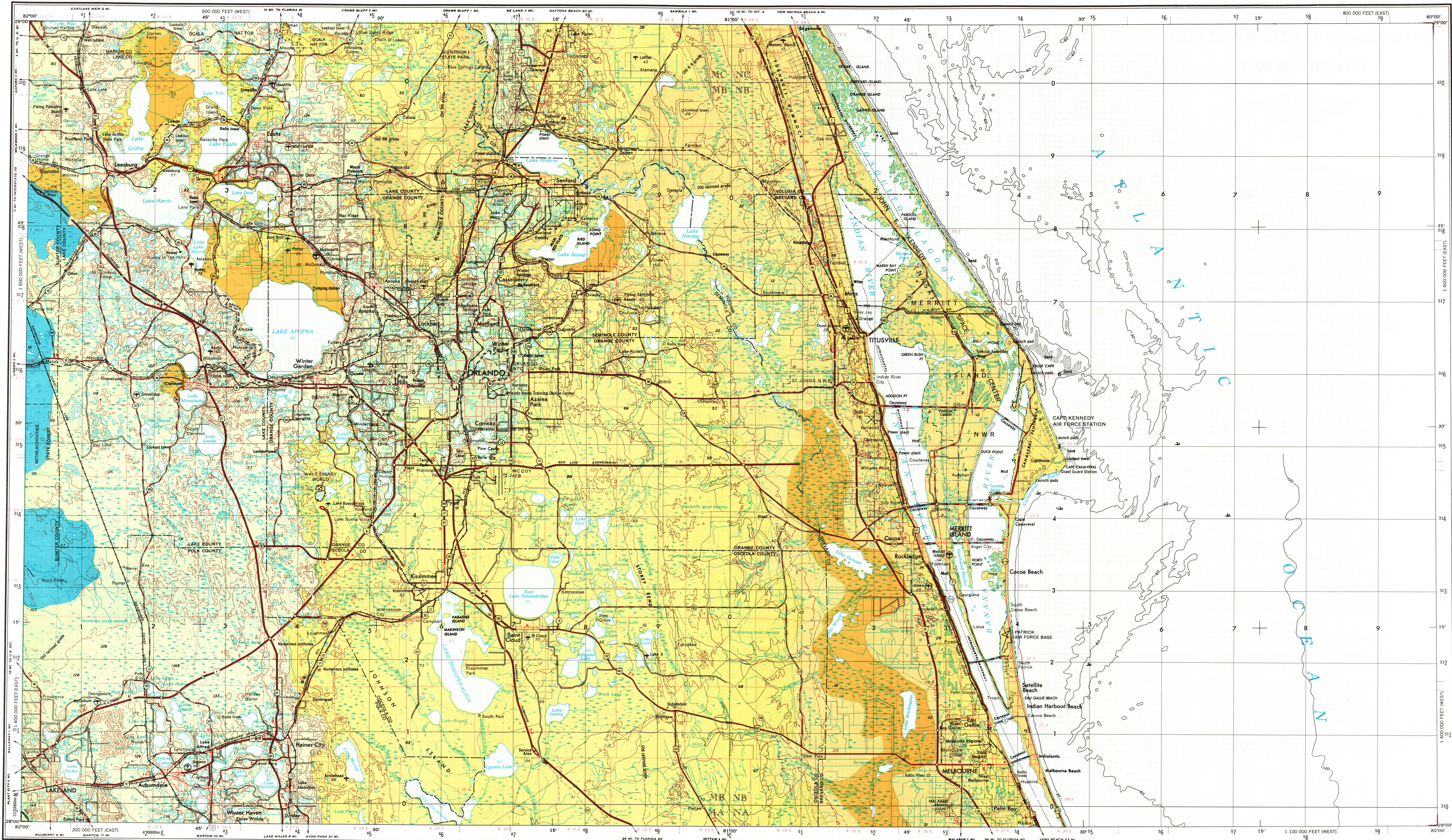


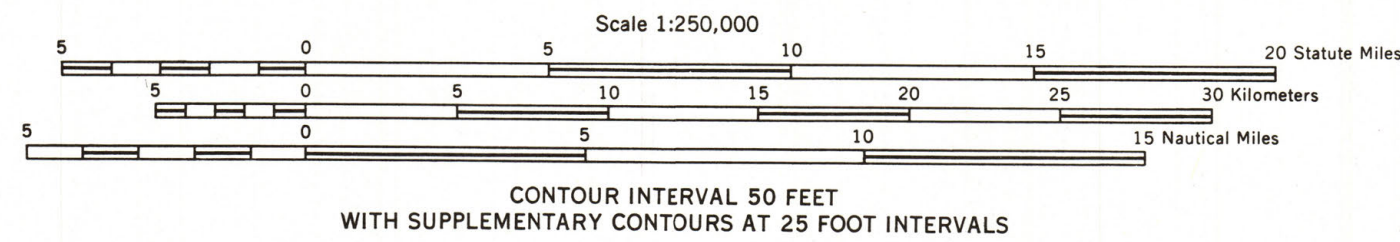


Each area outlined on this map may consist of more than one kind of sub-surface sediment. The map is thus meant for general planning rather than a basis for decisions on the use of specific tracts.

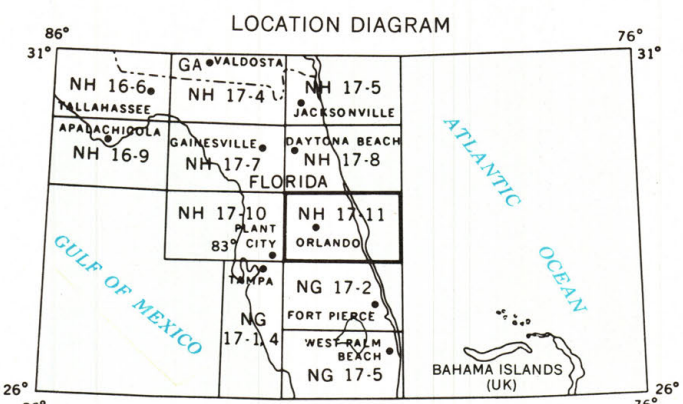
DEPARTMENT OF NATURAL RESOURCES
BUREAU OF GEOLOGY

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- EXPLANATION
- Med.-Fine Sand and Silt
 - Clayey Sand
 - Shelly Sand and Clay
 - Limestone
 - Peat



ENVIRONMENTAL GEOLOGY SERIES
ORLANDO SHEET



SECTIONIZED TOWNSHIP

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

GRID ZONE DESIGNATION: 17R

100,000 M. SQUARE IDENTIFICATION

MC	NC	350
MB	NB	360
MA	NA	370

TO GIVE A STANDARD REFERENCE ON THIS SHEET TO NEAREST 1000 METERS

SAMPLE POINT: CHRISTIAN

1. Read letters identifying 100,000 meter square in which the point lies.

2. Locate first VERTICAL grid line to LEFT of point and read LARGE figure labeling the line either in the top or bottom margin, or on the line itself.

3. Estimate tenths from grid line to point.

4. Locate first HORIZONTAL grid line below point and read LARGE figure labeling the line either in the left or right margin, or on the line itself.

5. Estimate tenths from grid line to point.

6. If reading nearest 500 m. in any direction, prefix Grid Zone Designation, as:

17RMB9857

TOWNSHIP OR RANGE LINE

LAND GRANT BOUNDARY

ENVIRONMENTAL GEOLOGY SERIES

ORLANDO SHEET

By
Thomas M. Scott
FLORIDA DEPARTMENT OF NATURAL RESOURCES
DIVISION OF RESOURCE MANAGEMENT
BUREAU OF GEOLOGY
Tallahassee
1978

ORLANDO
REGIONAL SETTING

The study area is located in east central peninsular Florida, east and southeast of the crest of the Ocala uplift or Ocala high. It encompasses various structural features proposed by Vernon (1951) including the Ocala Low, the Kissimmee Faulted Flexure and the Sanford High. The area is underlain by extensive deposits of Eocene limestone covered by younger dolomites, limestones, sands, clays and shell beds. Dissolution of limestone and marine processes are the predominant forces responsible for the development of the surface features found in the map area.

Two major generalized physiographic divisions occur within the map area. As named by Puri and Vernon (1964), they are the Central Highlands and the Coastal Lowlands. The Central Highlands form approximately the western one-third of the map area while the remaining two-thirds are the Coastal Lowlands. The highland area includes such physiographic features as the Marion, Sumter and Lake Uplands; the Mount Dora, Lake Wales, Winter Haven and Lakeland Ridges; and the Central Valley. The Coastal Lowlands are comprised of features such as the Eastern Valley, St. Johns River, Deland Ridge, Atlantic Coastal Ridge, Geneva Hill, the Osceola Plain, and various lagoons and chains of barrier islands.

Location and Extent—The map area is bounded on the east by the Atlantic Ocean and on the west by the longitudinal meridian of 82° west. The northern boundary is the parallel of latitude 29° north while the southern boundary is the parallel of 28° north latitude. The counties shown on the map either in their entirety or partially are Brevard, Lake, Marion, Orange, Osceola, Polk, Seminole, Sumter and Volusia. Major rivers of the area include the St. Johns, Oklawaha, Kissimmee, and the Big and Little Econlockhatchee Rivers. The area included on the map totals approximately 5,900 square miles.

Population and Development—The map area covers approximately 5,900 square miles with an average population density of 200 people per square mile (based on 1970 estimates). However, much of the total population is concentrated near the major cities of the region. The 1970 census reveals the following population by county: Brevard, 230,006; with 45% urban; Lake, 69,305 with 43.4% urban; Marion, 69,030 with 40.4% urban; Orange, 344,311 with 83.2% urban; Osceola, 25,267 with 48.1% urban; Polk, 227,222 with 60% urban; Seminole, 83,692 with 62.1% urban; Sumter, 14,839 with no urban; Volusia, 169,487 with 70.4% urban. A comparison of the 1960 census and the 1970 census gives the growth rates for each county. The rates, from greatest increase to least increase, are as follows: Brevard 106%; Osceola, 52.9%; Seminole, 52.3%; Marion, 33.7%; Orange, 30.6%; Sumter, 25%; Lake, 20.8%; Volusia, 20%.

The largest cities of the map area are: Orlando, 99,006; Lakeland, 41,550; Melbourne, 40,236; Titusville, 30,515; Sanford, 17,393; Cocoa, 16,101; Leesburg, 11,869; Deland, 11,641; New Smyrna, 11,580; Kissimmee, 7,189. Only one state university is located in the map area. Florida Technological University, located east of Orlando in Orange County, opened in 1968 and by 1974 had an enrollment of 10,589.

Industry and Transportation—The industry of the area is quite varied, ranging from tourism to extensive agricultural interest. Tourism is one of the greatest factors influencing the area's economy. Attractions such as Disney World, Kennedy Space Center, and the many beaches draw numerous vacationers. Agriculture is another important economic factor with citrus being the most important product. This area constitutes one of the major citrus producing areas of the United States, utilizing nearly 840,000 acres for citrus crops in 1970. Truck farming and cattle provide other major important economic activities. Agriculture is another important economic factor with citrus being the most important product. This area constitutes one of the major citrus producing areas of the United States, utilizing nearly 840,000 acres for citrus crops in 1970. Truck farming and cattle provide other major important economic activities.

Quarrying and mine operations also occur, with phosphate being the most economically important product. Limestone, coquina, shell material, sand, and clayey sands are also actively mined, most of the material being used in road construction and maintenance.

Numerous major highways traverse the area. These include the north-south coastal routes 195 and U.S. 1, the north-south central routes U.S. 441, U.S. 27, U.S. 17 and U.S. 92, the cross state I-4 and the Sunshine State Parkway. Many other state highways occur with the most prominent being Florida 50 running east-west from coast-to-coast.

Commercial airlines provide regular service to the larger cities such as Orlando and Lakeland and there are numerous small airports serving the smaller cities and rural areas. Most of the cities, towns, and rural communities are also served by bus lines and railroads.

Climate—The average annual temperature for the area is approximately 72°F (34°C), with August as the hottest month, having an average of 82°F (38.7°C) and January as the coldest month, having an average of 61°F (28.7°C). The annual precipitation fluctuates from year to year but averages between 50 inches (127.0 cm) and 55 inches (139.1 cm).

GEOLOGIC DISCUSSION

The surface and near-surface deposits of east central Florida range from unconsolidated sands to well indurated limestones and dolomites. Seven lithologic units are recognized for the purpose of surface mapping and cross section construction in this area. They are: medium to fine sand and silt, clayey sand, sandy clay and clay, shell sand and clay, peat, limestone, and dolomite. The deposits range in age from the Eocene Epoch (5 to 36 million years ago) to the Recent. The oldest deposit that crops out within the map boundaries is limestone of Upper Eocene age.

Limestone crops out or is very near the surface only along the far western edge of the map area. Here the Upper Eocene limestones of the Ocala Group crop out and are actively mined. The limestone is a very fine to fine grained, chalky, porous, cream colored limestone containing many large foraminifera and abundant mollusks. Hardness varies as does the amount of recrystallization. Small areas of Suwannee Limestone of Oligocene age (36 million to 25 million years ago) occur as erosional remnants in southern Sumter and northern Polk counties. These were deposited in low places on the top of the Ocala Group and have not yet been removed by erosion. This limestone is generally solution pitted and recrystallized, with occasional chert occurring sporadically in this area resulting from the silicification of the upper portion of the Ocala Group limestones. The occurrence of the chert is too sporadic to be mapped; thus, it is not represented as a lithic unit on the map. Locally, however, it interferes with quarrying operations and drilling of wells.

The surface of the limestone dips gently eastward from the outcrop area beneath an increasing thickness of younger materials. This is graphically illustrated on the cross sections A-A' and B-B'. The clayey sand and sandy clay sediments overlying the Tertiary limestones have been referred to as Miocene (25 million to 11 million years ago) in age. These lithologies are in the Hawthorn Formation. The highly variable, diverse lithologic character of the Hawthorn includes interbedded and interfingering sands, clayey sands, sandy clays, phosphatic sediments, dolomites and limestones. The carbonate portion generally occurs in the lower Hawthorn and contains highly variable amounts of sand, clay and/or phosphorite. The Hawthorn sediments underlie the entire map area except in the limestone outcrop area and in scattered areas where it was removed by erosion prior to deposition of younger units. Scattered outcrops of Hawthorn sandy phosphatic dolomites and limestones too small to map occur on springs on the Wekiva Plain northwest of Orlando.

Dolomite occurs at the surface only in isolated small outcrops that are too small to map. It commonly occurs in the subsurface in the Eocene formations and the Hawthorn Formation. The dolomites can be seen on the cross sections A-A', B-B' and C-C'. The Eocene dolomites are brownish in color, porous to dense, hard and crystalline. The dolomites of the Hawthorn Formation are buff colored, crystalline, soft to hard, and impure, containing varying amounts of sand, clay and phosphorite.

Clayey sands cover extensive areas of the central and western portions of the map area. They comprise much of the higher areas of the Central Highlands (elevations up to 310 feet near Lake Apopka). Lithologically, the clayey sands contain silt, fine to coarse sands and gravel bound by a matrix of clay. The clay may be kaolinite, montmorillonites or other clay minerals depending upon the depositional environment and post-depositional alterations. Coloration of the clayey sands varies from greenish and gray to orange hues. Large, steep-sloped outcrops through this material may be seen on many highways and in borrow pits of the area. These clayey sand sediments that do not belong to the Hawthorn have been variously called unnamed coarse clastics, Miocene coarse clastics, Citronelle Formation, and "Fort Preston" formation. At the present time there is still uncertainty as to the formal identity of the unit or units.

Sandy clays and clays do not crop out in sufficient quantities to provide a mappable surface unit on the map area. Subsurface sandy clay and clay units have been recognized and are shown on the cross sections. Lithologically they are green and bluish gray to brown and buff colored with varying amounts of sand and phosphorite. They do not contain shell material.

Unconsolidated sands are widespread throughout the map area and represent two basic depositional environments. The first and most widespread occurrence is due to deposition by marine agents. This includes large areas of Orange and Osceola counties, making up the Osceola Plain, the Atlantic Coastal Ridge, and part of the Atlantic Coastal Lowlands in Volusia County. Associated with these deposits are the sands deposited as dunes. The second occurrence is one in which the sand is deposited due to fluvial agents. Deposits of this type occur in the Central Valley from Lake Apopka northward and in areas bordering on the clayey sand highlands. Basically, sands are eroded from the higher areas and redeposited in valleys and lowlands. The two types of sand deposits overlap and interfinger.

This lithologic type consists of medium to fine sands and silts, lack-clay or shell. The surface expression of the unit is generally flat to slightly undulating except in areas where the formation where the relief may be more pronounced. Formal equivalents of the sands have not been described. Puri and Vernon's (1964) geologic map shows them as marine and estuarine terrace deposits. They are underlain in some areas by the shelly sand and clay lithology, in other areas by the Hawthorn Formation and in a few scattered areas by limestone of Eocene Age. As seen in the cross sections, the subsurface expression of this lithology occurs as facies in several different formations including the Miocene Hawthorn Formation.

Shell beds of Miocene through Pleistocene age occur on the eastern portion of the map area. They represent ancient lagoonal and estuarine environments and contain a highly variable association of lithologies. The lithologies represented by this unit include coquina, shelly sands, shelly clay, and sands and clays. The lithologies vary with such frequency that mapping an individual component is not possible on a regional scale. This unit is generally found below 35 feet above mean sea level and forms much of the Atlantic Coastal Lowlands. Most of the beaches along the Atlantic Coast segment of this map are designated as this lithology due to their incorporated shell content. Removal by solution of part or all of the shell material has occurred in areas where the shell beds are continuously or periodically above the water table. In these areas the residual sand is part of the shell lithologic unit and is mapped as such. This unit is mined in Brevard and Volusia counties for road material and is commonly seen surfacing semi-improved roads of the region.

This unit can be equated with several formations, depending upon the location. Along the coast it belongs in part to the Anastasia Formation and partially to the Recent. Inland in the St. Johns River Valley the shell sand, clay lithology is equivalent to the Caloosahatchee Formation and possibly to a portion of the Fort Thompson Formation. Lichtner (1972) stated that fossils from one of the shell beds of eastern Orange County and from northwestern Orange County show these sediments to be equivalent to the upper part of the Tamiama Formation of Mio-Pliocene age.

The shell lithology is overlain by sand and clay in areas along the coastal ridge by the medium to fine sand lithologic unit. It pinches out westward toward the highlands beneath the sands. The surface expression of this unit is generally a low lying, nearly flat, occasionally swampy terrain with numerous small shallow solution depressions. Cabbage palms are very abundant in areas where this unit is at or very near the surface. In the upper St. Johns River Valley and near Lake Jessup in Seminole County the shell lithology is overlain by thick deposits of peat.

Peat deposits are found scattered throughout the map area. Most are relatively small and are not shown on the map. However, several deposits are shown. One large deposit occurs along the St. Johns River from the southern portion to approximately the latitude of Titusville in Brevard County. Another large accumulation is shown adjoining Lake Apopka in Orange and Lake counties. Other smaller deposits are found near Lake Jessup in Seminole County, just west of Clermont in Lake County, and near Lake Denham in the Lake Harris Cross Valley in Lake and Sumter counties. These deposits range up to tens of feet thick.

This lithologic unit consists of black to dark brown, fibrous peat with varying amounts of sand, silt, and clay incorporated. Occasionally, shells of fresh-water snails are found scattered throughout the peat.

Some of the peat deposits are an important economic resource for the area. The peat provides excellent land for truck farming near Lake Jessup, Lake Apopka and Lake Denham. Other peat deposits, such as the one near Clermont, are being mined and sold commercially.

PHYSIOGRAPHY

The State of Florida has been divided into three 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 is entirely within White's central or mid-peninsular zone. This zone may be characterized as having discontinuous highlands forming subparallel ridges separated by broad valleys all roughly paralleling the present coastline.

The Atlantic Coastal Ridge, Atlantic Coastal Lagoons, and Atlantic Barrier Chain form and parallel the present coastline of the map area. The barrier islands are composed of relict beach ridges and dunes and essentially shield the lagoons from the effects of the sea. The land surface is undulating, with the highest crests generally no higher than 30 feet above mean sea level. The islands range in width from a few hundred feet to a maximum of 7 miles at Merritt Island. The barrier islands are composed primarily of shelly, fine to medium sands and are thus mapped as belonging to the shell lithologic unit.

Westward from the barrier chain are the Atlantic Coastal Lagoons. These are a series of lagoons that include the Indian River, Banana River, Mosquito Lagoon and the Halifax River. The Indian River ends abruptly near the Volusia-Brevard County line and becomes a valley with its floor reaching elevations of 5 to 10 feet above mean sea level (White 1970). The valley represents the sediment-limited extension of the lagoon. The infilling is a result of drainage from the Eastern Valley transporting sediment into the lagoon. The other lagoons also have been partially filled by sediment and become narrower northward in the map area.

The Atlantic Coastal Ridge lies on the mainland side (west) of the coastal lagoons and reaches elevations of 50 feet above mean sea level. It "seems to be almost wholly a product of Pamlico (?) time when sea level was about 30 feet higher than it now is" (White 1970). The Atlantic Coastal Ridge is higher and wider than the common relict progradational beach ridges of the Eastern Valley. White (1970) attributes this to the lack of shell material in the Coastal Ridge since it was deposited at the height of the transgression. The relict beach ridges were deposited with abundant shell debris that has been subsequently dissolved, thus reducing the height of these ridges. The Atlantic Coastal Ridge can be recognized on the map as a body of medium to fine sand paralleling the coast east of the Eastern Valley.

The Eastern Valley is a broad, flat valley lying immediately west of the coastal ridge. Many geologists have assumed that the valley represents a broad Pamlico lagoon. White (1970), however, believes that it represents a beach ridge plain lowered due to removal of the carbonate portion of the deposits by dissolution. The St. Johns River begins in the southern Eastern Valley and follows it northward until the river turns nearly 90 degrees west to follow the St. Johns River Offset.

The St. Johns River Offset can be seen only in the north central map area. It received its name from the fact that the St. Johns River suddenly jogs westward then northward to follow a more western valley than its headwaters. The reasons for this change are not clearly understood; however, Pickle (1969) suggested that both solution and structural attributes of the underlying rocks were the cause. As the St. Johns River jogs westward it passes between the Geneva Hill and the southern end of the Deland Ridge. Both are considered by White (1970) to be relict beach features. However, the western side of the Deland Ridge is composed of clayey sands that are lithologically similar to those of the Mt. Dora Ridge. This may be a remnant of a once ubiquitous highland. The southern end of the Deland Ridge can be seen in the north central area of the map.

South of the Deland Ridge and the St. Johns River Offset in Seminole, Orange, and Osceola counties is the Osceola Plain. It is bounded on the east by the Lake Wales and Mount Dora Ridges. Elevations range from approximately 35 feet to nearly 90 feet. The topography varies from undulating to nearly flat with shallow depressions and ridges. The ridges are bounded by the Marion and Osceola counties has abundant relict beach ridges which control the drainage patterns. These are readily identified on aerial photographs of the area. The relict ridges are generally less than 10 feet in height and usually less than 5 feet. White (1970) suggests that U.S. 441 marks the approximate line between ancient broad beach ridge covered barrier on the east from a broad lagoon on the west. He suggests that the Kissimmee River may have resulted from the drainage pattern developed in this lagoon as sea level dropped.

North and west of the Osceola Plain are the Marion Upland, Mount Dora Ridge, the Orlando Ridge and the Lake Wales Ridge. The Marion Upland is represented by the medium to fine sand lithology west of the St. Johns River Offset in northern Lake County. The Mount Dora Ridge bounds the Marion Upland on the west and extends northwest-southeast. It merges with the Orlando Ridge east of Lake Apopka and with the Lake Wales Ridge south of the lake. The ridges are all represented by a clayey sand lithology. Vernon (in White 1959) refers to the Lake Wales Ridge as a remnant of a Miocene fluvial blanket of bar plain deposits called the "Hawthorn Delta."

The Mount Dora Ridge and the Orlando Ridge may also represent erosional remnants of the "Hawthorn Delta." The elevation of the ridge areas range from 50 feet to as high as 310 feet. The ridge surfaces represent a mature karst surface as evidenced by the wide range in elevations and numerous lakes. White (1970) postulated that these lakes formed as a result of solution activity controlled by relict beach ridges, thus giving the lakes and their intervening high ground a parallel to subparallel alignment.

Bounding the Lake Wales Ridge on the west in Lake and Polk counties are the Lake and Polk Uplands, the Winter Haven Ridge and the Lakeland Ridge. All are represented on the map by the clayey sand lithology. The Lake Upland has numerous lakes covering much of it. These lakes are suggested by White (1970) to have formed due to the control of dissection exerted by relict beach ridges. The numerous lakes give Lake County its name. Unlike the Lake Upland, the Polk Upland has relatively few lakes. Relict beach ridges can also be seen on aerial photos of the Polk Upland (White 1958) and on the 75 minute topographic quadrangles of the area. However, the effects of dissolution controlled by the ridge is not as apparent, possibly due to the thicker sequence of sands, clayey sands, and clays overlying the limestone.

North of the Lake Upland is the Sumter Upland. They are separated by the Lake Harris Cross Valley which connects the Central and Western Valleys. The Sumter Upland is similar to the Polk Upland in its lithology, clayey sand, lack of abundant lakes and the occurrence of relict beach ridges on its southern portion. The Central Valley lies east of the Sumter and Lake Uplands and west of the Mount Dora Ridge. White (1970) refers to the Central Valley as an elongate lowland parallel both with the ridges which bound it and the lake of the peninsula. He further states that it represents an unprotected soil as the area reduced to its present lower elevations. The Central Valley is occupied through most of its length by the Oklawaha River and its tributaries. Also found in the valley are numerous large lakes including Lake Apopka, Lake Harris, Lake Dora, and Lake Griffin. Extensive peat deposits are found in the valley along the Oklawaha River, adjoining Lake Apopka as a result of solution activity controlled by the Oklawaha River. The southern end of the valley is shown on the map at the northwest corner.

The Western Valley also occurs within the map area. It can be seen on the far western edge of the map and is represented by the limestone lithology.

As has been discussed, the map area is quite diverse lithologically and geomorphically. The land surface has been shaped predominantly by marine forces and later modified by solution removal of portions of the underlying carbonate material. Some of the most beautiful terrain found in Florida is seen in this area.

GROUND WATER

The ground water found in the map area occurs under two conditions, artesian and nonartesian. Artesian conditions occur in areas where the water is confined below some impermeable layer known as a confining layer or bed. In an artesian well, water will rise above the point at which it is first encountered. Nonartesian conditions exist where the water in the zone of saturation is not confined and is therefore not under pressure; this is known as the water table.

The nonartesian aquifer is composed primarily of sands and shell with varying amounts of clay and hardpan. These sediments are generally referred to as undifferentiated sediments of Miocene to Recent age. It provides only limited quantities of water of highly variable quality. The thickness and character of the nonartesian aquifer are highly variable (Lichtner 1972). Wells developed in this aquifer are primarily used to water lawns and livestock and limited domestic supplies. The quality of water varies greatly depending on the composition of the aquifer and other factors. It may be soft or hard depending on calcium carbonate content. Iron content may be high and pH may vary, often making the water corrosive.

The artesian aquifers are more important. There are two types of artesian aquifers in the map area. They are the secondary artesian aquifers and the Floridan Aquifer. The secondary artesian aquifers occur in the undifferentiated sediments and more extensively in the Hawthorn Formation. They are composed of thin beds or layers of limestone, discontinuous shell beds, and layers of sand and gravel. They generally yield less water than the Floridan Aquifer but more generally provide water that is less mineralized than that of the Floridan but more mineralized than the nonartesian water. The quality of the water varies with depth, location, and local geologic and hydrologic conditions. The secondary artesian aquifers are the least likely to be polluted because the overlying, low-permeability beds protect them from surface pollution, and because drainage wells are usually cased through the secondary artesian aquifer zone into the deeper Floridan Aquifer (Lichtner 1972).

The Floridan Aquifer underlies all of Florida and in the map area includes the Lake City Limestone, the Avon Park Limestone, the Ocala Group Limestone and some portions of the Hawthorn Formation that are in hydraulic contact with the underlying limestones. It is one of the most productive aquifers in the world. In parts of the map area it may reach 2,000 feet in thickness. The lithologic and hydrologic character of the Floridan Aquifer is not uniform, either horizontally or vertically (Lichtner 1972). The aquifer consists in general of alternating layers of limestone and dolomite or dolomitic limestone.

There are numerous solution cavities and solution channels within the Floridan Aquifer. Some of the cavities may be quite large. For example, a well in Orlando encountered a 90-foot cavern. These caverns and cavities are well connected and much of the water flows through them as has been shown by current meter tests in many wells.

The major portion of the ground water recharge in the map area comes from local rainfall. However, some water enters by underground flow from outside the region. Total recharge for the East Central Florida region has been estimated to be on the order of one billion gallons per day (Lichtner 1972). Discharge of ground water from the Floridan Aquifer occurs by spring outflow, seepage into the St. Johns River, by outflow to other areas, off to the Atlantic Ocean, and by pumping in the area.

The quality of water in the Floridan varies greatly throughout the area. Geology is the major factor influencing the water quality but poor quality water is introduced through drainage wells that are common in some areas. Salt water is naturally found in some areas such as along the coast and in some parts of the St. Johns River Valley. It has not yet been flushed out of the aquifer since the last encroachment of the sea. Heavy pumping in some areas, such as along the coasts, may cause salt water to encroach and contaminate fresh water supplies. Yields from the Floridan Aquifer have been measured up to several thousand gallons per minute; however, lower figures are more common. The Floridan does produce more potable water than the nonartesian or secondary artesian aquifers. In most areas the Floridan Aquifer will produce potable water from the upper 1,000 feet of the aquifer. Most of the domestic and commercial supplies in the map area are drawn from this aquifer.

ECONOMIC GEOLOGY

The economic deposits of the map area include phosphate, limestone, shell material, lithified coquina, sand, clayey sand, and peat.

Phosphate is the most economically important deposit actively exploited in the area represented on the map. These resources are located in the southwestern portion of the map area in Polk County. Active pits, abandoned ones and reclaimed lands are very common in the area near Lakeland. The pebble phosphate deposits occur in the clayey sands of the Bone Valley Formation. Phosphate mining in Polk County began in 1890. In 1976 approximately 38 million short tons of phosphate were produced in Florida. Other phosphate deposits of potential economic value are found in the Hawthorn Formation but are too deeply buried to be economically mined at present.

Shell and coquina are mined locally and used for road base and fill material. These are mined only on a local scale and are not an important economic material.

Sand is found throughout the district as both thin veneers and thick deposits. Large sand deposits of economic value occur in the ridge areas in Lake and Polk counties. Other smaller deposits are mined locally and used for fill material and asphalt production.

Clayey sand is also mined in the map area and is basically used in construction and road base as fill material. The suitability of the material varies with its clay content.

Limestone is mined only near the far western edge of the map area in Sumter County. It is used primarily for road base material.

Peat is locally produced from deposits ranging up to tens of feet thick. Oil and gas have not been discovered in commercial quantities in the map area.

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OUTCROPS OF INTEREST

1. Brevard County - Shell sand, shell clay, and coquina. Brevard County shell pit, T29S, R37E, Sec. 23, SE¼ of NE¼.
2. Lake County - Clayey sand. T22S, R26E, Sec. 26, NE¼ of NE¼.

