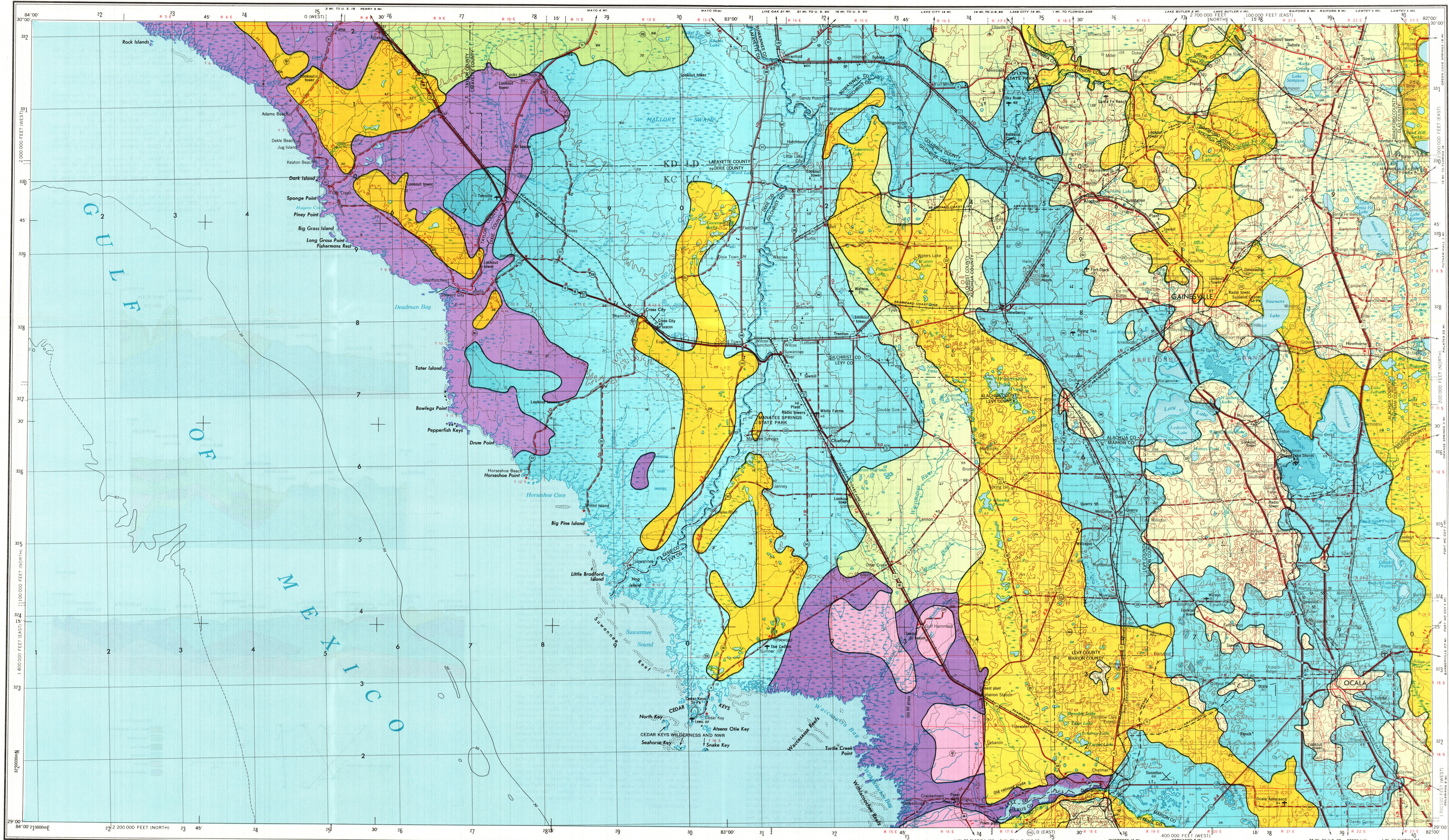




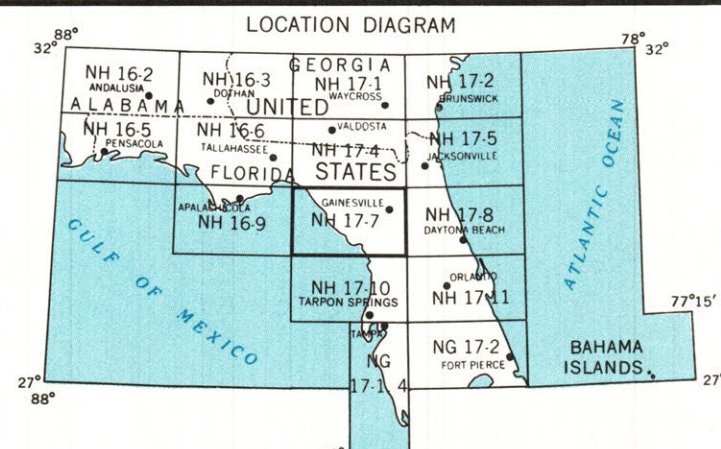
Each area outlined on this map may consist of more than one kind of sub-surface sediment. The map is thus meant for general planning rather than a basis for decisions on the use of specific tracts.

DEPARTMENT OF NATURAL RESOURCES
BUREAU OF GEOLOGY
This public document was promulgated at a total cost of \$1,995.00 or a per copy cost of \$.80 for the purpose of disseminating geologic data.

EXPLANATION

- Clayey Sand
- Sand
- Limestone
- Dolomite
- Limestone/Dolomite

Scale 1:250,000
CONTOUR INTERVAL 50 FEET
WITH SUPPLEMENTARY CONTOURS AT 25 FOOT INTERVALS
ENVIRONMENTAL GEOLOGY SERIES
GAINESVILLE SHEET



SECTIONIZED TOWNSHIP											
6	5	4	3	2	1						
7	8	9	10	11	12						
18	17	16	15	14	13						
19	20	21	22	23	24						
30	29	28	27	26	25						
31	32	33	34	35	36						

GRID ZONE DESIGNATION: 17R
TO GIVE A STANDARD REFERENCE ON THIS SHEET TO NEAREST 100 METERS
SAMPLE POINT: TELLERIDGE
Read letters identifying 100,000 meter square in which the point lies
Locate first VERTICAL, and line to LEFT of point and read LARGE figure labeling the line either in the top or bottom margin, or on the line itself
Estimate tenths from grid line to point
Locate first HORIZONTAL, and line BELOW point and read LARGE figure labeling the line either in the left or right margin, or on the line itself
Estimate tenths from grid line to point
If reporting bearing 180° in any direction, prefix Grid Zone Designation, as:
32°0000
17R/17R

ENVIRONMENTAL GEOLOGY SERIES
GAINESVILLE SHEET

By

Michael S. Knapf

FLORIDA DEPARTMENT OF NATURAL RESOURCES
DIVISION OF RESOURCE MANAGEMENT
BUREAU OF GEOLOGY

TALLAHASSEE

1978

INTRODUCTION

Development of guidelines for wise management of Florida's natural resources depends upon a good working knowledge of the State's geology as it relates to man's environmental problems. Management decisions must be based upon adequate geologic data for such fields as waste disposal, water resources management, land management, highway construction, geologic hazards, soils mapping, mining and reclamation. Environmental geologic maps provide the basic data needed for the creation and execution of sound programs in the above-mentioned fields. It is hoped that this map will not only serve the purpose for which it is intended but will also serve as a base map for future presentation of geologically related data of a more specialized or local nature. The ultimate purpose of the State's environmental geology mapping program is to insure development of Florida's natural resources with the least possible environmental damage.

This map presents geologic data in such a way that it can be understood by persons not specially trained in the science of geology. Common rock types are shown as they occur from just below the soil zone to depths of expected use for most purposes. Mapping involved aerial photographic and topographic interpretation and field work (visiting quarries, borrow pits, canals, road cuts and other rock exposures) to provide the necessary data points. Use was also made of all published and unpublished data in the files of the Florida Bureau of Geology plus published reports of the U. S. Geological Survey and the U. S. Soil Conservation Service.

ACKNOWLEDGEMENT

Sincere appreciation is expressed to Dr. E. C. Pirke, of the University of Florida, who gave freely of his time and geologic data during the preparation of this map.

REGIONAL SETTING

The sediments in the area of this study are dominated by a subsurface feature of Tertiary age known as the Ocala uplift or Ocala high. This structure was documented by Vernon (1951, pp. 54-58) as "a gentle flexure approximately 230 miles long and about 70 miles wide, where exposed in central peninsular Florida." Eocene and Oligocene limestones associated with this feature are exposed extensively throughout the map area; Miocene and younger sediments are also present forming the dune and highland areas.

The two major physiographic divisions in the map area, as proposed by Puri and Vernon (1964), are the Central Highlands and the Coastal Lowlands. The Central Highlands trend northward from the vicinity of Dunnellon and are made up of the following geomorphic features: the Brooksville Ridge, Fairfield Hills, Bell Ridge, High Springs Gap, Dunnellon Gap, Sumter Upland, Ocala Hill, Martel Hill, Cotton Plant Ridge, and finally, the Northern Highlands. The Coastal Lowlands consist of such features as the Chiefland Limestone Plain, various river valley lowlands, the Waccasassa Flats, and coastal terraces.

Location and Extent—The map area is bounded geographically on the west by the Gulf of Mexico and on the east by the meridian of longitude 82° West. The northern and southern boundaries respectively are the parallels of latitude 30° North and 29° North. The counties shown in their entirety are Levy, Dixie, Gilchrist, and Alachua. Other counties only partially shown are Taylor, Lafayette, Suwannee, Columbia, Union, Bradford, Clay, Putnam, Marion and Citrus. The major rivers running through the area are the Suwannee, Santa Fe, Ochsnee, New and Old rivers.

Population and Development—The map area totals approximately 4,725 square miles and has a population density of 38 people per square mile. Most of the land, however, contains fewer residents than the average because the population is concentrated around the major cities. The 1970 census by county is: Alachua - 104,764 with 68% urban; Marion - 69,030 with 40.4% urban; Levy - 12,756 with no urban; Dixie - 5,480 with no urban; Gilchrist - 3,551 with no urban; Taylor - 13,641 with 56.5% urban; Lafayette - 2,892 with no urban; Bradford - 14,625 with 33.1% urban; and Union - 8,112 with no urban. By comparing the 1960 census with the 1970 census a growth rate for each county has been ascertained. From the largest population increase to the smallest, the rates are: Alachua, 41.4%; Union, 34.2%; Marion, 33.7%; Gilchrist, 23.8%; Levy, 23.1%; Dixie, 22.3%; Bradford, 17.5%; Taylor, 3.6%; and Lafayette, 0.1%.

Gainesville is the largest and fastest growing city in the area. Its 1970 population of 64,510 resulted from a 117% population increase between 1960 and 1970. Gainesville has the distinction of being the home of the University of Florida since 1853. Ocala, with a population of 22,583, is the next largest city in the area and has had a 66% increase in population from 1960 to 1970. Some of the other important towns with more than 1,000 population are Trenton, Chiefland, Alachua, Cross City, Williston, Starke, Newberry, Lake Butler, High Springs, Hawthorne, and Dunnellon.

Industry and Transportation—Being a predominantly rural area, the major industries are agriculture and forestry. The principal crops grown are corn, watermelons, peanuts, peppers, potatoes, cucumbers, and tobacco. Cattle, swine, and poultry farming also are important economic factors in this district. Large tracts of land, abundant with planted pines and some native hardwoods, help to make forestry a major contributor to the economy of the area. Limestone quarrying operations are also in existence, with most of the limestone being crushed and used as aggregate for highway construction.

The two major four-lane highways traversing the area are Interstate 75 and U. S. Highway 19. Interstate 75 is a north-south route which crosses Marion County near Ocala and Alachua County near Gainesville. U. S. Highway 19 is also a north-south route and more or less parallels the coastline through Levy, Dixie, and Taylor counties. Numerous other state and county roads criss-cross the map area.

The major cities as well as most of the rural areas are served by railroads and bus lines. This district has the distinction of having the first cross-state railroad line. In 1860 the Florida Railroad linked Fernandina, on the east coast, with Cedar Keys on the west. Commercial air service is available at Gainesville and Ocala and there are several smaller airports in the rural communities of the area.

Climate—The average annual temperature for the area is approximately 71° F with July and August being the hottest months. The average annual precipitation is approximately 49.5 inches, but differs markedly from year to year. The record for rainfall over a 24-hour period in Florida is held by Yanketown, located on the coast in southwest Levy County. This municipality received 38.7 inches of rainfall on September 5-6, 1950. Since 1888 this area has had six reported hurricanes come ashore on its Gulf Coast.

GEOLOGIC DISCUSSION

Surface deposits of west central Florida are mostly limestones which resulted from marine deposition during the Eocene epoch (deposited from 58 to 36 million years ago) and the Oligocene epoch (deposited from 36 to 25 million years ago). These limestones are covered by Miocene to recent sands and clays (dated from 25 million years ago to present) of variable thicknesses with the highland areas being composed of a consistently thicker sequence. Most of the exposed limestone belongs to the late Eocene Ocala Group, although, in the vicinity of Gulf Hammock there are exposures of the late Middle Eocene Avon Park Limestone. The Avon Park Limestone is the oldest outcropping formation in Florida. Other Tertiary limestones outcrops in the map area belong to the Suwannee Limestone of Oligocene Age and the Hawthorn Formation of Miocene Age.

In south-central Levy County dolomite is exposed consistently enough to be delineated into three areas. On surface exposure these dolomites can generally be described as tan to brown, very dense, poorly fossiliferous, and massive. They can also be very finely crystalline and occasionally laminated (resembling siltstone) with plant remains between the dolomite layers. The dolomite, as represented on the map, is associated with the Avon Park Limestone. The environments favorable for the deposition of the Avon Park Limestone are described by Vernon (1951) as "shallow coastal bays, beaches, and marine shelves where almost no elastic material was being deposited." In the map area the Avon Park Limestone was apparently dolomitized subsequent to deposition, thus making it very difficult to recognize fossils and structures indicative of a particular environment. On cross section CC' the lower continuous dolomite bed and some of the limestone-dolomite beds in southern Levy County are associated with the Avon Park Limestone. The limestone-dolomite lithology is exposed in parts of Levy, Dixie, and Taylor counties. Being equated with this lithology means that for any given locality the type of carbonate rock that is encountered will vary from limestone to a dolomite and will exhibit differing degrees of recrystallization. In Levy County the limestone-dolomite lithology is associated with the Inglis Formation, one of three separate stratigraphic units within the Ocala Group. This formation surrounds the Avon Park Limestone in outcrop pattern and is recognized primarily by its abundant echinoid fauna. In southwestern Dixie County and around the Steinatchee River a dolomite lense occurs in the basal section of the Upper Ocala Crystal River Formation. This lense is informally termed the Steinatchee dolomite member and outcrops continuously along the coast from Horseshoe Beach to the Steinatchee River. The contact with the Crystal River Formation can be seen in several embankments along the Steinatchee River. The Steinatchee dolomite member crops out irregularly with limestones of the Crystal River Formation and is therefore equated with the limestone-dolomite lithology. North of the Steinatchee River extending into Taylor County the limestone-dolomite lithology is associated with the Suwannee Limestone. In Taylor County the Suwannee is normally a highly recrystallized granular limestone, except along the coast where it contains a large amount of dolomite. On cross section CC' the Suwannee Limestone is equated with the limestone-dolomite lithology which underlies much of Taylor County and pinches out against the limestone lithology in Dixie County.

Limestone, as depicted on the Environmental Geology Map, occurs in the Williston Formation, the Crystal River Formation, and the Suwannee Limestone. The Williston Formation forms a band around the Inglis Formation extending into western Marion, northern Levy, and southern Dixie counties. The Williston Formation is recognized by having more granular textures and higher porosities than the Inglis or Crystal River and generally it is harder than the Crystal River and softer than the Inglis. The faunal make-up of the Williston can be described as a transitional bed between the Inglis and Crystal River, consisting of a few species of marine organisms that are common to the Inglis and many others belonging to the Crystal River. The Crystal River Formation crops out from the vicinity of the Steinatchee River across Lafayette, Dixie, and Gilchrist counties to southeastern Alachua and eastern and southern Marion counties. The Crystal River lithology can be described as a very fine grained, chalky, porous, cream colored limestone which contains many large foraminifers and mollusks. On the cross sections the Crystal River and Williston are associated with the limestone lithology lying close to the surface. The limestone lithology associated with the Suwannee Limestone crops out in southern Columbia and Suwannee counties and is normally a hard, cream to yellow, massive, chalky limestone with numerous echinoids. The limestones throughout the map area are generally very high in calcium carbonate content. Occasionally the limestone has been silicified and is commonly called chert.

The clayey sands overlying the Tertiary limestones and forming much of the highland areas in north central Florida are commonly associated with sediments of Miocene age. More specifically, a Miocene unit called the Hawthorn Formation is exposed on the map in the northeast quadrant and in parts of Marion County. The Hawthorn is of a very diverse lithologic nature. It is composed of interbedded sands, clayey sands, sandy clays, dolomites, and limestones, which are all intermixed with phosphate grains of variable sizes. The Hawthorn is represented on cross section B-B' as clayey sands containing lenses of limestones and dolomites. These lenses of carbonate and clastic sediment pinch-out over the Ocala Limestone in what is apparently a deeply solutioned cavity in the vicinity of Orange Lake. The Hawthorn in peninsular Florida is thought to be largely a result of near shore marine deposition during Miocene time. The clayey sands which crop out in Gilchrist, western Alachua, and Levy counties belong to the Alachua Formation. The Alachua is of upper Miocene, possibly Pliocene age, and like the Hawthorn is of a very diverse lithology. It is a mixture of sands, clayey sands, and sandy clays. The Alachua has been mined in many localities in the map area for the hard rock phosphate that is commonly found in its lower section.

The fine to medium sands and silts, which cover almost the entire map area, are associated with Pliocene and Pleistocene sea level stands. These sands were only mapped where they had attained an appreciable thickness (at least 8 to 10 feet). The limestone surface throughout the map area is extensively pinnacled because of solution, and outcrops of the top of the limestone are quite variable in elevation. The lower elevations, including the coastal areas, have more consistent outcrops of limestone than the upland areas. Dolomitization and silicification make limestones in some areas more resistant to dissolution. An example of this can be seen west of Gainesville and in some areas of Marion County where residual silicified limestone boulders can be seen embedded in a clayey sand matrix above a more deeply buried limestone surface. The original limestone surface having been lowered, the more resistant materials are then left at the surface. Apparently, the karst surface has been developing from Miocene to Recent times when the limestone surface was above sea level and exposed to weathering and solutioning agents. Subsequent sea level transgressions are responsible for much of the dolomitization and some areas, such as Gulf Hammock, may have existed as more resistant limestone islands at certain times.

PHYSIOGRAPHY

The Florida peninsula has been divided into three distinct geomorphic zones by White (1970). These zones are the northern or proximal zone, the central or mid-peninsular zone, and the southern or distal zone. The map area falls primarily into the central zone, with the northeastern section directly northwest and east of Gainesville belonging to the northern zone. Characteristically, the central zone is a series of ridges and valleys which runs parallel to the peninsula coastline. The northern zone is the continuous highland area running from the St. Johns River Valley to the panhandle of the state.

The western portion of the map is part of the physiographic province known as the Gulf Coastal Lowlands. These lowlands begin at the present coastline and extend eastward to eastern Gilchrist, central Levy, and central Suwannee counties, bounded by the Brooksville Ridge on the east and the Northern Highlands on the north. Within the boundaries of the Gulf Coastal Lowlands there are several river valley lowlands and three marine terraces. These terraces and associated sand bars and dunes begin with the youngest, are the Silver Bluff, Pamlico, and Wicomico.

The Silver Bluff shoreline is considered to be at an elevation of 10 feet on topographic maps. In Levy County, the Silver Bluff terrace is associated with a coastal marsh belt. This marsh belt, extending from the Withlacoochee River Valley lowlands to the Suwannee River Valley lowlands, is composed primarily of Pleistocene to recent marine sediments underlain by limestones and dolomites at a shallow depth. In Dixie County, the Silver Bluff terrace extends inland as far as six miles and is also represented by coastal marshes. The Silver Bluff terrace is very narrow in the portion of the Taylor County coast shown on the map.

The Pamlico sea, which probably attained an elevation of 25 feet, left a distinctive mark on Taylor County in the linear arrangement of a series of 15- to 50-foot high dunes that parallel the coast. The toe of this strand line is marked by a 10-foot contour line, indicating that the Silver Bluff and Pamlico sea in this area did not extend inland to any great extent. In Dixie County, the Pamlico escarpment is less well defined, but the terrace can be considered to exist between the 10-foot and 25-foot contours. The northern extremity of the sand lithology that parallels the Suwannee River in Dixie County is thought to be a dune belt associated with the Pamlico and Pamlico sea in this area did not extend inland to any great extent. In Dixie County, the Pamlico escarpment is less well defined, but the terrace can be considered to exist between the 10-foot and 25-foot contours. 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