MAP SERIES NO. 88

VALDOSTA

FLORIDA DEPARTMENT OF NATURAL RESOURCES
BUREAU OF GEOLOGY

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 $2,195.00 or a per copy cost of $.88 for the purpose of disseminating geologic data.

EXPLANATION

- Med.— Fine Sand
- Clayey Sand
- Limestone
- Dolomite
- Limestone/Dolomite

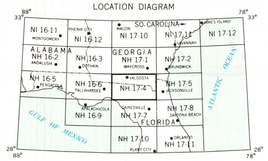
Scale 1:250,000

5 0 5 10 15 20 Statute Miles
5 0 5 10 15 20 25 30 Kilometers
5 0 5 10 15 Nautical Miles

CONTOUR INTERVAL 50 FEET
WITH SUPPLEMENTARY CONTOURS AT 25 FOOT INTERVALS

ENVIRONMENTAL GEOLOGY SERIES
VALDOSTA SHEET

LOCATION DIAGRAM



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

TOWNSHIP OR RANGE LINE
LAND GRANT BOUNDARY
APPROXIMATE TOWNSHIP OR RANGE LINE

VALDOSTA, GA.; FLA.
1954
LIMITED REVISION 1965

• INTERIOR—GEOLOGICAL SURVEY, WASHINGTON, D.C.—1967

MAP SERIES NO. 88

FLORIDA DEPARTMENT OF NATURAL RESOURCES
BUREAU OF GEOLOGY

ENVIRONMENTAL GEOLOGY SERIES

VALDOSTA SHEET

By
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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.

ACKNOWLEDGEMENT

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

REGIONAL SETTING

The surface geology of north central Florida is 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 peninsular Florida." Eocene and Oligocene limestones associated with this feature are exposed in much of the map area. Miocene and younger sediments are also present forming the relict dunes and highlands.

The major physiographic divisions in the area, as proposed by Puri and Vernon (1964), are the Northern Highlands, the Central Highlands, and the Coastal Lowlands. The Northern Highlands trend westward from the vicinity of Trail Ridge and the St. Marys River to the Alabama border in western Florida. The Central Highlands merge with the Northern Highlands in Suwannee County and form the higher ridges in central Florida. The Coastal Lowlands border the Central and Northern Highlands.

Location–The map area is bounded on the west by the meridian of longitude 84° west and on the east by the meridian of longitude 82° west. The southern boundary is the parallel of latitude 30° north and the northern boundary is the Florida–Georgia border. The counties making up most of the area are Jefferson, Taylor, Madison, Lafayette, Hamilton, Suwannee, Columbia, Union, Bradford, and Baker. Counties with minimal land represented on the map are Clay, Duval, and Nassau. The major rivers are the Suwannee, Withlacoochee, St. Marys, Aucilla, Econfina, Wacissa, and Fenholloway.

Population and Development–The study area totals approximately 4,788 square miles and has a population density of 25 people per square mile. Most of the land, however, contains fewer residents than the average because the population is concentrated around the major cities and towns. The 1970 census by county is: Baker - 9,242 with 29.6% urban; Bradford - 14,625 with 33.1% urban; Columbia - 25,250 with 56.2% urban; Hamilton - 7,787 with no urban; Jefferson - 8,778 with no urban; Lafayette - 2,892 with no urban; Madison - 13,481 with 27.7% urban; Suwannee - 15,559 with 43.9% urban; Taylor - 13,641 with 56.5% 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: Union - 34.2%; Columbia - 25.8%; Baker - 25.5%; Bradford - 17.5%; Suwannee - 4.0%; Taylor - 3.6%; Hamilton - 1.1%; Lafayette - 0.1%; Madison - –4.8%; and Jefferson - –8.0%.

Lake City is the largest city with a population of 10,575. The city was incorporated in 1859, but settlers had been living there since 1824. Perry, located in Taylor County, is the next largest city with a population of 7,701. Perry is known as the "Forest Capital of the South." Some of the other important towns with more than 1,000 population are Live Oak, Madison, Macclenny, Monticello, Jasper, Lake Butler, and Greenville.

Industry and Transportation–Being predominantly rural, the major industries are agriculture and forestry. The principal crops grown are tobacco, corn, peanuts, beans, peas, and other vegetables. Cattle, swine, and poultry farming are also 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. There are several limestone quarrying operations, with most of the stone being crushed and used as aggregate for highway construction. Phosphate mining is also an important contributor to the economy of northeast Florida.

The major cities, as well as most of the rural areas, are served by railways and bus lines. Commercial air service is available in Lake City and Perry and there are several smaller airports in the rural communities.

Climate–The average annual temperature is approximately 68.9° F with July and August being the hottest months. The average annual precipitation is approximately 55.6 inches, but differs markedly from year to year. The highest recorded temperature in the state is held by Monticello, located in central Jefferson County. This municipality had a temperature of 109° F on June 29, 1931.

GEOLOGIC DISCUSSION

Surface geologic exposures of North Central Florida range from limestones deposited during the Eocene Epoch to clastics deposited in the Pleistocene Epoch. The environmental geology map was drawn on the basis of recognizing five lithologic units exposed in the map area. These units are limestone, dolomite, limestone/dolomite, clayey sand, and fine to medium sand and silt.

In the subsurface a sandy clay lithology is also recognized. Most of the exposed limestone belongs to the Suwannee Limestone of Oligocene age, although in southern Jefferson County there are numerous exposures of the Early Miocene St. Marks Formation. Other Tertiary limestone outcrops in the map area belong to the Late Eocene Ocala Group, and the Hawthorn Formation of Miocene age.

Being equated with the limestone/dolomite lithology means that for any given locality the type of carbonate rock that is encountered will vary from a limestone to a dolomite and will exhibit differing degrees of recrystallization. The limestone/dolomite lithology in Taylor County is associated with the Suwannee Limestone. In this county the Suwannee Limestone is normally a highly recrystallized granular limestone, except along the coast where it contains a large amount of dolomite. On cross section B-B' the Suwannee Limestone is equated with the limestone/dolomite lithology near the surface in much of Taylor County, which interfingers with the limestone lithology in Lafayette County.

Limestone, as depicted on the environmental geology map, occurs in the Crystal River Formation, Suwannee Limestone, St. Marks Formation and the Hawthorn Formation. The Crystal River Formation crops out in the low areas bordering the Suwannee River from the northern border of Lafayette County to the map's lower boundary. The Crystal River lithology can be described as a very fine grained, chalky, porous, cream-colored limestone containing many large foraminifers and mollusks. The limestone lithology associated with the Suwannee Limestone crops out along the Withlacoochee and Suwannee Rivers and in Suwannee County. It is normally a relatively hard, cream to yellow, massive, chalky limestone with numerous echinoids. The St. Marks Formation crops out throughout the portions of Jefferson County shown on the map. It is a sandy, chalky limestone with many large mollusks present. Good exposures of Hawthorn limestone can be seen along the Alapaha and northern Suwannee rivers. These limestones are very silty and contain an abundance of sand and phosphate. With the exception of the Hawthorn limestone, the limestones throughout the map area are generally very high in calcium carbonate content. Occasionally, they have been silicified and are commonly called chert.

Dolomite is exposed only in one area consistently enough to be delineated for mapping purposes. This is just north of the confluence of the Suwannee and Withlacoochee rivers. These dolomites are associated with the Suwannee Limestone and can be described as tan to brown, very dense, poorly fossiliferous, and massive.

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, the Miocene Hawthorn Formation is exposed extensively throughout the eastern portion of the map. 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 and contain phosphorite grains of variable sizes. The Hawthorn is represented on cross section A-A' as the clayey sands containing lenses of limestones, dolomites, and sandy clays. West of the Withlocoochee River in Madison and northern Jefferson counties, the clayey sand outcrops are part of the Late Miocene Miccosukee Formation. The Miccosukee Formation can be described as a yellowish red, cross bedded, silty, clayey sand. The clayey sands located in eastern Taylor and western Suwannee counties are grouped under the undifferentiated Plio-Pleistocene clastics. These clastics were probably eroded from the older Hawthorn and Miccosukee Formations by higher Pliocene and Pleistocene seas.

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 attained a thickness of at least 10 feet.

The limestone surface throughout the map area is extensively pinnacled due to chemical weathering, and outcrops of the top of the limestone are quite variable in elevation. The lower elevations, especially the coastal areas and river valleys, have more consistent outcrops of limestone than the upland areas.

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 northern zone. This zone is characterized by the continuous highland area running from the St. Johns River Valley westward to the Appalachicola River Valley. The central zone, which occupies the southwestern margin of the map area, is characterized by a series of ridges and valleys, which run parallel to the Atlantic coastline.

The west central portion of the map is part of the physiographic province known as the Gulf Coastal Lowlands. These lowlands begin at the present Gulf of Mexico coastline and extend eastward through southern Madison and southwestern Hamilton counties into central Suwannee County. They are bounded on the northeast and northwest by the Northern Highlands. Within the boundaries of the Gulf Coastal Lowlands there are several river valley lowlands and three marine terraces. These terraces and associated shorelines, beginning with the youngest and lowest in elevation, are the Silver Bluff, Pamlico, and Wicomico.

The Silver Bluff shoreline is considered to be at an elevation of 10 feet and lower. In Jefferson and Taylor counties, the Silver Bluff Terrace extends inland from 4 to 6 miles and is associated with a coastal marsh belt. This marsh belt is directly underlain by sands and silts that help support the lush vegetative cover. Beneath this thin layer of clastics are dolomites and silicified limestones associated with the Suwannee Limestone.

The Pamlico sea, which probably attained an elevation of about 25 feet, left a distinctive mark on Taylor County in the linear arrangement of a series of 15 to 50 feet high dunes that lie adjacent to and parallel the coast. The northern extension of these dunes is represented by the sand lithology on the southwest corner of the map. In Jefferson County, the Pamlico Terrace extends inland for about 8 miles and is underlain by limestones and dolomites at a very shallow depth. Paralleling the Wacissa River for about 2 miles in the terrace area is a sand ridge called the Calico Hill. This feature is probably a Pamlico dune (Yon, 1966). Directly east of Calico Hill are some other areas of thick sands, which may be of the same origin.

The 100 foot elevation contour is the commonly accepted elevation for the Wicomico shoreline. This contour can be traced up all of the major river valleys in the study area. The Wicomico Terrace is considered to extend from the Pamlico shoreline to the northern margin of the Gulf Coastal Lowlands.

The most prominent physiographic feature in the map area is the Northern Highlands. These highlands extend eastward from northern Jefferson County to the eastern edge of the map. Other prominent landforms existing within the Northern Highlands are the Tallahassee Hills, the Trail Ridge and the Lake City Ridge. The Northern Highlands are separated from the Gulf Coastal Lowlands by what has been described as the "most persistent topographic break in the state" by Puri and Vernon (1964). This escarpment is called the Cody Scarp and extends from the eastern side of Trail Ridge, through the map area, and across northern Florida into Alabama. The continuity of the Cody Scarp in the map area is unbroken except where deep stream and river valleys have dissected it.

The Tallahassee Hills extend from the extreme western margin of the map westward to the Withlacoochee River. They are represented by the clayey sand lithology in Jefferson and Madison counties. According to Yon (1966), these hills are erosional-remnants of what was once a nearly flat Miocene delta plain.

Trail Ridge is represented by the fine to medium sand and silt lithology paralleling the eastern border of the map. Trail Ridge is believed to be a relict shoreline feature formed when sea level stood at a much higher elevation.

The Lake City Ridge is the slightly curved feature composed of sands running through Lake City. The large area of sands west of Lake City has not been formally assigned to the Lake City Ridge, but its configuration and location suggest that it is related.

GROUND WATER

Ground water is the subsurface water in the zone of saturation, the zone in which all interstitial spaces are filled with water. Once water has infiltrated into the zone of saturation, it moves laterally under the influence of gravity toward places of discharge such as springs, wells, streams, lakes, or the ocean. The geologic units which allow the storage and movement of subsurface water are called aquifers and are defined as natural zones below the surface that will yield water to wells in sufficient quantity to be economically important. The two major types of aquifers are the unconfined aquifer, which is in direct contact vertically with the atmosphere through open pore spaces, and the confined aquifer, which is separated from the atmosphere by relatively impermeable strata. Another type of aquifer is a perched aquifer, which is an isolated unit containing ground water whose position is governed by stratigraphy or structure.

The Floridan Aquifer is the principal water-bearing unit in this area and exhibits characteristics of both confined and unconfined aquifers. The Floridan is considered a confined aquifer where it is covered by low permeability clayey sands and sandy clays, and is considered an unconfined aquifer where it is thinly veneered by sands or is exposed at the surface. A less important unconfined aquifer exists in the surficial sand deposits. This unit is termed the water table aquifer and is more apparent where it is underlain by the clayey sands or sandy clays of the highlands. Another good source of ground water is the "secondary artesian aquifer." This aquifer is discontinuous and restricted to the Northern Highlands.

The Floridan Aquifer is composed primarily of permeable limestones and dolomites of Tertiary Age. The Floridan Aquifer is under artesian conditions (it is confined beneath a relatively impermeable layer of sediment) throughout most of the northern and eastern portions of the map. It is under water table conditions where exposed in river floodplains and in the southwestern portion of the map. The Floridan Aquifer receives recharge through localized rainfall in areas where limestones and dolomites are at the surface or are only veneered by a thin layer of sediment. The Floridan Aquifer also receives recharge from smaller perched aquifers, lakes, and streams where the impermeable sediments supporting these features have been breached, allowing downward percolation of water. Another method of recharge to the aquifer is by the infiltration of water through the relatively impervious overlying sediments into the major water bearing unit below. Ground water is discharged from the aquifer by springs, municipal and private wells, seepage into rivers and the Gulf of Mexico, and upward movement into overlying secondary aquifers. The dissolved solids in water from the upper part of the Floridan Aquifer are predominantly calcium and magnesium carbonates and bicarbonates with total concentrations ranging from less than 250 ppm to about 1,000 ppm.

The "secondary artesian aquifers" are found in northern Jefferson and Madison counties and from eastern Suwannee and Hamilton counties eastward. These aquifers occur within the Hawthorn Formation in the form of thin discontinuous limestone, dolomite, sand or shell beds which are surrounded by relatively impermeable material. When the potentiometric surface of the Floridan is lower than that of the secondary artesian the latter discharges into the Floridan Aquifer. The amount of water which can be pumped from a secondary artesian aquifer is much less than from the Floridan, but would probably be enough for small domestic supplies. The quality of the water from these aquifers is inferior to the Floridan as it contains more dissolved solids.

The water table aquifers which occur in the surficial sand deposits are present primarily at higher elevations in the map area. These aquifers receive recharge almost entirely from rainfall and to a lesser degree by upward percolation from underlying aquifers when their potentiometric surfaces are higher than that of the water table. Water from these aquifers discharge by seepage into underlying aquifers when the potentiometric surfaces of the underlying aquifers are lower than the water table of the surficial sand aquifers. Water is also discharged into lakes, streams, wells, and lost to the atmosphere by evapo-transpiration. The quality of the water within this aquifer is considered to be poor because of the high concentration of iron and color.

ECONOMIC GEOLOGY

North Central Florida is rich in mineral reserves. Phosphate, limestone, dolomite, and heavy minerals are all present in large quantities. Sand and clay are also abundant, but their development has been limited.

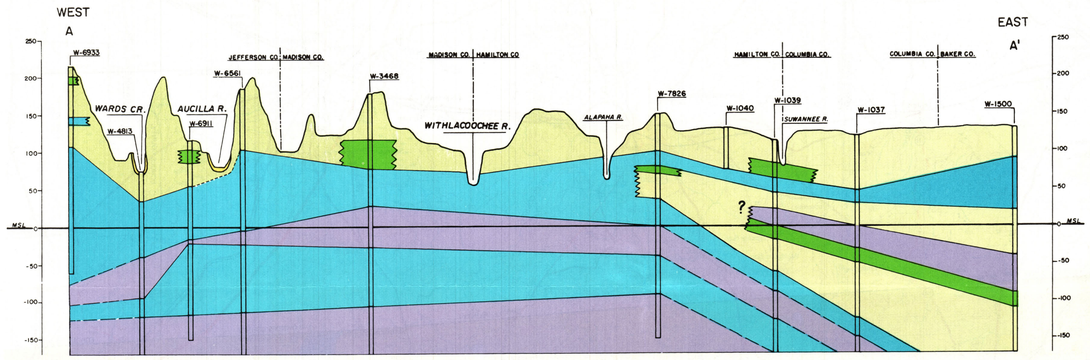
Pebble phosphate is present throughout the eastern portion of the map area where the Hawthorn Formation is at or near the land surface. It is currently being mined extensively in eastern Hamilton County. Other deposits of phosphate may exist east of Hamilton County.

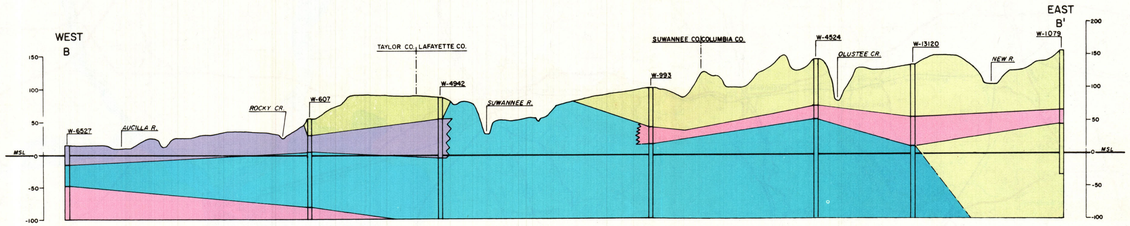
Limestone quarrying operations are, or have been, in existence in all of the counties where limestone is exposed. Quarrying is normally carried out by the use of draglines and occasionally by blasting. The limestone is primarily used for road base material and numerous small quarries are adjacent to the major highways. Dolomite and dolomitic limestone are also mined and used for road base material, agricultural soil conditioners, and sometimes as aggregate in concrete.

In 1947 the United States Bureau of Mines, working in cooperation with the Florida Geological Survey, outlined a heavy mineral ore body in western Clay and Duval counties. This deposit is associated with Trail Ridge and averaged about 4% heavy mineral grains. The mineralogical assemblage of the heavies is composed of the following variable constituents: titanium minerals, zircon, staurolite, sillimanite, tourmaline, kyanite, andalusite, pyroxene, spinel, and corundum. There are presently several mining operations existing in the vicinity of Trail Ridge.

Sand is abundant throughout the district with the thickest sequences being associated with the Trail and Lake City ridges. It is mined locally and used for construction, fill material, and asphalt.

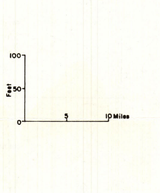
Oil and gas have not been produced from any of the numerous exploratory wells in the map area.

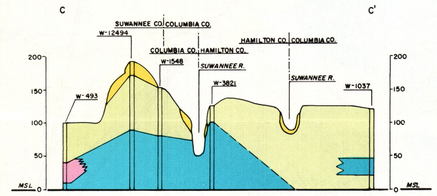




OUTCROPS OF INTEREST

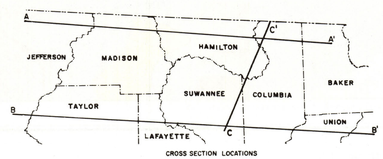
1. Madison County: Township 1S, Range 9E, Section 6 northwest quarter of northeast quarter. Roadcut in a steep embankment located on U. S. Hwy 14 just north of the intersection with I-10. The Miccosukee Formation is exposed in the form of a mottled clayey sand.
2. Taylor County: Township 5S, Range 6E, Section 15 northwest quarter of southwest quarter. Roadcuts in a Pamlico dune field expose fine to medium grained sands.
3. Columbia County: Township 2S, Range 16E, Section 18 northeast quarter of northwest quarter, approximately 3/4 mile southeast of Hwy 136 bridge on the Suwannee River. The Suwannee Limestone at this locality contains an abundance of the echinoid *Cassidulus gouldii*. From this point westward to Ellaville the Suwannee Limestone is exposed almost continuously in the banks of the Suwannee River.
4. Hamilton County: Township 1N, Range 16E, Section 4 northwest quarter of northwest quarter, approximately 2 miles north of the Hwy 6 bridge on the Suwannee River. This locality has an excellent exposure of three lithologically variable beds of the Hawthorn Formation. These beds vary from a basal phosphatic sandstone to an overlying dolomitic rubble into a sandy phosphatic dolomite.





EXPLANATION

- Med. Fine Sand and Silt
- Clayey Sand
- Sandy Clay
- Limestone
- Dolomite
- Limestone/Dolomite



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