark reddish-brown fine sand that is stained with organic matter and is about 10 inches thick. The fourth layer is very pale brown fine sand more than 30 inches thick. The total thickness of the profile is more than 42 inches.

This soil is porous, and water moves rapidly through the profile. The soil is highly leached, low in natural fertility, and droughty. The water table rises to the root zone of the deeper rooted plants during periods of high rainfall.

Poor soil qualities associated with the sandy texture limit the use of this soil. This soil is not suited to cultivated crops and is poorly suited to citrus trees. If citrus trees are grown, intensive management is necessary. Grasses that withstand drought make fair growth; however, large amounts of fertilizer and lime are needed and grazing must be carefully controlled. (Capability unit Vsw–1, Sand Scrub range site, woodland suitability group 1)

Pompano series

In the Pompano series are deep, slightly acid to neutral, poorly drained sands. These soils are in narrow, poorly defined drainageways or on low, broad flats. They occupy fairly large areas on the flood plain of the St. Johns River, in the Celery Delta, and adjacent to some of the larger streams of the county. The following describes the main layers in a typical profile:

0 to 5 inches, black, very friable fine sand.
5 to 52 inches +, light-gray to gray, loose fine sand that contains a few dark-gray mottles.

The surface layer ranges from dark gray to black in color and from 4 to 7 inches in thickness. In some places a layer of fine sandy loam or fine sandy clay loam is at a depth of 30 to 42 inches.

These soils are porous. They are low in natural fertility.

Pompano fine sand (Pn).—This is a deep, poorly drained soil on low, broad flats. The surface layer is black fine sand about 5 inches thick. Below the surface layer is light-gray to gray, loose fine sand with a few fine streaks of dark brown and dark gray. This soil is more than 42 inches thick.

Included in the areas mapped as this soil are small areas of Charlotte and Delray soils. Each of the included soils makes up not more than 10 percent of any area mapped as this soil.

This Pompano soil is porous, and as a result, mineral fertilizer leaches out rapidly. The available moisture capacity, natural fertility, and content of organic matter are low.

This soil is poorly suited to general farm crops and citrus trees. Wetness is the main limitation, but the low content of organic matter and the sandy texture also create management problems. Water-control measures and proper kinds and amounts of fertilizer are needed before cultivated crops can be grown or improved pastures can be established. If the water is controlled and intensive management is practiced, a number of special crops can be grown. (Capability unit IVws–3, Slough range site, woodland suitability group 8)

Pompano fine sand, moderately shallow (Po).—This is a deep, poorly drained soil on low, broad flats. The surface layer is black fine sand about 5 inches thick. Be-

low the surface layer is light-gray to gray, loose fine sand about 18 inches thick. In places a layer of gray fine sandy loam or fine sandy clay loam that contains mottles of light gray and yellowish brown underlies the second layer.

Included in the areas mapped as this soil are small areas of Charlotte and Delray soils. Each of the included soils makes up not more than 10 percent of any area mapped as this soil.

This Pompano soil is porous, and as a result, mineral fertilizer leaches out rapidly. The available moisture capacity, natural fertility, and content of organic matter are low.

This soil is poorly suited to general farm crops and is poorly suited to citrus trees. Wetness is the main limitation, but the sandy texture and the low content of organic matter also limit the use of this soil. Water-control measures and the proper kinds and amounts of fertilizer are needed before this soil can be used for cultivated crops or improved pasture. If the water is controlled and the soils are well managed, a number of special crops can be grown. (Capability unit IVws–3, Slough range site, woodland suitability group 8)

Rutlege series

The Rutlege soils are deep, very strongly acid, poorly drained or very poorly drained sands that have a thick, highly organic surface layer. They are on broad, low flats throughout the county. The following describes the main layers in a typical profile:

0 to 20 inches, black, friable fine sand.
20 to 52 inches +, light brownish-gray or dark-grayish-brown, loose fine sand that contains a few, medium, faint mottles of gray.

The surface layer ranges from very dark gray to black in color and from 16 to 30 inches in thickness. The color of the second layer ranges from light gray or light brownish gray to dark grayish brown. The second layer in many areas is more than 40 inches thick, but a layer stained with organic matter is at a depth of about 30 inches in some places. This layer is more pronounced in dry periods.

Rutlege fine sand (Rf).—This is a deep, very poorly drained soil in depressions. The surface layer is generally black, friable fine sand about 20 inches thick, but it is thinner in some places. Below the surface layer is light-gray to dark grayish-brown fine sand mottled with light brownish gray and gray. The sandy material is more than 42 inches thick.

The content of organic matter is high, and the available moisture capacity is moderately high. Natural fertility is low. This soil is porous, but mineral fertilizer is held fairly well in the surface layer. Wetness is the main limitation. If adequate water control is established and good management is practiced, this soil is suited to improved pasture grasses and to special crops, such as truck crops and flowers. This soil is poorly suited to citrus trees. (Capability unit IIIws–1, Slough range site, woodland suitability group 8)

Rutlege mucky fine sand (Rm).—This is a deep soil in depressions, and it is very poorly drained. Its surface layer is black, friable mucky fine sand about 14 inches thick. Below the surface layer is light-gray to dark grayish-brown fine sand that contains a few mottles of gray and light brownish gray. The sandy material is more than 42 inches thick.

The available moisture capacity is moderately high, but natural fertility is low. The content of organic matter is high. This soil is porous, but mineral fertilizer is held well in the surface layer.

Wetness is the main limitation in managing this soil. The water must be controlled before cultivated crops can be grown or this soil can be used for improved pasture. If the water is controlled and good management is practiced, this soil is suited to improved pasture grasses and to special crops, such as truck crops and cut flowers. It is poorly suited to citrus trees. Crops grown on this soil respond well to fertilizer. (Capability unit IIIws–1, Slough range site, woodland suitability group 8)

Rutlege fine sand, high (Rh).—This is a deep, nearly level, poorly drained soil that is very strongly acid. It occurs throughout the western and central parts of the county in positions higher than those occupied by Rutlege fine sand. This soil is generally in narrow bands that separate well-drained soils in higher positions from areas of wet or very wet soils below.

The surface layer is generally black fine sand about 20 inches thick, but the thickness ranges from 8 to 30 inches. Below the surface layer is light-gray or gray fine sand that is more than 30 inches thick and contains a few faint mottles of very dark grayish brown. In places a discontinuous layer of soft iron concretions is at a depth of 42 inches or more.

The content of organic matter is high, and the natural fertility is moderately low. The available moisture capacity is moderately high. This soil is porous, but mineral fertilizer does not leach rapidly from the surface layer. A simple system for controlling water must be installed before cultivated crops can be grown or this soil can be used for improved pasture. This soil is well suited to special truck crops and citrus trees if proper water control is established and good management is used. Crops grown on this soil respond well to fertilizer. (Capability unit IIws–1, Acid Flatwood range site, woodland suitability group 5)

Rutlege, Plummer, and St. Johns soils (Rn).—This undifferentiated mapping unit consists of Rutlege, Plummer, and St. Johns soils. One or more of these soils makes up at least 80 percent of any area, but the composition varies from place to place. These soils are generally nearly level to gently sloping. Some of the more sloping areas receive seepage water and are wet most of the year. The texture of the surface layer ranges from fine sand or mucky fine sand to coarse sand. A typical profile of each of these soils is described under their respective series.

Included in the areas mapped as these soils are areas of Leon and Immokalee soils. The included soils have a lighter colored surface layer and are less wet than the soils of this unit. Also, they have a layer stained with organic matter at a depth of 20 to 42 inches. The included soils make up less than 20 percent of any area mapped as these soils.

Few of the areas of this unit have been cleared, and most are used for range. The sloping areas that are affected by seepage are highly susceptible to erosion, especially if they are cleared. Animal trails across these soils commonly develop into gullies that contain flowing water most of the year.

Wetness is the main limitation to use of these soils. The soils are poorly suited to cultivated crops and citrus trees. Control of the excess water generally involves intercepting

the flow of seepage water, but this is difficult to do. (Capability unit IVws–2, Slough range site, woodland suitability group 8)

Rutlege and Pompano soils, ponded (Rp).—This undifferentiated unit consists of Rutlege, Pompano, Delray, and Plummer soils. The areas vary greatly in composition, but one or more of these soils makes up at least 90 percent of any area of this unit. These soils are mainly in low grassy depressions or sloughs throughout the county and are covered by water most of the year. A representative profile of each of these soils is described under the respective series.

Included in the areas mapped as these soils are small areas of organic soils in the middle of the deeper pockets. Plant remains are beginning to accumulate in these pockets.

Because they are flooded for long periods, the soils of this unit are poorly suited to cultivation. If proper water control is established, however, special truck crops can be grown. The native vegetation is mainly grasses that tolerate water. (Capability unit Vws–2, Slough range site, woodland suitability group 8)

St. Johns series

The soils in the St. Johns series are somewhat poorly drained or poorly drained, coarse-textured, and strongly acid. They are in nearly level areas or in narrow bands that separate the sand ridges from marshes or swamps in the flatwoods area of the county. The following describes the main layers in a typical profile:

0 to 12 inches, dark-gray to black fine sand.
12 to 27 inches, gray to light-gray, leached fine sand.
27 to 44 inches, dark-brown to black, weakly cemented fine sand.
44 to 50 inches +, grayish-brown fine sand.

The surface layer ranges from 10 to 12 inches in thickness; the second layer, from 2 to 20 inches; and the third layer, from 4 to 12 inches. The third layer, generally called an organic pan, is weakly cemented to strongly cemented and is stained with organic matter. Below the cemented layer, the soil material is grayish brown to pale brown or brown.

The suitability of these soils for crops is limited by a fluctuating water table that rises to the surface during wet periods. Also, the available moisture capacity and natural fertility are low.

Wetness, caused by the fluctuating water table, is a serious hazard if these soils are used for cultivated crops. If proper water control is established, however, and if intensive management is practiced, these soils are well suited to citrus trees, vegetables, cut flowers, and other special crops. The soils are excellent for improved pastures consisting of grass and clover if simple measures are used to control the water. Proper fertilization is required for crops and pastures.

St. Johns fine sand (Sa).—This soil is somewhat poorly drained or poorly drained and is strongly acid. It is mainly in the flatwoods area of the county. The surface layer is black fine sand about 12 inches thick, and the second layer is light-gray, loose fine sand about 18 inches thick. Below the second layer is black, weakly cemented fine sand that is stained with organic matter and is about 5 to 18 inches thick. The fourth layer is dark-brown to pale-brown, loose fine sand that is at a depth of 34 to 46 inches.

In areas that have been cultivated extensively, the black soil material in the surface layer is thicker than that in the typical profile. Also in areas that have been cultivated, this soil is less acid than in other areas because it has been irrigated by alkaline water for a long period.

Included in the areas mapped as this soil are small areas of a soil that has a surface layer thinner than 8 inches. In this included soil the layer stained with organic matter is at a depth greater than 30 inches.

This St. Johns soil has a fluctuating water table, a moderately low content of organic matter, and a sandy texture. Natural fertility is low.

If adequate water control is established and intensive management is practiced, this soil is well suited to truck crops. These crops need proper fertilization, but mineral fertilizer leaches out rapidly. (Capability unit IIIws–4, Acid Flatwood range site, woodland suitability group 4)

St. Lucie series

St. Lucie soils are deep, very rapidly permeable, excessively drained fine sands. These soils are nearly level to rolling. They are on sand ridges and occupy fairly large areas in the central part of the county. A minor acreage is in the southern part. These soils have little value for agriculture. The following describes the main layers in a typical profile:

0 to 3 inches, light-gray, loose fine sand.
3 to 52 inches +, white, loose fine sand.

The surface layer ranges from light gray to gray in color and from 1 to 5 inches in thickness. The second layer is generally more than 42 inches thick, but a layer of yellow to yellowish-brown fine sand is at a depth of more than 30 inches in some places. The texture throughout the profile ranges from fine sand to sand, but it is generally fine sand.

These soils are very strongly acid, extremely porous, and droughty. They have low natural fertility, and the content of organic matter is low.

St. Lucie fine sand, 0 to 5 percent slopes (SfB).—This is the only St. Lucie soil mapped in the county. It is a deep, excessively drained, sandy soil on low ridges. The surface layer is gray sand or fine sand about 3 inches thick. Below the surface layer is white, loose sand that is droughty and is more than 30 inches thick. In some places yellow to yellowish-brown sand underlies the second layer. In other places a layer stained with organic matter is at a depth of more than 48 inches.

Included in the areas mapped as this soil are small areas where the underlying yellow sand is within 30 inches of the surface. Also included are small areas that have a layer stained with organic matter at a depth of less than 48 inches. Each of the included soils makes up not more than 10 percent of the acreage of any area mapped as this soil.

This St. Lucie soil is extremely porous, and water and air move rapidly through the profile. It is droughty, and natural fertility and the content of organic matter are low. The response to fertilizer is poor.

This soil is poorly suited to crops, even to deep-rooted crops, such as citrus trees and deep-rooted pasture grasses. (Capability unit VIIs–1, Sand Scrub range site, woodland suitability group 1)

Sandy alluvial land

Sandy alluvial land (Sn) is adjacent to streams and is subject to frequent overflow. It consists of sandy sediments, but the texture varies. Generally coarse sand is near the streams and fine sand has been deposited by backwater in the low areas away from the stream channel. The higher areas adjacent to deep channels are better drained and are generally more brownish and yellowish than the low areas, which are more poorly drained and more grayish. Some of the wetter areas are also affected by seepage from adjacent soils. Many areas are sharply dissected by meandering stream channels.

This land type is poorly suited to cultivated crops. (Not placed in a capability unit or woodland suitability group; Swamp range site)

Swamp

Swamp (Sw) is a land type covered by dense vegetation and by water most of the year, except during extended dry periods. It occurs throughout the county along drainageways, along poorly defined streams, in depressions that have no outlets, and along large bay heads.

Not much alluvial soil material is deposited in the areas along streams, because the floodwaters move slowly. Small deposits of soil material may wash onto the edges of bay heads and depressions fron adjacent higher areas. This land type includes mineral soils and organic soils that range from strongly acid to neutral in reaction.

The use of this land type is limited to forest because this soil is wet and is subject to periodic flooding. The native vegetation is a mixture of sweetgum, cypress, cabbage-palm, black pine, bay, oak, saw-palmetto, vines, and low-growing shrubs. (Not placed in a capability unit or woodland suitability group; Swamp range site)

Terra Ceia series

In the Terra Ceia series are very poorly drained, slightly acid to neutral, mucky soils. These soils developed in the remains of sedges, lilies, and sawgrass in a fairly large depression called the Black Hammock north of Oviedo and along the southeastern and eastern sides of Lake Jessup. The following describes the main layers in a typical profile:

0 to 20 inches, black, friable, slightly acid muck.
20 to 60 inches +, light brownish-gray, slightly mottled, neutral sandy clay loam.

The surface layer ranges from 8 to 20 inches in thickness. In some places the muck is underlain by sand or fine sand rather than by sandy loam or sandy clay loam. In other places a layer of very dark brown, slightly decomposed felty peat, about 5 to 10 inches thick, lies just below the surface layer.

These soils are moderately fertile and have a high content of organic matter. If water control is established, they are well suited to truck crops and other shallow-rooted plants.

Terra Ceia muck (Tc).—This is the only Terra Ceia soil mapped in the county. It is very poorly drained and is covered by water most of the year. The surface layer is black, well-decomposed, slightly acid to neutral muck about 20 inches thick. Below the surface layer is light brownish-gray to dark-brown or gray sandy loam to sandy clay loam. In some places this layer is fine sand. In other places a layer of very dark brown, slightly decomposed felty peat, about 5 to 10 inches thick, lies just below the surface layer.

This soil is high in nitrogen, but it is low in other plant nutrients. Wetness is the main limitation to use for crops.

This soil is well suited to truck crops if adequate water control is established, but it is poorly suited to citrus trees. Allowances for subsidence should be made when this soil is drained. (Capability unit IIIws–5, Fresh Marsh (Organic) range site; not placed in a woodland suitability group)

Wabasso series

In the Wabasso series are somewhat poorly drained, strongly acid, sandy soils. These soils are in the flatwoods area of the county; they are in broad, nearly level areas or in narrow bands between other soils of the flatwoods or between areas of swamps, marshes, or lakes. The following describes the main layers in a typical profile:

0 to 6 inches, dark-gray to black, loose fine sand.
6 to 20 inches, light-gray to gray, leached, loose fine sand.
20 to 26 inches, dark-brown to black, weakly to strongly cemented fine sand (organic pan).
26 to 30 inches, brown to light yellowish-brown, loose or very friable fine sand or loamy sand.
30 to 48 inches +, mottled brownish-yellow fine sandy clay loam.

The surface layer ranges from 5 to 8 inches in thickness; the second layer, from 4 to 14 inches; and the third layer, from 5 to 12 inches. The material immediately below the third layer ranges from brown or very pale brown to light yellowish brown in color and from 2 to 10 inches in thickness. The fifth layer ranges from light gray or light brownish gray to brownish yellow in color and from sandy loam to fine sandy clay loam in texture. The degree and intensity of mottling are variable.

Most of the acreage is used for agriculture, although these soils are poorly suited to general farm crops. These soils have low natural fertility and low available moisture capacity. If intensive management is practiced and a subirrigation system is installed, the soils can be used for truck crops and improved pasture.

Wabasso fine sand (Wa).—This is the only Wabasso soil mapped in the county. It is level or nearly level and is somewhat poorly drained. The areas are in the northern and eastern parts of the county. The surface layer is very dark gray fine sand about 7 inches thick. The second layer is gray, loose fine sand that is 7 to 20 inches thick. The third layer is very dark brown fine sand that is stained with organic matter and is 4 to 12 inches thick. It is at a depth of about 24 inches.

The first three layers are strongly acid. The fourth layer is brown, neutral fine sand and is at a depth of 26 to 36 inches. It is underlain by mottled brownish-yellow and gray fine sandy loam or fine sandy clay loam. This finer textured layer is at a depth of more than 30 inches but generally less than 42 inches.

The low available moisture capacity, low natural fertility, and periodic wetness limit the use of this soil for most crops. Special crops, such as truck crops and cut flowers, can be grown if the water is controlled and intensive management is practiced. Mineral fertilizer added to this soil leaches out rapidly. (Capability unit IIIws–4, Acid Flatwood range site, woodland suitability group 4)

Use and Management of Soils

The soils of Seminole County are used extensively for cultivated crops and for pasture or range. This section explains how the soils may be managed for these main purposes and gives the estimated yields of the principal crops grown under two levels of management. In addition, it explains how the soils can be managed for woodland range, for woodland, for building highways, farm ponds, irrigation systems, and other similar engineering structures, and for a number of nonfarm uses. In describing management the method of presenting information is generally that of describing general practices for all the soils, then grouping soils that require similar management, describing the group, and suggesting suitable management practices.

Factors Affecting the Use of Soils for Cultivated Crops and Pasture

Most of the soils in Seminole County have serious limitations or hazards that must be overcome before cultivated crops can be grown successfully or the areas can be used for pasture. In a good management plan, these limitations or hazards are considered and adequate measures are provided to correct or eliminate them.

About 70 percent of the soils in this county are affected by a high water table. During certain periods of the year, many of the soils have excess water in the root zone that is harmful to crops. In dry seasons crops grown on the same soils may be damaged by a shortage of water. A combined drainage and irrigation system provides a high degree of water control by removing excess water in wet seasons and by supplying water to the soils in dry seasons. A subsurface irrigation system like that briefly described in the section "Engineering Properties of Soils" is the standard means of accomplishing good water control in this county.

Erosion is not a serious problem in this county, because most of the soils are highly permeable and are nearly level or gently sloping. On a few hundred acres of sloping to moderately steep, sandy soils, however, erosion is severe if protection is not provided. These more sloping soils required a cover of close-growing vegetation and other intensive practices that control erosion. Although erosion causes little permanent damage to these soils, the removal of soil material from the surface layer has a serious effect on crops growing on the soils. Removal of soil material from a citrus grove is likely to leave the roots of the trees exposed and may hinder the growth of the trees.

Most of the soils of the county are deep, but they are sandy and have low available moisture capacity and low capacity to hold plant nutrients. These poor soil qualities can be improved somewhat if soil-improving crops are grown intensively. Including a sod of perennial grass or an annual cover crop in the cropping system during the period when the soils are not protected by a growing crop generally improves the soil qualities.

Most of the soils are highly leached of important plant nutrients. Therefore, their natural fertility is generally low. Their response to fertilizer varies, depending on the kinds of soils and the type of management used. High-value crops, such as citrus trees and the truck crops grown under irrigation near Sanford, respond profitably to large applications of fertilizer. The amounts and kinds of fertilizer that should be used depend on other factors in addition to the quality of the soils. Plants grown on the droughty, more sandy soils generally make only limited response to fertilizer.

Improved pastures, like cultivated crops, require preparation of the soils, control of the water table, additions of fertilizer, and proper harvesting methods. A good pasture (fig. 3) serves other purposes besides supplying forage for livestock. It protects the soils from erosion by wind and water and improves the quality of the soils by adding organic matter, making a better environment for micro-organisms, and improving tilth.

Figure 3.—Beef cattle grazing on a well-managed pasture of bahiagrass on Leon fine sand.

General management practices are not discussed in detail in this report but are outlined briefly in each capability unit. Management practices suggested for different crops on different soils change as more and better information is gained from the experience of workers at the experiment station and from the experience of farmers. Current information regarding kinds of crops, improved varieties of plants, specific management practices, and other information can be obtained from a local representative of the Soil Conservation Service, the University of Florida Agricultural Experiment Stations, or the Extension Service.

Management of the Soils by Capability Units

In this section the system of capability grouping is explained, the soils of the county are placed in capability units, and use and management is suggested for the soils of each unit. In planning management of the soils, the factors that affect the use of the soils for cultivated crops and pastures are to be considered. Those factors are described in the preceding section.

Capability groups of soils

The capability classification is a grouping that shows, in a general way, how suitable soils are for most kinds of farming. It is a practical grouping based on limitations of the soils, the risk of damage when they are used, and the way they respond to treatment.

In this system all the kinds of soil are grouped at three levels, the capability class, subclass, and unit. The eight capability classes in the broadest grouping are designated by Roman numerals I through VIII. In class I are the soils that have few limitations, the widest range of use, and the least risk of damage when they are used. The soils in the other classes have progressively greater natural limitations. In class VIII are soils and landforms so rough, shallow, or otherwise limited that they do not produce worthwhile yields of crops, forage, or wood products.

The subclasses indicate major kinds of limitations within the classes. Within most of the classes, there can be up to four subclasses. The subclass is indicated by adding a small letter, *e*, *w*, *s*, or *c*, to the class numeral, for example, IIe. The letter *e* shows that the main limitation is risk of erosion unless close-growing plant cover is maintained; *w* means that water in or on the soil will interfere with plant growth or cultivation (in some soils the wetness can be partly corrected by artificial drainage); *s* shows that the soil is limited mainly because it is shallow, droughty, or has low capacity for available plant nutrients; and *c*, used in only some parts of the country, indicates that the chief limitation is climate that is too cold or too dry.

Most soils of Seminole County have at least two kinds of limitations that affect use and management about equally. For example, sloping, excessively drained soils are generally both droughty and subject to erosion; many soils that have poor soil qualities that limit their use for crops also have seasonal problems of excess water; and many permanently wet soils have other serious limitations, even if they are drained. The soils that have two kinds of limitations have been placed in subclasses that have two small letters to designate the kinds of limitations, for example, IIIws and IIIse. The first letter stands for the limitation that is the more severe.

In class I there are no subclasses, because the soils of this class have few or no limitations. Class V can contain, at the most, only subclasses *w*, *s*, and *c*, because the soils in it have little or no susceptibility to erosion but have other limitations that restrict their use largely to pasture, range, woodland, or wildlife.

Within the subclasses are the capability units, groups of soils enough alike to be suited to the same crops and pasture plants, to require similar management, and to have similar productivity and other responses to management. Thus, the capability unit is a convenient grouping for making many statements about management of soils. Capability units are generally identified by numbers assigned locally, for example, IIws–1 or IIIws–2.

Soils are classified in capability classes, subclasses, and units in accordance with the degree and kind of their permanent limitations; but without consideration of major and generally expensive landforming that would change the slope, depth, or other characteristics of the soil; and without consideration of possible but unlikely major reclamation projects.

The eight classes in the capability system, and the subclasses and units in this county, are described in the list that follows.

Class I. Soils that have few limitations that restrict their use. (None in Seminole County)

Class II. Soils that have some limitations that reduce the choice of plants or require moderate conservation practices.

Subclass IIws. Soils that have slight or moderate limitations because of seasonal wetness and sandy texture.

Unit IIws–1. Deep, nearly level, strongly acid, somewhat poorly drained or poorly drained, sandy soils.

Unit IIws–2. Deep to moderately shallow, nearly level, slightly acid or neutral, sandy soils that are poorly drained.

Class III. Soils that have severe limitations that reduce the choice of plants, or require special conservation practices, or both.

Subclass IIIws. Soils that have severe limitations because of excess water and moderate limitations because of soil qualities when the soils are drained; also organic soils that deteriorate rapidly when drained.

Unit IIIws–1. Deep, nearly level, poorly drained or very poorly drained, strongly acid, sandy soils that are dark colored.

Unit IIIws–2. Deep, nearly level, poorly drained or very poorly drained, sandy soils that are slightly acid or neutral and have a dark-colored surface layer.

Unit IIIws–3. Nearly level, poorly drained or very poorly drained, slightly acid or neutral soils that have a clayey subsoil at a depth of less than 30 inches.

Unit IIIws–4. Somewhat poorly drained or poorly drained, strongly acid or very strongly acid, sandy soils that have a dark-colored surface layer and are underlain by a layer stained with organic matter at a depth of less than 30 inches.

Unit IIIws–5. Very poorly drained, strongly acid to neutral peats and mucks.

Subclass IIIse. Soils that have severe limitations because of low moisture capacity and low capacity to hold plant nutrients; also subject to severe erosion if they are cultivated and not protected.

Unit IIIse–1. Nearly level or gently sloping, deep, droughty fine sands.

Unit IIIse–2. Nearly level or gently sloping, deep, droughty fine sands that have a favorable water table.

Class IV. Soils that have very severe limitations that restrict the choice of plants, require very careful management, or both.

Subclass IVws. Soils that have very severe limitations for cultivation because of excess wetness, low available moisture capacity, and low capacity to hold plant nutrients.

Unit IVws–1. Nearly level, deep, very poorly drained, very strongly acid organic soils.

Unit IVws–2. Nearly level or gently sloping, strongly acid, poorly drained or very poorly drained, sandy soils.

Unit IVws–3. Nearly level, deep, poorly drained or very poorly drained, slightly acid or neutral fine sands.

Subclass IVse. Soils that have very severe limitations of low available moisture capacity and low capacity to hold plant nutrients; also subject to very severe erosion if they are cultivated and not protected.

Unit IVse–1. Sloping or strongly sloping, deep, moderately well drained sands that have a favorable water table.

Unit IVse–2. Sloping, deep, droughty, sandy soils.

Subclass IVsw. Soils that have very severe limitations of low available moisture capacity, low capacity to hold plant nutrients, shallowness, and seasonal excess water.

Unit IVsw–1. Nearly level or gently sloping, somewhat poorly drained or poorly drained, strongly acid, sandy soils that are underlain by a pan stained with organic matter at a depth of less than 42 inches.

Unit IVsw–2. Nearly level, poorly drained, strongly acid soils that are sandy to a depth of more than 42 inches.

Class V. Soils not likely to erode but that have other limitations, impractical to remove without major reclamation, that limit their use largely to pasture or range, woodland, or wildlife food and cover.

Subclass Vws. Soils too wet for cultivation, and that have other severe limitations for cultivation because of poor soil qualities.

Unit Vws–1. Nearly level, poorly drained or very poorly drained soils that are subject to overflow and have a very sticky, clayey subsoil.

Unit Vws–2. Nearly level, very poorly drained, strongly acid to neutral, sandy soils that are subject to frequent flooding.

Subclass Vsw. Soils generally unsuitable for cultivation, because of low available moisture capacity, low capacity to hold plant nutrients, or excess water.

Unit Vsw–1. Nearly level or gently sloping, moderately well drained, strongly acid, sandy soils.

Class VI. Soils that have severe limitations that make them generally unsuitable for cultivation and that limit their use largely to pasture or range, woodland, or wildlife food and cover.

Subclass VIs. Soils generally unsuitable for cultivation and limited for other uses by low available moisture capacity or low capacity to hold plant nutrients.

Unit VIs–1. Deep, nearly level or gently sloping, strongly acid, excessively drained sands that are droughty.

Subclass VIse. Soils generally unsuitable for cultivation, because of low available moisture capacity and low capacity to hold plant nutrients; also severely limited by risk of erosion if protective cover is not maintained.

Unit VIse–1. Deep, strongly sloping, well-drained, sandy soils.

Class VII. Soils that have very severe limitations that make them unsuitable for cultivation without major reclamation and that restrict their use largely to grazing, woodland, or wildlife.

Subclass VIIs. Soils very severely limited by low available moisture capacity and low capacity to hold plant nutrients.

Unit VIIs–1. Deep, excessively drained, sandy soils.

Class VIII. Soils and landforms that, without major reclamation, have limitations that preclude their use for commercial production of plants and restrict their use to recreation, wildlife, water supply, or esthetic purposes. (None in Seminole County)

CAPABILITY UNIT IIws–1

In this capability unit are deep, nearly level, strongly acid, sandy soils that are somewhat poorly drained or poorly drained. These soils are in broad, low areas throughout the county. In wet seasons the water table rises to the surface for short periods, but it recedes to a depth below 60 inches in dry seasons. The soils in this unit are—

Ona fine sand.
Rutlege fine sand, high.

Water drains rapidly through these soils. The content of organic matter in the surface layer is high, but natural fertility is moderately low. Periodic wetness is the main limitation. It restricts the kind of crops that can be grown and makes special drainage practices necessary.

These soils are well suited to truck crops and are suited to cultivated crops that tolerate slight wetness. Because of the moderately low fertility, however, good management is required for successful yields. The soils can be made highly productive if a suitable cropping system is used and if crop residue is well managed, a green-manure crop is turned under, and lime and fertilizer are applied. A combined drainage and subirrigation system should be installed. This system provides rapid removal of excess surface water during severe rains and can be used for applying irrigation water during dry periods.

These soils are well suited to citrus trees, but a water-control system that supplies deep drainage is essential in the citrus groves. Shallow lateral ditches and bedding are also needed to speed up surface drainage after severe rains.

Excellent improved pasture can be produced if these soils are well managed. Simple drainage is required to remove the excess surface water after severe rains. The high content of organic matter in the surface layer and the accompanying good soil-moisture relationships make these soils well suited to clover-grass pastures for winter grazing. Such pastures need large applications of lime.

CAPABILITY UNIT IIws–2

This unit consists of deep to moderately shallow, slightly acid or neutral, sandy soils that are poorly drained. These soils are nearly level and are on broad flats in the northern and eastern parts of the county. During wet periods the water table rises to within a few inches of the surface, but it recedes to a depth below 60 inches during dry periods. The soils in this unit are—

Delray fine sand, high.
Delray fine sand, moderately shallow, high.

These soils have low to moderately high available moisture capacity and moderately low natural fertility. The content of organic matter is moderately high, but the

organic matter supplied by crop residue oxidizes quickly. The soils are porous, and water and air move rapidly through the profile. As a result, mineral fertilizer leaches out rapidly. Periodic wetness is the main limitation, but the soils are also somewhat droughty in dry seasons.

These soils are poorly suited to general farm crops. Truck crops, cut flowers, and other special crops are well suited, however, if water for irrigation is available and protection from frost is adequate. The level of the water table must be carefully controlled. For this purpose, a combined drainage and subirrigation system is needed, and it must be carefully designed, installed, and maintained. Such a system provides rapid removal of excess water during severe rains and a means of irrigating in dry seasons.

Because the supply of most plant nutrients is low, a complete fertilizer should be applied and lime added according to the needs of the particular crop. The amount of lime needed is generally not large. Include a green-manure crop or a cover crop in the cropping system.

Local drainage problems and susceptibility to freezing affect the suitability of these soils for citrus trees. Areas that are not subject to damaging frost are moderately well suited. Most areas used for citrus trees require bedding and a well-designed drainage system. A careful study of the site is necessary before a citrus grove is planned.

Highly productive pastures of improved grasses can be maintained on these soils, but a simple drainage system is essential for removing excess surface water during wet periods. The yields of grass are closely related to the rate of fertilization; liberal applications of fertilizer are required for successful yields. Occasionally a moderate application of lime is needed. Clover can be grown successfully with the grasses for winter pasture, but irrigation similar to that used for cultivated crops is required.

CAPABILITY UNIT IIIws-1

The soils of this unit are deep, nearly level, and poorly drained or very poorly drained, and they are strongly acid and dark colored. They are in depressions, on broad flats, and along drainageways. The surface layer is very dark gray to black fine sand at least 8 inches thick. Below the surface layer is dark-gray to light-gray fine sand. The water table is at or near the surface most of the time. The soils in this unit are—

Rutlege fine sand.
Rutlege mucky fine sand.

These soils have moderately high available moisture capacity and rapid permeability. Natural fertility is low, but good response is received from fertilizer. Wetness is the principal limitation to extensive use of these soils.

The soils of this unit are not well suited to general farm crops. They are excellent for truck crops and cut flowers, however, if the water level is properly controlled and if moderately intensive management practices are used. Large areas or small areas that have accessible drainage outlets are the most suitable for cultivated crops.

These soils are highly leached, and most crops grown on the soils require liberal applications of lime and a complete fertilizer. Rotating grasses and legumes with cultivated crops helps to maintain or improve the available moisture capacity and soil tilth.

These soils are generally not suitable for citrus trees, but excellent yields of improved pasture are obtained under good management. Properly designed ditches are needed to remove the excess surface water, and control structures are required for regulating internal drainage. Improved grasses and clover require large applications of lime and fertilizer for good growth.

CAPABILITY UNIT IIIws-2

In this capability unit are deep, nearly level, poorly drained or very poorly drained, sandy soils that are slightly acid or neutral and have a dark-colored surface layer. These soils are in sloughs, depressions, and other low areas. In places a layer of peat or muck less than 12 inches thick overlies the mineral soil material. In other places these soils are underlain by neutral to alkaline material at a depth of 30 inches or more. The soils in this unit are—

Delray fine sand.
Delray mucky fine sand.

These soils have moderately high available moisture capacity. The content of organic matter is high in the surface layer. Permeability is rapid. Natural fertility is low, but the response to fertilizer is good. Wetness is the main limitation to use of these soils. The sandy texture also limits use, but the high content of organic matter in the surface layer modifies this limitation to some extent.

The soils of this unit are not well suited to general farm crops. They are excellent for truck crops and cut flowers, however, if the level of the water table is properly controlled. The drainage system must be properly designed, constructed, and maintained. A complete fertilizer should be added according to the needs of the crop to be grown.

These soils generally are not suited to citrus trees. Problems caused by poor drainage and susceptibility to freezing temperatures adversely affect the growth of the trees.

Under intensive management excellent yields of improved pasture are obtained on these soils. A drainage system is required to remove excess surface water after severe rains. Clover-grass pastures for grazing in winter, and pastures of bahiagrass, pangolagrass, Coastal bermudagrass, and other improved grasses for grazing in warm seasons, are well suited. Only a small amount of lime is needed, but the need for lime increases if the soils have been drained for a long period.

CAPABILITY UNIT IIIws-3

This capability unit consists of nearly level, poorly drained or very poorly drained, slightly acid or neutral soils that have a sandy or mucky surface layer. These soils have a clayey subsoil at a depth of less than 30 inches, and the subsoil is underlain by calcareous material. A large acreage of these soils occurs in depressions, sloughs, or broad flats. Surface drainage is slow, and the water table is at or near the surface most of the year. The soils in this unit are—

Iberia mucky loam.
Manatee fine sand.
Manatee loamy fine sand.

These soils have moderately high to high available moisture capacity, high natural fertility, and a high content of organic matter. Wetness, however, severely limits their use for crops. Constructing and maintaining a system that will provide surface drainage is moderately difficult. Such a system needs to be carefully designed, installed, and maintained.

If the level of the water table is properly controlled, these soils are well suited to a number of crops. Truck crops, cut flowers, and flowering bulbs make excellent yields under good management. The size of the area, the availability of water suitable for irrigation, and the freedom from frost help determine whether developing the areas for crops is feasible or whether it is practical to continue use of the soils where the areas have already been developed.

Most crops grown on these soils require a small to moderate amount of lime. A complete fertilizer, including minor elements, should be applied according to the needs of the crop to be grown. A cultivated crop should be followed by a cover crop.

These soils are generally poorly suited to citrus trees. Under the most favorable conditions, however, citrus trees can be grown in selected areas if intensive management is practiced. A careful study of the site should be made before planning a citrus grove.

Under intensive management, pastures of high quality can be produced on these soils, but a drainage system properly designed for removing excess surface water is essential. The soils are well suited to clover-grass pasture for winter grazing if they are properly fertilized. They are also well suited to several grasses that grow in warm seasons and produce good yields. Grazing should be rotated and controlled to permit good growth of grasses and legumes. Control of grazing also prevents puddling or packing of the soils by livestock.

CAPABILITY UNIT IIIws–4

In this capability unit are somewhat poorly drained or poorly drained, strongly acid or very strongly acid, sandy soils. These soils have a surface layer of dark-colored fine sand that is underlain by a leached layer of lighter colored fine sand. A weakly cemented to strongly cemented pan stained with organic matter is at a depth of less than 30 inches. The water table rises to within a few inches of the surface in wet seasons and drops to a depth of more than 36 inches in dry seasons. The soils in this unit are—

St. Johns fine sand.
Wabasso fine sand.

These soils have low or moderately low available moisture capacity and are droughty in dry seasons. They are porous; as a result, plant nutrients leach out rapidly. Natural fertility is low, but response to fertilizer is good. A restricted root zone limits the kinds of crops that can be grown.

These soils are moderately well suited to general farm crops and are well suited to truck crops, flowers, and other special crops. In areas that are relatively free from frost and that have water readily available for irrigation, they can be used extensively for winter truck crops and other special crops. The level of the water table should be carefully controlled, and for that purpose, a combined drainage and subirrigation system that is properly designed is needed. Such a system ought to be installed and maintained carefully. It not only provides for the rapid removal of excess water during severe rains, but it also provides a means of irrigating the soils during dry seasons. Most crops grown on these soils require applications of lime and a complete fertilizer.

These soils are generally not suited to citrus trees; many local factors, however, influence their suitability for citrus groves. Among these factors are poor drainage, susceptibility to freezing temperatures, thickness of the leached layer, and the texture and color of the underlying material. Where the combination of these characteristics is favorable, citrus trees can be grown successfully if good management is used. A careful study of the site should be made, however, before planning a citrus grove.

Productive pastures of improved grasses can be maintained on these soils, but a simple drainage system is needed to remove excess water during wet seasons. Grass or a combination of clover and grass can be grown successfully for winter pasture if a liberal amount of lime and fertilizer is applied. Areas in which the surface layer is dark gray to black are best suited to clover. The water must be controlled to assure good growth of clover.

CAPABILITY UNIT IIIws–5

In this capability unit are very poorly drained, strongly acid to neutral, dark-brown to black organic soils. These soils formed from the remains of aquatic plants that have collected in depressions filled with water. They consist of soft felty peat or muck over material ranging from acid sand or clay to alkaline clay or marl. If these soils are drained, their surface layer rapidly changes to very dark brown or black muck or peaty muck. The soils in this unit are—

Brighton peat.
Brighton peat, shallow variant.
Brighton, Istokpoga, and Okeechobee soils.
Okeechobee muck.
Terra Ceia muck.

These soils are high in nitrogen, but their supply of other plant nutrients is low. Excess water is the main limitation to their use.

Before cultivated crops can be grown or the areas used for pasture, these soils must be reclaimed. After they are drained, subsidence as a result of oxidation is a continuous hazard. Normally, the large areas are more economical to reclaim than the smaller ones. Reclaiming the smaller areas is feasible, however, if drainage outlets are easily obtained and other basic requirements can be met. Drainage can be established through a system of canals, lateral ditches, mole drains, and tile drains. Control structures are required in the main canals. They keep the level of the water table at a proper depth for crops and permit flooding when the areas are not in use. The water level should be lowered just enough to permit good root development during the growing season. It can be raised again after the crop has been harvested.

These soils are well suited to truck crops if the water is properly controlled. Frequent applications of a fertilizer high in content of potash, phosphate, and minor elements are required, however, and a large amount of lime is needed.

These soils are not suitable for citrus trees. High-yielding pastures of grass and clover can be maintained

if a moderate amount of fertilizer is applied and grazing is rotated. The pastures generally require the same drainage practices as the cultivated areas.

CAPABILITY UNIT IIIse-1

In this capability unit are nearly level or gently sloping, well-drained, deep soils that are sandy and droughty. These soils occupy broad areas of the uplands. They are porous; therefore, water and air move rapidly through the profile. The soils in this unit are—

Blanton fine sand, high, 0 to 5 percent slopes.
Lakeland fine sand, 0 to 5 percent slopes.

The content of organic matter is low, and the soils have low available moisture capacity and low natural fertility. As a result, they are severely limited in their suitability for cultivated crops. Plant nutrients leach out rapidly. Erosion is a minor hazard, although unprotected areas are subject to washing and blowing.

Where the climate is favorable these soils are well suited to citrus trees. Growing a cover crop between the trees (fig. 4), applying lime and fertilizer, and irrigating during dry periods are good management practices.

These soils produce moderate yields of improved pasture if they are adequately fertilized and limed. Pangolagrass, bahiagrass, and other deep-rooted grasses are adapted. Deep-rooted legumes, such as hairy indigo and crotalaria, can be grown successfully, but careful management is required to maintain a good cover of plants.

CAPABILITY UNIT IIIse-2

This capability unit is made up of nearly level or gently sloping, deep, droughty soils that have a sandy texture to a depth of more than 42 inches. Some areas of these soils in the eastern part of the county are surrounded by wetter soils, and the areas in the western part are surrounded by drier soils. The depth to the water table varies greatly. Normally the water table is near enough to the surface to affect the amount of moisture in the soils above a depth of 42 inches. The soils in this unit are—

Blanton fine sand, low, 0 to 5 percent slopes.
Orlando fine sand, 0 to 5 percent slopes.

The available moisture capacity, natural fertility, and content of organic matter are low, and these soils are strongly acid. Water moves rapidly through the profile; not much moisture is retained for shallow-rooted plants, but the supply of moisture for deeper rooted plants generally is favorably influenced by the water table.

Figure 4.—**Grove of citrus trees on Lakeland fine sand, 0 to 5 percent slopes. A cover of grass that protects the soils grows between the trees.**

Erosion by water and wind is a hazard in unprotected areas.

These soils are only moderately well suited to row crops. They require intensive management if good yields are to be obtained. Returning all crop residue to the soils, turning under a green-manure crop, and applying lime and the proper kinds and amounts of fertilizer will help to maintain the content of organic matter and the supply of plant nutrients. Therefore, before planting a crop that requires cultivation, plow under all residue from the previous crop; after the cultivated crop is harvested, plant a cover crop.

In areas that are not subject to damaging cold, these soils are well suited to citrus trees. Areas where a grove is to be established, however, should be carefully chosen. Air drainage is poor in the many low areas where these soils occur. In these cold low spots, the fruit or the trees are likely to be damaged by frost. Natural drainage is generally adequate for good growth of the trees, but trees may be damaged by a high water table after unusually high rainfall. As a rule, the roots of the trees extend into the moist area just above the water table; therefore the trees are normally not affected seriously by drought. Good management of the citrus groves requires growing a cover crop between the trees and applying enough fertilizer and lime for good yields.

These soils are well suited to improved pasture. Deep-rooted grasses and lagumes make good growth if they are properly established, if enough fertilizer and lime are applied, and if grazing is controlled. Pastures on these soils are not adversely affected by drought to any great extent.

CAPABILITY UNIT IVws-1

Organic soils that are nearly level, deep, very poorly drained, and very strongly acid are in this capability unit. They formed in the remains of forest vegetation in depressions and swamps. These soils are brown to reddish-brown woody peats that are more than 12 inches thick over acid sand. The soils in this unit are—

Istokpoga peat, deep.
Istokpoga peat, moderately deep.
Istokpoga peat, shallow variant.

These soils are high in nitrogen, but their supply of other plant nutrients is low. They must be drained and cleared of dense forest vegetation before they can be used for cultivated crops or pasture. Subsidence, caused by oxidation of the peat, is extensive after the soils are drained. The presence of undecomposed tree trunks, stumps, and roots also limits the use of these soils for crops.

Only large areas of these soils can be economically reclaimed. After the soils have been reclaimed, they are moderately well suited to cultivated crops. The areas are generally drained by establishing a system of canals and lateral ditches; buried obstructions prohibit the use of mole drains. Control structures should be used in the main canals to keep the water table at a proper depth for crops and to permit flooding when the soils are not in use. The water level should be lowered enough to permit the proper development of roots during the growing season. It ought to be raised again when the crops have been harvested so that oxidation will be reduced.

Adapted legumes grown in regular sequence with cultivated crops help to restore organic matter lost through oxidation. Large applications of fertilizer high in phosphate, potash, and minor elements should be applied frequently according to the needs of the crop to be grown. Large applications of lime are also required.

These soils are not suited to citrus trees. If water control is established, however, and if a large amount of fertilizer and lime are applied and careful management is used, excellent yields of grass or of grass and clover pasture are obtained.

CAPABILITY UNIT IVws-2

In this capability unit are nearly level or gently sloping, deep, strongly acid, highly leached, sandy soils that are poorly drained or very poorly drained. These soils are in depressions, sloughs, and drainageways, and in seepage areas and on broad flats. The water table is at or near the surface most of the year. The soils in this unit are—

Plummer fine sand.
Rutlege, Plummer, and St. Johns soils.

The available moisture capacity, natural fertility, and content of organic matter are low. The sandy texture also limits use of these soils but wetness is the main limitation. These soils are not well suited to general farm crops but are well suited to truck crops, cut flowers, and other special crops if good management is used and other factors are favorable. The availability of water for irrigation and freedom from frost greatly affect the suitability of the soils for truck crops and special crops. A combined drainage and subirrigation system is needed, and it ought to be carefully designed, constructed, and maintained. Crops require frequent applications of lime and fertilizer, and all crop residue should be worked into the soils to increase the content of organic matter.

These soils are poorly suited to citrus trees, for they are in low areas where the trees would be highly susceptible to damage from frost. Proper drainage is also difficult to obtain in these low areas.

Highly productive pastures of improved grasses can be maintained on these soils for grazing in warm seasons. A drainage system that will remove excess water during wet seasons is essential. Also liberal applications of lime and fertilizer are required. The yields of grass are closely related to the rate of fertilization. Clover can be grown successfully with the grasses for winter pasture, but irrigation similar to that used for cultivated crops is required for successful growth.

CAPABILITY UNIT IVws-3

This capability unit consists of nearly level, deep, poorly drained or very poorly drained, slightly acid to neutral fine sands. These soils are in slight depressions, sloughs, or broad, flat drainageways. The soils in this unit are—

Charlotte fine sand.
Pompano fine sand.
Pompano fine sand, moderately shallow.

The available moisture capacity, natural fertility, and content of organic matter are low. These soils are also rapidly permeable, and they lose mineral fertilizer rapidly through leaching. Wetness, however, is the main limitation to their use.

These soils are not well suited to general farm crops. They are suited to truck crops, cut flowers, and other special crops if good management is used and other factors are favorable. The availability of water suitable for irrigation, however, as well as freedom from frost, greatly affect the suitability for truck crops and special crops. Large, uniform areas are the most economically reclaimed for cultivation. A combined drainage and subirrigation system is needed, and it should be carefully designed, constructed, and maintained. This system provides rapid removal of excess water during severe rains and a means of irrigating in dry seasons.

Crops grown on these soils require frequent applications of fertilizer, but lime is needed only occasionally. Also, all crop residue should be worked into the soils to increase the content of organic matter.

Because these soils are in low, wet areas, they are generally poorly suited to citrus trees. In areas near large lakes, however, the hazard of freezing is reduced and citrus trees can be grown if good water control is established. If these soils are used for citrus groves, the trees are more susceptible to damage from frost than those in higher areas. The trees also are unable to establish a good root system in these wet soils, for a well-aerated root zone that is 4 to 5 feet thick and that is free of saturation by water is necessary. A well-designed system for controlling water is needed. It should consist of tile drains, canals, and lateral ditches, and the area ought to be bedded (fig. 5).

Figure 5.—**A grove of orange trees 6 years old that have been planted on beds 2 feet high. The machine is opening the furrows between the beds so that excess surface water will be quickly removed. Tile placed below the surface provides internal drainage to the desired depth (capability unit IVws–3).**

Highly productive pastures of improved grasses suitable for grazing in warm seasons can be maintained on these soils. However, a drainage system for removing excess surface water during wet seasons is essential. Large applications of fertilizer and an occasional application of lime are required. Clover can be grown successfully with grasses for winter pasture. An irrigation system similar to that used for cultivated crops is required for successful growth of clover.

CAPABILITY UNIT IVse–1

The soils in this capability unit are sloping or strongly sloping, deep, moderately well drained, and rapidly permeable. Their sandy texture extends to a depth of more than 42 inches. The acreage of these soils is not large. The areas are mainly small and border streams, lakes, and depressions adjacent to less sloping soils. The soils in this unit are—

Blanton fine sand, low, 5 to 8 percent slopes.
Orlando fine sand, 5 to 8 percent slopes.

The available moisture capacity, natural fertility, and content of organic matter are low in these soils. Water moves rapidly through the profile, and only a small amount is retained for the use of plants. Crops, however, benefit from a favorable water table. Erosion by wind and water is active in unprotected areas.

These droughty soils are suited only to a few special crops, but they require more intensive management than the adjacent gently sloping soils. Watermelons grow well and produce fair yields if they are properly fertilized. The content of organic matter should be maintained by returning all crop residue, planting green-manure crops, and applying enough fertilizer and lime. Stripcropping is necessary for the control of erosion.

In areas where the trees are not subject to damage from cold, these soils are well suited to citrus trees. Good management requires growing a cover crop between the trees, planting and cultivating on the contour, and applying lime and the proper kinds and amounts of fertilizer. Erosion is active, unless a cover of close-growing vegetation is maintained between the trees or a mulch is applied in shaded areas that are completely covered by the tree canopy.

These soils are suited to improved pasture. Deep-rooted grasses and legumes make good growth if they are properly established, if fertilizer and lime are applied, and if grazing is controlled. The pastures are not much affected by drought.

CAPABILITY UNIT IVse–2

In this capability unit are well-drained, sloping fine sands that are 42 to more than 60 inches deep over acid sandy loam to sandy clay loam. These deep soils are strongly acid. They are mainly on the higher uplands in the central and western parts of the county, but they also occupy a minor acreage in the southeastern part. The soils in this unit are—

Blanton fine sand, high, 5 to 8 percent slopes.
Lakeland fine sand, 5 to 8 percent slopes.

These soils are porous, and water and air move rapidly through them. The available moisture capacity is low, and these soils are droughty in dry seasons. Natural fertility is low, and fertilizer is lost rapidly through leaching. The hazard of erosion is moderately severe in unprotected areas.

These soils are suited to only a few cultivated crops. All cultivated crops should be rotated with close-growing crops, and grass sod or a cover crop ought to be grown at least three-fourths of the time in the cropping system. A liberal amount of fertilizer is needed, and stripcropping is required for control of wind erosion. Where an easily accessible supply of water is available, high-value special crops can be grown under sprinkler irrigation.

These soils are well suited to citrus trees where air drainage is good. Good management of the citrus groves consists of growing a cover crop between the trees, planting and cultivating on the contour, applying enough lime

and fertilizer for good yields, and sprinkler irrigation where needed.

The soils are moderately well suited to pangolagrass, bahiagrass, and other deep-rooted grasses, and hairy indigo is a deep-rooted legume that grows well. Controlling grazing carefully and applying lime and fertilizer frequently are essential for maintaining good pastures.

CAPABILITY UNIT IVsw-1

This capability unit is made up of nearly level or gently sloping, somewhat poorly drained or poorly drained, deep soils that are sandy and strongly acid. These soils are highly leached and have an organic pan at a depth of less than 42 inches. They are extensive in the flatwood areas of the county. The soils in this unit are—

Immokalee fine sand.
Immokalee sand.
Leon sand.
Leon fine sand, 0 to 2 percent slopes.
Leon fine sand, 2 to 5 percent slopes.

These soils are sandy and have very low available moisture capacity. They are porous, and water and air move rapidly through them. The content of organic matter and the natural fertility are low. Plant nutrients leach out rapidly.

These soils are poorly suited to general farm crops, but they are well suited to truck crops, flowers, and other special crops. The availability of water suitable for irrigation, and freedom from frost in winter, greatly affect suitability for these crops. Such crops require intensive management and careful control of the water level. A carefully designed combined drainage and subirrigation system (fig. 6) needs to be installed, and it should be carefully maintained. This system provides for the rapid removal of excess water during heavy rains and a means of irrigating in dry seasons. Adding lime and a complete fertilizer according to the needs of the crop to be grown and including a green-manure crop or a cover crop in the rotation are also beneficial.

Generally, these soils are poorly suited to citrus trees. Such factors as poor drainage, the susceptibility to freezing temperatures, the thickness of the highly leached soil material below the surface layer, the hardness of the organic pan, the texture of the underlying material, and other important local differences may adversely affect the growth of the trees. Under the most favorable conditions, however, citrus trees can be grown successfully if they are carefully managed (fig. 7). They require a properly designed system for controlling water and also a protective cover. A careful study of the site should be made before a citrus grove is planned.

Figure 6.—Celery in a field where a combined drainage and subirrigation system has been installed.

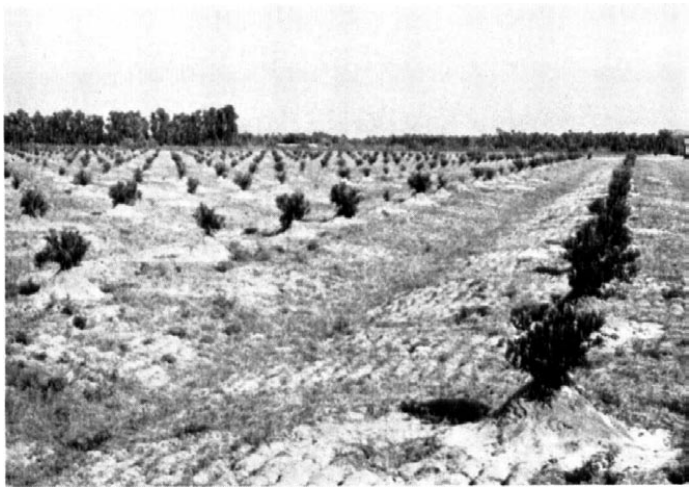

Figure 7—**A grove of young citrus trees on Leon fine sand. The trees were planted in carefully designed beds that are part of the overall system used for controlling water. A mulch between the trees prevents soil blowing. Mounds were placed around the base of the trees to protect the lower part of the young trees, below the graft, from a killing freeze.**

Highly productive pastures of improved grasses can be maintained on these soils, but a simple drainage system is needed to remove excess water during wet seasons. The yield of grass is closely related to the rate of fertilization; liberal applications of fertilizer and lime are required. Clover can be grown successfully with the grasses for winter pasture, but irrigation, similar to that used for cultivated crops, is required to assure good growth.

CAPABILITY UNIT IVsw-2

Plummer fine sand, high, is the only soil in this capability unit. It is nearly level, poorly drained, and strongly acid. This soil has a sandy texture that extends to a depth of more than 42 inches. The water table generally fluctuates between a depth of 24 and 48 inches. It may, however, rise to the surface during extended wet periods or recede below a depth of 60 inches in extremely dry seasons.

This soil has low available moisture capacity, and as a result, drought may damage crops in dry seasons. Some shallow-rooted crops, however, may benefit from the moisture that rises, through capillary action, from the water table into the root zone. Natural fertility is low, and plant nutrients leach out rapidly. The poor soil qualities associated with the sandy texture limit the use of this soil, and wetness is an additional limitation.

Most crops that are grown locally are grown on this soil, but yields are generally low unless intensive management is practiced. All crop residue ought to be incorporated into the surface layer, and improved pasture ought to be rotated with cultivated crops in the cropping system. In large fields windbreaks and close-growing crops planted in strips are needed to break the force of the wind.

Areas of this soil that are not subject to damaging frost are moderately well suited to citrus trees. Most areas where the climate is favorable are in low positions where air drainage is poor. All areas used for citrus trees require bedding and drainage.

784-135—66——3

Such grasses and legumes as pangolagrass, bahiagrass (fig. 8), and indigo are well adapted to this soil. These grasses grow well if they are properly established, if fertilizer and lime are applied, and if grazing is controlled.

Figure 8.—**A well-managed improved pasture of bahiagrass on Plummer fine sand, high.**

CAPABILITY UNIT Vws-1

In this capability unit are nearly level, poorly drained and very poorly drained soils that are subject to frequent flooding and have a sticky, clayey subsoil. These soils are neutral in reaction and are moderately deep over calcareous clay and marl. They are in depressions and sloughs and on the broad, flat flood plains of the St. Johns River and the associated chain of lakes. The soils in this unit are—

Felda fine sand.
Iberia clay loam, overflow.
Manatee-Delray complex, overflow.

These soils have moderately low to high available moisture capacity and high natural fertility. The Iberia soil is very slowly permeable, and water and air move slowly through the profile. Deep flooding is a severe hazard.

These soils require major reclamation and must be protected by high dikes before they can be used for cultivated crops or improved pasture. Also, some of these soils have a fine-textured surface layer and can be tilled only within a narrow range of moisture content.

These soils are not suited to citrus trees. Native grasses grow well in marshy or treeless areas, however, and these areas make good native range. Grazing should be controlled to permit good growth of the grasses. Wooded areas provide few plants suitable for grazing, but they are suitable for wildlife.

CAPABILITY UNIT Vws-2

Only one mapping unit, Rutlege and Pompano soils, ponded, is in this capability unit. These are deep, sandy, nearly level, very poorly drained soils that are strongly acid to neutral. They are in depressions or in marshy areas and sloughs; flooding is frequent, and these soils are covered by water most of the year.

The soils in this unit are porous, and water moves rapidly through the profile. As a result, the supply of all essential plant nutrients is low.

These soils are too wet for cultivated crops or improved pasture, and it is generally not economically feasible to reclaim them. Yields of native wetland grasses are fair.

CAPABILITY UNIT Vsw–1

Pomello fine sand, 0 to 5 percent slopes, is the only soil in this capability unit. It is nearly level or gently sloping, moderately well drained, and strongly acid. This soil is on low ridges and slightly higher knolls in the flatwood areas of the county. Its surface layer is light gray, and the soil material below the surface is white. A pan stained with organic matter is at a depth of 24 to 48 inches. The water table rises to within 24 inches of the surface during wet seasons.

This soil has very low available moisture capacity and rapid permeability. It is porous, highly leached, and droughty.

The main limitations to the use of this soil are the coarse texture, low available moisture capacity, and high degree of leaching. This soil is not suited to row crops and is poorly suited to citrus trees. Bahiagrass and other deep-rooted, drought-resistant grasses produce only fair yields, even if a large amount of fertilizer and lime is applied.

CAPABILITY UNIT VIs–1

Only one soil, Lakewood sand, 0 to 5 percent slopes, is in this capability unit. It is a nearly level or gently sloping, deep, strongly acid soil that is excessively drained and droughty. The surface layer is nearly white, and the soil material below the surface layer is yellowish or brownish. This soil is on ridges and dunes throughout the central and western parts of the county.

The available moisture capacity and natural fertility are very low, and this soil is porous and highly leached. As a result, it is severly limited in its use for crops. Water moves rapidly through the profile. As a result, the organic matter oxidizes rapidly and soluble plant nutrients are lost quickly through leaching.

This soil is suited to a few crops, but intensive management is required. Watermelons can be grown in areas that have not been previously cultivated for 1 year, but they should be followed by deep-rooted grasses, hairy indigo, or other close-growing vegetation.

If the local climate is favorable, this soil is moderately well suited to citrus trees. The groves require a cover crop or a cover of weeds and grass between the trees to protect the soil from wind erosion. Also, mulch tillage is necessary in winter and spring, but tillage should be kept to a minimum. Sprinkler irrigation is needed for the survival of young trees and to insure a good yield of fruit from mature trees.

This soil is poorly suited to improved pasture. Fair yields of bahiagrass and other deep-rooted grasses can be obtained, however, if fertilizer is applied frequently and if grazing is carefully controlled.

CAPABILITY UNIT VIse–1

In this unit are deep, strongly sloping, well-drained, sandy soils that are moderately eroded in some places. These soils are strongly acid, and their sandy texture extends to a depth of more than 42 inches. The underlying material is acid sandy loam to sandy clay loam. The soils in this unit are—

Blanton fine sand, high, 8 to 12 percent slopes.
Lakeland fine sand, 8 to 12 percent slopes.

These soils are highly leached, and their available moisture capacity and natural fertility are very low. Also, the hazard of erosion is severe if a protective cover is not maintained. As a result, these soils are generally not suitable for cultivation. If cultivated crops are grown, only those crops that are close growing should be planted, and they require intensive management.

These soils are normally not suitable for citrus trees, because of the poor air drainage and the hazard of erosion. Intensive management is required where the soils are included with other soils in citrus groves, and a mulch or a good cover of plants must be maintained between the trees.

These soils are not well suited to improved pasture, although fair yields of deep-rooted, drought-resistant grasses can be obtained under good management. Grazing must be restricted more than on similar, less sloping soils, so that the soils have a good protective cover at all times.

CAPABILITY UNIT VIIs–1

This unit consists of deep, excessively drained, strongly acid, sandy soils that have a light-colored surface layer. These soils are on ridges throughout the central and western parts of the county. The soils in this unit are—

Lakewood sand, 5 to 8 percent slopes.
St. Lucie fine sand, 0 to 5 percent slopes.

These soils have very low available moisture capacity and rapid permeability. They are porous, and water moves rapidly through the profile. As a result, the soils are highly leached and droughty.

The soils of this unit are severely limited in their use for crops. They are not suited to cultivated crops, improved pasture, or native range. The native vegetation consists of scrub oak or sand pine and a few shrubs, but it includes only a small amount of grass.

Many areas are used for building sites. Lawns and ornamental shrubs are difficult to maintain, and they require intensive irrigation, mulching, and a large amount of fertilizer.

Estimated Yields

Table 2 gives the estimated average acre yields of the principal crops grown on the soils of the county under two levels of management. The yields in columns A were obtained under the prevailing, or ordinary, management used in the county. Those in columns B were obtained under improved, or high-level, management.

Under ordinary management, the amount of fertilizer and lime applied is not sufficient to produce maximum yields, a definite cropping system generally is not followed, and erosion control, drainage, and irrigation generally are not adequate. In addition, certified seed and improved varieties of crops are not always planted.

The estimates in columns B indicate the average yields that may be obtained if more intensive management practices are used. These practices include applying enough commercial fertilizer and lime and adding enough manure for satisfactory yields; selecting a proper cropping system; managing crop residue properly; supplying drainage where needed; using adequate practices for

controlling runoff and erosion; and installing a properly designed irrigation system. Management of improved pasture consists of preparing the seedbed, applying fertilizer and lime, using good varieties of plants and plant mixtures, regulating grazing, and controlling undesirable plants.

The yields in table 2 are based largely on information obtained from observations made by members of the soil survey party, from interviews with farmers and other workers who have had experience with the soils and crops of the area, from records and experience of the local work unit conservationist, from bulletins and other information compiled by the University of Florida Agricultural Experiment Stations, from comparisons of yields from other counties in the central part of Florida where the soils and climatic conditions are similar, and from records of crop yields kept by the Florida Crop Reporting Service.

Use of the Soils for Woodland Range [2]

About 45,000 acres in the eastern part of the county is used for range. These areas are either rangeland or woodland used for range. Where the woodland is grazed, the income from the understory of native forage is secondary. The ranches in this county are mainly of the cow-calf type.

Native grasses are an important part of the overall, year-round supply of forage for this county. They are readily available, can be cheaply grown, and provide the important roughage needed by cattle.

Range sites and range condition

Range sites are distinctive kinds of rangeland or woodland used for grazing; they differ from each other significantly in the kinds and amounts of climax vegetation they produce. A significant difference means one large enough to require different management. Range sites are distinguished by differences in climate, topography, and kinds of soils.

The vegetation that grew originally on a site is called the *climax vegetation.* It is generally the most productive and most suitable for that particular site, and it reproduces itself as long as the environment does not change. The climax vegetation consists mainly of three kinds of plants—*decreasers*, *increasers*, and *invaders.*

Decreasers are the most palatable climax plants, and they are eliminated rather quickly under heavy grazing. Increasers are plants less palatable to livestock; they increase for a while under heavy grazing but finally go out under continual heavy use. Invaders are plants of little value for forage, but they become established after the other vegetation has been reduced.

Range condition is the present state of the vegetation in relation to the climax plants on the site. A range in excellent condition has 76 to 100 percent, by weight, of the climax vegetation; one in good condition, 51 to 75 percent; one in fair condition, 26 to 50 percent; and one in poor condition, less than 26 percent.

Principles of range management

The best yields of native grass can be obtained only if each season the plants are allowed to accumulate a good supply of carbohydrates in their roots. This requires that sufficient top growth be left for a long enough period to build up a reserve in the root system. The number of cattle and the length of time the range is grazed should be regulated, so that no more than half the current season's growth, by weight, is removed When more than half is continually removed, the most desirable plants are weakened and eventually die out; then weeds, brush, and other undesirable plants replace them.

Rotation-deferred grazing is a desirable practice. It consists of resting one or more range units at planned intervals throughout the growing season of the key plants and generally not grazing any unit more than half of any growing season or at the same time in successive years. Proper use is another desirable range practice. This requires grazing rangeland at an intensity that will maintain adequate cover for soil protection and maintain or improve the quantity and the quality of the desirable vegetation.

The better grasses in native pastures should have only light use during the early part of the growing season. At that time, the plants are susceptible to damage from overgrazing because they are drawing heavily upon the stored reserves of food in their roots. Deferring grazing for a full growing season permits the more desirable grasses to regain vigor and to spread and produce desirable forage. While grazing is deferred on the native pastures, cattle are on improved pasture. A native pasture that has been rested provides enough forage for excellent winter roughage if it is supplemented with minerals and proteins.

Other good range practices are controlled burning, brush control, and fencing. Also, salt, minerals, and protein feed should be properly distributed over the range.

Descriptions of range sites

The soils of Seminole County used for woodland range have been grouped in the seven range sites described in the following pages. The description of each range site gives the important characteristics of the soils and the names of the principal grasses or other forage plants.

ACID FLATWOOD RANGE SITE

In this range site are nearly level or gently sloping, strongly acid, poorly drained soils that are deep and sandy. These soils are rapidly permeable, have low available moisture capacity, and have low natural fertility. They contain a layer stained by organic matter. In some places this layer is near the surface, but in other areas it is at a depth of as much as 48 inches. The soils in this range site are—

Immokalee fine sand.
Immokalee sand.
Leon fine sand, 0 to 2 percent slopes.
Leon fine sand, 2 to 5 percent slopes.
Leon sand.
Ona fine sand.
Plummer fine sand, high.
Rutlege fine sand, high.
St. Johns fine sand.
Wabasso fine sand.

This is an extensive range site that originally supported an open forest of slash and longleaf pines. An open canopy permitted the growth of an understory of grasses and forbs. The climax grasses now on this site

[2] L. L. YARLETT, range conservationist, assisted in the preparation of this section.

TABLE 2.—*Estimated average acre yields of the*

[Yields in columns A were obtained under ordinary management; those in columns B were obtained under high-level management. grown or the soil

Soil	Oranges		Grapefruit		Snap beans		Cabbage	
	A	B	A	B	A	B	A	B
	Box	*Box*	*Box*	*Box*	*Bu.*	*Bu.*	*50-lb. crate or bag*	*50-lb. crate or bag*
Blanton fine sand, low, 0 to 5 percent slopes	375	600	450	700	120	150		
Blanton fine sand, low, 5 to 8 percent slopes	375	600	450	700	120	150		
Blanton fine sand, high, 0 to 5 percent slopes	325	550	400	650	100	125		
Blanton fine sand, high, 5 to 8 percent slopes	325	550	400	650	100	125		
Blanton fine sand, high, 8 to 12 percent slopes	325	550	400	650				
Borrow pits								
Brighton peat					150	175	320	480
Brighton peat, shallow variant					150	175	320	480
Brighton, Istokpoga, and Okeechobee soils					150	175	320	480
Charlotte fine sand					120	150	280	440
Delray fine sand					175	225	280	440
Delray mucky fine sand					200	250	360	520
Delray fine sand, high	300	450	375	600	200	250	320	480
Delray fine sand, moderately shallow, high	300	450	375	600	200	250	320	480
Felda fine sand								
Iberia clay loam, overflow								
Iberia mucky loam					200	250	360	520
Immokalee fine sand					100	125	200	280
Immokalee sand					100	125	200	280
Istokpoga peat, deep					150	175	320	480
Istokpoga peat, moderately deep					150	175	320	480
Istokpoga peat, shallow variant					150	175	320	480
Lakeland fine sand, 0 to 5 percent slopes	400	625	500	750				
Lakeland fine sand, 5 to 8 percent slopes	400	625	500	750				
Lakeland fine sand, 8 to 12 percent slopes	400	625	500	750				
Lakewood sand, 0 to 5 percent slopes	200	350	275	375				
Lakewood sand, 5 to 8 percent slopes	200	350	275	375				
Leon sand					125	160	200	280
Leon fine sand, 0 to 2 percent slopes					130	165	240	320
Leon fine sand, 2 to 5 percent slopes					130	165	240	320
Made land								
Manatee fine sand					125	160	260	400
Manatee loamy fine sand					200	250	360	520
Manatee-Delray complex, overflow								
Okeechobee muck					160	185	320	480
Ona fine sand	300	450	375	600	190	240	320	480
Orlando fine sand, 0 to 5 percent slopes	450	625	550	750	120	150		
Orlando fine sand, 5 to 8 percent slopes	450	625	550	750	120	150		
Plummer fine sand					100	125	200	280
Plummer fine sand, high	250	400	300	465	175	250	280	440
Pomello fine sand, 0 to 5 percent slopes	150	250	300	400	90	110		
Pompano fine sand					125	160	260	400
Pompano fine sand, moderately shallow					125	160	240	400
Rutlege fine sand					160	185	280	440
Rutlege mucky fine sand					160	185	320	480
Rutlege fine sand, high	375	600	350	700	200	250	320	480
Rutlege, Plummer, and St. Johns soils								
Rutlege and Pompano soils, ponded								
St. Johns fine sand					140	175	240	320
St. Lucie fine sand, 0 to 5 percent slopes								
Sandy alluvial land								
Swamp								
Terra Ceia muck					160	185	320	480
Wabasso fine sand					140	175	240	320

[1] The number of days 1 acre will support 1 animal unit (one cow, steer, or horse; five hogs; or seven sheep or goats) without injury to the pasture.

principal crops grown under two levels of management

Yields of all truck crops were obtained by using a subirrigation system. Absence of a yield figure indicates crop is not commonly is not suited to it]

Celery		Cucumbers		Lettuce		Carrots		Permanent improved pasture (grass)		Permanent improved pasture (grass-clover)
A	B	A	B	A	B	A	B	A	B	B
60-lb. crate	*60-lb. crate*	*Bu.*	*Bu.*	*35-lb. crate*	*35-lb. crate*	*Tons*	*Tons*	*Cow-acre-days* [1]	*Cow-acre-days* [1]	*Cow-acre-days* [1]
		140	250					200	275	
		140	250					200	275	
								125	230	
								125	230	
								125	230	
700	900			175	275	9	13	300	400	575
700	900			175	275	9	13	300	400	575
700	900			160	260	9	13	300	400	
550	750	175	250	100	150	8	12	275	350	525
550	750	175	250	150	250	8	12	290	375	575
550	750	175	250	160	260	8	12	300	400	575
600	800	200	300	140	175	8	12	275	350	525
600	800	200	300	140	175	8	12	275	350	525
600	800	175	250	160	260	9	13	300	400	575
		130	225	95	140	8	12	250	325	525
		130	225	95	140	8	12	200	275	500
700	900			175	275	9	13	300	400	
700	900			175	275	9	13	300	400	575
700	900			175	275	9	13	300	400	575
								125	220	
								125	220	
								125	220	
600	800	125	225	95	140	8	12	200	275	500
600	800	130	225	95	140	8	12	250	325	525
600	800	130	225	95	140	8	12	250	325	525
		200	300	110	160			275	350	557
600	800	175	250	160	260	9	13	300	400	575
700	900			175	275	9	13	300	400	575
		200	300	130	160	8	12	275	350	525
		150	250					200	275	
		150	250					200	275	
		130	225	100	150	7	11	225	300	525
600	800	175	250	110	160	8	12	275	350	525
								150	250	
550	750	175	250	110	160	8	12	275	350	525
550	750	175	250	110	160	8	12	275	350	525
550	750	175	250	130	160	8	12	290	375	575
550	750	175	250	150	200	8	12	300	400	575
		200	300	140	175	8	12	275	350	575
600	800	130	225	100	140	8	12	275	350	575
700	900			175	275	9	13	300	400	575
600	800	130	225	95	140	8	12	250	325	525

are creeping bluestem, lopsided indiangrass, chalky bluestem, Florida paspalum, brownseed paspalum, switchgrass, and hairy panicum. Grassleaf goldaster, deerstongue, and swamp sunflower are among the principal forbs. The main increasers are blue maidencane, pineland three-awn, and broomsedge bluestem. Carpetgrass, bottlebrush three-awn, pineland dropseed, and annuals are the most common invaders. To some extent, gallberry, sawpalmetto, and waxmyrtle were present under the canopy of the original pine forest. They have increased to where they are now the vegetation characterizing the site.

On this site average yields of air-dry herbage, based on plot clippings, are 3,500 to 6,000 pounds per acre on range in good or excellent condition. The production of forage under woodland use varies according to the age of the stand, the density of the canopy, and the extent to which needles have fallen.

FRESH MARSH (MINERAL) RANGE SITE

This range site is nearly level and is at a slightly lower elevation than the Acid Flatwood site, which is commonly adjacent. It is in small to large areas of the flood plains along the St. Johns River and the associated chain of lakes. The soils are rapidly to very slowly permeable. The content of organic matter is high in most areas, and the soils range from slightly acid to mildly alkaline. In summer the soils are subject to overflow from the St. Johns River one or two times each year, and occasional flooding is also likely in fall when hurricanes occur. The soils in this range site are—

Felda fine sand.
Iberia clay loam, overflow.
Iberia mucky loam.
Manatee-Delray complex, overflow.

Native maidencane is the principal climax vegetation that originally grew on large areas of this range site. The climax vegetation now on the site includes scattered cabbage-palms that grow on the mildly alkaline soils of slightly elevated rises within the marsh. Other climax plants are giant cutgrass and perennial sedges and rushes. The principal increasers are sand cordgrass, field paspalum, and broomsedge bluestem. Common invaders on all of these soils are carpetgrass, bermudagrass, and many annual grasses and weeds; other invaders on the Delray soil are smartweed, iris, willow primrose, and pickerelweed.

Average yields of air-dry herbage, based on plot clippings, are approximately 5,000 to 7,000 pounds per acre when this range is in good or excellent condition. This site has always been heavily grazed, however, and as a result, most of the range is in poor condition (fig. 9). Grazing management is based on maintaining a cover of carpetgrass and bermudagrass on the range.

FRESH MARSH (ORGANIC) RANGE SITE

In this range site are nearly level, deep, very poorly drained organic soils that are covered by water most of the year. The layers of peat or muck are more than 12 inches deep over sandy material. Areas of this site are relatively large and are adjacent to lakes, wide sloughs, and large streams throughout the country. These soils are rapidly permeable, and their supply of all plant nutrients, except nitrogen, is low. The soils in this range site are—

Figure 9.—**Typical area of Fresh Marsh (Mineral) range site on the flats along the St. Johns River. This area has been overgrazed and is in poor condition.**

Brighton peat.
Brighton peat, shallow variant.
Brighton, Istokpoga, and Okeechobee soils.
Istokpoga peat, deep.
Istokpoga peat, moderately deep.
Istokpoga peat, shallow variant.
Okeechobee muck.
Terra Ceia muck.

Native maidencane is the principal climax vegetation that originally grew on large areas of this site, but the climax vegetation includes giant cutgrass, perennial sedges, and rushes. The principal increasers are pickerelweed, duckpotato, and sawgrass. Common invaders are annuals, redroot, willow primrose, Ft. Thompson grass, and lizardtail.

On this site average yields of air-dry herbage are approximately 8,000 to 10,000 pounds per acre on range in good or excellent condition. This range in poor or fair condition produces approximately 1,000 to 2,000 pounds per acre, and the forage is mainly short-lived annuals.

SANDHILL RANGE SITE

This range site consists of deep, nearly level to strongly sloping, acid fine sands that are pale brown to yellowish brown and are on the uplands. These soils are moderately well drained or well drained, are rapidly permeable, and have low available moisture capacity. The content of organic matter and natural fertility are low. The soils in this range site are—

Blanton fine sand, high, 0 to 5 percent slopes.
Blanton fine sand, high, 5 to 8 percent slopes.
Blanton fine sand, high, 8 to 12 percent slopes.
Blanton fine sand, low, 0 to 5 percent slopes.
Blanton fine sand, low, 5 to 8 percent slopes.
Lakeland fine sand, 0 to 5 percent slopes.
Lakeland fine sand, 5 to 8 percent slopes.
Lakeland fine sand, 8 to 12 percent slopes.
Orlando fine sand, 0 to 5 percent slopes.
Orlando fine sand, 5 to 8 percent slopes.

The climax vegetation on this site is mostly open forest, mainly of longleaf pine. It includes scattered turkey oak, bluejack oak, other kinds of oak, and an understory of decreaser and increaser grasses and forbs. Creeping bluestem, indiangrass, needlegrass, splitbeard bluestem,

purple lovegrass, and forbs are the main decreasers on this site. The principal increasers are pineland three-awn, pineland dropseed, low panicum, broomsedge, turkey oak, bluejack oak, and runner oak. Invaders are natalgrass, pricklypear, persimmon, and annuals.

Average yields of air-dry herbage on this site are 2,000 to 4,000 pounds per acre on range in good or excellent condition and 1,000 to 2,000 pounds per acre on range in fair or poor condition. The production of forage under woodland use varies according to the age of the stand and the density of the canopy.

SAND SCRUB RANGE SITE

In this range site are deep, nearly level to strongly sloping, light-colored, sandy soils that are moderately well drained to excessively drained. These soils are on slightly elevated or elevated ridges or knolls, and they generally occur with soils of the Acid Flatwood site. Permeability is very rapid, and the available moisture capacity, content of organic matter, and natural fertility are low. The soils are highly leached and droughty, and as a result, they have little value for production of forage. The soils in this range site are—

Lakewood sand, 0 to 5 percent slopes.
Lakewood sand, 5 to 8 percent slopes.
Pomello fine sand, 0 to 5 percent slopes.
St. Lucie fine sand, 0 to 5 percent slopes.

The climax vegetation is mainly sand pine, sand hickory, scrub hickory, and scattered turkey oaks and bluejack oaks. The understory consists mainly of runner oak, saw-palmetto, yucca, pricklypear, rosemary, wild olive, and sand bay. Sparse stands of Florida bluestem, pineland three-awn, corkscrew three-awn, and low panicum are scattered throughout the range.

Only a small amount of desirable forage is obtained on this range site. The yields are so low that this range site should be disregarded when native forage resources are evaluated.

SLOUGH RANGE SITE

This range site is nearly level and is at a lower elevation than the surrounding Acid Flatwood site. In places it occurs in small, flat, wet areas that thread through areas of the Acid Flatwood site. In other places it is in poorly defined drainageways. The soils are rapidly permeable, low in content of organic matter, and slightly acid to mildly alkaline. In months of high rainfall, they are subject to frequent flooding. The soils in this range site are—

Charlotte fine sand.
Delray fine sand.
Delray fine sand, high.
Delray fine sand, moderately shallow, high.
Delray mucky fine sand.
Manatee fine sand.
Manatee loamy fine sand.
Plummer fine sand.
Pompano fine sand.
Pompano fine sand, moderately shallow.
Rutlege fine sand.
Rutlege mucky fine sand.
Rutlege, Plummer, and St. Johns soils.
Rutlege and Pompano soils, ponded.

Native maidencane originally was the principal climax vegetation that grew on large areas of this range site, but scattered cabbage-palms grew on the knolls and in a ring around the outer edges of this site. Other climax vegetation includes giant cutgrass, sawgrass, and rushes. The principal increasers are broomsedge bluestem, short-spike bluestem, lovegrass, hair-awn muhly, sand cordgrass, and pineland three-awn. Common invaders are knotroot bristlegrass, low panicum, carpetgrass, and annuals.

On this site average yields of air-dry herbage, based on plot clippings, are approximately 2,000 to 4,000 pounds per acre on range in good or excellent condition. This site has always been heavily grazed, however, and as a result, most of the range is in poor condition. The present grazing management consists mainly of maintaining the invader grasses that now make up much of the stand.

SWAMP RANGE SITE

This range site is made up of poorly drained or very poorly drained soils that are covered by water most of the year. It is in drainageways or on the bottom lands along poorly defined streams, in large bay heads, or in depressions that have no outlets. Many areas are inaccessible, because they are covered by water. The land types in this range site are—

Sandy alluvial land.
Swamp.

The dense canopy of wetland hardwoods and the excess water on this site reduce the production of forage in the understory. Desirable grasses, however, grow along the outer edges of the site where the water level is lower and the canopy is less dense than in the other areas.

The canopy ranges from a pure stand of species such as cypress to a mixed stand made up of many species. The dominant trees are baldcypress, pondcypress, planertree, swamp ash, swamp maple, and several species of gum and sweetbay. Climax grasses that grow along the outer margins of this site include maidencane, blue maidencane, chalky bluestem, and beaked panicum. Pond apple, waxmyrtle, storax, lizardtail, brackenfern, and pickerelweed are the main woody plants. Waxmyrtle is a serious invader along the outer margins of this site.

Average yields of air-dry herbage are 1,500 to 2,500 pounds per acre where the shade provided by the crown canopy is approximately 40 percent.

Use of the Soils for Woodland [3]

In this section suggestions are given for management of woodland. Also the potential productivity and limitations of the soils for wood crops are briefly discussed.

Woodland of commercial significance now occupies about 46 percent of Seminole County, but virgin forest covered all of the county at the time the first settlers arrived. The low, wet areas were covered by a forest of large hardwoods and cypress trees, and the flood plains of the St. Johns River and the associated chain of lakes were covered mainly by cabbage-palms. In the areas of flatwoods and on the sand ridges were almost pure stands of pine, and in the low, wet, swampy areas were mixed forests of pine, cypress, and hardwoods.

The forests of virgin pine were first worked for naval stores (turpentine and resin made from the sap of pines) and then were cut for lumber, but as the population increased, the acreage of forests gradually decreased. The

[3] EDWARD D. HOLCOMBE, woodland conservationist, Soil Conservation Service, assisted in the preparation of this section.

more fertile soils were cleared and were used for crops and pasture. The other areas were cleared for roads, communities, and industrial purposes. By about 1935, the last of the original forest had been cut and production of naval stores and lumber had declined. Since that time, cutting of the trees for pulpwood has become increasingly important.

Second-growth pines, cypress trees, and commercially valuable hardwoods are among the trees now harvested for local markets. A number of sawmills, planing mills, mills where veneer and furniture stock are manufactured, and pulpwood yards are located in the county.

Woodland suitability grouping of soils

The soils in Seminole County vary greatly in their suitability for wood crops. The combinations of species or forest types that grow on a particular soil are determined mainly by the characteristics of the soils and by the climate.

Among the most important factors that affect the capacity of a soil for growing trees is the depth of the root zone and the ability of the soil to supply moisture. Other significant soil characteristics are the thickness and the texture of the surface layer, the content of organic matter, the depth to fine-textured material, the aeration of the soil, and depth to the water table. In the Coastal Plain, drainage is an especially important factor that affects the suitability of a site for trees.

Potential soil productivity for trees is rated by determining the average site index of different trees in the stand, determining the age of these trees, and estimating from the measurements taken the height the trees will likely attain at 50 years of age. Some sites are best suited to hardwoods, and others are best suited to pines. The sites that are best suited to pines make better yields if competition from inferior hardwoods is controlled.

To assist owners in planning the proper use and management of their woodland, the soils suitable for pines have been placed in eight woodland suitability groups. Each group consists of soils that require the use of similar kinds of conservation practices and other management and that have about the same potential productivity. For each group the commercially important trees are listed, their average annual growth is indicated, and the site index is shown. Also indicated are the main limitations and the hazards when these soils are used for growing trees.

Except for the site index ratings, the information given is based mainly upon the experience and judgment of local soil scientists, woodland conservationists, farm foresters, and landowners. It is the best information now available about the way soils influence the growth and management of trees. The ratings are tentative and are subject to revision as more information becomes available.

WOODLAND SUITABILITY GROUP 1

In this group are deep, loose, moderately well drained to excessively drained soils of the uplands. These soils have a very rapid rate of infiltration, very rapid permeability, and very low available moisture capacity. The content of organic matter and natural fertility are low. The soils in this group are—

LdB Lakewood sand, 0 to 5 percent slopes.
LdC Lakewood sand, 5 to 8 percent slopes.
PmB Pomello fine sand, 0 to 5 percent slopes.
SfB St. Lucie fine sand, 0 to 5 percent slopes.

Sand pine grows on all of the soils of this group. Longleaf pine and slash pine grow naturally only on the Pomello soil. The average yearly growth of well-stocked natural stands to age 30, without intermediate cutting, ranges from 0.8 to 1.2 cords for sand pine, from 0.5 to 0.8 cord for longleaf pine, and from 1 to 1.3 cords for slash pine. The average height of the dominant trees in the stand at age 50 (site index) is 70 to 80 feet for sand pine and less than 70 feet for longleaf pine and slash pine.

On these droughty soils, the natural regeneration of pines cannot be relied upon, and usually more than half of the planted seedlings die. Preparing the site by controlling grass and unwanted trees and shrubs is necessary if pines are to be established. Replanting may be necessary.

WOODLAND SUITABILITY GROUP 2

This group consists of well-drained or excessively drained fine sands that have finer textured material below a depth of about 72 inches. These soils are on the uplands. They have a rapid rate of infiltration, rapid permeability, and low available moisture capacity. The content of organic matter and the natural fertility are low. The soils in this group are—

BfB Blanton fine sand, high, 0 to 5 percent slopes.
BfC Blanton fine sand, high, 5 to 8 percent slopes.
BfD Blanton fine sand, high, 8 to 12 percent slopes.
LaB Lakeland fine sand, 0 to 5 percent slopes.
LaC Lakeland fine sand, 5 to 8 percent slopes.
LaD Lakeland fine sand, 8 to 12 percent slopes.

Slash pine, longleaf pine, and sand pine grow on the soils of this group. The average yearly growth of well-stocked natural stands to age 30, without intermediate cutting, ranges from 1.3 to 1.6 cords for slash pine, from 0.6 to 0.9 cord for longleaf pine, and from 1 to 1.3 cords for sand pine. The average height of the dominant trees in the stand at age 50 is 70 to 80 feet for slash pine and sand pine and less than 70 feet for longleaf pine.

On these droughty soils, the natural regeneration of pines cannot be relied upon. Preparation of the site is necessary to control grass, shrubs, and unwanted trees so that adequate survival of the planted pine seedlings will be assured.

WOODLAND SUITABILITY GROUP 3

In this group are moderately well drained, deep, loose fine sands that have sandy clay loam or sandy clay at a depth of more than 72 inches. These soils have a high rate of infiltration, rapid permeability, and low available moisture capacity. The natural fertility and the content of organic matter are low. The water table is normally between a depth of 36 and 72 inches. The soils in this group are—

BnB Blanton fine sand, low, 0 to 5 percent slopes.
BnC Blanton fine sand, low, 5 to 8 percent slopes.
OrB Orlando fine sand, 0 to 5 percent slopes.
OrC Orlando fine sand, 5 to 8 percent slopes.

Slash pine and longleaf pine (fig. 10) grow on the soils of this group. The average yearly growth of well-stocked natural stands to age 30, without intermediate cutting, ranges from 1.5 to 1.8 cords for slash pine and from 0.8 to 1.2 cords for longleaf pine. The average height of the dominant trees in the stand at age 50 is 80 to 90 feet for slash pine and 70 to 80 feet for longleaf pine. Release of

the pine seedlings from unwanted trees and shrubs may be necessary to assure satisfactory growth of the trees and development of the stand.

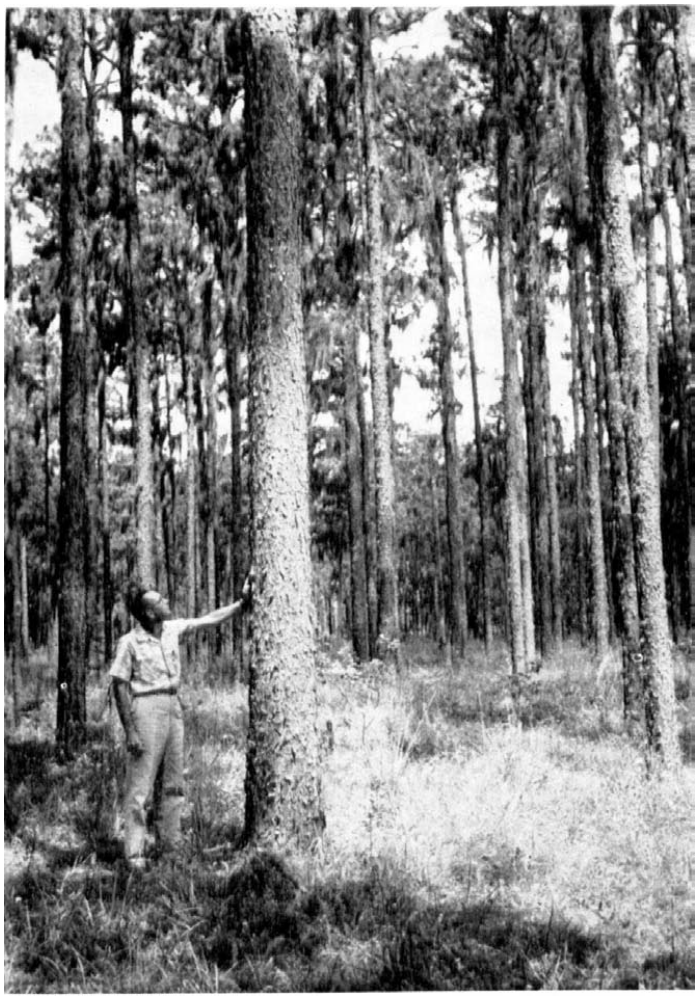

Figure 10.—**A stand of longleaf pine growing on Orlando fine sand.**

WOODLAND SUITABILITY GROUP 4

In this group are nearly level, somewhat poorly drained and poorly drained, strongly acid, loose sands or fine sands that have a water table, normally at a depth of 12 to 36 inches. These soils have a moderate to rapid rate of infiltration, rapid permeability, and low available moisture capacity. The natural fertility is low, and the content of organic matter is moderately low or low. The soils in this group are—

Im	Immokalee fine sand.
In	Immokalee sand.
LfA	Leon fine sand, 0 to 2 percent slopes.
LfB	Leon fine sand, 2 to 5 percent slopes.
Lo	Leon sand.
Ph	Plummer fine sand, high.
Sa	St. Johns fine sand.
Wa	Wabasso fine sand.

Slash pine and longleaf pine grow on the soils of this group. The average yearly growth of well-stocked natural stands to age 30, without intermediate cutting, ranges from 1.3 to 1.7 cords for slash pine and from 0.5 to 0.9 cord for longleaf pine. The average height of the dominant trees in the stand at age 50 is 80 to 90 feet for slash pine and 70 to 80 feet for longleaf pine.

Release of established pine seedlings from unwanted trees, shrubs, and vines is necessary. The high water table restricts the root zone. Therefore, windthrow may occur after a severe intermediate cutting. The soils may be wet enough that logging or planting operations are restricted for 3 to 4 months each year.

WOODLAND SUITABILITY GROUP 5

In this group are nearly level, very poorly drained and poorly drained, loose, dark-colored fine sands that are slightly acid to strongly acid. These soils have a water table that is normally at a depth of 12 to 36 inches. They have a moderate to rapid rate of infiltration, rapid permeability, and moderately high to moderately low available moisture capacity. Natural fertility and the content of organic matter are moderately low to moderately high. The soils in this group are—

Df	Delray fine sand, high.
Dh	Delray fine sand, moderately shallow, high.
On	Ona fine sand.
Rh	Rutlege fine sand, high.

Slash pine and longleaf pine grow on the soils of this group. The average yearly growth of well-stocked natural stands to age 30, without intermediate cutting, ranges from 1.3 to 1.7 cords for slash pine and from 0.9 to 1.3 cords for longleaf pine. The average height of the dominant trees in the stand at age 50 is 90 to 100 feet for slash pine and 80 to 90 feet for longleaf pine.

On these soils established pine seedlings must be released from unwanted trees, shrubs, and vines. The high water table restricts the root zone. Therefore, windthrow may occur after a severe intermediate cutting. The soils may be wet enough that logging or planting operations are restricted for 3 to 4 months each year.

WOODLAND SUITABILITY GROUP 6

This group consists of nearly level, poorly drained fine sands or loamy fine sands that have a subsoil of sandy loam to sandy clay loam. These soils are slightly acid to neutral and have a moderate to rapid rate of infiltration and permeability. The available moisture capacity is medium. Natural fertility and the content of organic matter are high. The soils in this group are—

Mb	Manatee fine sand.
Mc	Manatee loamy fine sand.

Slash pine and longleaf pine grow on the soils of this group. The average yearly growth of well-stocked natural stands to age 30, without intermediate cutting, ranges from 1.6 to 1.8 cords for slash pine and from 0.9 to 1.2 cords for longleaf pine. The average height of the dominant trees in the stand at age 50 is 80 to 90 feet for slash pine and 70 to 80 feet for longleaf pine.

On these soils planting or seeding can be done with reasonable expectation of success. Release from competing trees and shrubs may be necessary, however, after the seedlings are established. Wetness is a limiting factor throughout most of the year. Therefore, the soils may become compacted under heavy traffic. Drainage may increase the growth of the trees.

WOODLAND SUITABILITY GROUP 7

In this group are nearly level, poorly drained or very poorly drained soils that are slightly acid to alkaline.

784-135—66——4

These soils have a loamy or sandy surface layer that is underlain by calcareous sandy clay to clay. Permeability and the rate of infiltration are slow or very slow, and the available moisture capacity is medium to high. These soils are in slight depressions, and water stands on the surface for long periods. The natural fertility and content of organic matter are high. The soils in this group are—

Ff	Felda fine sand.
Ib	Iberia clay loam, overflow.
Ik	Iberia mucky loam.
Md	Manatee-Delray complex, overflow.

Slash pine grows on the soils of this group. The average yearly growth of well-stocked natural stands to age 30, without intermediate cutting, ranges from 1.2 to 1.5 cords for slash pine. The average height of the dominant trees in the stand at age 50 is 80 to 90 feet.

Plant competition is severe, and preparation of the site is necessary before the seedlings are planted. Seedling mortality may be severe. The root zone is restricted by the high water table, and drainage is necessary for good growth of the trees.

WOODLAND SUITABILITY GROUP 8

Poorly drained and very poorly drained soils that have a surface layer of dark-gray to black fine sand or mucky fine sand and loose fine sand below the surface layer make up this group. Some of these soils have a layer of fine sandy clay loam at a depth between 30 and 42 inches. The water table is high. Permeability and the rate of infiltration are rapid, and the available moisture capacity is low to moderately high. Natural fertility ranges from moderately low to moderately high, and the content of organic matter ranges from low to high. The soils in this group are—

Ch	Charlotte fine sand.
De	Delray fine sand.
Dm	Delray mucky fine sand.
Pf	Plummer fine sand.
Pn	Pompano fine sand.
Po	Pompano fine sand, moderately shallow.
Rf	Rutlege fine sand.
Rm	Rutlege mucky fine sand.
Rn	Rutlege, Plummer, and St. Johns soils.
Rp	Rutlege and Pompano soils, ponded.

Slash pine and longleaf pine grow on the soils of this group. The average yearly growth of well-stocked natural stands to age 30, without intermediate cutting, ranges from 1.8 to 2.1 cords for slash pine and from 0.6 to 1.1 cords for longleaf pine. The average height of the dominant trees in the stand at age 50 is 80 to 90 feet for slash pine and 70 to 80 feet for longleaf pine.

In these soils the water table is high during most of the year. Control of the water is necessary for the good growth of pines. Competition from undesirable plants is severe. Wetness restricts the use of equipment during most of the year.

Engineering Properties of Soils [4]

Soils engineering is well established today. It is, in a broad sense, a subdivision of structural engineering, for it deals with soil as foundation material and as structural material. To the engineer, soil is a natural material that varies widely from place to place. The engineering properties of this material also vary widely, even within the boundaries of a single project. Generally, soil is used in the condition in which it occurs in the locality. A large part of soil engineering, however, involves selecting the best possible soil or soils for each construction project. In doing so, engineers determine the engineering properties of the soils at a proposed site and correlate them with construction requirements.

This soil survey report contains information about the soils of Seminole County that will be helpful to engineers. Emphasis in this section has been placed on engineering properties that are related to agriculture, especially properties that affect irrigation structures, farm ponds, and structures to control and conserve soil and water.

The information in this report can be used by engineers to—

1. Make soil and land use studies that will aid in selecting and developing sites for industries, businesses, residences, and recreational areas.
2. Make estimates of runoff and erosion characteristics for use in designing drainage structures and for planning dams and other structures for conserving soil and water.
3. Make reconnaissance surveys of soil and ground conditions that will aid in selecting locations for highways, pipelines, and airports and in planning more detailed investigations at the selected locations.
4. Locate specific kinds of soils for use in construction.
5. Correlate performance of engineering structures with soil mapping units and thus develop information that will be useful in designing and maintaining the structures.
6. Determine the suitability of soil mapping units for cross-country movement of vehicles and construction equipment.
7. Supplement information obtained from other published maps and reports and aerial photographs, for the purpose of making soil maps and reports that can be used readily by engineers.

The engineering interpretations reported here can be used for many purposes. It should be emphasized, however, that these interpretations may not eliminate the need for sampling and testing at the site of specific engineering works involving very heavy loads and where the excavations are deeper than the depths of the layers reported. Even in these situations, the soil map is useful for planning more detailed field investigations and for suggesting the kinds of problems that may be expected.

Some of the terms used by the soil scientist may be unfamiliar to the engineer, and some words—for example, soil, clay, silt, sand, and aggregate—have special meaning in soil science. These terms, as well as other special terms that are used in the soil survey report, are defined in the Glossary at the back of this report.

The engineering interpretations made in this section are based on data obtained by taking samples from a number of soil profiles in this county and testing them in the Soils Laboratory, Bureau of Public Roads (BPR).

[4] BISHOP C. BEVILLE, area engineer, Soil Conservation Service; DAVID P. POWELL, soil specialist for interpretations, Soil Conservation Service; and WILLIAM GARTNER, JR., engineer of research, Florida State Road Department, assisted in preparing this section.

They were also based on data obtained from testing similar soils outside the county.

Engineering classification systems

Two systems used by engineers for classifying soils are used in this report. These are the systems used by the American Association of State Highway Officials (AASHO) and the U.S. Army Corps of Engineers, or the Unified system. These systems are explained briefly in the following paragraphs. The explanations are taken mainly from the PCA Soil Primer.[5]

AASHO CLASSIFICATION SYSTEM.—Most highway engineers classify soil material according to the AASHO system. In that system soil material is classified in seven principal groups. The groups range from A–1, which consists of gravelly soils of high bearing capacity, to A–7, which consists of clayey soils that have low strength when wet. Within each group the relative engineering value of the soil material is indicated by a group index number. Group index numbers range from 0 for the best materials to 20 for the poorest. The group index number is shown in parenthesis in the next to last column of table 3.

UNIFIED CLASSIFICATION SYSTEM.—Some engineers prefer to use the Unified Soil Classification system. In this system the soil material is identified as coarse grained (eight classes), fine grained (six classes), or highly organic (one class). The classification of the soils tested in the laboratory, according to the Unified system, is also given in table 3.

Engineering test data and interpretations of soils

Three tables are given in this section. The first (table 3) contains engineering test data for samples from five soil series. The second (table 4) describes the soils briefly and gives estimated physical properties important to engineering. The third (table 5) indicates the suitability of the soils for various engineering uses.

The samples for which data are given in table 3 were tested to help evaluate the soils for engineering purposes. The profiles indicated as modal are the ones most typical of the soil as it occurs in this county. Each of the soils tested was sampled at three locations. All samples were obtained at a depth of less than 7½ feet; therefore the test data may not be adequate for estimating the characteristics of soil material at a lower depth. The soils were tested for grain-size distribution, liquid limit, and plastic limit. According to results of the tests, the soils were assigned ratings under the AASHO and Unified systems.

The tests for liquid limit and plastic limit measure the effect of water on the consistence of the soil material. As the moisture content of a clayey soil increases from a very dry state, the material changes from a semisolid to a plastic state. As the moisture content is further increased, the material changes from a plastic to a liquid state. The plastic limit is the moisture content at which the soil material passes from a semisolid to a plastic state. The liquid limit is the moisture content at which the material passes from a plastic to a liquid state. The plasticity index is the numerical difference between the liquid limit and the plastic limit. It indicates the range of moisture content within which a soil material is in a plastic condition.

The estimates in table 4 are based on the information given in table 3, on various other test data, and on field performance of the soils. The interpretations apply only to the soils of Seminole County.

The column that shows permeability in table 4 gives the estimated rate at which water moves through a soil that is not compacted. The rate is expressed in inches per hour.

The available moisture capacity, measured in inches per inch of soil, is an approximation of the amount of capillary water in the soil that is available to plants when the downward flow caused by gravity has practically stopped. The following terms are used to express available moisture capacity: Less than 0.05, *very low;* 0.05 to 0.10, *low;* 0.10 to 0.15, *medium;* 0.15 to 0.20, *high;* and more than 0.20, *very high.*

By shrink-swell potential is meant the amount a soil will expand upon wetting and contract upon drying. In general, soils classified as CH and A–7 have high shrink-swell potential. Clean sands and gravel (single grain) and other soils that contain only a small amount of nonplastic to slightly plastic soil material have low shrink-swell potential.

Table 5 indicates the suitability of the soils as a source of topsoil and road fill. It also names features that adversely affect the suitability of the soils for the location of highways or for excavated farm ponds, agricultural drainage, irrigation, and ditches and canals.

The suitability of a soil for topsoil depends mainly on the fertility of the soil material and content of organic matter. The suitability of a soil for road fill depends largely on the texture of the soil and on the natural content of water.

Choosing a location for a highway calls for careful consideration as to the kind of soil material and the need for drainage. In some soils of this county, a high water table, flooding, seepage, or the presence of plastic clay or of highly erodible sand in cut sections has to be considered in determining the location of a proposed highway.

Table 5 also gives features that affect the use of the soils for the two main kinds of irrigation used in the county—sprinkler irrigation and subsurface irrigation. Irrigation is often needed in this county, for rainfall is poorly distributed, though the total amount of rainfall is generally adequate for agriculture. At times, the moisture required for the best growth of crops must be maintained by irrigation.

Under sprinkler irrigation, water is pumped through pipes and is applied to the soil through sprinklers in a way that simulates rain. The content of moisture in the soils is brought to field capacity by water moving downward through the profile. Sprinkler irrigation is most useful on productive soils that can be made more productive by irrigation. In this county only the soils of capability classes II, III, and IV are suitable for sprinkler irrigation.

The soils must have good drainage to be suitable for sprinkler irrigation. Imperfectly drained soils included in an irrigated field must be artificially drained before they can be used for cultivated crops. Most poorly drained or very poorly drained soils are not suited to sprinkler irrigation.

[5] PORTLAND CEMENT ASSOCIATION. PCA SOIL PRIMER. 86 pp., illus. Chicago. 1956.

TABLE 3.—*Engineering*

[Tests performed by Bureau of Public Roads (BPR) in accordance with standard

Soil name and location	Parent material	Bureau of Public Roads report No.	Depth	Horizon
			Inches	
Blanton fine sand, high:				
NW¼NW¼ sec. 27, T. 21 S., R. 31 E. (Modal profile)	Marine sand.	S-39352	0-6	A
		S-39353	6-25	C1
		S-39354	25-64+	C2
SW¼SW¼ sec. 24, T. 21 S., R. 30 E. (More grayish than modal profile)	Marine sand.	S-39355	4-12	C11
		S-39356	27-45	C2
		S-39357	45-69+	C3
SE¼SW¼ sec. 33, T. 19 S., R. 29 E. (Contains shallow D horizon)	Marine sand and clay.	S-39358	6-33	C1
		S-39359	33-63	C2
		S-39360	63-72	IIC3
Blanton fine sand, low:				
NE¼SE¼ sec. 24, T. 19 S., R. 29 E. (Modal profile)	Marine sand.	S-39361	0-4	A11
		S-39362	19-31	A13
		S-39363	42-72	C12
SW¼NW¼ sec. 22, T. 21 S., R. 30 E. (Has a uniform gray color)	Marine sand.	S-39364	0-6	A1
		S-39365	11-38	C12
		S-39366	38-64	C2
NE¼SE¼ sec. 27, T. 19 S., R. 29 E. (Contains a shallow D horizon)	Marine sand and clay.	S-39367	0-8	A1
		S-39368	8-39	C1
		S-39369	47-58+	IIC3
Leon fine sand:				
NW¼NW¼ sec. 14, T. 21 S., R. 32 E. (Modal profile)	Marine sand.	S-39370	0-4	A11
		S-39371	10-23	A2
		S-39372	23-27	B22h
NW¼NW¼ sec. 24, T. 21 S., R. 31 E. (Has a thicker Bh horizon than modal profile)	Marine sand.	S-39373	0-4	A11
		S-39374	10-20	A2
		S-39375	20-27	B2h
NW¼NW¼ sec. 14, T. 21 S., R. 32 E. (Occupies a higher position than the soil from which modal profile was taken)	Marine sand.	S-39376	3-16	A12
		S-39377	25-28	B22h
		S-39378	38-55+	C2
Iberia clay loam, overflow:				
NW¼SE¼ sec. 20, T. 20 S., R. 31 E. (Modal profile)	Clay and lime sediments.	S-39379	½-3	A
		S-39380	16-33	IIB23g
		S-39381	33-78+	IICg
NE¼NW¼ sec. 2, T. 20 S., R. 31 E. (Contains no marl layer)	Clay overlying sand.	S-39382	5-17	A12
		S-39383	27-56	C2g
		S-39384	56-86+	IIC3
NE¼SE¼ sec. 2, T. 20 S., R. 31 E. (Has a thin surface layer of peat)	Clay and lime sediments.	S-39385	1-9	A1
		S-39386	18-48	C1g
		S-39387	48-65+	C2g
Pomello fine sand:				
SW¼SW¼ sec. 24, T. 21 S., R. 31 E. (Modal profile)	Marine sand.	S-39388	0-4	A1
		S-39389	4-41	A2
		S-39390	41-47	B2h
SE¼NE¼ sec. 27, T. 21 S., R. 31 E. (Deeper over pan than modal profile)	Marine sand.	S-39391	4-28	A21
		S-39392	48-53	B2h
		S-39393	53-77	B3
NW¼NE¼ sec. 31, T. 20 S., R. 32 E. (Has sandy texture)	Marine sand.	S-39934	0-4	A1
		S-39395	15-25	A22
		S-39396	36-40	B21h

See footnotes at end of table.

test data

procedures of the American Association of State Highway Officials (AASHO)]

Mechanical analysis [1]							Liquid limit	Plasticity index	Classification	
Percentage passing sieve—			Percentage smaller than—						AASHO [2]	Unified [3]
No. 10 (2.0 mm.)	No. 40 (0.42 mm.)	No. 200 (0.074 mm.)	0.05 mm.	0.02 mm.	0.005 mm.	0.002 mm.				
100	98	5	4	3	3	2	[4] NP	[4] NP	A-3(0)	SP-SM.
100	98	5	5	4	3	2	NP	NP	A-3(0)	SP-SM.
100	98	3	3	2	2	1	NP	NP	A-3(0)	SP.
100	99	2	2	2	2	2	NP	NP	A-3(0)	SP.
100	99	2	2	2	1	1	NP	NP	A-3(0)	SP.
100	99	2	2	2	2	1	NP	NP	A-3(0)	SP.
----------	100	6	5	3	2	1	NP	NP	A-3(0)	SP-SM.
----------	100	5	3	2	1	1	NP	NP	A-3(0)	SP-SM.
----------	100	30	29	28	28	27	33	16	A-2-6(1)	SC.
100	99	5	4	4	4	3	NP	NP	A-3(0)	SP-SM.
100	99	4	3	3	3	3	NP	NP	A-3(0)	SP.
100	99	4	3	3	3	3	NP	NP	A-3(0)	SP.
100	98	7	6	5	3	1	NP	NP	A-3(0)	SP-SM.
100	98	6	5	4	3	1	NP	NP	A-3(0)	SP-SM.
100	98	6	5	3	3	2	NP	NP	A-3(0)	SP-SM.
100	99	5	4	4	3	1	NP	NP	A-3(0)	SP-SM.
100	99	4	3	3	3	2	NP	NP	A-3(0)	SP.
----------	100	31	30	29	29	28	36	18	A-2-6(1)	SC.
100	99	8	7	5	3	1	NP	NP	A-3(0)	SP-SM.
100	99	6	5	5	3	1	NP	NP	A-3(0)	SP-SM.
100	99	11	10	9	8	6	NP	NP	A-2-4(0)	SP-SM.
100	98	8	6	3	2	2	NP	NP	A-3(0)	SP-SM.
100	98	4	2	2	2	1	NP	NP	A-3(0)	SP.
100	98	11	9	6	6	4	NP	NP	A-2-4(0)	SP-SM.
100	99	4	3	2	2	1	NP	NP	A-3(0)	SP.
100	99	11	10	8	6	6	NP	NP	A-2-4(0)	SP-SM.
100	99	5	4	4	3	2	NP	NP	A-3(0)	SP-SM.
100	95	49	46	42	37	35	57	34	A-7-6(11)	SC.
100	95	54	52	49	45	42	62	40	A-7-6(14)	CH.
100	100	63	59	53	48	46	69	51	A-7-6(16)	CH.
100	100	39	37	32	26	23	44	23	A-7-6(4)	SC.
100	100	43	41	38	32	30	51	33	A-7-6(8)	SC.
100	100	3	3	3	3	3	NP	NP	A-3(0)	SP.
100	100	81	77	66	53	46	77	45	A-7-5(20)	CH.
100	93	68	67	[5]	----------	----------	65	40	A-7-6(18)	CH.
100	100	78	74	62	50	46	73	52	A-7-6(20)	CH.
100	98	2	1	1	1	1	NP	NP	A-3(0)	SP.
100	98	3	2	1	1	1	NP	NP	A-3(0)	SP.
100	98	9	7	5	4	4	NP	NP	A-3(0)	SP-SM.
100	97	1	1	1	1	1	NP	NP	A-3(0)	SP.
100	97	6	6	5	4	4	NP	NP	A-3(0)	SP-SM.
100	97	4	4	3	3	2	NP	NP	A-3(0)	SP.
100	96	3	2	2	1	1	NP	NP	A-3(0)	SP.
100	97	2	2	2	2	2	NP	NP	A-3(0)	SP.
100	97	10	9	7	5	5	NP	NP	A-3(0)	SP-SM.

TABLE 3.—*Engineering*

Soil name and location	Parent material	Bureau of Public Roads report No.	Depth	Horizon
			Inches	
Plummer fine sand, high:				
NE¼SE¼ sec. 21, T. 21 S., R. 32 E. (Modal profile)	Marine sand.	S-39397	4–8	A12
		S-39398	23–39	C12
		S-39399	39–60+	C2
NE¼SE¼ sec. 23, T. 21 S., R. 31 E. (Contains shallow D horizon)	Marine sand.	S-39400	8–19	A3
		S-39401	19–48	C1
		S-39402	55–76+	IIC3
SW¼NE¼ sec. 17, T. 20 S., R. 30 E. (Has a uniform gray color)	Marine sand.	S-39403	0–3	Ap
		S-39404	8–25	A13
		S-39405	25–44	C1

[1] Mechanical analyses according to AASHO Designation: T 88–57, "Mechanical Analysis of Soils," in "Standard Specifications for Highway Materials and Methods of Sampling and Testing," pt. 1, ed. 8 (1961), published by AASHO. Results by this procedure frequently may differ somewhat from results that would have been obtained by the soil survey procedure of the Soil Conservation Service (SCS). In the AASHO procedure, the fine material is analyzed by the hydrometer method and the various grain-size fractions are calculated on the basis of all the material, including that coarser than 2 millimeters in diameter. In the SCS soil survey procedure, the fine material is analyzed by the pipette method and the material coarser than 2 millimeters in diameter is excluded from calculations of grain-size fractions. The mechanical analyses used in this table are not suitable for use in naming textural classes for soils.

TABLE 4.—*Estimated physical*

[Absence of figure indicates that soil has variable

Map symbol	Soil	Description of soil	Depth to seasonally high water table [2]	Flooding hazard [3]
BnB	Blanton fine sand, low, 0 to 5 percent slopes.	42 inches or more of moderately well drained, loose fine sand over stratified fine sandy loam or fine sandy clay loam.	15 to 30 inches for 1 to 2 months of the year.	None.
BnC	Blanton fine sand, low, 5 to 8 percent slopes.			
BfB	Blanton fine sand, high, 0 to 5 percent slopes.	42 inches or more of well-drained, loose fine sand over stratified layers of fine sandy loam or fine sandy clay loam.	60 to more than 120 inches continuously.	None.
BfC	Blanton fine sand, high, 5 to 8 percent slopes.			
BfD	Blanton fine sand, high, 8 to 12 percent slopes.			
Bp	Brighton peat.	Strongly acid peat over acid sand. The thickness of the organic material ranges from 12 to 60 inches or more.	0 to 15 inches continuously.	Every year for more than 6 months.
Br	Brighton peat, shallow variant.			
Bt	Brighton, Istokpoga, and Okeechobee soils.	Strongly acid to neutral peats and mucks that vary in thickness and consistence and overlie variable material. For estimated properties, see individual soils of this undifferentiated unit.		
Ch	Charlotte fine sand.	Poorly drained and very poorly drained, slightly acid to neutral fine sand that is more than 42 inches thick.	0 to 15 inches for 6 to 12 months of the year.	Every year for 1 to 6 months.

See footnotes at end of table.

test data—Continued

Mechanical analysis [1]							Liquid limit	Plasticity index	Classification	
Percentage passing sieve—			Percentage smaller than—						AASHO [2]	Unified [3]
No. 10 (2.0 mm.)	No. 40 (0.42 mm.)	No. 200 (0.07 4mm.)	0.05 mm.	0.02 mm.	0.005 mm.	0.002 mm.				
100	98	5	4	3	2	2	NP	NP	A-3(0)	SP-SM.
100	98	3	2	2	2	2	NP	NP	A-3(0)	SP.
100	98	4	3	2	1	1	NP	NP	A-3(0)	SP.
100	98	5	4	4	3	2	NP	NP	A-3(0)	SP-SM.
100	98	5	4	3	2	2	NP	NP	A-3(0)	SP-SM.
100	98	26	25	25	25	25	31	14	A-2-6(0)	SC.
100	99	7	6	5	5	4	NP	NP	A-3(0)	SP-SM.
100	99	7	6	5	5	4	NP	NP	A-3(0)	SP-SM.
100	99	3	3	3	3	3	NP	NP	A-3(0)	SP.

[2] Based on AASHO Designation: M 145-49, "The Classification of Soils and Soil-Aggregate Mixtures for Highway Construction Purposes."

[3] Based on "Unified Soil Classification System," Tech. Memo. No. 3-357, v. 1, Waterways Experiment Station, Corps of Engineers, March 1953. SCS and BPR have agreed that all soils having a plasticity index within two points from A-line are to be given a borderline classification. An example of a borderline classification is SP-SM.

[4] NP stands for nonplastic.

[5] Hydrometer analysis could not be performed, because of the presence of gypsum.

properties significant to engineering [1]

characteristics or that properties have not been estimated]

Depth from surface	Classification			Percentage passing No. 200 sieve (0.074 mm.)	Permeability	Available moisture capacity	Shrink-swell potential
	USDA	Unified	AASHO				
Inches					*Inches per hour*	*Inches per inch of soil*	
0 to 60	Fine sand	SP or SP-SM	A-3	3 to 10	10 to 50	<0. 05	Low.
60 to 72+	Sandy clay loam	SC	A-2 or A-6	25 to 40	2. 5 to 5	0. 10 to 0. 15	Low to moderate.
0 to 60	Fine sand	SP or SP-SM	A-3	3 to 10	50+	<0. 05	Low.
60 to 72+	Sandy clay loam	SC	A-2	15 to 35	2. 5 to 5	0. 10 to 0. 15	Low to moderate.
0 to 40	Peat	Pt			5 to 10	>0. 20	High.
40 to 60+	Sand	SP-SM or -SM	1-2 or A-3	5 to 15	10 to 50	<0. 05	Low.
0 to 52+	Fine sand	SP to SM	A-2 or A-3	2 to 15	5 to 10	<0.05	Low.

TABLE 4.—*Estimated physical properties*

Map symbol	Soil	Description of soil	Depth to seasonally high water table [2]	Flooding hazard [3]
De Dm Df Dh	Delray fine sand. Delray mucky fine sand. Delray fine sand, high. Delray fine sand, moderately shallow, high.	Poorly drained or very poorly drained, slightly acid to neutral soils that have a thick surface layer that contains a large amount of organic matter and overlies fine sand no more than 30 inches thick. The moderately shallow phase consists of 30 to 42 inches of fine sand over finer textured material. The high phases are at a slightly higher elevation than the other phases.	0 to 15 inches 6 to 12 months of the year.	Every year for 6 to 12 months.
Ff	Felda fine sand.	Less than 30 inches of poorly drained, neutral fine sand to loamy sand over neutral to calcareous sandy clay loam that is underlain by calcareous clay or marl. This soil is on flood plains.	0 to 15 inches 6 to 12 months of the year.	Every year for 6 to 12 months.
Ib Ik	Iberia clay loam, overflow. Iberia mucky loam.	Less than 18 inches of poorly drained or very poorly drained, neutral loam to clay loam that is high in content of organic matter; overlies neutral to calcareous sandy clay to clay and is underlain by calcareous clay or marl.	0 to 15 inches continuously.	Every year for 6 to 12 months.
Im In	Immokalee fine sand. Immokalee sand.	Poorly drained, strongly acid, nearly level fine sand and sand; a pan stained with organic matter is at a depth of 30 to 48 inches; the organic pan is underlain by sandy material.	0 to 15 inches 1 to 2 months of the year.	Every 20 to 50 years for 2 to 7 days.
Io Ip Is	Istokpoga peat, deep. Istokpoga peat, moderately deep. Istokpoga peat, shallow variant.	Strongly acid woody peats over acid sand. The thickness of the organic material ranges from 12 to 108 inches or more.	0 to 15 inches continuously.	Every year for 6 to 12 months.
LaB LaC LaD	Lakeland fine sand, 0 to 5 percent slopes. Lakeland fine sand, 5 to 8 percent slopes. Lakeland fine sand, 8 to 12 percent slopes.	42 inches or more of well-drained, loose fine sand over stratified fine sandy loam or fine sandy clay loam.	60 to more than 120 inches continuously.	None.
LdB LdC	Lakewood sand, 0 to 5 percent slopes. Lakewood sand, 5 to 8 percent slopes.	Loose, droughty sand in beds that are generally more than 72 inches thick.	60 to more than 120 inches continuously.	None.
Lo LfA LfB	Leon sand. Leon fine sand, 0 to 2 percent slopes. Leon fine sand, 2 to 5 percent slopes.	Poorly drained, strongly acid sand and fine sand underlain by sandy material; a pan stained with organic matter is at a depth of less than 30 inches.	0 to 15 inches 1 to 2 months of the year.	None.
Mb Mc	Manatee fine sand. Manatee loamy fine sand.	Less than 30 inches of poorly drained or very poorly drained, neutral fine sand to loamy fine sand; overlies neutral fine sandy loam to sandy clay loam; underlain by calcareous clay or marl; the uppermost 10 inches has a high content of organic matter.	0 to 15 inches 6 to 12 months of the year.	Every year for 1 to 6 months.
Md	Manatee-Delray complex, overflow.	Very poorly drained, dark-colored soils on the flood plain of the St. Johns River. For estimated properties, see individual soils of this complex.		

See footnotes at end of table.

significant to engineering [1]—Continued

Depth from surface	Classification			Percentage passing No. 200 sieve (0.074 mm.)	Permeability	Available moisture capacity	Shrink-swell potential
	USDA	Unified	AASHO				
Inches					*Inches per hour*	*Inches per inch of soil*	
0 to 15	Fine sand	SP–SM or OL	A–2, A–3, or organic.	5 to 15	5 to 10	0. 10 to 0. 15	Moderate.
15 to 52+	Fine sand	SP or SP–SM	A–3	2 to 10	5 to 10	<0. 05	Low.
0 to 19	Fine sand to loamy sand	SP to SM	A–2 or A–3	2 to 25	5 to 10	0. 05 to 0. 10	Low.
19 to 29	Fine sandy clay loam	SC	A–6 or A–7	35 to 50	2. 5 to 5	0. 10 to 0. 15	Moderate to high.
29 to 52+	Sandy loam	SM–SC or SC	A–2 or A–6	25 to 40	2. 5 to 5	0. 10 to 0. 15	Moderate.
0 to 10	Loam to clay loam	SC to CH or OH.	Organic, A–6, or A–7.	35 to 60	5 to 10	0. 15 to 0. 20	High.
10 to 78+	Clay	CH	A–7	50 to 80	0. 05 to 0. 20	0. 10 to 0. 15	High.
0 to 42	Fine sand and sand	SP–SM or SM	A–3	2 to 10	10 to 50	<0. 05	Low.
42 to 54	Fine sand	SP–SM	A–2 or A–3	7 to 15	0. 8 to 2. 5	0. 10 to 0. 15	Low.
54 to 60+	Fine sand	SP–SM	A–3	5 to 10	10 to 50	<0. 05	Low.
0 to 84+	Peat	Pt	Organic		5 to 10	>0. 20	High.
0 to 60	Fine sand	SP to SP–SM	A–3	3 to 10	50+	<0. 05	Low.
60 to 72+	Fine sandy loam or fine sandy clay loam.	SC	A–2	20 to 35	2. 5 to 5	0. 10 to 0. 15	Low to moderate.
0 to 25	Fine sand and sand	SP	A–3	0 to 5	50+	<0. 05	Low.
25 to 70+	Fine sand and sand	SP to SM	A–2 or A–3	3 to 15	50+	<0. 05	Low.
0 to 24	Fine sand and sand	SP to SP–SM	A–3	2 to 10	10 to 50	<0. 05	Low.
24 to 30	Fine sand	SP–SM or SM	A–2 or A–3	7 to 15	0. 8 to 2. 5	0. 10 to 0. 15	Low.
30 to 60+	Fine sand	SP–SM	A–3	5 to 10	10 to 50	<0. 05	Low.
0 to 20	Fine sand to loamy fine sand.	SP–SM to SM	A–2	10 to 25	5 to 10	0. 05 to 0. 10	Low to moderate.
20 to 48	Fine sandy clay loam	SM–SC to SC	A–2 or A–6	20 to 40	2. 5 to 50	0. 10 to 0. 15	Moderate.
48 to 60+	Clay	CH	A–7	50 to 80	0. 05 to 0. 20	0. 10 to 0. 15	High.

TABLE 4.—*Estimated physical properties*

Map symbol	Soil	Description of soil	Depth to seasonally high water table [2]	Flooding hazard [3]
Ok	Okeechobee muck.	Slightly acid to neutral muck over calcareous sandy material. The thickness of the organic material ranges from 12 to more than 60 inches.	0 to 15 inches continuously.	Every year for 6 to 12 months.
On	Ona fine sand.	30 inches or more of poorly drained, acid fine sand or sand underlain by sandy material. The uppermost 6 to 8 inches of the surface layer is high in content of organic matter; a layer stained with organic matter is at a depth of less than 18 inches.	0 to 15 inches 1 to 2 months of the year.	None.
OrB OrC	Orlando fine sand, 0 to 5 percent slopes. Orlando fine sand, 5 to 8 percent slopes.	42 inches or more of moderately well drained, loose, acid fine sand. The uppermost 12 inches is high in content of organic matter.	15 to 30 inches 1 to 2 months of the year.	None.
Pf	Plummer fine sand.	Very poorly drained, strongly acid fine sand that is more than 42 inches thick.	0 to 15 inches 6 to 12 months of the year.	Every year for 1 to 6 months.
Ph	Plummer fine sand, high.	Somewhat poorly drained and poorly drained, strongly acid fine sand that is more than 42 inches thick.	0 to 15 inches 2 to 6 months of the year.	Every 20 to 50 years for 2 to 7 days.
PmB	Pomello fine sand, 0 to 5 percent slopes.	Thick beds of loose, moderately well drained, strongly acid fine sand underlain by sandy material; a pan stained with organic matter is at a depth of 30 to 48 inches.	15 to 30 inches 1 to 2 months of the year.	None.
Pn Po	Pompano fine sand. Pompano fine sand, moderately shallow.	Poorly drained or very poorly drained, slightly acid to neutral fine sand that is more than 30 inches thick. In the moderately shallow phase, sandy loam to sandy clay loam is at a depth of 30 to 42 inches.	0 to 15 inches 2 to 6 months of the year.	Every year for 1 to 6 months.
Rf Rm	Rutlege fine sand. Rutlege mucky fine sand.	Very poorly drained, strongly acid fine sand or mucky fine sand that is more than 42 inches thick. The surface layer is dark colored and has a high content of organic matter.	0 to 15 inches 6 to 12 months of the year.	Every year for 6 to 12 months.
Rh	Rutlege fine sand, high.	Poorly drained, strongly acid fine sand that is more than 42 inches thick. The surface layer is dark colored and has a high content of organic matter.	0 to 15 inches 2 to 6 months of the year.	Every 20 to 50 years for 2 to 7 days.
Rn	Rutlege, Plummer, and St. Johns soils.	Poorly drained and very poorly drained, acid, deep, sandy soils. For estimated properties, see individual soils of this undifferentiated unit.		
Rp	Rutlege and Pompano soils, ponded.	Small isolated areas that resemble saucers and that are covered by shallow water in wet seasons. For estimated properties see individual soils of this undifferentiated unit.		
Sa	St. Johns fine sand.	Poorly drained, strongly acid fine sand that has a highly organic surface layer and a pan stained with organic matter at a depth of less than 30 inches. This pan is underlain by sandy material.	0 to 15 inches for 2 to 6 months of the year.	Every 5 to 20 years for 7 to 30 days.

See footnotes at end of table.

significant to engineering [1]—Continued

Depth from surface	Classification			Percentage passing No. 200 sieve (0.074 mm.)	Permeability	Available moisture capacity	Shrink-swell potential
	USDA	Unified	AASHO				
Inches					*Inches per hour*	*Inches per inch of soil*	
0 to 36	Muck	OL	Organic		5 to 10	>0. 20	High.
36 to 60+	Fine sand	SP or SP–SM	A–3	2 to 10	5 to 10	<0. 05	Low.
0 to 18	Fine sand	SP–SM or SM	A–2 or A–3	7 to 15	0. 8 to 2. 5	0. 10 to 0. 15	Low.
18 to 44+	Fine sand	SP–SM	A–3	5 to 10	10 to 50	<0. 05	Low.
0 to 30	Fine sand	SP–SM or SM	A–2 or A–3	7 to 15	10 to 50	0. 10 to 0. 15	Low.
30 to 56	Fine sand	SP–SM	A–3	5 to 10	10 to 50	<0. 05	Low.
56 to 72+	Fine sand	SP–SM or SM	A–2 or A–3	7 to 15	5 to 10	0. 10 to 0. 15	Low.
0 to 60	Fine sand	SP	A–3	2 to 5	5 to 10	<0. 05	Low.
60 to 76+	Fine sandy clay loam	SC	A–2 or A–6	25 to 40	2. 5 to 5	0. 10 to 0. 15	Low to moderate.
0 to 60	Fine sand	SP	A–3	2 to 5	5 to 10	<0.05	Low.
60 to 76+	Fine sandy clay loam	SC	A–2 or A–6	2.5 to 40	2. 5 to 5	0.10 to 0.15	Low to moderate.
0 to 41	Fine sand	SP	A–3	2 to 5	20 to 50	<0.05	Low.
41 to 47	Fine sand	SP–SM or SM	A–2 or A–3	7 to 15	10 to 20	0.05 to .10	Low.
47 to 72+	Fine sand	SP–SM	A–3	5 to 10	20 to 50	<0.05	Low.
0 to 36	Fine sand	SP or SP–SM	A–3	2 to 10	5 to 10	<0.05	Low.
36 to 48	Sandy clay loam	SC	A–6 or A–7	35 to 50	2.5 to 5	0.10 to 0.15	Moderate to high.
48 to 60+	Sandy loam	SM–SC or SC	A–2 or A–4	25 to 40	2. 5 to 5	0.05 to 0.10	Moderate.
0 to 24	Fine sand	SP–SM or OL	A–2, A–3, or organic.	5 to 15	5 to 10	0.10 to 0.15	Low to moderate.
24 to 56+	Fine sand	SP	A–3	2 to 5	5 to 10	<0.05	Low.
0 to 24	Fine sand	SP–SM or OL	A–2, A–3, or organic.	5 to 15	5 to 10	0.10 to 0.15	Low to moderate.
24 to 56+	Fine sand	SP	A–3	2 to 5	5 to 10	<0.05	Low.
0 to 11	Fine sand	SP–SM or SM	A–2	10 to 15	5 to 10	0.10 to 0.15	Low.
11 to 27	Fine sand	SP	A–3	2 to 5	5 to 10	<0.05	Low.
27 to 40	Fine sand	SP–SM or SM	A–2 or A–3	7 to 15	2.5 to 5	0.10 to 0.15	Low.
40 to 50+	Fine sand	SP–SM	A–3	5 to 10	5 to 10	<0. 05	Low.

TABLE 4.—*Estimated physical properties*

Map symbol	Soil	Description of soil	Depth to seasonally high water table [2]	Flooding hazard [3]
SfB	St. Lucie fine sand, 0 to 5 percent slopes.	Beds of loose, excessively drained sand, generally more than 72 inches thick.	30 to more than 60 inches for less than 1 month of the year.	None.
Sn	Sandy alluvial land.	Highly variable sandy material deposited by streams.	(4)	(4)
Tc	Terra Ceia muck.	Slightly acid to neutral muck over calcareous sandy loam or sandy clay loam. The thickness of the organic material ranges from 12 to 60 inches or more.	0 to 15 inches continuously.	Every year for 6 to 12 months.
Wa	Wabasso fine sand.	Fine sand over neutral to calcareous, clayey material at a depth of 30 to 42 inches.	0 to 15 inches for 1 to 2 months of the year.	None.

[1] These estimates are based on field observations and other experience; they apply only to the soils in Seminole County. Properties were not estimated for Borrow pits, Made land, and Swamp.
[2] Level expected during the normal wet season.

TABLE 5.—*Engineering*

[Dashes indicate that the soil features affecting

Map symbol	Soil [1]	Suitability as a source of—		Soil features adversely affecting—
		Topsoil	Road fill	Highway location
BnB BnC	Blanton fine sand, low, 0 to 5 percent slopes. Blanton fine sand, low, 5 to 8 percent slopes.	Fair	Good	Loose sands; erodible
BfB BfC BfD	Blanton fine sand, high, 0 to 5 percent slopes. Blanton fine sand, high, 5 to 8 percent slopes. Blanton fine sand, high, 8 to 12 percent slopes.	Fair	Good	Loose, droughty sands; erodible
Bp Br	Brighton peat. Brighton peat, shallow variant.	Good if mixed with mineral soil material.	Unsuited	Low position; high water table; high content of organic matter.
Bt	Brighton, Istokpoga, and Okeechobee soils.	Variable	Unsuited	Low position; frequent flooding; high water table; high content of organic matter.
Ch	Charlotte fine sand.	Poor	Fair to poor	Low position; high water table; frequent flooding.
De Dm	Delray fine sand. Delray mucky fine sand.	Good	Poor	Low position; high water table; frequent flooding; mucky surface layer.
Df Dh	Delray fine sand, high. Delray fine sand, moderately shallow, high.	Good	Poor	High water table

See footnote at end of table.

significant to engineering [1]—Continued

Depth from surface	Classification			Percentage passing No. 200 sieve (0.074 mm.)	Permeability	Available moisture capacity	Shrink-swell potential
	USDA	Unified	AASHO				
Inches 0 to 52+	Fine sand	SP	A-3	0 to 5	*Inches per hour* 50+	*Inches per inch of soil* <0.05	Low.
[4]							
0 to 52	Muck	OL	Organic			>0.20	High.
52 to 68+	Sandy loam or sandy clay loam.	SC	A-4 or A-6	35 to 50	2.5 to 5	0.10 to 0.15	Moderate.
0 to 20	Fine sand	SP to SP-SM	A-3	2 to 10	10 to 50	<0.05	Low.
20 to 30	Fine sand	SP-SM	A-2 or A-3	7 to 15	0.8 to 2.5	0.10 to 0.15	Low.
30 to 60+	Fine sandy clay loam	SC	A-6 or A-7	35 to 50	2.5 to 5	0.10 to 0.15	Moderate to high.

[3] Water standing or flowing above the surface of the soil under natural conditions without artificial drainage.
[4] Variable.

interpretations

engineering practices have not been estimated]

Soil features adversely affecting—Continued				
Excavated farm ponds	Agricultural drainage	Sprinkler irrigation	Subsurface irrigation	Ditches and canals
Loose sands; rapidly permeable; seasonally low water table; unstable side slopes.	Loose, erodible sands	Low available moisture capacity.	Rapidly permeable; seasonally low water table.	Loose, erodible sands; moderately sloping.
Rapidly permeable; deep to water table.	Not needed	Low available moisture capacity.	Rapidly permeable; deep to water table.	Loose, erodible sands; unstable side slopes; moderately sloping or steep.
High content of organic matter.	Low position; inadequate outlets; rapid oxidation.		Frequent flooding	
High content of organic matter.	Low position; inadequate outlets; rapid oxidation.		Frequent flooding	High content of organic matter.
Loose sands; unstable side slopes.	Low position; loose sands; some areas have no suitable outlet.	Low available moisture capacity; frequent flooding.	Frequent flooding	Loose, erodible sands; unstable side slopes.
Loose sands; unstable side slopes.	Low position; loose sands; some areas have no suitable outlet.	Frequent flooding	Frequent flooding	Loose, erodible sands; unstable side slopes.
Loose sands; unstable side slopes.	None	None	None	Loose, erodible sands; unstable side slopes.

TABLE 5.—*Engineering*

Map symbol	Soil [1]	Suitability as a source of—		Soil features adversely affecting—
		Topsoil	Road fill	Highway location
Ff	Felda fine sand.	Fair	Poor	Low position; frequent flooding; high water table; clayey substratum.
Ib Ik	Iberia clay loam, overflow. Iberia mucky loam.	Fair	Unsuited	Slowly permeable; plastic, clayey soils; high water table; frequent overflow.
Im In	Immokalee fine sand. Immokalee sand.	Fair	Fair to good	High water table
Io Ip Is	Istokpoga peat, deep. Istokpoga peat, moderately deep. Istokpoga peat, shallow variant.	Good if mixed with mineral soil.	Unsuited	Low position; frequent flooding; high water table; high content of organic matter.
LaB LaC	Lakeland fine sand, 0 to 5 percent slopes. Lakeland fine sand, 5 to 8 percent slopes.	Fair	Good	Loose, droughty sands; erodible
LaD	Lakeland fine sand, 8 to 12 percent slopes.	Fair	Good	Loose, droughty sands; erodible; strong slopes.
LdB LdC	Lakewood sand, 0 to 5 percent slopes. Lakewood sand, 5 to 8 percent slopes.	Poor	Good	Loose, droughty sands
Lo LfA	Leon sand. Leon fine sand, 0 to 2 percent slopes.	Fair	Fair to good	Occasional high water table
LfB	Leon fine sand, 2 to 5 percent slopes.	Fair	Fair to good	Occasional high water table
Mb Mc	Manatee fine sand. Manatee loamy fine sand.	Good	Poor	High water table; clayey subsoil
Md	Manatee-Delray complex, overflow.	[2]	[2]	[2]
Ok	Okeechobee muck.	Good if mixed with mineral soil material.	Unsuited	Low position; high water table; high content of organic matter.
On	Ona fine sand.	Good	Fair to good	High water table
OrB OrC	Orlando fine sand, 0 to 5 percent slopes. Orlando fine sand, 5 to 8 percent slopes.	Good	Good	None
Pf	Plummer fine sand.	Fair	Poor	Low position; high water table; frequent flooding.
Ph	Plummer fine sand, high.	Fair	Fair to good	High water table
PmB	Pomello fine sand, 0 to 5 percent slopes.	Poor	Good	Loose sands
Pn Po	Pompano fine sand. Pompano fine sand, moderately shallow.	Poor	Fair	Low position; high water table; frequent flooding.

See footnotes at end of table.

interpretations—Continued

Soil features adversely affecting—Continued				
Excavated farm ponds	Agricultural drainage	Sprinkler irrigation	Subsurface irrigation	Ditches and canals
----------	Low position; slowly permeable; frequent flooding.	----------	Frequent flooding; slowly permeable.	
Slowly permeable, plastic, clayey soils; frequent overflow.	Low position; slowly permeable; frequent overflow.	----------	Slowly permeable; high water table; frequent flooding.	
Loose sands; unstable side slopes.	Loose, erodible sands	----------	None	Loose, erodible sands; unstable side slopes.
High content of organic matter.	Low position; inadequate outlets; rapid oxidation.	----------	Frequent flooding	
Rapidly permeable; deep to water table.	Not needed	Low available moisture capacity.	Rapidly permeable; deep to water table.	Loose, erodible sands; unstable side slopes.
Rapidly permeable; deep to water table; strong slopes.	Not needed	Low available moisture capacity; strong slopes.	Rapidly permeable; deep to water table; strong slopes.	Loose, erodible sands; unstable side slopes; strong slopes.
Rapidly permeable; deep to water table.	Not needed	Low available moisture capacity.	Rapidly permeable; deep to water table.	Loose, erodible sands; unstable side slopes.
Loose sands; unstable side slopes.	Loose, erodible sands	Low available moisture capacity.	None	Loose, erodible sands; unstable side slopes.
Loose sands; moderate slopes; unstable side slopes.	Loose, erodible sands; moderate slopes.	Low available moisture capacity; moderate slopes.	Moderate slopes	Loose, erodible sands; unstable side slopes; moderate slopes.
Clayey subsoil	Slowly permeable subsoil	----------	Slowly permeable subsoil.	
(2)	(2)	(2)	(2)	(2).
High content of organic matter.	Low position; inadequate outlets; rapid oxidation.	----------	Frequent flooding	
Loose sands; unstable side slopes.	None	----------	None	
Rapidly permeable; seasonally low water table.	Loose, erodible sands	None	Rapidly permeable; seasonally low water table.	Loose, erodible sands; unstable side slopes; moderate to strong slopes.
Loose sands; unstable side slopes.	Low position; loose sands; sone areas have no suitable outlet.	Low available moisture capacity; frequent flooding.	Frequent flooding	Loose, erodible sands; unstable side slopes.
Loose sands; unstable side slopes.	Loose, erodible sands	----------	None	Loose, erodible sands; unstable side slopes.
Rapidly permeable; seasonally low water table; loose sands; unstable side slopes.	Loose, erodible sands	Low available moisture capacity.	Rapidly permeable; seasonally low water table; uncoated white sands.	Loose, erodible sands; unstable side slopes.
Loose sands; unstable side slopes.	Low position; loose sands; some areas have no suitable outlet.	Low available moisture capacity; frequent flooding.	Frequent flooding	Loose, erodible sands; unstable side slopes.

TABLE 5.—*Engineering*

Map symbol	Soil [1]	Suitability as a source of—		Soil features adversely affecting—
		Topsoil	Road fill	Highway location
Rf Rm	Rutlege fine sand. Rutlege mucky fine sand.	Good	Poor	Low position; high water table; frequent flooding; high content of organic matter.
Rh	Rutlege fine sand, high.	Good	Fair to good	High water table; high content of organic matter.
Rn	Rutlege, Plummer, and St. Johns soils.	Fair	Poor	High water table; seepage on slopes; high content of organic matter.
Rp	Rutlege and Pompano soils, ponded.	Fair to good	Poor	Low position; high water table; frequent flooding.
Sa	St. Johns fine sand.	Good	Poor	High water table; high content of organic matter.
SfB	St. Lucie fine sand, 0 to 5 percent slopes.	Poor	Good	Loose, droughty sands
Sn	Sandy alluvial land.	Poor	Unsuited	Low position; frequent flooding; high water table.
Sw	Swamp.	Poor to fair	Unsuited	Low position; high water table; frequent flooding; high content of organic matter.
Tc	Terra Ceia muck.	Good	Unsuited	Low position; frequent flooding; high water table; high content of organic matter.
Wa	Wabasso fine sand.	Fair	Poor	High water table; clayey substratum

[1] Interpretations have not been estimated for Borrow pits and Made land.

Water for sprinkler irrigation is obtained from wells, streams, natural lakes, or irrigation pits (see the section "Ground Water"). Streams used as a source of water for irrigation must have a constant flow during extended dry periods. If an excavated pit is used for supplying water, the storage capacity must be large enough to meet the needs of crops during the irrigation season.

Most sources of surface water are suitable for irrigation, but water from some deep wells contains a large amount of salt that makes it unsuitable. The quality of the water must be determined before the water is used for sprinkler irrigation.

Subsurface irrigation is feasible only when the soils are nearly level and have a water table near the surface. This type of irrigation has been used for many years in this county for such high-value crops as celery, cabbage, and other truck crops. The use of subsurface irrigation for improved pasture and for fields of clover is expanding rapidly in this county.

This method of irrigation maintains the water table within controlled limits. It permits adequate capillary movement of water from the water table into the root zone. Open ditches, mole drains, or tile are generally used for this kind of irrigation, and the same system can be used for removing excess water after severe rains, as well as for irrigation. Open ditches are most widely used because they are comparatively inexpensive and operate satisfactorily. Mole drains are used only in organic soils. Tile drains can be used in both organic and sandy soils, but a tile system is expensive. It is used mainly where celery and other high-value crops are grown.

Water for irrigation may be obtained from artesian wells, ground water wells, streams, natural lakes, and constructed irrigation pits. However, most of the irrigation water in the county comes from wells. Where ground water wells are used, they are located at the highest point in the area to be irrigated. If water from a stream or lake is used, the water must be pumped to the highest point in the area. The water is then distributed by gravity to all points in the irrigated area through a system of ditches, field laterals, canals, or tile lines.

Much of the highly developed farmland in the county is at a low elevation, and water for irrigation is obtained from flowing wells. The water is controlled by a system

interpretations—Continued

Soil features adversely affecting—Continued				
Excavated farm ponds	Agricultural drainage	Sprinkler irrigation	Subsurface irrigation	Ditches and canals
Loose sands; unstable side slopes.	Low position; loose sands; some areas have no suitable outlet.	Frequent flooding	Frequent flooding	Loose, erodible sands; unstable side slopes.
Loose sands; unstable side slopes.	Loose, erodible sands		None	Loose, erodible sands; unstable side slopes.
Loose sands; unstable side slopes.	Loose, erodible sands; nearly level or gently sloping; seepage.		Nearly level or gentle slopes.	Loose, erodible sands; unstable side slopes; nearly level or gently sloping.
Loose sands; unstable side slopes.	Low position; loose sands; some areas have no suitable outlet.	Frequent flooding	Frequent flooding	Loose, erodible sands; unstable side slopes.
Loose sands; unstable side slopes.	Loose, erodible sands		None	Loose, erodible sands; unstable side slopes.
Rapidly permeable; deep to water table; loose sands; unstable side slopes.	Not needed	Very low available moisture capacity.	Rapidly permeable; deep to water table.	Loose, erodible sands; unstable side slopes.
				Variable soil material.
Frequent flooding; high content of organic matter.	Low position; frequent flooding; variable soil material.			Frequent flooding; variable soil material.
High content of organic matter.	Low position; inadequate outlets in some places; rapid oxidation.		Frequent flooding	
Loose sands; unstable side slopes.	Slowly permeable substratum.	Low available moisture capacity.	None	

[2] For interpretations for Manatee and Delray soils of this complex, see the individual soils.

of open ditches or tile. Such a system makes it possible to maintain a fairly uniform water table throughout the growing season. It provides the good soil-moisture relationships needed to grow a large number of different truck crops, pasture grasses, legumes, and ornamental plants.

Nonfarm Uses of Soils [6]

Seminole County is in the east-central part of Florida where the population is rapidly increasing. Expansion of industry, research, educational facilities, and other activities associated with space-age development in the area are making continuing demands for changes in use of the soils. Although agriculture and forestry have been the foremost enterprises in the past, more and more land is being diverted to nonfarm uses.

An additional increase in population will require more homesites; more land for highways, streets, and parking areas; more space for businesses, industrial plants, schools, and churches; and additional sites for playgrounds, parks, and recreational areas. The kind of soils in an area has an important bearing on these uses, just as it has for agriculture. Many factors other than the kind and relative suitability of the soils for specific uses must be considered in determining changes in land use, but the characteristics of the soils are important. Knowledge of the soils is needed for making wise decisions about alternative uses and for determining the kind and degree of problems related to the soils that must be overcome before the site can be used for a specific purpose. Careful consideration of the soil characteristics during the early stages of urban development can prevent costly mistakes that are difficult to correct later.

This section gives limitations for a number of important nonfarm uses of the soils, and other parts of the soil survey report give information needed for planning nonfarm uses. Table 6 groups the soils according to their limitations when they are used for the construction of buildings, transportation, recreational purposes, and uses such as for basements, fallout shelters, and cemeteries. It also names the chief limiting properties for the soils

[6] DAVID P. POWELL, soil specialist for interpretations, Soil Conservation Service, assisted in the preparation of this section.

of each group. The degree of limitation is indicated by the ratings *slight*, *moderate*, *severe*, and *very severe*.

The terms used to indicate degree of limitation do not indicate suitability, because suitability involves more than the soil characteristics. Most soils can be made suitable for many uses if they are managed so that the limitations or hazards are overcome. The ratings do show the degree of intensity of the problems that must be overcome if the soils are used for the purpose indicated. Soils may have very severe limitations for a specified use; they can be made suitable for that use, however, if it is feasible to apply the intensive treatment needed to overcome the limitations.

Some properties of soils are significant to only one or

TABLE 6.—*Degree of soil limitation for selected*

Soil name and map symbol	Building construction [1]			Transportation
	Footings and foundations	Lawns and ornamental shrubs	Septic tanks and filter fields	Airports, highways, and large parking areas
Group 1: BfB Blanton fine sand, high, 0 to 5 percent slopes. LaB Lakeland fine sand, 0 to 5 percent slopes.	Slight	Moderate; low available moisture capacity and low natural fertility.	Slight	Slight
Group 2: BfC Blanton fine sand, high, 5 to 8 percent slopes. LaC Lakeland fine sand, 5 to 8 percent slopes.	Slight	Moderate; low available moisture capacity and low natural fertility.	Slight	Moderate; 5 to 8 percent slopes.
Group 3: BfD Blanton fine sand, high, 8 to 12 percent slopes. LaD Lakeland fine sand, 8 to 12 percent slopes.	Moderate; 8 to 12 percent slopes.	Moderate; low available moisture capacity and low natural fertility.	Moderate; 8 to 12 percent slopes.	Moderate; 8 to 12 percent slopes.
Group 4: LdB Lakewood sand, 0 to 5 percent slopes.	Slight	Severe; droughty; very low natural fertility.	Slight	Slight
Group 5: LdC Lakewood sand, 5 to 8 percent slopes.	Slight	Severe; droughty; very low natural fertility.	Slight	Moderate; 5 to 8 percent slopes.
Group 6: SfB St. Lucie fine sand, 0 to 5 percent slopes.	Slight	Very severe; very droughty; very low natural fertility.	Slight	Slight
Group 7: BnB Blanton fine sand, low, 0 to 5 percent slopes. OrB Orlando fine sand, 0 to 5 percent slopes.	Slight	Slight	Moderate; seasonally high water table 15 to 30 inches from the surface for 1 to 2 months each year.	Slight
Group 8: BnC Blanton fine sand, low, 5 to 8 percent slopes. OrC Orlando fine sand, 5 to 8 percent slopes.	Slight	Slight	Moderate; seasonally high water table 15 to 30 inches from the surface for 1 to 2 months each year.	Moderate; 5 to 8 percent slopes.

See footnote at end of table.

two uses; others are significant to a number of uses. The characteristics of the water table, for example, are important to most uses, but depth to bedrock has only limited importance. In rating the soils for each use shown in table 6, all of the soil characteristics considered to be important to that particular use were rated. Only the most limiting soil characteristics are shown, however, and these determine the rating for degree of soil limitation. The other limiting characteristics are significant and must be considered, but their effect is not so great. The following paragraphs discuss some of the main nonfarm uses of the soils of this county.

BUILDING CONSTRUCTION.—Table 6 indicates the degree of soil limitation for soils used for the construction of

nonfarm uses and the chief limiting properties

Transportation—Con.	Recreation			Basements, fallout shelters, and cemeteries
Farm roads, streets, and small parking areas	Campsites and picnic areas	Playgrounds	Golf courses	
Moderate	Slight	Slight	Slight; low available moisture capacity and low natural fertility.	Slight.
Moderate; 5 to 8 percent slopes.	Slight to moderate; 5 to 8 percent slopes.	Moderate; 5 to 8 percent slopes.	Moderate; 5 to 8 percent slopes; low available moisture capacity and low natural fertility.	Slight; 5 to 8 percent slopes.
Severe; 8 to 12 percent slopes.	Moderate; 8 to 12 percent slopes.	Severe; 8 to 12 percent slopes.	Moderate; 8 to 12 percent slopes; low available moisture capacity and low natural fertility.	Moderate; 8 to 12 percent slopes.
Severe	Slight	Moderate	Moderate; droughty; very low natural fertility.	Slight.
Severe; 5 to 8 percent slopes.	Slight to moderate; 5 to 8 percent slopes.	Moderate; 5 to 8 percent slopes.	Moderate; droughty; very low natural fertility.	Slight; 5 to 8 percent slopes.
Severe	Severe; poor trafficability.	Severe; poor trafficability.	Very severe; poor trafficability; very droughty; very low natural fertility.	Slight.
Moderate	Slight	Slight	Slight	Moderate; seasonally high water table 15 to 30 inches from the surface for 1 to 2 months each year.
Moderate	Slight to moderate; 5 to 8 percent slopes.	Moderate; 5 to 8 percent slopes.	Slight; 5 to 8 percent slopes.	Moderate; 5 to 8 percent slopes; seasonally high water table 15 to 30 inches from the surface for 1 to 2 months each year.

TABLE 6.—*Degree of soil limitation for selected nonfarm*

Soil name and map symbol	Building construction [1]			Transportation
	Footings and foundations	Lawns and ornamental shrubs	Septic tanks and filter fields	Airports, highways, and large parking areas
Group 9: Df Delray fine sand, high. Dh Delray fine sand, moderately shallow, high. Im Immokalee fine sand. In Immokalee sand. LfA Leon fine sand, 0 to 2 percent slopes. LfB Leon fine sand, 2 to 5 percent slopes. Lo Leon sand. On Ona fine sand. Ph Plummer fine sand, high. Rh Rutlege fine sand, high. Sa St. Johns fine sand. Wa Wabasso fine sand.	Moderate; water table less than 15 inches from the surface for more than 1 month each year.	Moderate; water table less than 15 inches from the surface for more than 1 month each year. Some soils have low available moisture capacity and low natural fertility.	Severe; water table less than 15 inches from the surface for more than 1 month each year.	Moderate; water table less than 15 inches from the surface for more than 1 month each year.
Group 10: PmB Pomello fine sand, 0 to 5 percent slopes.	Slight	Severe; droughty; very low natural fertility.	Moderate; seasonally high water table 15 to 30 inches from the surface for 1 to 2 months each year.	Slight
Group 11: Ch Charlotte fine sand. De Delray fine sand. Dm Delray mucky fine sand. Pf Plummer fine sand. Pn Pompano fine sand. Po Pompano fine sand, moderately shallow. Rf Rutlege fine sand. Rm Rutlege mucky fine sand. Sw Swamp.	Very severe; flooded for 1 to 12 months each year; water table less than 15 inches from the surface for 2 to 12 months each year.	Very severe; flooded for 1 to 12 months each year; water table less than 15 inches from the surface for 2 to 12 months each year.	Very severe; low position; flooded for 1 to 12 months each year; water table less than 15 inches from the surface for 2 to 12 months each year.	Very severe; flooded for 1 to 12 months each year; water table less than 15 inches from the surface for 2 to 12 months each year.
Group 12: Ff Felda fine sand. Ib Iberia clay loam, overflow. Ik Iberia mucky loam. Mb Manatee fine sand. Mc Manatee loamy fine sand. Md Manatee-Delray complex, overflow.	Very severe; flooded for 1 to 12 months each year; water table less than 15 inches from the surface for 6 to 12 months each year; moderate to high shrink-swell potential.	Very severe; flooded for 1 to 12 months each year; water table less than 15 inches from the surface for 6 to 12 months each year.	Very severe; flooded for 1 to 12 months each year; water table less than 15 inches from the surface for 6 to 12 months each year; slow permeability in much of the acreage.	Very severe; flooded for 1 to 12 months each year; water table less than 15 inches from the surface for 6 to 12 months each year; poor traffic-supporting capacity.
Group 13: Bp Brighton peat. Br Brighton peat, shallow variant. Bt Brighton, Istokpoga, and Okeechobee soils. Io Istokpoga peat, deep. Ip Istokpoga peat, moderately deep. Is Istokpoga peat, shallow variant. Ok Okeechobee muck. Tc Terra Ceia muck.	Very severe; flooded for more than 6 months each year; water table less than 15 inches from the surface throughout the year; high shrink-swell potential.	Very severe; flooded for more than 6 months each year; water table less than 15 inches from the surface throughout the year.	Very severe; low position; flooded more than 6 months each year; water table within 15 inches of the surface throughout the year.	Very severe; flooded more than 6 months each year; water table less than 15 inches from the surface throughout the year; poor traffic-supporting capacity.

[1] Includes dwellings, churches, shopping centers, individual stores, filling stations, and industrial plants where buildings are not more than two stories high.

uses and the chief limiting properties—Continued

Transportation—Con.	Recreation			Basements, fallout shelters, and cemeteries
Farm roads, streets, and small parking areas	Campsites and picnic areas	Playgrounds	Golf courses	
Moderate; water table less than 15 inches from the surface for more than 1 month each year.	Moderate; water table less than 15 inches from the surface for more than 1 month each year; fair trafficability.	Moderate; water table less than 15 inches from the surface for more than 1 month each year; fair trafficability.	Moderate; water table less than 15 inches from the surface for more than 1 month each year; fair trafficability	Very severe; water table less than 15 inches from the surface for more than 1 month each year.
Moderate	Moderate	Moderate	Severe; droughty; very low natural fertility.	Severe; seasonally high water table 15 to 30 inches from the surface for 1 to 2 months each year.
Very severe; flooded for 1 to 12 months each year; water table less than 15 inches from the surface for 2 to 12 months each year; very poor trafficability.	Very severe; flooded for 1 to 12 months each year; water table less than 15 inches from the surface for 2 to 12 months each year; very poor trafficability.	Very severe; flooded for 1 to 12 months each year; water table less than 15 inches from the surface for 2 to 12 months each year; very poor trafficability.	Very severe; flooded for 1 to 12 months each year; water table less than 15 inches from the surface for 2 to 12 months each year; very poor trafficability.	Very severe; flooded for 1 to 12 months each year; water table less than 15 inches from the surface for 2 to 12 months each year.
Very severe; flooded for 1 to 12 months each year; water table less than 15 inches from the surface for 6 to 12 months each year; very poor trafficability.	Very severe; flooded for 1 to 12 months each year; water table less than 15 inches from the surface for 6 to 12 months each year; very poor trafficability.	Very severe; flooded for 1 to 12 months each year; water table less than 15 inches from the surface for 6 to 12 months each year; very poor trafficability.	Very severe; flooded for 1 to 12 months each year; water table less than 15 inches from the surface for 6 to 12 months each year; very poor trafficability.	Very severe; flooded for 1 to 12 months each year; water table less than 15 inches from the surface for 6 to 12 months each year.
Very severe; flooded more than 6 months each year; water table less than 15 inches from the surface throughout the year; very poor trafficability.	Very severe; flooded more than 6 months each year; water table less than 15 inches from the surface throughout the year; very poor trafficability.	Very severe; flooded more than 6 months each year; water table less than 15 inches from the surface throughout the year; very poor trafficability.	Very severe; flooded more than 6 months each year; water table less than 15 inches from the surface throughout the year; very poor trafficability.	Very severe; flooded for more than 6 months each year; water table less than 15 inches from the surface throughout the year.

buildings. It gives ratings where the soils are to be used for footings and foundations, for lawns and ornamental shrubs, and for septic tanks and filter fields. The buildings include dwellings (fig. 11), churches, individual stores of one story in shopping centers, filling stations, and motels. They also include light industrial plants where the buildings are no more than two stories high and where no heavy machinery is to be installed. All of these structures require a stable foundation. They must also be placed on a site that is free from the hazards of flooding and that can be appropriately landscaped. Where a community sewage-disposal system is not available and individual septic tanks are used for disposing of sewage, the soils must have characteristics that permit reliable absorption of the effluent from the septic tank. From table 6 it is possible to determine the limitations of a site for a residence or place of business without landscaping or a septic tank, with landscaping and without a septic tank, or with landscaping and a septic tank by summarizing the information in the pertinent columns.

Footings and foundations for buildings must rest on soils that are strong enough to hold the weight of the building. The bearing value, that is, the ability of a soil to support a dead weight without settling, is most important in designing and constructing foundations for buildings. The bearing value of a soil varies in accordance with differences in such soil characteristics as texture, consistence, wetness, and degree of compaction. On sloping sites that require grading before construction is begun, the ease of grading and stability after the site is graded are directly related to the kind of soil.

The soil qualities that most strongly affect the difficulty in constructing strong footings and foundations are the presumptive bearing value, shrink-swell potential, characteristics of the water table, permeability, slope, depth to bedrock, and erodibility.

Lawns and ornamental shrubs are important to many sites used for nonfarm purposes. The ability of the soils to support grass, as well as ornamental trees and shrubs, is especially important for homesites and for many suburban business establishments. It also has significance for highway beautification and for most recreational uses. Although there is a wide range in the kinds of adapted plants available for landscaping, local variations in the soils limit, to some extent, the kinds that can be grown in a specific area. Qualities of soils that most affect landscaping are the susceptibility to flooding, available moisture capacity, depth to the water table, productivity, permeability, slope, and erodibility.

Figure 11.—**Many areas of Blanton soils are adjacent to lakes and make excellent homesites.**

Septic tanks are a common means of disposing of sewage. They are used for isolated homes in rural sections and in some subdivisions where rapidly expanding residential areas have outgrown the existing community facilities for disposing of sewage. To function properly, septic tanks must be installed where the soils have adequate absorptive capacity and are not affected by a high water table. Most of the well-drained soils in this county are highly permeable and absorb water rapidly; however, many of the soils have a high water table that makes them poorly suited as filter fields for septic tanks. Septic tanks installed in such soils may function well in dry seasons, but they fail to function when the water table rises in wet seasons. Susceptibility to flooding, depth to the water table, permeability, depth to bedrock, and slope are the main qualities that most affect the use of the soils as filter fields for septic tanks.

TRANSPORTATION.—Highways, airports, and parking areas for large shopping centers require a strong foundation and nearly level relief. Soils differ widely in their ability to support a heavy mobile load and in the properties they exhibit when they are graded to prepare a uniform, nearly level bed.

Some soils do not require much alteration to provide a good foundation. Others are totally unsuitable for foundations; they must be replaced by better material if a road is to be built on the site. The kinds of soils and the degree of slope greatly influence the difficulty and cost of preparing a foundation adequate for bearing a heavy traffic load.

The soil qualities that most affect use of the soils for highways, airports, and parking areas are susceptibility to flooding, depth to the water table, traffic-supporting capacity, erodibility, shrink-swell potential, depth to bedrock, and slope. Traffic-supporting capacity refers to the ability of the undisturbed soil to support a moving load.

Farm roads, streets, and small parking areas carry a lighter load than main highways and larger parking lots, but they are also strongly affected by the soils on which they are located. The ratings in table 6 deal with the limitations of the soils for supporting movement of traffic over unpaved or surface-treated roads. The soil qualities that affect these uses, however, are not necessarily the same as those considered for heavier traffic; nor are they given equal weight in each proposed use, even where they apply to both. The qualities of soils that affect graded roads, streets, and small parking areas are the susceptibility to flooding, depth to the water table, erodibility, trafficability, and slope. Trafficability refers to the ease with which people can move about over the soil on foot, on horseback, or in a small vehicle, such as a golf cart. It is also indicative of the ability of the soil to support cross-country movement of larger vehicles, such as trucks and tractors.

RECREATION.—In overall plans for a community, adequate provisions should be made for recreational areas. Three broad recreational uses are considered in table 6. These are campsites and picnic areas, playgrounds, and golf courses. The ratings given in table 6 can be used to evaluate the soils for other kinds of recreation, such as for hunting and nature study.

Although the interpretations given in table 6 are concerned with the capability of the soils, an important corollary to use of the soils for some recreational purposes is the existence of an attraction that will cause people to choose the site for recreation. Seminole County has many such attractions. Scattered throughout the county are many small- and medium-sized lakes that are associated with many kinds of soils. The large lakes—Lake Jessup, Lake Monroe, and Lake Harney—are bordered mainly by low, wet soils, as are the winding St. Johns, Econlockhatchee, and Wekiva Rivers.

Campsites are small areas suitable for setting up tents and for doing the accompanying tasks required for outdoor living over a period of several days. The selection of a campsite is commonly limited by factors other than soil characteristics. Attractions, such as beautiful scenery, good hunting, fishing, or swimming, are required to interest campers. Accessibility and comfort of a campsite depend to a great extent on such soil features as wetness, susceptibility to flooding, and trafficability.

Picnic areas should be suitable for pleasure outings at which a meal is eaten out of doors. Requirements for a picnic area are similar to those for a campsite in that the area must have some attractive feature that will interest people in coming to the site. The area must also be accessible and reasonably comfortable. The main qualities that limit use of the soils for a picnic area are depth to the water table, susceptibility to flooding, slope, trafficability, erodibility, and productivity.

Playgrounds, as considered in table 6, include city parks, football fields, tracks, and other small areas where competitive sports are played out of doors. They must be level or nearly level, free from flooding or excessive wetness, easy to walk over, and suitable for growing sod and ornamental plants. The main qualities that limit use of the soils for playgrounds are susceptibility to flooding, depth to the water table, slope, erodibility, trafficability, and productivity.

Golf courses can be established on sites where the soils vary widely, if the site has a good balance between fairways and rough areas, or hazards. The requirements for fairways are affected most by the kinds of soils. The ratings in table 6 are based on the suitability of the soils for fairways. A fairway requires well-drained soils, gentle slopes, and a good cover of grass. Also, people must be able to move over the fairway with ease, on foot or in a golf cart or other light motor vehicle. The main qualities that limit use of the soils for fairways for golf courses are susceptibility to flooding, depth to the water table, productivity, trafficability, and slope.

BASEMENTS, FALLOUT SHELTERS, AND CEMETERIES.—Such underground structures should be located in areas of well-drained soils. Cemeteries also require a site where grass and ornamental plants for landscaping can be grown. Throughout the year, the water table in the areas used for basements, fallout shelters, and cemeteries ought to be no higher than 6 feet from the surface, and the areas must not be subject to flooding. In addition to these requirements, the principal soil features that affect the use of an area for basements, fallout shelters, and cemeteries are the slope, depth to bedrock, and productivity.

Formation, Classification, and Morphology of Soils

This section has two main parts. In the first part the factors of soil formation and their effect on the soils of Seminole County are described. In the second part the soil series are placed in great soil groups and the morphology of the soils is discussed.

Factors of Soil Formation

Soil is produced by forces of weathering and soil formation acting on the parent material that has been deposited or accumulated by geologic agencies. The characteristics of the soil depend on five major factors. These are (1) the physical and mineral composition of the parent material; (2) the climate under which the soil material has accumulated and has existed since accumulation; (3) the plant and animal life on and in the soil; (4) the relief, or lay of the land; and (5) the length of time these forces 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, however, may have more influence than the others on the development of a soil and may account for most of its properties. Climate and living organisms are the active forces of soil genesis, but their effects are influenced by relief. Relief affects climate by modifying the degree of surface drainage, the amount of water that percolates through the soil, and the rate of erosion. Geologic formations from which the parent material is derived influence relief and also the local soil climate. The length of time that the forces of soil formation have worked is reflected in the degree of profile development. Time is also relative, for some soils develop much faster than others, depending on the interrelationship of the other four factors. The effects of these five primary soil-forming factors, as well as a number of secondary factors, are so closely interrelated that few generalizations can be made about one without specifying the conditions for the others.

Parent material

The parent material of the soils in this county consists mainly of interbedded unconsolidated sands and clays and of unconsolidated beds of marly clays interbedded with soft limestone and marl. The parent material of the soils in the extreme western part of the county was derived from formations of Recent and Pleistocene age and from the Citronelle formation, which is of Pliocene age. Most of the soils in the central part of the county formed in thick beds of unconsolidated sands and clays of Pleistocene age. Soils on the flood plains of the St. Johns River, around Lake Jessup, and in an area locally called the Celery Delta, also formed in material of Recent and Pleistocene age and in material weathered from the Caloosahatchee formation of Miocene or Pliocene age. Marine deposits of Pleistocene or Recent age form a mantle over the entire county. The thickness of these deposits ranges from 10 to 75 feet.

The parent material in this county differs widely in mineralogical and chemical composition as well as in texture, color, and structure. The main differences other than mineral and chemical, such as the differences between sand, silt, and clay, can be observed in the field. Differences in mineralogical and chemical composition, important to the formation and present physical and chemical characteristics of the soils, generally can be determined only by careful laboratory examination. The chemical composition and the mineralogical composition of the sediments in this county have not been studied intensively enough to determine how they are related to differences among the soils. Many differences appear to reflect original differences in the geologic material when the sediments were laid down.

Climate

This county has a subtropical, humid climate. The relatively high year-round temperature and the large amount of rainfall have strongly influenced the formation of the soils. Most of the soils are sandy, porous, and well aerated. Only a small amount of organic matter has accumulated in them, and much of the organic matter that has accumulated has been lost through oxidation. Where a compact layer, or pan, does not restrict the movement of water downward through the profile, much of the soluble minerals have been leached from the upper horizons. Also the fine-textured particles, the silts and clays, have been transported from the upper part of the profile to the lower horizons. As a result, the upper horizons are sandy.

In about 70 percent of the county, the soils are underlain by impervious strata and have a fluctuating water table. These soils do not have free drainage; they formed in wet areas where aeration was poor. The internal soil climate in which they formed is entirely different from that of well-drained soils. The chemical composition of these soils is different from that of well-drained soils, and biologic activity within the soils is different. In many of these soils, a significant amount of organic matter has accumulated in the surface layer. Strong organic acids, released by decaying organic matter, have hastened the leaching processes in the mineral layers.

Plants and animals

Plants, earthworms, micro-organisms, and other forms of life that live on and in the soil are active in the soil-forming processes. The changes they bring about depend mainly on the kind of life processes peculiar to each. The kinds of plants and animals are determined by the environment, that is, by the climate, relief, parent material, and age of the soils, by the other kinds of organisms present, and also by the effects the organisms themselves have on the environment. From the standpoint of soil development, the chief function of plants and animals is to furnish organic matter to the soils, to stir the soils, and to bring plant nutrients from the lower horizons to the upper horizons.

The native vegetation of the better drained soils of the county was dominantly longleaf pine, numerous native grasses, scattered saw-palmettos, a few low shrubs, and some hardwoods. Now the vegetation on these areas consists mainly of turkey oak, blackjack oak, scattered longleaf and slash pines, wiregrass, and scattered saw-palmettos. On the excessively drained soils, the present vegetation is predominantly the same as the original plant cover. It consists mainly of scrub oak, runner oak, rosemary, sand pine, and saw-palmetto. The plant cover

on the somewhat poorly drained soils of the flatwoods is longleaf and slash pine, saw-palmetto, gallberry, and native grasses. That on the poorly drained and very poorly drained soils of the swamps is black pine, water-tolerant hardwoods, such as bay, magnolia, blackgum, and saw-palmettos, and shrubs, cypress trees, cabbage-palms, and water-tolerant grasses.

In a few swampy areas that are covered by water most of the time, organic soils have formed under a forest of swamp hardwoods and grasses. The soils that formed in organic material derived from fallen trees are woody peats. In other places, where hardwoods have come in only recently, the soils formed in material derived from grasses and are felty peats.

Relief

Relief has affected the formation of soils in this county, primarily through its influence on the soil-water relationships. Other factors of soil formation normally associated with relief, such as erosion, temperature, and plant cover, are of minor importance.

The county is mainly a nearly level or gently sloping plain that rises from about 5 feet mean sea level on the shores of Lake Monroe to about 135 feet mean sea level in the southwestern corner of the county, near Bear Lake. Only a few, short breaks adjacent to depressions and lakes are steep.

Three general areas—sandhills, flatwoods, and flood plains—are in this county. In each of these general areas, the formation of the soils is directly related to relief.

The sandhills are dominant in the western part of the county. They are mainly gently sloping uplands dotted with lakes, ponds, and slight depressions. The slopes adjacent to some of the lakes, however, are steep. Lakeland, Lakewood, St. Lucie, and the high phases of Blanton soils formed mainly on these well-drained sandhills.

The flatwoods border the sandhills and extend eastward from the sandhills. They are broad, nearly level areas dissected by a few slow-moving streams and dotted with shallow ponds and swamps. In these areas the water table fluctuates and is normally within 4 feet of the surface. Dominant in the flatwoods are the Immokalee, Leon, Ona, and St. Johns soils on low, broad, nearly level ridges. These soils are highly leached, and they have a dark-brown to black B horizon, stained with organic matter, within 42 inches of the surface.

Other soils of the flatwoods are on low knolls and on slightly elevated ridges where the fluctuating water table is at a lower level. These are better drained than the other soils of the flatwoods. The dominant soils in these higher lying areas are the Pomello and low phases of the Blanton.

Still other soils of the flatwoods are in depressions and on bottoms along streams. They are mainly the Rutlege, Delray, Pompano, and Plummer soils, which are wet most of the time and have a dark-colored surface layer in many places.

The areas of flood plains are adjacent to the St. Johns River or the large lakes of the county. They are large and nearly level. The soils are wet most of the time and are subject to frequent, deep flooding from the lakes or the river. The Felda, Delray, Iberia, Manatee, and Rutlege soils are representative of this area.

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Microrelief within any of these three main areas influences the soils of a specific site in a way much like that in which the soils are influenced by the differences in relief of the three main general areas. For example, small areas of flatwoods may occur within the sandhills, or small areas of well-drained sandhill soils may occur within the flatwoods.

Time

Time is an important factor in the formation of soils. The physical and chemical changes brought about by climate, living organisms, and relief are slow; the length of time required to convert raw geologic material to a soil depends upon the length of time required for the interaction of the other soil-forming factors and on the characteristics of the geologic parent material.

Some basic minerals from which soils are formed weather fairly rapidly, but other minerals change slowly, even though weathering has taken place over a long period of time. The translocation of fine particles within the soils to form the various horizons varies under different conditions. All of the soil-forming processes, however, require a relatively long period of time. Almost pure quartz sand that is highly resistant to weathering is the dominant geologic material in this county. The finer textured materials, silts and clays, are the end product of earlier weathering.

In terms of geologic time, the soil material that makes up many of the soils of this county is young. Not enough time has elapsed since the material was laid down or emerged from the sea for pronounced genetic horizons to have developed.

Classification and Morphology of Soils

Two of the main objectives of a soil survey are to describe and identify the soils and to determine their relationship to agriculture and their use in nonagricultural endeavors. Another objective is to group the soils according to common characteristics. Such a grouping shows the relationship of the soils to one another and to soils of other areas. This grouping is necessary because there are so many different kinds of soils that it would be difficult to remember the characteristics of all of them. If the soils are placed in a few groups, each group having the same selected characteristics, their general nature can be remembered more easily.

Soils are placed in narrow classes for the organization and application of knowledge about their behavior within farms, ranches, or counties. They are placed in broad classes for study and comparisons of large areas, such as continents. In the comprehensive system of soil classification followed in the United States, the soils are placed in six categories, one above the other. Beginning at the top, the six categories are order, suborder, great soil group, family, series, and type.

In the highest category, the soils of the whole country are grouped into three orders, whereas thousands of soil types are recognized in the lowest category. The suborder and family categories have never been fully developed and thus have been little used. Attention has been given largely to the classification of soils into soil types and series within counties or comparable areas and to the subsequent grouping of series into great soil groups

and orders. Soils series, soil type, and soil phase are defined in the section "How This Soil Survey Was Made."

Classes in the highest category of the classification scheme are the zonal, intrazonal, and azonal orders. Each of these orders is made up of many great soil groups. In a great soil group are soils that have fundamental characteristics in common.

The zonal order consists of soils that have well-developed characteristics that reflect the influence of climate and living organisms in their development. The zonal order is not represented in this county.

In the intrazonal order are soils that have distinct, genetically related horizons that reflect the dominant influence of a local factor of topography or parent material over the effects of climate or living organisms. The intrazonal soils in this county are members of the Low-Humic Gley, Humic Gley, Ground-Water Podzol, and Bog great soil groups.

The azonal order is made up of soils that lack well-developed, genetically related horizons, commonly because of youth, resistant parent material, or steep topography. The azonal soils in this county are members of the Regosol great soil group.

The soils of two series in this county are not representative of the central concept of any great soil group but intergrade from one group toward another. These are the Charlotte and Lakewood soils.

Table 7 gives the order and great soil group to which the soil series in the county belongs. It also shows the parent material of the soils in each series, and the physiographic position, drainage, relief, and degree of horizon development.

The classification of the soils in the county is based largely on characteristics observed in the field. It may be revised as knowledge about the soils increases.

Low-Humic Gley soils

The soils in this group are imperfectly drained or poorly drained, and they have a thin surface horizon, moderately high in content of organic matter. The surface layer is underlain by a mottled gray and brown, gleylike horizon that is only slightly different from the surface horizon in texture.

In this county the soils of this group formed in wet areas in acid to alkaline marine sediments under a forest of longleaf and pond pine, cabbage-palm, wiregrass, oak, and saw-palmetto. Water-tolerant grasses and hard-

TABLE 7.—*Characteristics and genetic relationships of the soil series*

INTRAZONAL

Great soil group and soil series	Parent material	Position	Soil drainage	Slope range	Degree of horizon development [1]
				Percent	
Low-Humic Gley soils:					
Charlotte [2]	Unconsolidated neutral sands	Uplands	Poorly drained or very poorly drained.	0 to 2	Weak or moderate.
Felda	Unconsolidated sands and alkaline clayey material.	Uplands	Poorly drained	0 to 2	Moderate.
Plummer	Unconsolidated acid sands	Uplands	Poorly drained or very poorly drained.	0 to 2	Weak.
Pompano	Unconsolidated neutral sands	Uplands	Poorly drained or very poorly drained.	0 to 2	Weak.
Humic Gley soils:					
Delray	Unconsolidated neutral sands	Uplands	Poorly drained or very poorly drained.	0 to 2	Weak.
Iberia	Unconsolidated neutral loams and alkaline clays and marl.	Bottom lands	Very poorly drained	0 to 2	Moderate.
Manatee	Unconsolidated neutral sands and loamy sands and alkaline clayey material.	Depressions in the uplands.	Poorly drained or very poorly drained.	0 to 2	Moderate.
Rutlege	Unconsolidated acid sands	Uplands	Poorly drained or very poorly drained.	0 to 2	Weak.
Ground-Water Podzols:					
Immokalee	Unconsolidated acid sands	Uplands	Poorly drained	0 to 5	Strong.
Leon	Unconsolidated acid sands	Uplands	Poorly drained	0 to 5	Strong.
Ona	Unconsolidated acid sands	Uplands	Poorly drained	0 to 2	Moderate or strong.
Pomello	Unconsolidated acid sands	Uplands	Moderately well drained	0 to 5	Strong.
St. Johns	Unconsolidated acid sands	Uplands	Poorly drained	0 to 2	Strong.
Wabasso	Unconsolidated acid sands	Uplands	Poorly drained	0 to 2	Strong.
Bog soils:					
Brighton	Fibrous plant remains	Depressions in the uplands.	Very poorly drained	0 to 2	Weak.
Istokpoga	Woody plant remains	Depressions in the uplands.	Very poorly drained	0 to 2	Weak.
Okeechobee	Fibrous plant remains	Depressions in the uplands.	Very poorly drained	0 to 2	Weak.
Terra Ceia	Highly decomposed plant remains.	Depressions in the uplands.	Very poorly drained	0 to 2	Weak.

TABLE 7.—*Characteristics and genetic relationships of the soil series*—Continued

AZONAL

Great soil group and soil series	Parent material	Position	Soil drainage	Slope range	Degree of horizon development [1]
Regosols:				*Percent*	
Blanton	Unconsolidated acid sands	Uplands	Moderately well drained or well drained.	0 to 12	Weak.
Lakeland	Unconsolidated acid sands	Uplands	Well drained	0 to 12	Weak.
Lakewood [3]	Unconsolidated acid sands	Uplands	Excessively drained	0 to 8	Moderate.
Orlando	Unconsolidated acid sands	Uplands	Moderately well drained or well drained.	0 to 8	Weak.
St. Lucie	Unconsolidated acid sands	Uplands	Excessively drained	0 to 12	Weak.

[1] Estimated according to the number of important genetic horizons and the degree of contrast between horizons.

[2] Intergrading toward Red-Yellow Podzolic soils.

[3] Intergrading toward Podzols.

woods, such as blackgum, sweetgum, maple, and cabbage-palm, covered the more poorly drained areas. The characteristics of these soils reflect the influence of nearly level relief, a high water table, and poor drainage more strongly than that of climate and vegetation. The color of the surface layer ranges from gray to black, and the texture is fine sand. The subsoil ranges from mottled light brownish gray or gray to light gray in color and from fine sand to fine sandy clay loam in texture. A detailed description of the Low-Humic Gley soils of Seminole County follows.

CHARLOTTE, FELDA, PLUMMER, AND POMPANO SERIES.—Soils of the Felda, Plummer, and Pompano series are representative of the Low-Humic Gley great soil group. The Charlotte soils are also in this great soil group, but they have some characteristics of Red-Yellow Podzolic soils.

The soils of this group are mainly in nearly level areas and in depressions. They are poorly drained or very poorly drained and have a high water table. The texture of the Charlotte, Plummer, and Pompano soils is fine sand throughout the profile. Those soils are similar in color of the surface layer and subsoil and have similar mottling in the subsoil. The Felda soils are finer textured than the Plummer and Pompano soils, and they have more mottling in the subsoil. The slopes generally are between 0 and 2 percent, but they range from 2 to 5 percent in about 26 acres of Plummer soils.

Charlotte Series

Profile of Charlotte fine sand in a pasture on the La Mont Ranch, 3 miles east of Chuluota and about 0.5 of a mile south of the Brumley Road:

Ap—0 to 4 inches, black (10YR 2/1) fine sand that contains grains of white (10YR 8/1) sand; single grained; very friable; abundant fine roots; slightly acid; clear, wavy boundary.

A12—4 to 12 inches, grayish-brown (10YR 5/2) fine sand with many, fine, faint, black (10YR 2/1), dark-brown (10YR 4/3), pale-brown (10YR 6/3), and light-gray (10YR 7/2) mottles; single grained; loose; numerous fine roots; slightly acid to neutral; gradual, wavy boundary.

A3—12 to 20 inches, dark-brown (10YR 4/3) fine sand with many, medium, distinct, dark-red (2.5YR 3/6), dark-gray (10YR 4/1), light brownish-gray (10YR 6/2), light-gray (10YR 7/2), and black (10YR 2/1) mottles; single grained; loose; few, fine, faint roots; neutral; gradual, wavy boundary.

C1—20 to 34 inches, yellowish-brown (10YR 5/6) fine sand with few, coarse, distinct, pale-brown (10YR 6/3), very dark gray (10YR 3/1), dark-gray (10YR 4/1), and dark-red (2.5YR 3/6) mottles; single grained; loose; coatings of iron on the sand grains; mildly alkaline; gradual, wavy boundary.

C2—34 to 40 inches, grayish-brown (10YR 5/2) fine sand with few, fine, faint, brown (10YR 5/3) and black (10YR 2/1) mottles; single grained; loose; mildly alkaline; wavy, clear boundary.

C3—40 to 52 inches +, gray (10YR 5/1) fine sand with few, fine, faint, brown (10YR 5/3) mottles; single grained; loose; streaks along old root channels; moderately alkaline.

The color of the Ap horizon ranges from black or very dark gray to dark gray, and the thickness of that horizon, from 2 to 8 inches. The color of the A12 horizon ranges from grayish brown to pale brown, and the thickness of that horizon ranges from 4 to 10 inches. The A3 horizon ranges from dark brown or yellowish brown to reddish yellow or yellow in color, but the predominant color is yellowish brown.

The color of the C1 horizon ranges from yellow to yellowish brown, and the thickness of that horizon ranges from 12 to 24 inches; mottling varies greatly in degree and intensity. In places the C2 horizon is absent, but where it occurs, it ranges from grayish brown to dark brown in color and from 5 to 10 inches in thickness. The C3 horizon ranges from 10 to more than 30 inches in thickness and from light gray to gray in color. In places fine-textured material is at a depth of 30 to 42 inches. In other places, in the Celery Delta, a discontinuous layer of iron rock is at a depth of 20 to 40 inches. This layer is so hard in some places that it cannot be penetrated by a soil auger.

Felda Series

Profile of Felda fine sand in an area covered by cabbage-palms about 1.5 miles east of Sanford Avenue (Florida Highway No. 425) on the north side of Lake Jessup:

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

A21—5 to 10 inches, gray (10YR 5/1) to grayish-brown (10YR 5/2) fine sand; single grained; loose; numerous fine or medium roots; medium acid; clear, smooth boundary.

A22—10 to 19 inches, light brownish-gray (10YR 6/2) fine sand with few, fine, faint mottles of yellowish brown (10YR 5/8); mottles are yellowish red (5YR 5/8) along old root channels; single grained; loose; few medium roots; mildly alkaline; abrupt, smooth boundary.

Bg—19 to 29 inches, dark-gray (10YR 4/1) fine sandy clay loam with few, fine, faint mottles of brownish yellow (10YR 6/8) and light gray (10YR 6/1); very weak subangular blocky structure; very slightly sticky; contains lenses of sandy material; few fine or medium roots; moderately alkaline; gradual, wavy boundary.

Cg—29 to 52 inches +, light-gray (10YR 6/1) sandy loam with few, fine, faint, yellow (10YR 7/8 and 10YR 8/6) mottles; weak, fine, granular structure; friable; few fine roots in uppermost 4 inches; many small flakes of marl throughout; strongly calcareous.

The A horizon ranges from dark gray to black in color and from 4 to 7 inches in thickness. The combined thickness of the A21 and A22 horizons ranges from 10 to 26 inches. The color of those horizons ranges from light gray to grayish brown.

The Bg horizon ranges from dark gray or light brownish gray to pale brown or grayish brown in color and from 8 to 18 inches in thickness. The texture of that horizon ranges from sandy loam to fine sandy clay loam, and the horizon contains lenses of fine sandy clay, loamy fine sand, and fine sand. The lenses of finer textured material are associated with the brighter colors, and the lenses of coarser textured material are associated with the more grayish colors. The degree, size, and intensity of the mottles vary greatly. In places streaks where calcareous material occurs are present in the lower part of the Bg horizon.

The Cg horizon ranges from light gray to gray in color and from loamy fine sand to fine sandy clay loam in texture. The degree of mottling in the Cg horizon varies. In places a discontinuous layer of marl, 2 to 5 inches thick, is within or below the Cg horizon.

Plummer Series

Profile of Plummer fine sand in a swampy area 1.5 miles south of Seminole Raceway:

A—0 to 3 inches, black (10YR 2/1) fine sand; very weak, fine, granular structure; very friable; numerous fine or very fine roots; very strongly acid; clear, smooth boundary.

C1—3 to 42 inches, gray (10YR 5/1) fine sand with few, fine, faint, vertical mottles of very dark gray (10YR 3/1) and dark gray (10YR 4/1); single grained; loose; very strongly acid; gradual, wavy boundary.

IIC2—42 to 52 inches +, brown (10YR 5/3) fine sand that crushes to dark brown (10YR 4/3) with common, medium, faint mottles of very dark grayish brown (10YR 3/2); mottles are dark brown (10YR 4/3) along old root channels; very strongly acid.

The A horizon ranges from dark gray to black in color and from 3 to 7 inches in thickness. The C1 horizon ranges from 18 to 42 inches in thickness and from light gray or gray to very pale brown or pale brown in color. The degree and intensity of mottling varies greatly in the C1 horizon. The color of the C2 horizon ranges from light brownish gray to grayish brown or brown. In places that horizon is at a depth of more than 42 inches.

In some places an incipient pan is in the upper part of the C horizon at a depth of 22 to 50 inches. In dry periods this pan resembles an organic pan. During wet periods, however, it retrogrades to a layer of sludgelike material stained with organic matter.

Pompano Series

Profile of Pompano fine sand in a wooded area 0.25 of a mile west of Florida Avenue and 0.5 of a mile south of Howard Avenue:

A—0 to 5 inches, black (10YR 2/1) fine sand; weak, fine, granular structure; friable; numerous fine to very large roots; slightly acid; abrupt, smooth boundary.

C1—5 to 42 inches, gray (10YR 5/1) fine sand with few, fine, faint mottles of light gray (10YR 7/1), dark brown (10YR 4/3), and dark gray (10YR 4/1); very weak, fine, granular structure; very friable; few fine or medium roots; mildly alkaline; gradual, wavy boundary.

C2—42 to 52 inches +, light-gray to gray (10YR 6/1) fine sand; single grained; loose; mildly alkaline.

The color of the A horizon ranges from dark gray to black, and the thickness of the A horizon ranges from 4 to 7 inches. The C1 horizon ranges from 10 to 40 inches in thickness and from gray to light gray or light brownish gray in color. The mottles in that horizon vary in degree and intensity. In some places the C1 horizon is absent. The color of the C2 horizon ranges from gray to light brownish gray, very pale brown, or yellow.

Humic Gley soils

In this great soil group are poorly drained or very poorly drained soils that have a thick, black A horizon, high in content of organic matter. Below the A horizon is a gray or mottled B or C horizon.

In this county the soils of the Humic Gley great soil group formed in acid or neutral marine sediments in areas where the water table fluctuated but was generally near the surface. The forest cover in the low areas was chiefly water-tolerant oaks, sweetgums, maples, blackgums, and cabbage-palms. The low open areas were covered with water-tolerant grasses and other small plants that tolerate water. Slightly higher areas were covered with longleaf pine, black pine, wiregrass, and saw-palmetto. A detailed description of Humic Gley soils in this county follows.

DELRAY, IBERIA, MANATEE, AND RUTLEGE SERIES.—The soils of these series are very poorly drained or poorly drained, and some areas of the Iberia soils on flood plans are subject to flooding. The soils have a very dark gray to black surface layer and a gray subsoil of fine sand to clay. The Delray and Rutlege soils have a sandy texture throughout the profile, but the Iberia and Manatee soils have fine textured material in the lower part of the profile. The content of organic matter for all the soils of this group ranges from 5 to 15 percent.

Delray Series

Profile of Delray fine sand in a cultivated field 1.5 miles east of the curve of Florida Highway No. 419 and 1.5 miles north of Oviedo, just north of a graded road:

Ap1—0 to 15 inches, black (10YR 2/1) fine sand; weak, fine, granular structure; friable; neutral; clear, wavy boundary.

A12—15 to 23 inches, black (10YR 2/1) fine sand with few, medium, faint mottles of very dark brown (10YR 2/2), very pale brown (10YR 7/3), and light brown-

ish gray (10YR 6/2); weak, fine, granular structure; friable; neutral; clear, wavy boundary.

AC—23 to 36 inches, gray (10YR 5/1) fine sand with few, fine, faint mottles of light brownish gray (10YR 6/2), dark gray (10YR 4/1), light gray (10YR 7/2), and very dark gray (10YR 3/1); single grained; loose; mildly alkaline; gradual, wavy boundary.

C—36 to 52 inches +, light brownish-gray (10YR 6/2) fine sand with few, fine, faint mottles of very dark gray (10YR 3/1); single grained; loose; mildly alkaline.

The Ap1 horizon ranges from very dark gray to black in color and from 8 to 18 inches in thickness. The A12 horizon ranges from dark gray to black in color and from 2 to 10 inches in thickness. In places the A12 horizon is absent. The color of the AC horizon ranges from light gray or gray to very pale brown, and the thickness of that horizon ranges from 10 to 24 inches. The C horizon ranges from light brownish gray to very pale brown in color and from 12 to 24 inches or more in thickness. In a few places the C horizon of fine sand is absent, and sandy clay loam is at a depth of 30 to 42 inches.

Iberia Series

Profile of Iberia clay loam, overflow, in a pasture about 1.5 miles east of Sanford Avenue (Florida Highway No. 425):

O1–½ inch to 0, very dark brown (10YR 2/2) assorted litter of the remains of hyacinths, flags, water-tolerant grasses, and lilies brought in by floodwaters.

A—0 to 10 inches, black (10YR 2/1) clay loam; weak, subangular blocky structure; extremely hard when dry, very firm when moist, and very sticky when wet; breaks to clumps along pressure surfaces; high in content of organic matter; abundant fine grass roots; mildly alkaline; gradual, wavy boundary.

B21g—10 to 12 inches, very dark gray (10YR 3/1) clay; few, fine, distinct mottles of yellow (10YR 8/6), pale olive (5Y 6/3), and black (10YR 2/1); massive; extremely hard when dry; where much pressure is applied, breaks along the pressure surfaces to coarse angular peds; very firm when moist, very plastic when wet; many fine roots; mildly alkaline; gradual, wavy boundary.

B22g—12 to 16 inches, dark-gray (N 4/0) clay; many, medium, distinct mottles of yellowish brown (10YR 5/8), yellow (10YR 6/8), black (10YR 2/1), and gray (N 5/0); moderate, medium, subangular blocky structure and pronounced pressure surfaces; extremely hard when dry, very firm when moist, and very plastic when wet; 5 percent, by volume, lime concretions 2 to 25 millimeters in diameter; many fine roots; mildly alkaline; clear, wavy boundary.

IIB23g—16 to 33 inches, gray (N 5/0) marly clay; many, coarse, distinct mottles of olive yellow (2.5Y 6/8), dark gray (N 4/0), white (2.5Y 8/2), olive (5Y 5/3), and black (10YR 2/1); moderate, medium, subangular blocky structure and noticeable pressure surfaces; extremely hard when dry, very firm when moist, and very plastic when wet; 25 percent, by volume, lime concretions 1 to 10 millimeters in diameter; many fine roots; calcareous; gradual, wavy boundary.

IICg—33 to 78 inches +, gray (N 5/0) clay; many, coarse, distinct mottles of dark gray (N 4/0) and yellow (10YR 7/8); massive; extremely hard when dry, very firm when moist, and very plastic when wet; many fine roots; calcareous.

The A horizon ranges from very dark gray or black to very dark brown in color, but normally that horizon is black. It ranges from 8 to 20 inches in thickness and from clay loam to clay in texture. The B21g horizon ranges from dark gray to very dark gray in color and from 2 to 6 inches in thickness. The B21g horizon is absent in some places. The mottles in the B22g horizon vary in degree and intensity, and their color is yellow, black, gray, yellowish brown, and very dark gray. The thickness of the B22g horizon ranges from 4 to 20 inches. In places the B22g or IIB23g horizon contains as much as 50 percent, by volume, of gypsum crystals that are 1 to 5 millimeters in diameter and are rhomboid in shape. The IIB23g horizon ranges from gray to light gray in color, and it is mottled with varying shades of yellow, dark gray, olive, and black. The thickness of that horizon ranges from 12 to 36 inches. In places the lime concretions are absent.

The IICg horizon ranges from light gray to gray in color, and that horizon is mottled with shades of dark gray and yellow. The IICg horizon is absent in some places. In places a IIICg horizon that ranges from fine sand to sandy loam in texture lies below the IIB23g horizon at a depth of more than 42 inches. Where the IIICg horizon is present, its color ranges from light gray to gray and it is mottled in places with shades of brown and yellow.

Manatee Series

Profile of Manatee fine sand in a cultivated field 0.9 of a mile south of Florida Highway No. 46 and 0.25 of a mile east of Cameron Avenue:

Ap—0 to 10 inches, black (10YR 2/1) fine sand; weak, fine, granular structure; very friable; neutral; clear, smooth boundary.

A2—10 to 17 inches, light brownish-gray (10YR 6/2) fine sand; a few, medium, faint, vertical streaks of dark brown (10YR 4/3), brown (10YR 5/3), and dark grayish brown (10YR 4/2) along old root channels; weak, very fine, granular structure; very friable; slightly hard when dry; mildly alkaline; gradual, wavy boundary.

A3—17 to 20 inches, brown (10YR 5/3) fine sand that crushes to dark grayish brown (10YR 4/2); common, fine, distinct mottles of yellowish brown (10YR 5/8), pale brown (10YR 6/3), and brownish yellow (10YR 6/6) and a few, fine, red mottles along old root channels; weak, very fine, granular structure; very friable; slightly hard or hard when dry; mildly alkaline; gradual, wavy boundary.

Bg—20 to 28 inches, light brownish-gray (10YR 6/2) fine sandy clay loam; many, medium, distinct mottles of yellowish brown (10YR 5/8) and strong brown (7.5YR 5/8); massive when wet, subangular blocky structure when dry; sticky when wet, and very hard when dry; contains gray (10YR 6/1) and light-gray (10YR 7/1) lenses of fine sand to fine sandy loam; mildly alkaline; gradual, wavy boundary.

Cg—28 to 48 inches +, gray (N 5/0) fine sandy clay loam with common, coarse, distinct mottles of olive yellow (2.5Y 6/6), yellow (5Y 8/6), and yellowish brown (10YR 5/8); massive when wet; slightly sticky when wet, and very hard when dry; dark yellowish-brown (10YR 4/4), reddish-yellow (7.5YR 6/6), and light-gray (10YR 7/1) lenses of fine sand along root channels; mildly alkaline.

The Ap horizon ranges from very dark gray to black in color and from 8 to 14 inches in thickness. The texture of that horizon ranges from fine sand to loamy fine sand. The color of the A2 horizon ranges from light gray to pale brown, and the thickness of that horizon ranges from 7 to 20 inches. The color of the A3 horizon ranges from pale brown to brown, and the thickness of that horizon ranges from 1 to 5 inches. In some places the A2 and A3 horizons are absent, particularly in areas where the texture of the surface layer is loamy fine sand.

The Bg horizon ranges from gray or light brownish gray to grayish brown in color and from 6 to 18 inches in thickness. That horizon ranges from sandy loam to fine sandy clay loam in texture, and it contains lenses of fine sandy clay to fine sand. The lenses of fine sandy clay are associated with the brighter colors, and the coarser textured lenses are associated with the light-gray colors. Mottles in the Bg horizon vary greatly in abundance, size, and contrast. In places streaks of calcareous material are present in the lower part of the Bg horizon.

The Cg horizon ranges from light gray to gray in color and from sandy loam to sandy clay loam in texture. In some places that horizon is coarser textured with increasing depth. The mottles in the Cg horizon vary greatly in abundance, size, and contrast. They range from yellow or yellowish brown to reddish brown or gray in color. Lenses of sandy material occur throughout the Cg horizon, and there are thin streaks of marly material throughout that horizon in some places.

Rutlege Series

Profile of Rutlege fine sand in a grassy pond 0.25 of a mile south of Curryville Road near Legion Hall:

A11—0 to 13 inches, black (10YR 2/1) fine sand; weak, fine, granular structure; friable; abundant very fine to medium roots; very strongly acid; gradual, wavy boundary.

A12—13 to 18 inches, black (10YR 2/1) fine sand with many, medium, faint mottles of dark grayish brown (10YR 4/2), very dark brown (10YR 2/2), very dark gray (10YR 3/1), and grayish brown (10 YR 5/2); weak, fine, granular structure; very friable; few fine roots; very strongly acid; gradual, wavy boundary.

A13—18 to 25 inches, very dark brown (10YR 2/2) fine sand with few, medium, faint mottles of black (10YR 2/1), very dark grayish brown (10YR 3/2), and very dark gray (10YR 3/1); single grained; loose; gradual, wavy boundary.

C1—25 to 40 inches, dark grayish-brown (10YR 4/2) fine sand with few, medium, faint mottles of very dark gray (10YR 3/1) and very dark grayish brown (10YR 3/2); base color of crushed soil is very dark grayish brown (10YR 3/2); single grained; loose; very strongly acid; gradual, wavy boundary.

C2—40 to 52 inches +, light brownish-gray (10YR 6/2) fine sand with few, fine, faint mottles of black (10YR 2/1) and dark grayish brown (10YR 4/2); single grained; loose; very strongly acid.

The A11 horizon ranges from very dark gray to black in color and from 9 to 16 inches in thickness; the A12 horizon ranges from dark grayish brown to black or very dark gray in color and from 4 to 8 inches in thickness; and the A13 horizon ranges from dark brown to very dark brown in color and from 3 to 9 inches in thickness. In places the A12 and A13 horizons are absent, and only the A13 horizon is absent in other places. The total thickness of the A11, A12, and A13 horizons ranges from 12 to 30 inches.

The combined C horizons range from 24 to 60 inches or more in thickness. The color of those horizons ranges from light gray to gray or from light brownish gray to dark grayish brown. In places an incipient pan stained with organic matter is in the upper part of the C horizon. In dry periods this incipient pan resembles an organic pan. During wet periods, however, it retrogrades to a layer of sludgelike material that is stained with organic matter. In places the texture is sandy loam to sandy clay loam between a depth of 30 and 42 inches.

Ground-Water Podzols

The soils of this great soil group formed in imperfectly drained sandy deposits in a humid climate. These soils have a thin organic layer, an organic-mineral layer, and a light-gray or white, leached layer. The leached layer rests on a dark-brown B horizon that is irregularly cemented with iron, organic matter, or both. A detailed description of the Ground-Water Podzols in Seminole County follows.

Immokalee, Leon, Ona, Pomello, St. Johns, and Wabasso Series.—The soils of these series have a small to moderate amount of organic matter in the A1 horizon. All of them except the Ona contain a highly leached A2 horizon. The A2 horizon is underlain by a weakly cemented organic pan, or horizon of illuvial humus, at a depth of 6 to 48 inches. Below the pan is brown to light-gray sand.

Immokalee Series

Profile of Immokalee fine sand in a wooded area 0.75 of a mile west of the Lyman School and 200 yards east of a powerline:

A1—0 to 5 inches, black (10YR 2/1, wet) fine sand, gray (10YR 6/1 to 10YR 5/1) when dry; weak, fine, granular structure; very friable; numerous fine to large roots; very strongly acid; gradual, wavy boundary.

A21—5 to 12 inches, dark-gray (10YR 4/1, moist) fine sand, gray (10YR 6/1) when dry; few, medium, faint mottles of very dark gray (10YR 3/1), black (10YR 2/1), and light brownish gray (10YR 6/2); very dark gray (10YR 3/1) when crushed; weak, fine, granular structure when moist, single grained when dry; loose; numerous fine roots; very strongly acid; clear, irregular boundary.

A22—12 to 42 inches, light-gray (10YR 7/1) fine sand with common, fine, faint mottles of very dark brown (10YR 2/2) along root channels; light brownish gray (10YR 6/2) when crushed; single grained; loose; common fine roots; very strongly acid; clear, smooth boundary.

Bh—42 to 54 inches, black (5YR 2/1) fine sand; weak, fine, granular structure; soft when wet, very weakly cemented when dry; very strongly acid; diffuse, irregular boundary.

C—54 to 60 inches + light-gray (10YR 7/2) fine sand with few, medium, faint, vertical mottles of gray (10YR 6/1); single grained; loose; very strongly acid.

The A1 horizon ranges from gray to black in color and from 3 to 8 inches in thickness; the A21 horizon ranges from dark gray to gray in color and from 2 to 8 inches in thickness; and the A22 horizon ranges from white to gray in color and from 24 to 42 inches in thickness. In places the A21 and A22 horizons have organic stains of varying intensity along root channels.

In some areas there is a B21h horizon between the A22 and Bh horizons. In those areas the B21h horizon ranges from very dark gray to black in color and from 2 to 4 inches in thickness. The color of the Bh horizon ranges from dark brown or dark yellowish brown to very dark brown, dark reddish brown, or black, and the thickness of that horizon ranges from 4 to 12 inches. The color changes gradually from the Bh horizon to the C horizon. In most places the material that underlies the pan stained with organic matter consists of loose fine sand, but more than one organic pan or a continuous dark-colored, sludgelike layer of loose fine sand occurs in some places. The Bh horizon is generally weakly cemented, but the degree of cementation, density, or com-

paction of that horizon varies greatly within short distances. In places a B3 horizon underlies the Bh horizon. Where it occurs, its color ranges from brown to very dark grayish brown. Normally, this B3 horizon is 2 to 7 inches thick, but it is as much as 20 inches thick in some places. The color of the C horizon ranges from very pale brown or grayish brown to light gray.

Leon Series

Profile of Leon fine sand in a wooded area about 1 mile east of Florida Highway No. 13 and about 0.25 of a mile south of the Econlockhatchee River on the Acorn River Ranch:

A1—0 to 4 inches, black (N 2/0) fine sand that has a salt-and-pepper appearance; few, coarse, faint splotches of dark gray (N 4/0); single grained; loose; abundant very fine to large roots; very strongly acid; clear, wavy boundary.

A2—4 to 23 inches, gray (N 5/1) fine sand; common, medium, faint streaks of dark gray (N 4/0) and very dark gray (N 3/0) along old root channels; single grained; loose; many fine or medium roots; very strongly acid; clear, irregular boundary.

B21h—23 to 27 inches, black (10YR 2/1) fine sand; few, medium, faint, vertical tongues of very dark brown (10YR 2/2); massive; slightly hard when dry, firm when moist; abundant saw-palmetto roots; very strongly acid; gradual, wavy boundary.

B22h—27 to 31 inches, very dark brown (10YR 2/2) fine sand; common, medium, faint, vertical tongues of black (10YR 2/1) and dark brown (10YR 3/3); massive; slightly hard when dry, firm when moist; abundant fine or medium roots; very strongly acid; gradual, wavy boundary.

B3—31 to 35 inches, dark yellowish-brown (10YR 3/4) fine sand; common, medium, faint, vertical tongues of dark brown (10YR 4/3) and very dark brown (10YR 2/2); weak, fine, granular structure; friable; common fine or medium roots; very strongly acid; gradual, wavy boundary.

C—35 to 60 inches +, brown (10YR 5/3) fine sand; few, fine, faint streaks of very dark brown (10YR 2/2) and very dark grayish brown (10YR 3/3); single grained; loose; very strongly acid.

The color of the A1 horizon ranges from gray to black, and the thickness of that horizon ranges from 3 to 7 inches. A mixture of very dark gray or black organic matter and of light-gray to white grains of quartz gives this horizon a salt-and-pepper appearance when these soils are dry. The A2 horizon ranges from white to gray in color and from 2 to 20 inches in thickness. In some areas a dark grayish-brown B1 horizon, 2 to 4 inches thick, lies between the A2 and B21h horizons.

The B21h horizon ranges from dark brown or dark yellowish brown to very dark brown, dark reddish brown, or black in color and from 4 to 6 inches in thickness. The color of the B22h horizon ranges from very dark brown to dark reddish brown, and the thickness of that horizon ranges from 2 to 7 inches. The pan stained with organic matter in the B21h and B22h horizons is generally weakly cemented, but the degree of cementation, density, or compaction of these horizons varies greatly within short distances. In places the B21h and B22h horizons consist of material that is strongly stained with organic matter, especially where these soils grade to other soils or where these soils have been artificially drained for many years. The B3 horizon ranges from weakly cemented to loose, and its thickness ranges from 2 to 6 inches. The color of the B3 horizon ranges from brown to dark yellowish brown or dark grayish brown. In places these soils contain two or three pans stained with organic matter.

The C horizon ranges from brown or very pale brown to yellowish brown or brown in color. Where these soils occur in the Celery Delta, their reaction ranges from slightly acid to neutral.

Ona Series

Profile of Ona fine sand in a pasture about 3 miles east of Chuluota and about 1 mile south of the Brumley Road:

Ap—0 to 6 inches, black (10YR 2/1) fine sand; weak, fine, granular structure; friable; abundant fine roots; strongly acid; abrupt, smooth boundary.

B21h—6 to 13 inches, dark reddish-brown (5YR 2/2) fine sand; moderate, fine, granular structure; friable; many fine roots; strongly acid; gradual, wavy boundary.

B22h—13 to 18 inches, dark reddish-brown (5YR 3/2) fine sand; single grained; loose; many fine roots; strongly acid; gradual, wavy boundary.

C—18 to 44 inches +, light yellowish-brown (10YR 6/4) fine sand with few, fine, faint mottles of very dark grayish brown (10YR 3/2); single grained; loose; few fine roots; strongly acid.

The color of the Ap horizon ranges from very dark gray to black, and the thickness of that horizon ranges from 4 to 8 inches. The color of the B21h and B22h horizons ranges from very dark grayish brown or dark brown to reddish brown or dark reddish brown, and the thickness of those horizons ranges from 6 to 14 inches. In places the B22h horizon is absent and a B3 horizon is present. Where the B3 horizon is present, it ranges from dark brown to brown or dark grayish brown in color and from 3 to 6 inches in thickness. The Bh horizons are better defined in some areas than in others. The color of the C horizon ranges from light yellowish brown, pale brown, or yellowish brown to light gray; the color generally becomes lighter with increasing depth.

Pomello Series

Profile of Pomello fine sand in a wooded area 0.25 of a mile east of the Econlockhatchee River and about 1.25 miles south of Florida Highway No. 419 on the Lockwood Road:

A1—0 to 4 inches, gray (N 6/0) fine sand; single grained; loose; abundant fine or medium roots; very strongly acid; clear, smooth boundary.

A2—4 to 41 inches, white (N 8/0) fine sand; contains common, medium, faint streaks of very dark grayish brown (10YR 3/2) and very dark brown (10YR 2/2) along root channels; single grained; loose; common fine or medium roots; very strongly acid; clear, wavy boundary.

B2h—41 to 47 inches, very dark brown (10YR 2/2) fine sand; moderate, medium, granular structure; hard when dry, very firm when moist; common fine to large roots and occasional large decomposed roots that are dark reddish brown (2.5YR 3/4); very strongly acid; gradual, wavy boundary.

B3—47 to 53 inches, dark-brown (10YR 4/3 to 3/3) fine sand; very dark brown (10YR 2/2) along root channels; weak, fine, granular structure; friable; common fine or medium roots; very strongly acid; gradual, wavy boundary.

C—53 to 72 inches +, brown (10YR 5/3) fine sand; single grained; weakly cemented when dry and loose when moist; very strongly acid.

The color of the A1 horizon ranges from light gray to dark gray, and the thickness of that horizon ranges

from 1 to 7 inches. The color of the A2 horizon ranges from white to light gray, and the thickness of that horizon ranges from 30 to 48 inches.

The B2h horizon ranges from 4 to 12 inches in thickness. In some places that horizon is stained with organic matter but is not cemented. In other places it is weakly cemented. The color of the B2h horizon ranges from dark grayish brown or dark reddish brown to very dark brown or black. In places the B3 horizon is absent. Where it is present, it ranges from brown to dark brown in color and from 4 to 15 inches in thickness. In places that horizon is single grained, but the structure is weak granular in other places. The consistence in the B3 horizon ranges from loose to friable. The color of the C horizon ranges from light gray to yellowish brown or brown. In places that horizon is underlain by sandy clay at a depth of more than 42 inches.

St. Johns Series

Profile of St. Johns fine sand in a wooded area 0.25 of a mile east of the intersection of Florida Avenue and Florida Highway No. 426 and south of Florida Highway No. 426:

A11—0 to 9 inches, black (10YR 2/1) fine sand; weak, fine, granular structure; friable; numerous fine or medium roots; very strongly acid; clear, wavy boundary.

A12—9 to 12 inches, dark-gray (10YR 4/1) fine sand with common, coarse, faint, black (10YR 2/1) mottles; very weak, very fine, granular structure; loose; many medium or fine roots; very strongly acid; gradual, wavy boundary.

A2—12 to 27 inches, light-gray (10YR 7/1) fine sand with common, coarse, faint mottles of very dark gray (10YR 3/1) and dark gray (10YR 4/1) along root channels; single grained; loose; few fine and medium roots; very strongly acid; clear, smooth boundary.

B21h—27 to 35 inches, black (10YR 2/1) fine sand with few, coarse, faint, vertical mottles of very dark brown (10YR 2/2) and very dark gray (10YR 3/1); weak, fine, granular structure; friable; slightly hard when dry; few fine roots; very strongly acid; gradual, wavy boundary.

B22h—35 to 40 inches, very dark brown (10YR 2/2) fine sand with many, coarse, faint mottles of very dark grayish brown (10YR 3/2); very weak, very fine, granular structure; loose; few fine roots; very strongly acid; gradual, wavy boundary.

B3—40 to 44 inches, dark-brown (10YR 3/3) fine sand with few, medium, faint, vertical mottles of very dark grayish brown (10YR 3/2), very dark brown (10YR 2/2), and light brownish gray (10YR 6/2); very weak, very fine, granular structure; loose; very strongly acid; gradual, wavy boundary.

C—44 to 50 inches +, grayish-brown (10YR 5/2) fine sand with few, medium, faint, vertical mottles of gray or light gray (10YR 6/1); single grained; loose; very strongly acid.

The A11 horizon ranges from dark gray to black in color and from 8 to 14 inches in thickness; the A12 horizon ranges from dark gray to very dark gray in color and from 2 to 5 inches in thickness; and the A2 horizon ranges from light gray to gray in color and from 2 to 18 inches in thickness. In some areas there is a B1 horizon between the A2 horizon and B21h horizon. In these areas the color of the B1 horizon ranges from dark gray to very dark gray and the thickness ranges from 1 to 2 inches.

The B21h horizon ranges from dark brown to black or dark reddish brown in color and from 4 to 10 inches in thickness. The B22h horizon ranges from dark brown to dark reddish brown in color and from 2 to 8 inches in thickness. Generally the B21h and B22h horizons are weakly cemented, but the degree of cementation, density, or compaction varies within short distances. In places, especially where these soils grade to other soils or where they have been artificially drained for many years, a Bh horizon of dark-brown material stained with organic matter is present. The B3 horizon ranges from 2 to 6 inches in thickness. The color of that horizon ranges from brown or dark brown to very dark grayish brown, the structure ranges from very weak granular to single grained, and the consistence ranges from very friable to loose.

The color of the C horizon ranges from very pale brown or brown to grayish brown, but normally that horizon is grayish brown. In some areas as many as two or three pans stained with organic matter underlie the C horizon. Where these soils are in the Celery Delta or where they are irrigated with artesian water, the reaction ranges from pH 6.0 near the surface to pH 7.5 in the lower part of the profile.

Wabasso Series

Profile of Wabasso fine sand in a wooded area about 0.5 of a mile south of Pine Way and about 0.5 of a mile east of Sanford Avenue (Florida Highway No. 425):

A1—0 to 7 inches, very dark gray (10YR 3/1) fine sand that crushes to black (10YR 2/1); weak, very fine, granular structure; very friable; numerous small or medium roots; strongly acid; clear, wavy boundary.

A2—7 to 20 inches, gray (10YR 5/1) fine sand with common, medium, faint mottles of dark gray (10YR 4/1) to light gray (10YR 6/1); single grained; loose; many small or medium roots; strongly acid; clear, smooth boundary.

B21h—20 to 26 inches, very dark brown (10YR 2/2) fine sand; moderate, fine, granular structure; friable; few medium roots; strongly acid; clear, wavy boundary.

B22h—26 to 30 inches, very dark grayish-brown (10YR 3/2) fine sand with few, fine, distinct mottles of yellowish red (5YR 4/8), dark brown (7.5YR 4/4), and very dark gray (10YR 3/1); weak, fine, granular structure; friable; few medium roots; neutral; gradual, wavy boundary.

C1—30 to 33 inches, brown (10YR 5/3) fine sand with few, medium, faint mottles of very dark grayish brown (10YR 3/2); very weak, fine, granular structure; very friable; few medium roots; mildly alkaline; gradual, wavy boundary.

IIC2—33 to 48 inches, mottled brownish-yellow (10YR 6/8) fine sandy clay loam with many, medium and coarse, distinct, vertical mottles of gray (N 6/0), strong brown (7.5YR 5/6), and yellow (10YR 7/6); contains gray (N 6/0) lenses of fine sand; moderate, medium, angular blocky structure; slightly sticky; many fine or medium roots; has lime concretions in lower part; mildly alkaline; gradual, wavy boundary.

IIC3—48 to 65 inches +, light-gray to gray (5Y 6/1) fine sandy clay loam with many, coarse, distinct mottles of light gray (10YR 7/1), yellowish red (5YR 5/6), and yellow (10YR 7/6); massive; slightly sticky; contains lenses of fine sand and fine sandy loam; many fine concretions; few fine roots; strongly alkaline.

The A1 horizon ranges from very dark gray to black in color and from 5 to 8 inches in thickness. The color of the A2 horizon ranges from light gray to gray, and the thickness of that horizon ranges from 4 to 14 inches.

In places these soils have a B1 horizon that ranges from very dark gray to black in color and from 2 to 4 inches in thickness. The B21h horizon ranges from very dark brown, dark reddish brown, or dark yellowish brown to black in color and from 4 to 7 inches in thickness. The B21h horizon grades to a B22h horizon that ranges from brown or dark yellowish brown to very dark grayish brown in color and from 2 to 6 inches in thickness. In places the B22h horizon is absent.

The color of the C1 horizon ranges from brown to very pale brown, and the thickness of that horizon ranges from 2 to 10 inches. The texture of the IIC2 and IIC3 horizons ranges from sandy loam to sandy clay loam. The IIC2 and IIC3 horizons vary greatly in base color and in degree of mottling. In places they have streaks of marl or lime concretions throughout. In other places the IIC3 horizon is coarser textured than the IIC2 horizon.

Bog soils

This group of soils consists of deposits of brown, dark-brown, or black peat or muck. These deposits are partly decayed remains of plants that have been preserved in areas saturated with water. The soils of this group formed under swamp or marsh vegetation, mostly in a humid or subhumid climate. A detailed description of the Bog soils in Seminole County follows.

BRIGHTON, ISTOKPOGA, OKEECHOBEE, AND TERRA CEIA SERIES.—These are the organic soils of this county. They are nearly level and are in broad areas that are covered by water most of the year. These soils formed in the remains of plants that are mixed in some places with a small amount of sandy material. The organic material ranges from 12 to 60 inches or more in thickness. In the Brighton and Istokpoga soils, the peat is woody and fibrous and the plant remains are only slightly decomposed. In contrast, in the Terra Ceia and Okeechobee mucks, the plant remains are highly decomposed. The plant remains in the surface layer of these organic soils are more decomposed than those below the surface layer.

Profile of Brighton peat in a grassy area where there are a few scattered trees, at the east end of Triplet Lake:

1—0 to 4 inches, black (10YR 2/1), partly decomposed felty peat; massive; very friable; abundant fine to large roots; very strongly acid; clear, smooth boundary.
2—4 to 40 inches, dark reddish-brown (5YR 3/2) peat; few, coarse, distinct, black (10YR 2/1) streaks; fibrous; massive; soft; many fine roots; very strongly acid; abrupt, smooth boundary.
II3—40 to 54 inches +, very dark grayish-brown (10YR 3/3) mixed sand; single grained; loose; very strongly acid.

In cultivated areas the peat in the first horizon is more decomposed than that in areas that have not been cultivated. It is somewhat mucky and ranges from 6 to 10 inches in thickness. Also in cultivated areas the pH value is as high as 6.0 or 7.0 because lime has been added and water that is alkaline in reaction has been used for irrigation. In some areas in the south-central part of the county, the first and second horizons contain a large amount of diatom remains.

Istokpoga Series

Profile of Istokpoga peat in a cultivated area about 2 miles south of Oviedo and about 0.5 of a mile west of Florida Highway No. 520 on a grade near a powerline:

1—0 to 8 inches, very dark brown (10YR 2/2) peat that contains woody remains of bay trees, myrtle, ferns, and other organic material; extremely acid; clear, wavy boundary.
2—8 to 84 inches +, dark reddish-brown (5YR 2/2) woody peat that contains various kinds of organic material; extremely acid.

In cultivated areas the surface layer is darker and is more of a mucky peat than in areas that have not been cultivated. Also in cultivated areas the reaction is as high as pH 6.0 or pH 7.0. The high pH value is caused by the addition of lime and the use of irrigation water that is alkaline in reaction. Below a depth of 6 inches, the content of undecomposed woody material increases with increasing depth.

Okeechobee Series

Profile of Okeechobee muck in a cultivated area about 0.25 of a mile south of the intersection of Florida Avenue and Florida Highway No. 426:

1—0 to 12 inches, black (10YR 2/1) muck; weak, fine, granular structure; friable; slightly acid; gradual, wavy boundary.
2—12 to 30 inches, black (10YR 2/1) muck; breaks along pressure surfaces to subangular blocky structure; friable; few, fine, dark yellowish-brown (10YR 4/4) peaty remains of plants; neutral; clear, smooth boundary.
3—30 to 60 inches +, very dark grayish-brown (10YR 3/2) peat with a few, medium, faint mottles of black (10YR 2/1); massive; nonsticky; mildly alkaline.

The first horizon ranges from 8 to 14 inches in thickness. The second horizon ranges from dark brown to black in color and from 10 to 20 inches in thickness. It is less distinct in areas that have not been cultivated than in areas that have been cultivated. The color of the third horizon ranges from brown to very dark grayish brown.

Terra Ceia Series

Profile of Terra Ceia muck in a cultivated area about 1.75 miles east of the curve in Florida Highway No. 419 just north of Oviedo and about 0.5 of a mile south of Howard Avenue:

1—0 to 10 inches, black (10YR 2/1) muck; breaks along pressure surfaces to weak, medium, subangular blocky structure; friable; numerous fine roots; slightly acid; clear, wavy boundary.
2—10 to 42 inches, very dark brown (10YR 2/2) muck; breaks along pressure surfaces to moderate, coarse, subangular blocky structure; friable; contains many clumps of undecomposed woody plants; many fine roots; neutral; clear, wavy boundary.
3—42 to 52 inches, very dark brown (10YR 2/2) felty peat; massive; slightly sticky; few fine roots; neutral; abrupt, wavy boundary.
II4—52 to 68 inches +, light brownish-gray (10YR 6/2) sandy clay loam; many, coarse, faint mottles of very dark gray (10YR 3/1) and many, fine, faint mottles of brown (10YR 5/3), light gray (10YR 7/2), and yellowish red (5YR 4/8); dark reddish-brown (5YR 3/2) vertical channels filled with plant residue; contains lenses of sand and sandy loam; weak, medium, subangular blocky structure that fractures along sandy lenses; slightly sticky; few fine roots; neutral.

The thickness of the first horizon ranges from 8 to 12 inches. In areas that have not been cultivated, this horizon ranges from dark brown to very dark brown in color. The second horizon ranges from 20 to 40 inches in thickness and from dark brown to very dark brown

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in color. In places that horizon is less woody than the one in the profile described. The color of the third horizon ranges from dark brown to very dark brown or black, and the thickness of that horizon ranges from 2 to 12 inches. In places the third horizon is absent. The fourth horizon ranges from sandy loam to sandy clay in texture, and it varies greatly in degree and intensity of mottling. In places the fourth horizon has a sandy texture and the color is gray to very dark brown.

Regosols

This is a group made up of soils that lack definite genetic horizons. These soils developed in deep, unconsolidated deposits or in soft, rocky deposits. A detailed description of the Regosols in this county follows.

BLANTON, LAKELAND, LAKEWOOD, ORLANDO, AND ST. LUCIE SERIES.—Soils of the Blanton, Lakeland, Orlando, and St. Lucie series are representative of the Regosol great soil groups. The Lakewood soils are also in this group, but they have some characteristics of soils of the Podzol great soil group.

The soils of the Regosol group formed in marine sands and loamy sands consisting mainly of particles of quartz. They have a weakly developed profile; all of them, except the Lakewood, lack a B horizon. In most places the texture is fine sand throughout the profile. The soil material below the surface layer is light gray to light brownish gray in the Blanton and Orlando soils, yellowish in the Lakeland soils, and light gray to white in the St. Lucie soils. The Lakewood soils have a light-gray to dark-gray A1 horizon, a light-gray to white A2 horizon, a brownish-yellow B horizon, and a light yellowish-brown C horizon.

Blanton Series

Profile of Blanton fine sand, 0 to 5 percent slopes, in a wooded area about 2 miles south of traffic light in Oviedo on Florida Highway No. 520 and about 100 yards west and just south of grade:

A—0 to 6 inches, dark-gray (10YR 4/1) fine sand; common, medium, faint splotches of yellowish brown (10YR 5/4) and light brownish gray (10YR 6/2); weak, fine, granular structure; very friable; many fine or medium roots; strongly acid; clear, wavy boundary.

C1—6 to 25 inches, light brownish-gray (10YR 6/2) fine sand; many, coarse, faint splotches of gray (10YR 6/1) and few, fine, faint splotches of brownish yellow (10YR 6/6); single grained; loose; abundant, very fine or medium, black (N 2/0) carbon particles 1 to 5 millimeters in diameter; numerous fine to large roots; medium acid; diffuse, wavy boundary.

C2—25 to 64 inches +, very pale brown (10YR 8/4) fine sand; common, coarse, faint splotches of white (10YR 8/2), yellow (10YR 8/6), and light gray (10YR 7/2); single grained; loose; numerous, very fine to medium, black (N 2/0) carbon particles 1 to 5 millimeters in diameter; few fine or medium roots; strongly acid.

The color of the A horizon ranges from light gray or dark gray to grayish brown, and the thickness of that horizon ranges from 2 to 8 inches. In places the splotches in the A horizon are absent.

The color of the C1 horizon ranges from light gray or light brownish gray to pale brown or grayish brown. The degree of splotching varies; the color is white or gray to light yellowish brown in places. In other places it is very pale brown, light gray, or brownish yellow. The black particles of carbon in this horizon are lacking in some places. The C1 horizon ranges from 18 to 36 inches in thickness. The C2 horizon generally ranges from very pale brown to pale brown in color, but the color is light gray to white in some places. The light-gray to white color generally occurs in the higher dune-like areas. In some places a layer of fine sandy loam to fine sandy clay loam is at a depth between 42 inches and 72 inches or more.

Lakeland Series

Profile of Lakeland fine sand, 0 to 5 percent slopes, in a wooded area about 2 miles west of Longwood, just south of the turn of the Longwood-Lake Markham Road:

A1—0 to 4 inches, dark-gray (10YR 4/1) fine sand that crushes to very dark gray (10YR 3/1); weak, fine, granular structure; loose; abundant fine roots; very strongly acid; clear, wavy boundary.

AC—4 to 6 inches, grayish-brown (10YR 5/2) fine sand that crushes to dark grayish brown (10YR 4/2); more yellowish with increasing depth; single grained; loose; abundant fine roots; very strongly acid; clear, wavy boundary.

C1—6 to 40 inches, yellow (10YR 7/6) fine sand that crushes to light yellowish brown (10YR 6/4); single grained; loose; few fine roots; few carbon particles; very strongly acid; diffuse, irregular boundary.

C2—40 to 54 inches +, yellow (10YR 7/6) fine sand that crushes to light yellowish brown (10YR 6/4); contains a few, fine, faint mottles of brownish yellow (10YR 6/8) and very pale brown (10YR 7/3); single grained; loose; few carbon particles; very strongly acid.

In general the color of the A1 horizon ranges from dark gray to grayish brown, but it is gray or black in a few places. The thickness of the A1 horizon ranges from 2 to 7 inches. The texture is generally fine sand, but it is medium sand or sand in some small areas.

The AC horizon is absent in some places, but where it is present, it ranges from 2 to 5 inches in thickness. The color of the C1 and C2 horizons ranges from light yellowish brown or yellowish brown to yellow.

Lakewood Series

Profile of Lakewood fine sand that has slopes of 0 to 5 percent; in a wooded area about 1 mile northwest of the intersection at Geneva, just north of Florida Highway No. 46:

A1—0 to 3 inches, dark-gray (N 4/0, dry) fine sand; single grained; loose; the mixture of organic matter and white sand grains gives a salt-and-pepper appearance when the soil is dry; many fine or medium roots; many small particles of carbon; very strongly acid; clear, smooth boundary.

A2—3 to 25 inches, light-gray to gray (10YR 6/1, dry) fine sand; single grained; loose; many fine or medium roots in the upper part of horizon; many particles of carbon; very strongly acid; diffuse, wavy boundary.

B—25 to 47 inches, brownish-yellow (10YR 6/6) fine sand, yellow (10YR 7/6) when dry; single grained; loose; contains vertical streaks of very dark grayish-brown (10YR 3/2), weakly cemented fine sand about 12 inches long, 3 inches wide, and 10 inches apart (in a 27-inch pit); grades to soil material in lower part of horizon that has strong-brown (7.5YR 5/8) mottles or contains weakly cemented nodules; streaks appear to be old root channels and have light-gray (10YR 7/2) material in the center; also contains animal burrows, 2 inches in diameter, filled with light-gray (10YR 6/1) material that grades to very dark grayish brown (10YR 3/2) at the lower bound-

ary of the burrow; discontinuous ¼-inch bands of very dark grayish brown (10YR 3/2) on surface of horizon; very strongly acid; diffuse, wavy boundary.

C—47 to 70 inches +, light yellowish-brown (10YR 6/4) fine sand, very pale brown (10YR 7/4) when dry; single grained; loose; very strongly acid.

The A1 horizon ranges from light gray to dark gray in color and from 1 to 6 inches in thickness. In areas where these soils have been planted to citrus trees, the A1 horizon is slightly thicker and darker than that in the profile described. The thickness of the A2 horizon ranges from 6 to 24 inches.

In some places the B horizon is almost free of vertical streaks. The color of the B horizon ranges from yellow to reddish yellow or brownish yellow. The vertical streaks range from 6 to 20 inches in length, from 2 to 5 inches in width, and from 8 to 18 inches in distance apart. The color of the C horizon ranges from yellow to very pale brown or light yellowish brown.

Orlando Series

Profile of Orlando fine sand, 0 to 5 percent slopes, in a citrus grove about 0.25 of a mile east of the New Tribes Mission and about 1 mile west of Oviedo:

Ap1—0 to 11 inches, very dark gray (10YR 3/1) fine sand; weak, fine, granular structure; friable; many fine to large roots; medium acid; clear, wavy boundary.

A12—11 to 34 inches, dark grayish-brown (10YR 4/2) fine sand that crushes to very dark grayish brown (10YR 3/2); contains common, coarse, faint, vertical tongues of very dark grayish brown (10YR 3/2) and dark gray (10YR 4/1); weak, fine, granular structure; very friable; many fine roots and occasional medium roots; many carbon particles; strongly acid; gradual, irregular boundary.

C1—34 to 42 inches, pale-brown (10YR 6/3) fine sand; contains common, coarse, faint, vertical mottles of dark gray (10YR 4/1) and occasional streaks of black carbon; weak, fine, granular structure; very friable; many fine or medium roots; medium acid; gradual, irregular boundary.

C2—42 to 54 inches, light yellowish-brown (10YR 6/4) fine sand; contains a few, fine, distinct mottles of yellowish brown (10YR 5/8), light gray (10YR 7/2), and red (2.5YR 4/8); strongly acid; weak, fine, granular structure; very friable; clear, smooth boundary.

IIC3—54 to 70 inches +, reddish-brown (5YR 4/3) fine sand; weak, fine, granular structure; very friable; strongly acid.

The color of the Ap1 horizon ranges from very dark grayish brown or very dark brown to dark gray or black, and the thickness of that horizon ranges from 8 to 14 inches. The color of the A12 horizon ranges from dark grayish brown or very dark grayish brown to dark gray or very dark gray, and the thickness of that horizon ranges from 4 to 24 inches. In places an A13 or AC horizon is present.

The C1 horizon ranges from pale brown to light yellowish brown in color. The mottling in that horizon varies in degree and intensity, and the color ranges from yellow or brown to gray. The C1 horizon ranges from 6 to 10 inches in thickness. The color of the C2 horizon ranges from very pale brown to light brownish gray or light yellowish brown, and the thickness of that horizon ranges from 10 to 30 inches. The number of mottles in the C2 horizon varies, and the color of the mottles ranges from yellow or brown to gray. In places the C2 horizon is almost free of mottles. The color of the IIC3 horizon ranges from light reddish brown to dark reddish brown, the thickness ranges from 10 to 20 inches, and the consistence from very friable to strongly cemented. In places the IIC3 horizon is absent or consists of a thin and discontinuous layer.

St. Lucie Series

Profile of St. Lucie fine sand, 0 to 5 percent slopes, in a wooded area about 0.75 of a mile east of the intersection of Mitchell Hammock Road and Florida Highway No. 520, south of Oviedo:

A—0 to 3 inches, light-gray (10YR 7/1) fine sand that crushes to gray (10YR 5/1); few coarse splotches of gray (10YR 5/1) and white (10YR 8/1); single grained; loose; many fine to large roots; very strongly acid; clear, wavy boundary.

C—3 to 52 inches +, white (N 8/0) fine sand; single grained; loose; few fine or medium roots; very strongly acid.

The A horizon ranges from light gray to gray in color and from 1 to 5 inches in thickness. A horizon of yellow to yellowish-brown fine sand is at a depth of more than 30 inches in some places.

General Nature of the Area

In this section the geology, ground water, and climate of Seminole County are described. Also discussed are significant facts about the agriculture.

The area that is now Seminole County was settled in 1836. The first permanent settlement, Camp Monroe, later called Fort Mellon, was established to protect the early settlers from the Indians. It became a busy trading center.

Gen. Henry S. Sanford settled in the area in 1870 and bought a large tract of land south of Lake Monroe. He laid out the town of Sanford, and that town became the county seat. The population of the county increased rapidly. It was 54,947 in 1960.

Geology [7]

The major geologic formations in Seminole County are the Hawthorn, Caloosahatchee, and Citronelle (fig. 12). Recently deposited sandy and clayey marine terraces cover these formations, except for a few small areas where erosion has exposed the older material.

An overlapping, or transgressive, sea flooded and eroded the land and deposited the water-worked sediments identified in these geologic formations. Four distinct kinds of deposits are important in this county, although the soils formed wholly or in part in the most recent, overlying, sandy material.

The Hawthorn formation is the oldest in the county and is of Miocene age. It consists of sand, silt, clay, marl, and limestone, and of marine, deltaic, and alluvial phosphatic material. This formation covers most of the county and is capped by more recent material in most places; it is exposed only in a few places in the southwestern corner of the county. Relief in areas underlain by the Hawthorn formation varies as much as 75 feet in places.

[7] L. O. Rowland, geologist, and David P. Powell, soil specialist for interpretations, Soil Conservation Service, assisted in the preparation of this section.

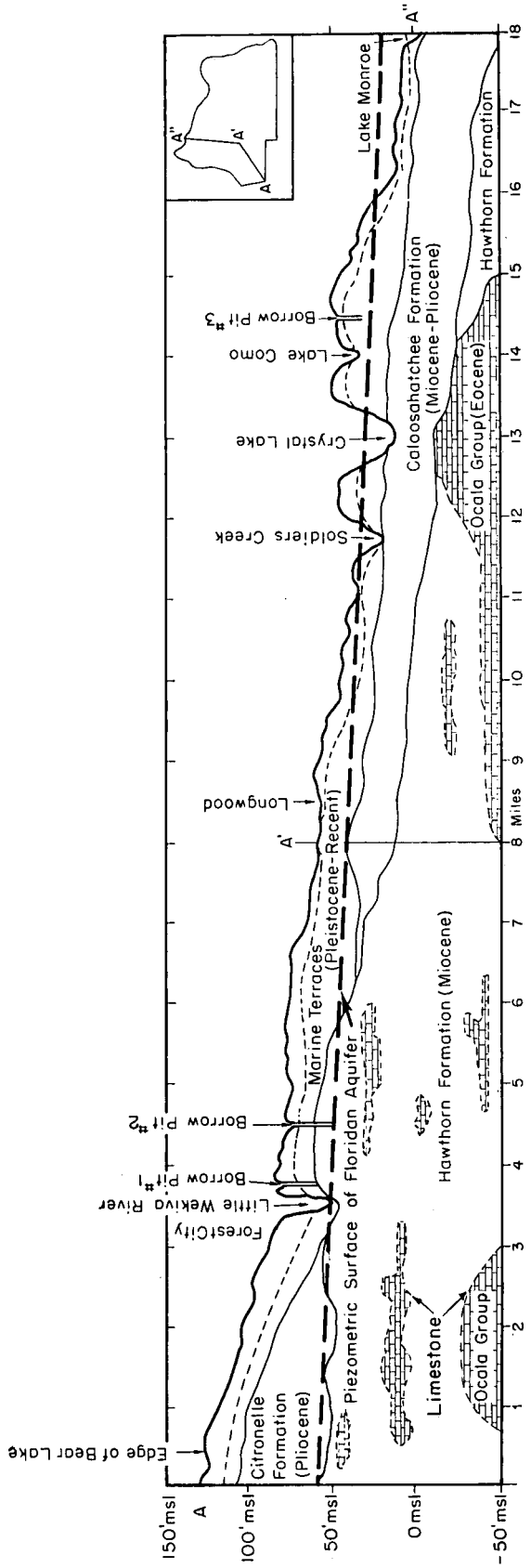

Figure 12.—Cross section of the main geologic formations of Seminole County.

Small areas of phosphatic material from this formation are exposed along the sides and bottoms of steep valleys where erosion has removed the sandy surface layer. Alluvial outwash from these areas may also be phosphatic. Soil tests indicate 0.01 percent phosphate at a depth of 24 inches in these areas and 0.14 percent at a depth of 40 inches. Soils influenced by phosphatic material in this county are not extensive enough to be recognized in this soil survey.

The Caloosahatchee formation is of Miocene-Pliocene age. It underlies approximately 57 percent of the county, mainly the north-central, east-central, and southern parts. The Caloosahatchee formation overlies the Hawthorn formation, but it is covered so deeply by the sandy deposits of the marine terraces that it generally is exposed only along streambanks and lakes.

The Caloosahatchee formation consists of sand, shells, and some clay and marl. Neutral or alkaline soils, such as the Manatee, Delray, and Pompano, formed mainly in material derived from this formation and partly in material derived from the Hawthorn formation. These soils are also mapped outside the general area where these formations occur because calcareous material from these formations has been moved to other areas by erosion. Enough of the material has been deposited over the surrounding sandy areas that the soils contain a significant amount of calcium; the content of calcium influences soil classification.

The Citronelle formation overlies the Hawthorn formation and is of Pliocene age. It consists of yellow to yellowish-brown sand, clay, and water-worked quartz gravel. The Citronelle formation underlies about 2 percent of the county. The areas are in the extreme southwestern part of the county; elevations of more than 130 feet above sea level are common in the areas. The Citronelle formation is fairly near the surface and is exposed in roadcuts and pits in some places. It underlies many areas of deep, sandy Blanton and Lakeland soils of the uplands.

Sandy deposits in marine terraces of Pleistocene or Recent age cover about 38 percent of the county. In the areas where they occur, these deposits overlie and surround the geologic formations. In areas where sandy deposits overlie the Caloosahatchee formation, the elevation is lower, generally below 75 feet, than in other areas.

The deposits of marine sediments are fairly thick in areas around Lake Jessup and in an extensive belt along the St. Johns, Wekiva, and Econlockhatchee Rivers. Almost all of the flowing wells of the county are in this area because the piezometric surface of the Floridan aquifer is at or near the surface.

Sandy marine terraces deposited recently are a product of erosion of the surrounding older formations, and they vary widely from place to place. These deposits consist mainly of sand, but they also contain some clay, shell, and other alkaline material. In some areas these deposits have been contaminated by alkaline material from the underlying Caloosahatchee formation.

Most of the soils of this county formed in these acid, sandy marine terrace deposits, and they, in turn, are acid and sandy. The formation of some of the soils, however, was influenced by alkaline and phosphatic material washed from the Caloosahatchee and Hawthorn formations. Also, the substratum of some of the soils consist of material derived from the Caloosahatchee and Hawthorn formations.

Ground Water [8]

Ground water is the subsurface water in the zone of saturation, the zone in which all pore spaces are filled with water under pressure greater than atmospheric pressure. Ground water is derived almost entirely from precipitation.

Ground water oucurs under either nonartesian or artesian conditions. Where it is not confined, its upper surface, the water table, is free to rise and fall and is said to be under nonartesian or water table conditions. Where the water is confined in a permeable bed that underlies a bed of less permeable material, so that the upper surface is not free to rise and fall, it is said to be under artesian conditions. Figure 13 shows the typical location of artesian and nonartesian ground water in the county.

In about 70 percent of the acreage in this county, the soils are affected by nonartesian ground water. This water saturates the soils because impervious material does not permit free drainage to a deeper level. Depth to the water table, or depth to saturated soil material, fluctuates gently according to the amount of seasonal rainfall. Nonartesian water has greatly influenced the development of soils.

Geologic stratification, which is common in Florida, accounts for the presence of a high water table in much of the county. The uppermost layer in most of the soils is porous, rapidly permeable, and sandy, and it ranges from 1 foot to more than 20 feet in thickness. The second layer consists of slowly permeable or impervious sandy clay or clay that is several feet thick. Free water accumulates in the soils or on the soils in depressions or lakes wherever it becomes trapped by the slowly permeable or impervious clayey material. Ground water, or a perched water table, occurs at any elevation in areas where depressions and broad flats are underlain by impervious material. This makes it difficult or impossible for absorbed rainwater to drain away. Thus it is possible for wet soils to be at a higher elevation than soils that have good drainage.

Free water in the soils under natural conditions affects soil characteristics and use, and therefore, it is important in classifying and mapping soils. Continued presence of a high water table results in unmistakable changes in color and in changes in other characteristics, which provide almost permanent clues to the water regime. These changes are so distinctive and stable that they are used along with other criteria to classify different kinds of soils.

The soils in this county that are influenced by ground water range from slightly wet or moderately well drained to very wet or very poorly drained. For example, Blanton soils are only slightly wet and Delray, Rutlege, and Brighton soils are very wet. The normal depth to the water table ranges from 3 to 6 feet in the better drained soils, but water may be at the surface in the wettest soils.

[8] BARRACLOUGH, JACK T. GROUND WATER RESOURCES OF SEMINOLE COUNTY, FLORIDA. Rpt. of Invest. No. 27, U.S. Geol. Survey, 91 pp., illus. 1962.

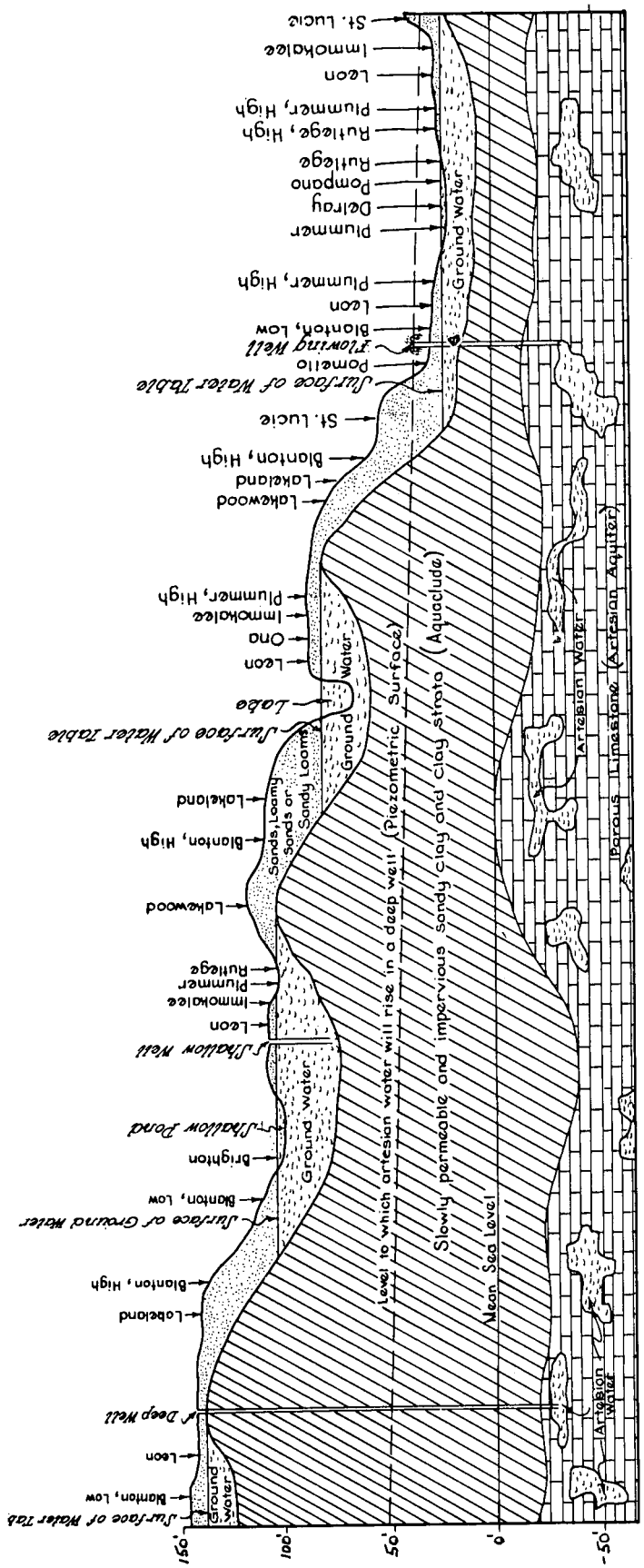

Figure 13.—Cross section of Seminole County showing the relationship between the geologic strata and artesian and nonartesian water, and the relative position of some of the sandy soils to the ground water table.

The most poorly drained soils are generally flooded for a long period during the rainy season.

One of the main sources of water in this county is the Floridan aquifer. This consists of a thick layer of cavernous limestone that underlies the entire county. In most places this so-called Ocala limestone is as much as 150 feet below the surface and is overburdened by material from the different geologic formations that are important in soil formation.

Except for a few areas, such as the springs along the Wekiva and St. Johns Rivers and the bottom of Lake Jessup and Crystal Lake, the overlying layers of relatively impermeable sand, clay, and marl effectively cap or seal off the deep water-bearing limestone. They serve as an aquaclude, 5 to 75 feet thick, through which water cannot easily move downward by gravity or upward under pressure. Ground water is perched above this impervious stratum in many places and it saturates all, or at least the lower lawers, of many soils. Below this impervious stratum, great quantities of water fill the caverns and smaller pores in the limestone. This water is under pressure from recharge areas that are at a higher elevation and perhaps at a great distance. The pressure causes the water to rise in a well to the level determined by the amount of pressure; this is the piezometric surface. In much of the county the ground level is below the piezometric surface, and water flows freely from wells drilled into the artesian aquifer.

In much of the county, the ground level is below the piezometric surface, and therefore water flows freely from wells drilled into the artesian aquifer. This is a ready source of water for many uses. It has little influence, however, on soils and their classification. At the higher elevations common in the southwestern part of the county, the piezometric surface is below the ground level and water from the aquifer must be pumped from deep wells.

Water from some artesian wells has a high content of chloride. The chloride may come either from sea water that entered the porous rock and was sealed off or from sea water that was trapped in old buried lakes. The content of chloride ranges from 5 parts per million (p.p.m.) in the hilly areas in the southwestern part of the county to approximately 8,000 p.p.m. in the areas near Mullet and Harney Lakes in the northeastern and eastern parts of the county. This wide range in content of the chloride shows that water from deep aquifer is excellent for general use in some parts of the county but is unsuitable for almost any use in other parts.

Irrigating with water that is high in content of salts makes the soils toxic if the water is applied over a long period of time. For example, yields of snap beans on soils that normally produce good yields rapidly decline where the content of chloride reaches 250 parts per million (p.p.m.). A similar decrease in yields of tomatoes occurs where the content of chloride reaches 600 p.p.m. In contrast, Pensacola bahiagrass, St. Lucie bermudagrass, and similar grasses tolerate at least 1,500 p.p.m. of chloride. Different crops have different levels of sensitivity, however; therefore, careful planning is required in the use of artesian water for irrigation.

At the present time, the depth of artesian wells in the county ranges from 33 to 1,122 feet, but the depth of most of the wells is between 75 and 250 feet. The depth and location of wells used to supply irrigation water are most important in the major truck-farming areas around Sanford and Oviedo because the content of chloride in those areas ranges from about 10 p.p.m. to more than 1,500 p.p.m.

Climate [9]

The climate of Seminole County is characterized by long, warm, somewhat humid summers and by mild, dry winters. The average annual rainfall is about 53 inches. Rainfall is seasonally distributed; nearly 60 percent of the average annual total falls during the 4-month period from June through September. Facts about temperature and precipitation in the county, taken from records of the U.S. Weather Bureau at Sanford, are given in table 8.

TEMPERATURE.—Warm air from the Atlantic Ocean and the Gulf of Mexico largely accounts for the mild, moist climate of this county. These bodies of water, together with the numerous lakes in the county, have a moderating effect on the temperature in both winter and summer. In any year the temperature varies only slightly from day to day in summer. During June, July, and August, the average daily maximum temperature is between 91° F. and 92° and the average daily minimum temperature is between 71° and 72°. Although the temperature reaches 90° or higher on an average of 105 days a year, it reaches 100° or higher only once or twice a year. Because most of the masses of air that affect this area in summer pass over extensive bodies of water, the relative humidity is somewhat high. It seldom drops below 50 percent during June, July, August, or September, and consequently, hot dry winds and extremely high temperatures are almost unknown in this county.

The temperature in winter varies considerably from day to day, largely because of periodic invasions of cold, dry air from Canada. The average daily maximum temperature in December, January, and February is about 72°; the highest temperature on most days in winter is between 65° and 80°. The average minimum temperature in winter is about 50°; the minimum temperature on most winter days is between 40° and 60°

Some of the cold spells in winter bring freezing temperatures and frost. The agricultural areas in the colder parts of the county can expect freezing temperatures and frost at least once each winter. In an average winter, freezing temperatures and frost occur on about 8 days and the temperature drops to 28° or lower at least two or three times in most areas used for agriculture. The colder parts of the county can expect at least 1 day with a temperature of 25° or lower in about half the winters. A temperature of 20° or lower is rare; records indicate that a temperature of 20° or lower occurs in the colder areas on an average of about once in a 10-year period. Winter cold spells usually last for only 2 or 3 days at a time. Even on the coldest days, the temperature generally rises to 40° or higher at some time during the day.

A farmer should know, as nearly as possible, the chances of damaging low temperatures in spring and in fall, so that he can select safe planting and harvesting

[9] By KEITH D. BUTSON, State climatologist, U.S. Weather Bureau.

TABLE 8.—*Temperature and precipitation*

[Data based on records of the U.S. Weather Bureau kept at Sanford, Fla., for the period 1931-60]

Month	Temperature				Precipitation				
	Average daily maximum	Average daily minimum	Two years in 10 will have at least 4 days with—		Average total	One year in 10 will have—		Average number of days with rainfall of—	
			Maximum temperature equal to or higher than—	Minimum temperature equal to or lower than—		Less than—	More than—	0.10 inch	0.50 inch
	°F.	°F.	°F.	°F.	Inches	Inches	Inches		
January	71.9	49.9	83	35	2.04	0.6	4.2	4	2
February	73.4	51.2	85	37	2.40	.3	5.4	4	2
March	77.4	53.9	88	42	3.69	.9	6.9	5	3
April	82.2	59.6	90	50	3.39	1.0	5.8	5	2
May	87.9	65.0	94	57	3.24	1.2	6.7	6	2
June	91.0	70.2	97	66	7.02	3.5	12.9	10	5
July	91.9	71.9	97	69	8.89	3.7	14.2	13	5
August	91.8	72.4	97	70	7.13	3.3	11.9	11	5
September	89.1	71.4	95	68	7.33	2.9	13.1	10	4
October	83.8	65.3	90	54	4.48	1.5	10.6	6	3
November	77.0	56.5	86	42	1.73	.3	4.5	3	1
December	72.8	51.3	84	36	2.01	.3	4.6	4	1
Total					53.35			81	35

dates. Table 9 gives probabilities of the occurrence of temperatures of 32° and 28° after stated dates in spring and before stated dates in fall. Data in table 9 are based on temperatures recorded in groves and fields in Seminole County. These records were kept by the Federal-State Frost Warning Service at selected observation points in the county. Because the minimum temperature varies considerably from place to place in winter, the probability of receiving freezing temperatures at points in the county other than those for which temperatures were observed may differ from the probabilities shown in table 9. The data given in the table, however, are generally representative of the colder parts of the county. Table 9 shows that a temperature of 32° or lower will occur after March 1 in 2 years out of 10, on the average. The probability of a temperature of 28° or lower after March 1 is almost negligible. Similarly, a temperature of 28° or lower will occur before December 1 in about 1 year out of 10, on the average. A temperature of 28° or lower can be expected before January 1 about 5 years in 10.

PRECIPITATION.—For any one month, precipitation in this county varies greatly from year to year. In a normal year, more than half of the total annual precipitation falls during the summer rainy season of June through September. Also, although this is not reflected in the monthly totals in table 8, slightly more precipitation is sometimes received in March and in the early part of April than is received over a similar length of time during the fall and winter months. On the average, November is the driest month. November through February is considered the dry season; only 15 percent of the annual total amount of precipitation generally falls in that period. In some years the period from the middle of April to the middle of May is droughty, and periods of 3 to 4 weeks without measurable rainfall are relatively frequent at that time of year.

TABLE 9.—*Probabilities of last freezing temperatures in spring and first in fall*

Probability	Dates for given probability and temperature—	
	32° F.	28° F.
Spring:		
1 year in 10 later than	Mar. 6	Feb. 20
2 years in 10 later than	Mar. 1	Feb. 10
3 years in 10 later than	Feb. 24	Feb. 1
5 years in 10 later than	Feb. 15	Jan. 15
7 years in 10 later than	Feb. 1	Jan. 1
8 years in 10 later than	Jan. 23	(1)
9 years in 10 later than	Jan. 15	(1)
Fall:		
1 year in 10 earlier than	Nov. 15	Dec. 1
2 years in 10 earlier than	Nov. 21	Dec. 7
3 years in 10 earlier than	Nov. 27	Dec. 15
5 years in 10 earlier than	Dec. 9	Jan. 1
7 years in 10 earlier than	Dec. 22	Jan. 15
8 years in 10 earlier than	Jan. 1	(1)
9 years in 10 earlier than	Jan. 15	(1)

[1] The probability of receiving a temperature as low as 28° F. after January 1 or before January 15 is less than 8 out of 10.

Rainfall in summer comes mostly in local showers and thundershowers of short duration that occur in the afternoon or early in the evening. On the average about 85 thundershowers occur each year, and about three-fourths of this number occur in summer. In June, July, and August, a measurable amount of rain can be ex-

pected on about half the days. Summer showers are sometimes heavy; 2 or 3 inches of rain may fall in an hour or two.

Rains that last all day are rare in summer; when they occur, they are almost always associated with a tropical storm. Rains in winter and early in spring are generally associated with large-scale weather developments; hence, they do not display any marked tendency to occur only in the afternoon or evening. Occasionally, in winter and in spring, rains may last 24 hours or longer. Although these rains usually are less intense than thundershowers, some release a relatively large amount of precipitation over a large area. More than 7 inches of rain in 24 hours can be expected at some time during the year in about 1 year in 10.

Nearly all the precipitation in this county falls as rain. Hail falls occasionally in spring and early in summer, almost always during a thunderstorm. Snowflakes have been reported in this county, but they have always melted as they fell.

In this county rainfall is poorly distributed through the year, and extended periods of dry weather can be expected almost every year. These dry periods can seriously affect farming in areas that do not have facilities for irrigation. In addition, forest fires are a serious threat during extended periods of little or no rainfall.

Extended dry periods may occur during any season but are most likely to occur in winter and spring. According to records kept at rainfall stations in this area, less than 1 inch of precipitation has been recorded in each of the months from November through February. The total amount of rainfall for 2 months of this period has been less than 2 inches about one-fifth of the time; the total amount for 3 months, less than 3 inches about one-eighth of the time; and the total amount for 4 months, less than 4 inches about one-tenth of the time.

Generally, dry periods in April and May do not last as long as those in fall and winter, but they may seriously affect crops. Because they are accompanied by high temperature, dry periods in spring are as serious as those in fall.

Tropical storms, which may occur from June through about the middle of November, are the main causes of widespread excessive rainfall and flooding. Since these storms rapidly diminish in intensity as they move inland, winds of hurricane force (75 miles per hour or greater) seldom occur in this county. When these storms and the associated copious rains do occur, flooding may cause considerable damage to crops and to the soils.

WIND.—Prevailing winds in this area are generally southerly in spring and summer and northerly in fall and winter. The speed of the wind by day generally ranges from 8 to 15 miles per hour; it nearly always drops below 8 miles per hour at night.

Agriculture [10]

Oranges were among the first crops grown by the early settlers. The first orange groves were set out near Sanford between 1840 and 1845. A packing plant had been built by 1869. Many different kinds of seeds and citrus trees, and different species of tropical and subtropical fruits and ornamentals, were brought into the area for trial plantings by Gen. Sanford. In 1879 Gen. Sanford set out the first citrus groves at St. Gertrude, west of Sanford. Later, these groves were moved to Bel-Air, where drainage was better. Sanford greatly benefited the agriculture of the State by his experiments. The best-known fruits and nuts he introduced, and the ones still produced, are oranges, limes, lemons, avocados, mangos, lychees, and guavas.

In 1894 a severe freeze halted the growth of the citrus industry, and early in 1895 another severe freeze almost completely wiped out the groves, except for a small area at Bel-Air. Many farmers left the area. The ones who remained looked for other means of earning a livelihood. Dairying was begun, and vegetable seed was brought into the area in an effort to find crops suitable for the climate and soils. Among the vegetables introduced from the first shipment of seed were celery and cabbage, which were well suited to the soils and climate. In the spring of 1898, the first celery was shipped from Sanford, and this crop has been grown extensively for many years.

Vegetable growing in this area has been successful, mainly because of the underground irrigation systems that have been used to supply water to the crops. The first attempt to irrigate the soils consisted of using an inverted trough to transport excess water from a large artesian well located in the center of the town of Sanford. The trough allowed part of the water to seep out, so that the soil material above the trough remained moist during dry periods. When the farmers learned that the soil material above the trough remained moist, they began to place other troughs 18 inches deep and 18 feet apart through the fields so that more moisture would be supplied to vegetable crops. The original inverted wooden troughs eventually became obsolete and were replaced by round clay tile, 4 inches in diameter, which permitted better distribution of water. Now many irrigation systems are used to irrigate fields where celery, cabbage, and other vegetables are grown. Irrigation has made it possible to produce nearly 2 million crates of celery each year, more than a million bags of cabbage, and a large quantity of other vegetables.

Within 10 years after most of the citrus trees had been killed by freezing temperatures, the area was as busy producing vegetables as it had been producing citrus fruit prior to the freeze. Each year the fields expanded. Most of the farms are now laid out in blocks of 10 to 20 acres. Irrigation systems have been improved, and yields have increased as more information has been obtained about soil management.

Since this early start as a center for truck farming, the growing of vegetables for winter market has been among the leading agricultural enterprises in the county. In spite of the rapid conversion of arable land to urban uses, agriculture has also shown continued expansion. In 1959 approximately 10,500 acres of vegetables was harvested, as compared to about 7,850 in 1954. The vegetable crops grown most extensively are celery, cabbage, and sweet corn, but beans, sweet peppers, squash, lettuce, escarole, and endive are also grown on a fairly large acreage. Also, in recent years watercress has been grown commercially in flooded paddies. Citrus crops have become increasingly important, as a larger acreage has recently been planted to citrus trees; about 21,000 acres

[10] Statistics used in this section are mainly from the U.S. Bureau of the Census.

was in citrus groves in 1960. Growing of horticultural specialties has expanded rapidly during the past few years. The kinds grown are mainly bulbs, ferns, grass for turf, ornamental shrubs and trees, and citrus trees grown in fields.

Milk for local use is produced at several dairy farms, and beef cattle are raised, both on improved pasture and on native range. The total number of beef cattle in the county increased from about 14,490 in 1954 to about 24,328 in 1959. The number of dairy cows remained about the same during the same period.

The acreage of woodland in the county is fairly large, but there has been little commercial development of wood crops in recent years. Much of the woodland is in poor condition and is used mainly for range. Also the county has been rapidly developed for more intensive uses, which has discouraged development of the woodland for production of wood crops.

Although the value of the major commodities produced in the county fluctuates, there has been a constant increase in the value of agricultural commodities to the economy of the county. In 1959 the total value of all commodities produced for sale in the county was nearly a million dollars more than in 1949, and more than 6 million dollars more than in 1939. In 1959 the sale of fruits and nuts, including citrus fruits, accounted for about 41 percent of the total income received from the sale of farm products, as compared to nearly 16 percent in 1949. Income from the sale of vegetables harvested for sale, other than Irish potatoes and sweetpotatoes, increased somewhat during the period between 1954 and 1959, and the acreage of such vegetables increased from 7,847 acres in 1954 to 10,512 acres in 1959.

Glossary

Aggregate, soil. Many fine particles held in a single mass or cluster, such as a clod, crumb, block, or prism.

Available moisture capacity. The capacity of a soil to hold water in a form available to plants. Amount of moisture held in a soil between field capacity, or about one-third atmosphere of tension, and the wilting coefficient, or about 15 atmospheres of tension.

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.

Consistence, soil. The feel of the soil and the ease with which a lump can be crushed by the fingers. Terms commonly used to describe consistence are—

Loose. Noncoherent; will not hold together in a mass.

Friable. When moist, crushes easily under gentle to moderate pressure between thumb and forefinger and can be pressed together into a lump.

Firm. When moist, crushes under moderate pressure between thumb and forefinger, but resistance is distinctly noticeable.

Plastic. When wet, readily deformed by moderate pressure but can be pressed into a lump; will form a wire when rolled between thumb and forefinger.

Sticky. When wet, adheres to other material; tends to stretch somewhat and pull apart, rather than pull free from other material.

Hard. When dry, moderately resistant to pressure; can be broken with difficulty between thumb and forefinger.

Soft. When dry, breaks to powder or individual grains under very slight pressure.

Erosion. The wearing away of the land surface by wind, running water, and other geologic agents.

Gleization. The reduction, translocation, and segregation of soil compounds, notably of iron, generally in the subsoil or substratum, as a result of poor aeration and drainage; expressed in the soil by mottled colors dominated by gray. The soil-forming processes leading to the development of a gleyed soil.

Green-manure crop. A crop grown for the purpose of being turned under for soil improvement at an early stage of maturity or soon after maturity.

Horizon, soil. A layer of soil, approximately parallel to the surface, that has distinct characteristics produced by soil-forming processes.

Infiltration. The downward entry of water into the immediate surface of a soil or other material, as contrasted with percolation, which is movement of water through soil layers or soil material.

Internal drainage. The downward movement of water through the soil profile. The rate of movement is determined by the texture, structure, and other characteristics of the soil profile and underlying layers, and by the height of the water table, either permanent or perched. Relative terms for expressing internal drainage are *none, very slow, slow, medium, rapid,* and *very rapid.*

Leaching. The removal of soluble materials from soils or other material by percolating water.

Mottled. Irregularly marked with spots of different colors that vary in number and size. Mottling in soils usually indicates poor aeration and lack of 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 these: *Fine,* less than 5 millimeters (about 0.2 inch) in diameter along the greatest dimension; *medium,* ranging from 5 millimeters to 15 millimeters (about 0.2 to 0.6 inch) in diameter along the greatest dimension; and *coarse,* more than 15 millimeters (about 0.6 inch) in diameter along the greatest dimension.

Natural drainage. Refers to moisture conditions that existed during the development of the soil, as opposed to altered drainage, which is commonly the result of artificial drainage or irrigation but may be caused by the sudden deepening of channels or the blocking of drainage outlets. Seven different classes of natural drainage are recognized.

Excessively drained soils are commonly very porous and rapidly permeable and have low water-holding capacity.

Somewhat excessively drained soils are also very permeable and are free from mottling throughout their profile.

Well-drained soils are nearly free from mottling and are commonly of intermediate texture.

Moderately well drained soils commonly have a slowly permeable layer in or immediately beneath the solum. They have uniform color in the A and upper B horizons and have mottling in the lower B and the C horizons.

Imperfectly or somewhat poorly drained soils are wet for significant periods but not all the time, and in podzolic soils they commonly have mottlings below a depth of 6 to 16 inches in the lower A horizon and in the B and C horizons.

Poorly drained soils are wet for long periods and are light gray and generally mottled from the surface downward, although mottling may be absent or nearly so in some soils.

Very poorly drained soils are wet nearly all the time. They have a dark-gray or black surface layer and are gray or light gray, with or without mottling, in the deeper parts of the profile.

Parent material (soil). The horizon of weathered rock or partly weathered soil material from which soil has formed; horizon C in the soil profile.

Permeability, soil. The quality of a soil horizon that enables water or air to move through it. Terms used to describe permeability are *very slow, slow, moderately slow, moderate, moderately rapid, rapid,* and *very rapid.*

Profile, soil. A vertical section of the soil through all its horizons and extending into the parent material. See also Horizon, soil.

Reaction, soil. The degree of acidity or alkalinity of the soil expressed in pH values. A soil that tests to pH 7.0 is precisely neutral in reaction because it is neither acid nor alkaline. In words the degrees of acidity or alkalinity are expressed thus:

	pH		*pH*
Extremely acid	Below 4.5	Mildly alkaline	7.4 to 7.8
Very strongly acid	4.5 to 5.0	Moderately alkaline	7.9 to 8.4
Strongly acid	5.1 to 5.5		
Medium acid	5.6 to 6.0	Strongly alkaline	8.5 to 9.0
Slightly acid	6.1 to 6.5	Very strongly alkaline	9.1 and higher
Neutral	6.6 to 7.3		

Relief. The elevations or inequalities of a land surface, considered collectively.

Sand. Individual rock or mineral fragments in soils having diameters ranging from 0.05 to 2.0 millimeters. Most sand grains consist of quartz, but they may be of any mineral composition. The textural class name of any soil that contains 85 percent or more sand and not more than 10 percent clay. See also Texture, soil.

Silt. Individual mineral particles in a soil that range in diameter form the upper limit of clay (0.002 millimeter) to the lower limit of very fine sand (0.05 millimeter). Soil of the silt textural class is 80 percent or more silt and less than 12 percent clay.

Soil. A natural three-dimensional body on the earth's surface that supports plants and that has properties resulting from the integrated effect of climate and living matter acting upon parent material, as conditioned by relief over periods of time.

Structure, soil. The arrangement of primary soil particles into compound particles or clusters that are separated from adjoining aggregates and have properties unlike those of an equal mass of unaggregated primary soil particles. 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 (1) *single grain* (each grain by itself, as in dune sand) or (2) *massive* (the particles adhering together without any regular cleavage, as in many claypans and hardpans).

Subsoil. Technically, the B horizon; roughly, the part of the profile below plow depth.

Substratum. Any layer lying beneath the solum, or true soil; the C or R horizon.

Surface layer. A term used in nontechnical soil descriptions for one or more layers above the subsoil. Includes the A horizon and part of the B horizon; has no depth limit.

Terrace (geologic). An old alluvial plain, ordinarily flat or undulating, bordering a river, lake, or the sea. Stream terraces are frequently called *second bottoms*, as contrasted to *flood plains*, and are seldom subject to overflow. Marine terraces were deposited by the sea and are generally wide.

Texture, soil. The relative proportions of sand, silt, and clay particles in a mass of soil. The basic textural classes, in order of increasing proportions of fine particles are as follows: 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." See also Clay, Sand, and Silt.

GUIDE TO MAPPING UNITS, CAPABILITY UNITS, AND RANGE SITES

[See table 1, p. 7, for the approximate acreage and proportionate extent of the soils and table 2, p. 34, for the estimated yields per acre of the principal crops. For facts about the suitability of the soils for woodland, see the section beginning on p. 37; for facts about the engineering properties of the soils, turn to the section beginning on p. 40; and for facts about nonfarm uses of the soils, see the section beginning on p. 55]

Map symbol	Mapping unit	Page	Capability unit		Range site	
			Symbol	Page	Name	Page
BfB	Blanton fine sand, high, 0 to 5 percent slopes	7	IIIse-1	27	Sandhill	36
BfC	Blanton fine sand, high, 5 to 8 percent slopes	8	IVse-2	29	Sandhill	36
BfD	Blanton fine sand, high, 8 to 12 percent slopes	8	VIse-1	32	Sandhill	36
BnB	Blanton fine sand, low, 0 to 5 percent slopes	6	IIIse-2	27	Sandhill	36
BnC	Blanton fine sand, low, 5 to 8 percent slopes	7	IVse-1	29	Sandhill	36
Bo	Borrow pits	8	(1/)	--	(2/)	--
Bp	Brighton peat	8	IIIws-5	26	Fresh Marsh (Organic)	36
Br	Brighton peat, shallow variant	9	IIIws-5	26	Fresh Marsh (Organic)	36
Bt	Brighton, Istokpoga, and Okeechobee soils	9	IIIws-5	26	Fresh Marsh (Organic)	36
Ch	Charlotte fine sand	9	IVws-3	28	Slough	37
De	Delray fine sand	10	IIIws-2	25	Slough	37
Df	Delray fine sand, high	10	IIws-2	24	Slough	37
Dh	Delray fine sand, moderately shallow, high	10	IIws-2	24	Slough	37
Dm	Delray mucky fine sand	10	IIIws-2	25	Slough	37
Ff	Felda fine sand	10	Vws-1	31	Fresh Marsh (Mineral)	36
Ib	Iberia clay loam, overflow	11	Vws-1	31	Fresh Marsh (Mineral)	36
Ik	Iberia mucky loam	11	IIIws-3	25	Fresh Marsh (Mineral)	36
Im	Immokalee fine sand	12	IVsw-1	30	Acid Flatwood	33
In	Immokalee sand	12	IVsw-1	30	Acid Flatwood	33
Io	Istokpoga peat, deep	13	IVws-1	28	Fresh Marsh (Organic)	36
Ip	Istokpoga peat, moderately deep	13	IVws-1	28	Fresh Marsh (Organic)	36
Is	Istokpoga peat, shallow variant	13	IVws-1	28	Fresh Marsh (Organic)	36
LaB	Lakeland fine sand, 0 to 5 percent slopes	13	IIIse-1	27	Sandhill	36
LaC	Lakeland fine sand, 5 to 8 percent slopes	14	IVse-2	29	Sandhill	36
LaD	Lakeland fine sand, 8 to 12 percent slopes	14	VIse-1	32	Sandhill	36
LdB	Lakewood sand, 0 to 5 percent slopes	14	VIs-1	32	Sand Scrub	37
LdC	Lakewood sand, 5 to 8 percent slopes	14	VIIs-1	32	Sand Scrub	37
LfA	Leon fine sand, 0 to 2 percent slopes	15	IVsw-1	30	Acid Flatwood	33
LfB	Leon fine sand, 2 to 5 percent slopes	15	IVsw-1	30	Acid Flatwood	33
Lo	Leon sand	15	IVsw-1	30	Acid Flatwood	33
Ma	Made land	15	(1/)	--	(2/)	--
Mb	Manatee fine sand	16	IIIws-3	25	Slough	37
Mc	Manatee loamy fine sand	16	IIIws-3	25	Slough	37
Md	Manatee-Delray complex, overflow	16	Vws-1	31	Fresh Marsh (Mineral)	36
Ok	Okeechobee muck	16	IIIws-5	26	Fresh Marsh (Organic)	36
On	Ona fine sand	17	IIws-1	24	Acid Flatwood	33
OrB	Orlando fine sand, 0 to 5 percent slopes	17	IIIse-2	27	Sandhill	36
OrC	Orlando fine sand, 5 to 8 percent slopes	17	IVse-1	29	Sandhill	36
Pf	Plummer fine sand	17	IVws-2	28	Slough	37
Ph	Plummer fine sand, high	18	IVsw-2	31	Acid Flatwood	33
PmB	Pomello fine sand, 0 to 5 percent slopes	18	Vsw-1	32	Sand Scrub	37
Pn	Pompano fine sand	18	IVws-3	28	Slough	37
Po	Pompano fine sand, moderately shallow	18	IVws-3	28	Slough	37
Rf	Rutlege fine sand	19	IIIws-1	25	Slough	37
Rh	Rutlege fine sand, high	19	IIws-1	24	Acid Flatwood	33
Rm	Rutlege mucky fine sand	19	IIIws-1	25	Slough	37
Rn	Rutlege, Plummer, and St. Johns soils	19	IVws-2	28	Slough	37
Rp	Rutlege and Pompano soils, ponded	20	Vws-2	31	Slough	37
Sa	St. Johns fine sand	20	IIIws-4	26	Acid Flatwood	33
SfB	St. Lucie fine sand, 0 to 5 percent slopes	20	VIIs-1	32	Sand Scrub	37
Sn	Sandy alluvial land	21	(1/)	--	Swamp	37
Sw	Swamp	21	((1/)	--	Swamp	37
Tc	Terra Ceia muck	21	IIIws-5	26	Fresh Marsh (Organic)	36
Wa	Wabasso fine sand	21	IIIws-4	26	Acid Flatwood	33

1/ Not placed in a capability unit.

2/ Not placed in a range site.

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