

The following document is a scanned and reformatted* version of *the Guide to the Physiographic Divisions of Florida*:

Brooks, H.K. 1981. *Guide to the Physiographic Divisions of Florida*. Institute of Food and Agricultural Sciences. Gainesville, Fla.:University of Florida.

The *Guide* is a companion publication to the Physiographic Divisions Map, by H.K.Brooks, 1981:

Brooks, H.K. 1981. *Physiographic Divisions of Florida* (map). Institute of Food and Agricultural Sciences. Gainesville, Fla.:University of Florida.

The original map and guide can be found in the SJRWMD library.

*Scanned July 1998(?), reformatted into a single column January 1999.

PHYSIOGRAPHIC DIVISIONS OF FLORIDA

With a Key to the Code Symbols on the Map

H.K. Brooks*

INTRODUCTION

Florida is a portion of the Coastal Plain Province as defined by Fenneman (1938) in the "Physiography of Eastern United States." A small portion of the Atlantic Coastal Plain extends into northeastern Florida, i.e., the Sea Island District; and the area west of the Choctawhatchee River is associated genetically with the Gulf Coastal Plain Section. The greater portion of the State of Florida belongs in the Florida Section, a distinctive physiographic unit characterized by the influences that solution of the underlying limestones have had on the development of the topographic features.

Most of the significant physiographic subdivisions of the State of Florida have long been recognized and the pioneers had appropriate names for the areas. These were the terms used in the first publication on the natural division of Florida by Shaler (1890), Matson and Sanford (1913), Harper (1914 and 1921) and Davis (1943). More recent authors have had varied concepts of the physiographic divisions (Cooke, 1939 and White 1958, 1970). There is some merit to Cooke's concept of using physiographic features associated with higher stands of sea level. However, to be consistent with geomorphic practice, and to best characterize the natural features, I have used the classical principles of (1) rock and soil type, (2) geological structure of the underlying rocks, (3) geomorphic process that constructed or sculptured the landscape, and (4) relief. Degree of dissection and other genetic factors that have controlled runoff, relationship to the watertable and the soil forming processes are definitive in the minor divisions.

In Florida there is a direct relationship between the natural vegetation and the physiographic units as now distinguished. The vegetative associations mentioned below in the descriptions of the subdivisions are those of the original land; most areas are now modified in various degrees. Where mentioned, it is for the purpose of conveying environmental information. For the purpose of brevity in the following descriptions, the statement of "thick residual sand soil" or "sand hills" will imply a natural vegetation of longleaf pine and turkey oak unless otherwise stated, "flatwoods" will indicate a pine flatwoods, "mixed forest" will be of hardwoods and pine and "swamps" will be hardwoods as well as cypress. The best works on the natural divisions of Florida are by Harper and Davis, both botanists.

The "Physiographic Divisions of the State of Florida" map should be used in conjunction with the "Geologic Map of Florida" (Brooks, 1982, IFAS) and the "NASA ERTS 1 Satellite Image Mosaic of Florida", published by the U.S. Geological Survey. All three are at the same scale, 1:500,000. Also useful is the series of "Environmental Geology" maps published by the Florida Bureau of geology, scale 1:250,000.

The code symbols on the map for each of the three physiographic sections are the basis for referring the subdivision names to the appropriate areas of the map. Brief descriptions of each unit are given, and, where appropriate, the genetic considerations making the area worth separate recognition are mentioned. A description of the subdivisions and the map code symbols follows.

*Professor Emeritus of Geology. Dr. Brooks prepared this key for the maps Physiographic Division of Florida and the associated Geologic Map of Florida as a special project of the Center for Environmental and Natural Resources Programs, Institute of Food and Agricultural Sciences, University of Florida, Gainesville.

SUBDIVISIONS AND MAP CODE SYMBOLS

ATLANTIC COASTAL PLAIN SECTION

The Atlantic Coastal Plain is a province of clastic sediments, and except for the coastal areas, fluvial processes have largely controlled the landscape development. Eastward and southeastward flowing rivers typically carry sand, silts and clay, if not all the way to the ocean, at least to estuaries and marshlands.

Sea Island District

The portion of this section of Florida is associated with the Southeast Georgia Structural Basin. In most places, Ocala Limestone is covered by an overburden too thick for it to influence the landscape or drainage. (Note: Some of the areas in Georgia previously assigned are more properly included in the Florida Section or in the Gulf Coastal Plain Section).

1. The Okefenokee Upland

Undissected upland terraces and separating ridge with sluggish to poorly organized surface drainage systems constitute this unit. Vegetation is flatwoods, swamps and marsh types.

a. Okefenokee Basin: Eastward sloping terrace with little or no local relief. This is the headwater of such rivers as the Suwannee and St. Marys. The central basin contains Recent peat and muck deposits upon which marsh and cypress swamp vegetation now exists; this grades laterally into poorly drained flatwoods. Elevations range from 120 to 150 feet.

b. Lake City Ridge: An arcuate ridge with gentle slopes. The crest ranges in elevation from 150 feet¹ on the east to 202 feet at Lake City. Drainage of the fine sandy soils is poor and flatwoods is the native vegetation.

c. Trail Ridge: A depositional ridge with a very gentle westward slope and a more pronounced eastward slope; some small streams originate upon the eastern slope. Overall, the surface drainage is poor and there is little downward migration through the fine sand soils; thus, a flatwoods exists. The southern portion has been uplifted; it is more deeply weathered and internal drainage downward to the underlying limestone has given rise to circular basins containing lakes. The southern portion is also distinctive in that two spit-like ridges are attached to this upland and a paleodune field exists. Longleaf pine-turkey oak and sand pine are typical of the southern portion. Elevations in the uplifted portion are up to 240 feet; whereas, the typical ridge crest is between 150 and 160 feet.

d. High Flatwoods: A poorly dissected upland plain; surface drainage systems are present; but, for the most part, are sluggish. Typically, elevation of the land is between 140 and 160 feet; the uplifted western margin reaches heights 190 feet above mean sea level. Flatwoods are prevalent; however, there are extensive areas of river swamps.

2. Duval Upland

An area of subdued, Plio-Pleistocene beach ridges accreted eastward of Trail Ridge, the upland plain generally has elevations between 80 and 100 feet.

a. St. Marys Upland: A partially dissected plain, predominantly flatwoods. The areas along the eastern margin and near the St. Marys River are more eroded and are deeply weathered. Thick residual sand soils exist. Subdued relic beach ridges are more conspicuous in the northern and eastern portions. Elevations typically are between 70 and 100 feet.

b. Black Creek Basin: An erosional river valley partially backfilled with Late Pleistocene estuarine deposits. Flatwoods exist on the terraced lands and a swamp occurs in the flood plain. The terrace is usually between 20 and 25 feet in elevation. Outcrops of Miocene limestone occur along the river.

c. Penney Farms Upland: Similar to the St. Marys Upland. The elevations are slightly higher with the upland plain generally being slightly over 100 feet. As is true with the southern portion of Trail Ridge, there appears to have been relative uplift. The surface drainage is better and the soils are thicker. Most of the area is covered by flatwoods; however, in the southern portion there are xeric sand hills.

3. Northern Coastal Strip

This increment of landscape related to Pleistocene and Recent fluctuations of sea level includes both erosional and depositional features.

a. Nassau Basin: A very poorly drained flatwoods and swamp plain. Clayey soils occur. Except for one relic hill, all elevations are less than 20 feet. Genetically, the sediments are probably related, in part, to a bayhead delta that formed at a time when the Satilla River was deflected southward into Florida.

b. Dinsmore Plain: A terrace between 25 and 30 feet in elevation, covered by flatwoods. Remnants of a barrier island with elevations 42 to 95 feet exist along the eastern margin. The remnants typically have a thicker, better drained sandy soil, and in places, a longleaf pine-turkey oak vegetation exists.

c. Arlington Plain: A dissected, moderately well drained plain 40 to 50 feet in elevation with sandy soils.

d. Mandarin Plain: A poorly dissected and drained terrace, 20 to 30 feet in elevation with flatwoods and river swamps. An abandoned ancient, very large tidal inlet near the eastern central portion of this unit is genetically related. Most elevations are between 20 and 30 feet.

e. Reids Bluff Ridge Sets: Relic coastal barrier island with conspicuous sets of beach ridges that have prograded southward into Florida; some paleodunes. Elevations are up to 50 feet.

f. Fort Caroline Ridge Sets: A complex set of relic ridges related to Middle and Late Pleistocene high stands of sea level. Considerable areas of paleo sand dune fields exist. Trees are longleaf pine and turkey oak with some sand pine. Elevations are up to 72 feet.

g. The Sea Islands: Relic ridges and erosional hill remnants are surrounded by extensive areas of Recent silt and clay deposition now developed as saltwater marshes. The existing barrier islands are composites of Late Pleistocene and Recent origin. Most of the area is at or about present mean high tide. There is a paleodune field at Fernandina with elevations up to 52 feet.

FLORIDA SECTIONS

This is the area of the Florida Structural Platform upon which Cretaceous, Tertiary and Quaternary limestones have been deposited. In most places, solution of the limestones have influenced the landscape and the courses of the creeks and rivers. Sand is the dominant surficial material.

1. The Eastern Flatwoods District

This is a portion of the area called the "Coastal Lowlands" by Cooke; elevations are generally less than 90 feet. The district originated as a sequence of barrier islands and lagoons during Plio-Pleistocene and Recent time.

a. Palatka Anomalies: A complex area associated with limestone solution, stream diversion and possibly faulting.

1. Rice Creek Swamp: The abandoned strath of a large river ancestral to the Oklawaha. The swampy lowland has been backfilled with Pleistocene estuarine deposits. Elevations are less than 40 feet. Flatwoods and river swamp with many cabbage palms occur.

2. Green Cove Springs-Bostwick Terrace: A plain 11 to 21 feet in elevation largely underlain by estuarine deposits. The forest are flatwoods and river swamps. See description of Hastings Plain, la4.

3. Palatka Relic Hills: Consisting of the hills at Palatka and San Mateo; residual hills composed of sand, silt and clay of Plio -Pleistocene age. The 80 to 85 foot elevations of these hills and deep weathering has resulted in the development of a thick sand soil.

4. Hastings Plain: An area of estuarine and lagoonal deposits of Late Pleistocene age. The silty sand soils are poorly drained. For the most part, the land is less than 20 feet in elevation. The associated tidal inlet was just north of what is presently St. Augustine. Flatwoods and swamp forests are prevalent.

5. Roy Divide: A poorly drained low ridge 25 to 30 feet in elevation; sandy soils covered by flatwoods.

6. Crescent Lake Basin: A lowland underlain by estuarine and lagoonal silts, clay and fine sand. Crescent Lake is associated with a structural high on the Ocala Limestone which at one place, is known to be near the surface of the land. An extensive swamp forest exists along with flatwoods. Salinity levels of the water in the Floridan aquifer are high; the Recent marls underlying the lake are related to ground water discharge from the Floridan aquifer.

b. St. Augustine Ridge Sets: A complex relic of a barrier island with beach ridge sets of several different ages. There is more coquina shell in the younger eastern portion. Elevations are generally between 30 and 50 feet. The swales contain cypress stands and the subdued ridges are covered by flatwoods.

c. Volusia Ridge Sets: Accreted coastal deposits consisting of four distinct parts, a flatwoods plain of subdued beach ridge sets, typically about 40 feet in elevation (the "Talbot Terrace"), an eastern boundary sand ridge with a crest typically at 46 feet elevation, an eastern set of beach ridges forming a flatwoods plain 25 to 30 feet in elevation (the "Pamlico Terrace"), and the high coastal ridge (the "Atlantic Coastal Ridge") that is up to 55 feet in

elevation. The plains are underlain directly by fine sands and silty sand with some clay; whereas the ridges have well drained sand soils. Coquina deposits underlie the Atlantic Coastal ridge.

d. St. Johns Wet Prairie: Marshes and grass prairies with clumps of cabbage palms and willow that are seasonally flooded. The lake basins are controlled by structures in the underlying Ocala Limestone. The surficial fine sand, silty sand and clayey sand are Late Pleistocene lagoonal deposits. Elevations are between 6 and 12 feet above present sea level.

e. Central Atlantic Coastal Strip: A coastal strip of land originated or modified by shoreline processes during Late Pleistocene time when sea level stood at about 18 feet and 6 to 8 feet above its present level. In most places, the beaches are perched upon older coquinas.

1. St. Augustine-Edgewater Ridge: A ridge of coquina is the principal relief feature. It begins at Anastasia Island and extends southeastward to the Cape. Northward of St. Augustine, the ridge forming the main body of the barrier island becomes increasingly clastic in origin; this northern portion has a broader marshland in the intercoastal waterway. Except for the barrier island seaward of Mosquito Lagoon, the beaches are perched.

2. Turnbull Hammock: Consists of two parts, the true Turnbull Hammock developed as a gentle eastward slope and a terrace that is accreted onto a more ancient upland. The upland generally is 25 to 35 feet in elevation; solution depressions occur, some of which contain lakes. The older upland is dominantly covered by flatwoods, the crest of the ridge is vegetated with longleaf pine and turkey oak; and the lower slope of the ridge and the associated terrace supports a forest of cabbage palms with scattered hammocks.

3. Titusville Dunes: A paleo sand dune field developed upon a Pleistocene barrier island dominates the landscape. Relic dunes up to 60 feet in elevation are covered by sand pines.

4. Cocoa-Sebastian Ridge: The "Atlantic Coastal Ridge" is narrow and poorly developed; in some places it is absent. A very narrow terrace 6 to 10 feet in elevation occurs eastward of a scarp with a toe elevation between 6 and 10 feet. A sand pine scrub vegetation occurs on the ridge, with flatwoods on the terrace. The offshore barrier island is perched upon a coquina ridge.

5. Sebastian-Jupiter Ridge: The "Atlantic Coastal Ridge" is very well developed, but narrow. It is interrupted by the site of four relic inlets. Paleo sand dune fields developed upon the relic barriers have crests that are up to 90 feet in elevation. Seaward of a scarp with a toe elevation of 8 to 10 feet is a terrace. The coquina ridge upon which the present offshore barrier island is perched is discontinuous and the position of inlets has shifted considerably during Recent time. Shoals and tidal flats have developed in Indian River that now support a mangrove forest. An unusual feature associated with the high coastal ridge is a series of lakes and marshes on the landward side. It appears that solution of coquina has contributed to their development.

f. Cape Canaveral: Merritt Island and the Cape consist of an accreted series of coastal ridges. Coquina and sand shell of Middle and Late Pleistocene age underlie Indian River, Merritt Island and Banana River; the Cape is Recent in age.

g. Upper St. Johns Karst: An area of predominately internal drainage in which solution of shell deposits has resulted in karst depressions. It is not naturally well drained and is a flatwoods.

h. St. Johns Marsh: Similar to St. Johns Wet Prairie, but with elevations mostly above 18 feet. Organic soils are more common. There are no karst features and the origin of Blue Cypress Lake needs investigation.

i. Sebastian-St. Lucie Flats: A linear depression in which silty fine sand and clayey sand were deposited as a lagoonal deposit in Late Pleistocene time. The elevations are generally less than 20 feet. This is an area of flatwoods.

j. Green Ridge-Loxahatchee Karst: A poorly drained open flatwoods with cypress strands and heads. The shallow depressions have originated from solution of shell in the underlying Pleistocene shelly, calcareous sand. The elevation range is largely between 20 and 23 feet; whereas, the ridge has elevations that are in places higher than 30 feet.

k. Allapattah Flats: The elevations are not significantly different from the karst land to the east. There is no karst; drainage is very poor. This is a wet prairie and marsh land plain with few trees.

l. Holopaw-Indian Town Ridges and Swales: A barrier spit of clastic sediments, with some shell, that prograded southward from the Orlando Promontory in Plio- Pleistocene time. Gentle slopes and the fine sand result in much of this relief feature being covered by flatwoods with cypress strands in the swales. Sand pine scrub does occur discontinuously along the eastern margin. The northern portion reaches elevations higher than 90 feet;

whereas the southern portion is about 40 feet. It would appear that southward tilting has occurred since the time of depositional formation.

m. Bombing Range Ridge: An arcuate depositional sand ridge with elevation to 158 feet. Sand pine and scrub dominates the vegetative cover.

n. Kissimmee Valley: A seasonally flooded lowlands of river swamp and grassland prairies largely underlain by silty sand; a lagoonal deposit. The elevations are, for the most part, higher than 50 feet.

o. Okeechobee Prairie: A wet prairie and flatwoods plain with sluggish surface drainage. Most of the land is less than 40 feet in elevation.

p. Istokpoga Prairie: A broad, gentle erosional swale that slopes southward to Lake Okeechobee. Meander scars and scrolls are suggestive that a river system once existed; the headwaters of which have been captured by the modern Kissimmee River. Plio-Pleistocene sand and sandy shell occur below shallow soils. The area near Lake Istokpoga is a marsh that overlies peat and muck. This gives way southeastward to a seasonal wet prairie with isolated cabbage palm and oak hammocks.

2. The Gold Coast-Florida Bay District

This is the area of south and southeastward sluggish drainage from Lake Okeechobee, i.e., the Everglades. The coastal ridge is no longer underlain nor influenced by the coquina deposits of the Anastasia Formation. The rocks and sediments are Pleistocene and largely limestones or with limestone cap rocks.

a. Southern Atlantic Coastal Strip: A broad ridge underlain by sand and shelly sand that probably originated as a shoal. Very gentle slopes exist on the westward side. The eastern side is more complex having been subsequently modified by marine processes. The southern portion originated as an oolitic shoal.

1. Palm Beach-Deerfield Ridge: A narrow coastal ridge with much dune sand reaches elevations to 48 feet. Scrub vegetation with some sand pine occurs. The offshore barrier island is perched upon coquina of the Anastasia Formation.

2. Green Acres Sand Prairie: A gentle sloping plain with pine flatwoods and wet prairie. The elevations are generally less than 20 feet.

3. Pompano-Fort Lauderdale Gap: There is no detectable coastal ridge; the elevations are generally 10 to 12 feet. No barrier islands occur along the northern portion. From Fort Lauderdale southward to Key Biscayne the barrier islands are not perched.

4. Miami Rock Ridge: Typically a rockland; the limestones formed as oolitic carbonate shoals. Vegetation is varied, but southern slash pine probably dominates. Tropical and subtropical hammocks occur. Elevations generally are between 6 and 22 feet.

5. Silver Bluff-Coastal Marsh Terrace: Seaward of a distinct scarp, the terrace is everywhere less than 6 feet in elevation. Wet prairie, marsh and mangrove occur on the marl and rocklands plain.

6. Cape Sable: A complex of very low beach ridge deposits of Recent age border an extensive area of mangrove swamps and open water "lakes".

b. Okeechobee Basin: A broad circular depression with elevations to 1.5 feet below mean sea level. Sand occurs in the northern portion, sand and shell with much hard limestone cap rock in the southeastern portion and sand and shell in the western portion. Originally, peat deposits dammed and controlled the outflow of water to the southeast.

c. Everglades: A freshwater marsh with varying thicknesses of peat and muck.

1. Andytown Ridges and Sloughs: Elevation is 15 feet or less and the peat is less thick than in the other portions of the northern Everglades. The saw grass marsh has tree islands and sloughs.

2. Saw Grass Plain: An expansive open marsh with few trees.

3. Shark River Ridges and Sloughs: The peat is generally thin; tree islands and sloughs occur.

d. Ten Thousand Islands: A vast area of mangrove forest, tidal sloughs and open lagoons. On the seaward side there is a sand ridge that in places has been built up above sea level.

e. Florida Keys: Islands of limestone or carbonate sand and mud.

1. Coral Reef Keys: Linear island chain of coral rock. A modern coral reef lies offshore.

2. Oolitic Keys: Islands composed of oolitic limestone. The greatest dimension of the islands is transverse to the trend of the chain. The Pleistocene and Recent coral reef tracts are to the southeast and south of the islands.

3. Dry Tortugas: Shoals and islands of bioclastic carbonate sand and mud.

3. The Southwestern Flatwoods

This is a province of Miocene and Pliocene sedimentary rocks and sediments. The Quarternary deposits are thin or nonexistent.

a. Pinellas Peninsula: A cupsate foreland between the limestone coast to the north and the Middle Miocene to Recent clastic sediments southward along the coast. Residual, deeply weathered sand hills occur in the northern portion of the Peninsula; whereas, sand and shell of Plio -Pleistocene age underlies the lower terraces.

b. Barrier Island Coastal Strip: The coastal strip is bordered by lagoons and islands of Recent origin. The coastal flatwoods are generally at elevations of less than 20 feet. The barrier island chain is very dynamic and the inlets are prone to shifts in position.

c. Bone Valley Uplands: A poorly drained plateau underlain by deeply weathered sand and clayey sand of the Bone Valley Formation. Flatwoods with cypress heads and stands exist in most places. The margin of the upland has thick white sands that are well drained. The elevation of the upland is generally above 130 feet.

d. Water Tank Ridge: A high ridge composed of fine, deeply weathered sand with no karstic features. The maximum elevation exceeds 230 feet.

e. Agricola Ridge: A low ridge with gentle slopes; the crest is 160 to 170 feet above mean sea level. It supports a flatwoods vegetation.

f. Carlton Ranch Ridge: A linear ridge with thick sands. There are no karstic features. Sand pine scrub exists upon the thick, deeply weathered sand soil.

g. De Soto Slope: A sloping plain from a maximum of about 90 feet to as low as 30 feet in elevation. The portion east of Tampa Bay is terraced. Except for the Peace River, the surface drainage systems are disrupted by swamps. This is an area of wet prairie and flatwoods. The cypress swamps tend to be underlain by clay deposits.

h. Caloosahatchee Valley: An ancient river valley backfilled with sand and shell deposits of Plio-Pleistocene age. The terraced land is largely covered by wet prairie and flatwoods.

i. Estero Bay-Cape Romano Coastal Strip: A low energy coast with few good beaches. There is much mangrove swamp. The poorly drained mainland is a flatwoods plain less than 12 feet in elevation. Paleodune fields exist, i.e., near Caxambus Pass one reaches an elevation of 52 feet.

j. Immokalee Rise: A broad area of land slightly higher than that surrounding it. Elevations are typically between 30 and 40 feet. Slopes are gentle and there is much flatwoods with some wet prairie and cypress swamp.

k. Devils Garden: A wet prairie and cypress swamp developed upon a low plain between 20 and 30 feet in elevation. Calcareous shelly sands underlie the thin soils.

l. Corkscrew Swamp: Flatwoods and cypress swamp are developed upon a low plain, 15 to 25 feet in elevations. Soils are sandy.

m. Big Cypress Swamp: A rockland and marl plain with elevations largely below 16 feet. The wet to dry prairies, marshes and stunted cypress are distinctive features.

4. The Central Lake District

The uplifted limestones of the Floridan Aquifer lie unconformably below surficial sands. This is a sand hill karst with solution basins. It is the region of most active collapsed sink hole development. Because of the xeric hills and the internal drainage, this is the principle recharge area of the Floridan aquifer.

a. Perched Lakes and Prairies: Not geologically typical of the district in that Miocene limestone has influenced the karst development and the surficial sand is more clayey. Flatwoods and river swamp vegetation are predominant in the lower portions with sand hill type vegetation occurring on the low hills. The maximum elevation is 186 feet; the lake and swamp levels are at about 140 feet.

b. Interlachen Sand Hills: A direct hydraulic connection through thick sand and gravel deposits exists to the Floridan aquifer. The lakes are at or only slightly above the potentiometric level in the limestone aquifer. Elevations are up to 220 feet. A vegetation association of longleaf pine-turkey oak is prevalent.

c. St. Johns Offset: A portion of the St. Johns River Valley that is very ancient. It is partially filled with Pleistocene estuarine deposits. The Eocene limestone is very near the surface and solution has contributed to the development of the broad valley. Several large springs now discharge water from Wekiva northward to Salt Springs. Flatwoods occur on the Pleistocene terraces and a river swamp forest, generally with many cabbage palms, occurs on the flood plain.

d. Crescent City-Deland Ridge: Consists of sand hills with summits generally between 80 and 100 feet in elevation. Plio-Pleistocene sand and shell rest directly upon the Floridan Aquifer. The sand soils are very thick.

e. Ocala Scrub: Primarily a paleo sand dune field upon which sand pine thrives. However, the western portion is underlain by deeply weathered Upper Miocene sand and gravel deposits and the residual hills, without a

surficial dune sand cover, are forested with longleaf pine and turkey oak. The western hills are usually 130 to 160 feet in elevation; whereas, the eastern hills are largely below 85 feet.

f. Lynne Karst: An area of subdued relief, but with sand hills and lakes. The low hills are less than 100 feet in elevation. Miocene limestone has been involved in the karst development. Pine flatwoods occur, but longleaf pine and turkey oak are more common.

g. Central Lakes: Proportionally the area of large solution basins is nearly equivalent to that of the sand hills. The level of the water table lakes, marshes and wet prairies ranges between 60 and 70 feet in elevation; whereas, the longleaf pine-turkey oak covered hills are up to 100 feet higher.

h. Apopka Upland: A sand hills area modified by karst processes. The lakes that occur are small.

1. Mt. Dora Ridge: Consists of a linear belt of high, residual sand hills developed from weathering and erosion of the coarse clastics of Upper Miocene age. The hills are up to 185 feet in elevation.

2. Apopka Hills: Residual sand hills with the parent material containing more silt and clay. The deposits, now modified by weathering and erosion, are probably largely a seaward equivalent of the coastal deposits in the Mt. Dora Ridge. Most of the hills have elevations that are less than 150 feet.

i. Orlando Promontory: A karst area of comparatively low relief, but with many lakes. Most elevations are between 100 and 120 feet. Phosphatic sand and clayey sand occur at a shallow depth; however, deep weathering of the surficial sand has given rise to a longleaf pine and turkey oak woodlands.

j. Dr. Phillips Ridge: An anomalous ridge of high relief, the crest reaches 187 feet. There are many solution depressions with lakes. Thick residual sandy soils occur as well as dune sand.

k. Casselberry-Oviedo-Geneve-Chuluota Hills:

Isolated residual hills all less than 95 feet in elevation separated by terraced flatwoods and river swamps. The parent material for the thick residual sand soils on these hills is probably the same as that of the Crescent City-Deland Ridge.

l. Groveland Karst: An area of linearly oriented low sand hills and solution lakes in an advanced stage of planation. The area of the prairies, swamp and lakes exceeds that of the xeric sand hills. The prairies are at an elevation of slightly less than 100 feet and the highest hill is about 75 feet higher.

m. Green Swamp: Similar to the Groveland Karst, but much more of the surface has been reduced to the watertable level. Elevations are typically between 100 and 150 feet.

n. Winter Haven Karst: Genetically related to the Groveland Karst and to Green Swamp, but there are more large circular lakes and the tops of the hills are commonly 150 to 190 feet in elevation.

o. Bartow Embayment: A large erosional basin partially backfilled with the phosphatic sand and clay sand of the Bone Valley Formation of Pliocene age. All elevations are 150 feet or less. Flatwoods, a swamp forest and a lake occur in the basin.

p. Lakeland Ridge: Consists of sand hills forming a distinct ridge. Many solution depressions containing lakes exist. Much of the area is at or near 200 feet in elevation and one hill reaches 260 feet. Very deep weathering of phosphatic silty sand has resulted in a thick residual sand soil.

q. Lake Wales Ridge: This is the topographic crest of Central Florida. It consists of residual sand hills, relic beach ridges and paleo sand dune fields.

1. Sugar Loaf Mountains: Very high sand hills underlain by sand, gravel and clayey sand of Upper Miocene age that are now deeply weathered. Two of the hills are 310 feet high. The relative relief within the ridge is due to solution of the underlying limestone. As is true of many of the hills in central Florida, citrus groves now largely replace the native vegetation of longleaf pine-turkey oak.

2. The Gap: An area in an advanced stage of erosion. Much of the land surface is now about 120 feet in elevation; there are a few sand hills 40 to 60 feet high.

3. No Name Ridge: A depositional sand ridge little modified by surface runoff or karst processes. It crests at an elevation of 230 feet. The sand and silty sand in this ridge are now deeply weathered.

4. Iron Mountains: Residual sand hills similar to the Sugar Loaf Mountains, but the maximum elevation is 15 feet lower.

5. Eastern Complex of the Central Ridge: Contains some residual high hills (to 220 feet) and there are considerable amounts of Upper Miocene coarse clastics underlying the ridge. However, most of the surficial deposits and the relief features are related to Pliocene and Early Pleistocene beach ridges and paleodunes. Many solution basins, some with large lakes occur on the western margin. Sand pine is very common.

5. The Ocala Uplift District

This is the “Lime Sink Region” of the pioneers. Early Tertiary limestones are at or near the surface in most places. Structurally, this is a broad uplift that occurred in Middle and Late Tertiary time. The most distinctive features are the low rolling limestone plains, but the landscape is varied.

a. State Line Hills: Originally sculptured by southward flowing streams; they are now being modified by solution of the underlying limestone, especially in the valleys and lowlands.

1. Tallahassee Red Hills: Subsurface drainage has captured most of the surface runoff and there are large solution basins containing lakes, marshes and swamps. Clayey sands have weathered to a thick, red residual soil. Three hills reach elevations of 245 feet. The native vegetation is mixed forest.

2. Greenville Islands and Swamps: Similar to the Tallahassee Red Hills, but in a more advanced stage of planation. There are many isolated hills with a mixed forest surrounded by swamps and marshes. The level of the lowlands is about 100 feet in elevation. Very few of the hills reach 200 feet.

3. Cherry Lake Hills: An upland of rolling hills with perched lakes. A considerable portion of the hills is 170 feet or higher in elevation upon which is a mixed forest.

4. Madison Hills: A maturely dissected hilly upland. Rich, well drained soils support a mixed forest. Elevations are mostly less than 170 feet.

5. Jennings Hills: A heterogeneous area that is geologically transitional to northern peninsular Florida. A flatwoods area near Jennings is developed upon terrace deposits of Pliocene age (elevations about 150 feet). Other areas are largely hills dissected from Upper Miocene clastic sediments. The hills support a hardwood forest or a longleaf pine-turkey oak association depending upon the drainage and the thickness of the sandy soils.

b. Big Bend. Karst: An erosional limestone plain with some low hills consisting of surficial sand. Beaches are rare; salt marshes give way to the open water of the Gulf of Mexico. Some mangroves occur southward of the Cedar Keys. The low coastal plain is predominantly flatwoods and swamps:

1. Lake Munson Hills: An anomalous area of xeric sand hills with internal drainage. This division is probably genetically related to the paleodeltas of the Apalachicola River. It is not included with the Tallahassee Hills because it is coastward of an extension of the Colby Scarp. The elevation is in the range of 50 to 100 feet.

2. Woodville Karst: Largely a plain, but with some low sand and limestone hills. Many karst features, including a very large spring, occur. There are relic coastal features and a paleodune field. All elevations are less than 50 feet. Flatwoods predominate.

3. St. Marks Coastal Strip: A poorly drained erosional limestone plain with little elastic soil; a rockland upon which has developed swamps and flatwoods.

4. Keaton Beach Coastal Strip: A continuation of the low limestone plain, but there is a very large paleo sand dune field associated with a relic coastal feature. Flatwoods and longleaf pine-turkey oak are the prevalent woodland types.

5. Horseshoe Beach Coastal Strip: A limestone plain with increasing amount of elastic surficial deposits inward to Mallory Swamp. This is a very swampy flatwoods.

6. Cedar Keys Coastal Strip: Predominantly a low swampy limestone plain, but there are ridges and low hills of elastic sediment derived from the discharge of the ancestral Suwannee River. The Cedar Keys are all drowned relic sand dunes. One dune is 52 feet high. There is also an extensive dune field on the mainland.

7. Waccasassa Coastal Strip: This is the area of Gulf Hammock; a low limestone plain with some rockland upon which has developed a hardwood forest mixed with flatwoods and swamps.

8. Chassahowitzka Coastal Strip: A very low coastal strip of limestone rocklands mostly covered by hardwoods and swamps; there are some flatwoods. Elevations are typically 10 feet and less. Mangroves become increasingly significant along the rocky, flat coast.

c. The Flats and Swamps: Poorly drained terraces underlain by Plio-Pleistocene sand and clayey sand.

1. San Pedro Bay: A terrace generally 90 to 100 feet above mean sea level; clastic sediments are over 50 feet thick. Poor drainage exists, the surface water is perched. This is an extensive area of swamps and swampy flatwoods.

2. Mallory Swamp: A gentle erosional slope underlain by impermeable elastic sediments. There are more flatwoods than to the north on the San Pedro Bay terrace.

3. **Bell Sand Hills and Williford Flats:** A paleodune field exists westward of a poorly drained terrace of flatwoods and swamps underlain by sand and silty sand. The elevation range is between 70 to 90 feet.
4. **Waccasassa Flats:** Surficial clastic sediments overlie limestone; the elevation is all less than 56 feet. This is a flatwoods terrain.
- d. **Suwannee River Valley:** The erosional valley of the Suwannee River consisting of river swamps, terraced flatwood and erosional limestone plains.
 1. **Upper:** Youthful to submature valley with bluffs. Rock shoals and rapids occur in the river channel. Slopes are gentle to steep.
 2. **Lower:** The flood plain is a swamp forest. It is bordered on either side by well drained plains with varying amounts of surficial sand over limestone.
- e. **Northern Peninsular Plains:** Karst plains generally between 90 and 100 feet in elevation. In the southern portion a secondary level has developed at about 60 feet which is the water table.
 1. **McAlpin Plain:** A low rolling plain discontinuously covered by deeply weathered Plio-Pleistocene sand and clay deposits. Paleo sand dune fields exist along the western and southern margin. Drainage is internal. Longleaf pine-turkey oak is more common than a hardwoods forest or flatwoods.
 2. **Haile Limestone Plain:** A plain with low subdued hills. There is a very thin sand soil. There are pockets of terra rosa soil. This was originally a hardwoods forest.
 3. **Williston Plain:** Similar to the above, but with large solution basins containing lakes and marshes graded to the present watertable.
 4. **Alachua Prairies:** Solution has reduced much of this limestone terrain to near the present watertable. Lakes and marshes at about 60 feet above mean sea level are prevalent. The “prairies” and lakes have developed their own aquicludes, a green to bluish green, silty, clayey sand, thus the lakes are at times slightly perched.
- f. **Wellborn Uplands:** The westward dissected extremity of the Lake City Ridge. These are clastic capped hills of moderate to high relief.
 1. **Live Oak Hills:** Isolated outlying hills surrounded by karst; elevation to over 160 feet.
 2. **Rocky Creek Terrace:** A dissected terrace with elevation between 150 and 175 feet. It is probably underlain by Pliocene sediments.
 3. **Wellborn Hills:** A highland poorly dissected by both streams and solution. Thick deposits of sand, silty sand and clayey sands occur above the Ocala and the Suwannee Limestone. Typical elevations are between 180 and 202 feet.
- g. **Northern Peninsular Slopes:** Erosional slopes and hills developed along the western margin of the High Flatwoods. The land is well drained by both surface and subsurface drainage systems. Rich sandy soils developed upon the phosphatic sand and clayey sand of Miocene and Pliocene age originally supported a hardwood forest; however, places with thicker residual sand soils occur and woodlands of longleaf pine and turkey oak are common.
 1. **Lake City Karst:** An area of spectacular karst with several large lake basins. The drainage is internal and the hills are more xeric than to the south. The elevation range is between 90 and 170 feet.
 2. **Rose Creek Scarp:** An area of hills with moderate slopes developed on sand, silt and clay of Miocene age. Outcrops of Suwannee Limestone do occur. Both streams and solutions have contributed to the landscape. The hills are relatively lower, the soils are thicker and the area is more xeric than the San Felasco Hammock. The most common vegetation is probably longleaf pine and turkey oak.
 3. **San Felasco Hammock:** A broad scarp and karst terrain with many high hills. A hardwoods forest originally thrived on soils derived from weathering of Miocene and Pliocene clayey phosphatic sands. Elevations are to 195 feet.
 4. **Newnans Lake Basin:** A broad basin with very gentle slopes. The soils are derived from weathering of Pliocene phosphatic, clayey sands. Elevations are generally less than 125 feet. An anomalous sand hill, “Starvation Hill”, rises to an elevation of 162 feet.
- h. **Marion Hills:** Relic hills and hill systems of Miocene and Pliocene clastic sediments with karst terrain intervening.
 1. **Fairfield Hills:** An extensive area of high, spectacular hills, forested with hardwoods. One hilltop reaches an elevation of 202 feet.

2. Anthony Hills: Low hills developed where lower Miocene clay is thin or nonexistent and sands and clayey sands of Upper Miocene rest directly on the limestones. The residual sandy soils support a xeric vegetation of

longleaf pine and turkey oak. Only a few hills exceed an elevation of 100 feet.

3. Kendrick Hills: Low limestone hills capped with outliers of Lower Miocene limestone and clay with karst terrain in the lower areas. The most common elevation range is 80 to 120 feet, but there are hills to 180 feet.

4. Ocala Hills: An isolated area of hills similar to the Fairfield Hills. Elevations are between 100 and 184 feet.

5. Cotton Plant Hills: A small outlier of Miocene clays caps a small group of hills, the maximum crest elevation is 168 feet.

i. Oklawaha Valley: Erosional valley partially backfilled with Plio-Pleistocene estuarine deposits; a poorly drained flatwoods terrace (elevations about 80 feet) borders the river swamp.

j. Newberry Sand Hills: Deeply weathered and leached Miocene sand and clay rests directly upon the Ocala Limestone. Drainage is internal and the xeric sand hills are a vast woodlands of longleaf pine-turkey oak. Elevations are generally between 80 to 150 feet; one isolated hill of clayey sand has an elevation of 182 feet.

k. Hernando Hammock: Outliers of Suwannee Limestone are common; the most characteristic features; however, are the thick deeply weathered deposits of sand and clayey sand that have largely buried these pre-Upper Miocene relics. Typically, the elevation range is 100 to 160 feet. One hill is 226 feet high.

1. Weeki Wachee Dune Field: An area of paleo sand dunes and solution basins. Elevations are all lower than 90 feet. Sand pine and longleaf pine-turkey oak both occur.

m. Tsala Apopka Basin: An erosional valley in a limestone terrain. The surficial sands are generally thin. In some areas, recent freshwater marls and peat have been deposited. The area is a maze of islands, swamps, marshes and lakes. Flatwoods are typical of the land portions.

n. Webster Limestone Plains: An erosional plain of low relief. Almost all elevations are less than 100 feet.

1. Dry Plain: A plain of low relief dipping slightly westward. A thin veneer of clastic sand covers the limestone. Only during very wet years and very high watertables do shallow temporary lakes exist in the solution depressions. Drainage is internal.

2. Wet Plain: A plain genetically similar to the Dry Plain, but the water table is at or above the land surface so that swamps and flatwoods are extensive. This is the headwaters of the Withlacoochee and Hillsborough Rivers.

o. Brooksville Hills: (the term Brooksville Ridge should be abandoned). An area of very high hills capped by Lower Miocene clay. The isolated hills are separated by karst and sand hills. Several of the hills are over 200 feet in elevation and it is common for them to be 100 feet or more above the surrounding land. A hardwood forest thrives on the hills.

p. Masaryktown Slope: A sloping plain with elevation below 100 feet. The surficial sand over the limestone is thin.

q. Dade City Hills: A spectacular ridge of high hills dissected from Upper Miocene sand and silty sand. Drainage is downward to the Floridan aquifer and solution is now the dominant process influencing the landscape. Deep weathering has produced thick sand soils. Many hills are above 200 feet in elevation; one reaches 301 feet.

r. Tampa Plain: The karst features in these lowlands are related to the occurrence of the Tampa Limestone.

1. Land-O-Lakes: A plain with elevations between 50 and 80 feet. There are many small lakes despite the fact that the silty sand overlying the limestone is moderately thick.

2. Odessa Flats: The Anclote River watershed, a poorly dissected low sand plain. Flatwoods occur in most places except near the coast where there are some paleodunes.

3. Lake Tarpon Basin: An erosional basin partially backfilled with Late Pleistocene sediments. All elevations are less than 30 feet.

s. Hillsborough Valley: An erosional basin that is the watershed of the Hillsborough River. Sluggish surface drainage still is dominant, but there are many karst features in this valley in which much of the surficial clastic sediments has been removed. Except for the relief in the headwaters, a considerable portion is best termed a plain.

6. Tifton Upland District

This is a structurally controlled upland; the district should be restricted to only those areas in Florida and Georgia underlain by the Gulf Trough.

a. Quincy Hills: A very thick sequence of Lower Miocene clay and clayey sand underlie this area. Surface drainage has sculptured the relief features. In Florida, some of the hills approach an elevation of 300 feet. Thick residual silty and clayey soils support a mixed forest.

7. Dougherty Karst District

The Early Tertiary limestones are near enough to the surface to have influenced the landscape development; this is the area of the Marianna Structural High (formerly called the Chattahoochee Arch).

a. Marianna Red Lands: A landscape of low, rolling hills; however, there are some high hills. Generally the elevation range is between 90 and 200 feet. South of Chipley, there is a hill 322 feet high. The soils are typically red residual soils with clay developed on the limestones or from weathering of surficial clastic sediments.

1. **Grand Ridge:** Topographically very little different from the limestone terrain. This appears to be an area sculptured from high level river terrace deposits, now highly weathered and eroded. Near Ocheesee Pond, the karst and high hills are probably genetically related to the Compass Lake Highlands.

2. **Limestone Terrain:** Solution is now the dominant process modifying the landscape, but in the past, stream erosion and deposition was more important. This is not a plain or a lowland, it is a varied landscape with hills and ridges.

b. Compass Lake Highlands: A belt of high sand hills developed upon thick sand, sandy clay and gravel deposits. Deep weathering has occurred. Drainage is internal and downward to the Floridan Aquifer. The present relative relief is the result of solution. The tops of the hills are between 200 and 300 feet in elevation.

c. Crystal Lake Karst: An area of coastal "terrace" deposits that have lost their identity because of weathering and extensive karst development. Clastic deposits of Plio-Pleistocene age overlie a limestone of Miocene age. Elevations are typically 90 to 190 feet. The hills are covered by longleaf pine and turkey oak.

d. Bonifay Karst: River terrace deposits of Plio-Pleistocene age and highly eroded and weathered Upper Miocene clastic sediments overlie Early and Middle Tertiary limestones. They are now partially modified by karst processes. A large portion of the land surface is less than 100 feet in elevation and all but a few hills are below 200 feet. Except for the river swamp, drainage is generally good. A mixed forest is common.

e. De Funiak Karst: A hilly upland with elevations between 200 and 300 feet that contains a surprising number of solution basins and other karst features. Stream erosion is still very important. A mixed forest is predominant as the soils have, in large part, originated from deposits containing silt and clay.

8. Apalachicola Delta District

The river terraces and the cusped deltas, past and present, of the Apalachicola River are the base for distinguishing this district. It is a clastic terrain with no karst, thus is atypical of the Florida Section.

a. Paleodelta Relics: Weathered and partially eroded relics of Upper Miocene and Pliocene accretion from the initial development of a depositional cusped foreland. The deposits are sand and silt with subordinate amounts of clay and gravel.

1. **Betts Delta:** The relics of this initial stage of accretion are typically above 200 feet in elevation. Longleaf pine-turkey oak occurs upon the residual thick sand soils.

2. **Fountain Delta:** The elevation range of this second phase of accretion is between 150 and 190 feet. The soils and vegetation are similar to those of the Betts.

3. **Hosford Delta:** An increment of beach ridges overlying fossiliferous silty sand and silts of Pliocene age. Elevations between 80 and 150 feet occur. The beach ridge plain of this delta is conspicuously warped downward toward the present cusped foreland, which is the depo-center of a considerable thickness of sediments of Miocene, Pliocene and Pleistocene age.

4. **Norfleet Ridge:** A ridge of sand, silt and clay. Probably Late Miocene in age, with some Plio-Pleistocene surface sand deposits. That the course of the Ochlocknee River abruptly shifts westward just north of this feature, suggests in the final stage of deposition, what is now the crest of a ridge, was a spit that accreted westward.

b. River Terraces: Alluvial plains now somewhat modified by erosion. Terraces with elevations 200 to 220 feet and 130 to 140 feet can readily be distinguished.

c. Delta Plain: A very poorly drained, gently sloping plain. All elevations are less than 90 feet. Surficial deposits are sand and silt. The recent flood plain is swamp. Flatwoods and swamp forests exist elsewhere.

d. Coastal Strip: Seaward of a scarp with a toe at about 18 feet in elevation is a relic lagoon-barrier island complex that forms the present margin of the existing cusped foreland. Offshore barrier islands and St. Josephs

Spit have formed during Recent time. The Apalachicola River is now building a bay head delta; whereas, the drowned valley system to the west which is St. Andrews Bay, is receiving little land derived clastic sediment.

GULF COASTAL PLAIN SECTION

This is a province of clastic sediments and rocks that is very thick. It is structurally related to the Gulf Coast Geosyncline.

1. The Southern Pine Hills District

The uplands are sculptured from an alluvial plain underlain by sand, gravel, silt, and clay.

a. Blackwater Hills: A mature landscape dissected by south-southwestward flowing streams. The tops of ridges and hills are mostly 200 to 300 feet in elevation (one hill reaches 345 feet).

b. Escambia Terraced Lands: Similar to the Blackwater Hills but the uplands are less eroded and the parent materials for most of the soils contain less silt and clay. It is difficult to impossible to distinguish river terrace deposits from those of the Upper Miocene alluvial plain.

c. Milton-Crestview Ridge: A broad, arcuate belt marginal to the above units. It occurs as a distinct broad ridge which is, for the most part, bounded on the north and south by stream valleys. The upper sand is interpreted to be a belt of accreted coastal deposits now modified by weathering. Longleaf pine and turkey oak form the native woodlands. The crest of the ridge is usually above an elevation of 200 feet. There is evidence of post depositional subsidence in the western portion.

d. Eglin Ridge: This would appear to be a composite of two coastal increments deposited during the Fountain (Late Miocene) and the Hosford (Pliocene) phases of the Apalachicola Delta. As with the Milton-Crestview Ridge, westward tilting toward the depocenter of the Gulf Coast Geosyncline has occurred.

1. Eastern Clay Hills: Because of relative uplift, the eastern portion of the ridge is more deeply eroded and soils with clay are common. Elevations in the Miocene belt are typically over 200 feet; whereas, in the Pliocene increment, they are mostly between 100 and 170 feet.

2. Western Sand Hills: The two increments are less eroded by surface streams and are more evident. The soils are thick sands.

e. Coastal Strip: Because of downwarping, the intermediate coastal "terraces" of middle Pleistocene age and older are not present. Rather the relic lagoon and barrier island features along the coast occur coastward of an abrupt scarp with a toe elevation of 20 to 25 feet.

References Cited

- Cooke, C.W., 1939. Scenery of Florida, Fla. Geol. Survey, Bull. 17, 118 p.
- Davis, J.H., 1943. The natural features of southern Florida, Fla. Geol. Survey, Bull. 25, 311 p.
- Fenneman, N.M., 1938. Physiography of eastern United States, McGraw Hill, N.Y., 691 p.
- Harper, R.M., 1914. Geography and vegetation of northern Florida, Florida Geol. Survey, 6th Ann. Rept., 302 p.
- Harper, R.M., 1921. Geography of central Florida, Fla. Geol. Survey, 13th Ann. Rept., p. 71-288.
- Matson, G.C. and Sanford, S., 1913. Geology and ground waters of Florida, U.S. Geol. Survey, Water Supply Paper 319, 445 p.
- Shaler, N.S., 1890. The topography of Florida, Bull. Mus. Comp. Zool., Harvard U., geol. ser., v. 16, 139-158.