OPEN FILE MAP SERIES NO. 91

SURFICIAL AND BEDROCK GEOLOGY OF THE WESTERN PORTION OF THE U.S.G.S. 1:100,000 SCALE MARIANNA QUADRANGLE, NORTHWESTERN FLORIDA

BY

RICHARD C. GREEN, P.G. #1776,[1]

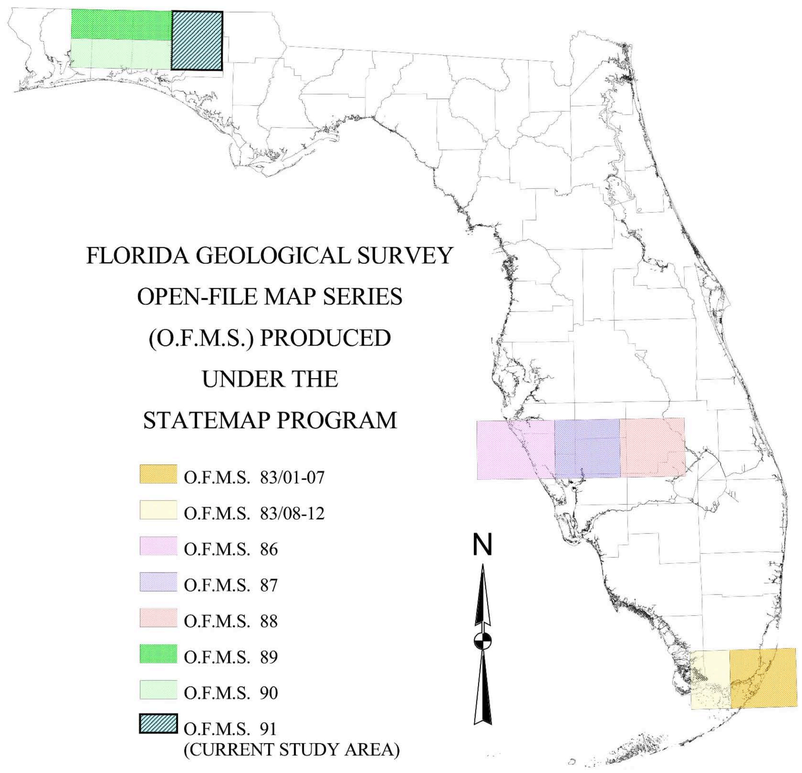
WILLIAM L. EVANS III, P.G.,[1]

JONATHAN R. BRYAN,[2]

DAVID T. PAUL,[1]

AND MABRY M. GABOARDI [1]

2002



WALTER SCHMIDT
STATE GEOLOGIST AND CHIEF

LIST OF CONTENTS

SHEET 91-01

GEOLOGIC MAP AND GEOLOGIC CROSS SECTIONS A-A' THROUGH D-D', WITH EXPLANATORY TEXT

SHEET 91-02

SURFICIAL SEDIMENTS MAP AND SELECTED PHOTOGRAPHS, WITH EXPLANATORY TEXT AND REFERENCE LIST

COOPERATIVELY FUNDED BY THE FLORIDA GEOLOGICAL SURVEY AND THE U.S. GEOLOGICAL SURVEY, NATIONAL COOPERATIVE GEOLOGIC MAPPING PROGRAM, UNDER U.S.G.S. ASSISTANCE AWARD NUMBER 01-HQ-PA-0003. THE VIEWS AND CONCLUSIONS CONTAINED IN THIS DOCUMENT ARE THOSE OF THE AUTHORS AND SHOULD NOT BE INTERPRETED AS NECESSARILY REPRESENTING THE OFFICIAL POLICIES, EITHER EXPRESS OR IMPLIED, OF THE U.S. GOVERNMENT.

1
FLORIDA GEOLOGICAL SURVEY
GEOLOGICAL INVESTIGATIONS SECTION
903 W. TENNESSEE ST.
TALLAHASSEE, FL. 32304-7700

2
OKALOOSA-WALTON COMMUNITY COLLEGE
DEPARTMENT OF EARTH SCIENCES
100 COLLEGE BOULEVARD
NICEVILLE, FLORIDA 32578-1294

Channel-fill (Citronelle Formation on Alum Bluff Group).
Location: T05N, R15W, S02, SW 1/4 of SE 1/4.
Photo by Richard Green.

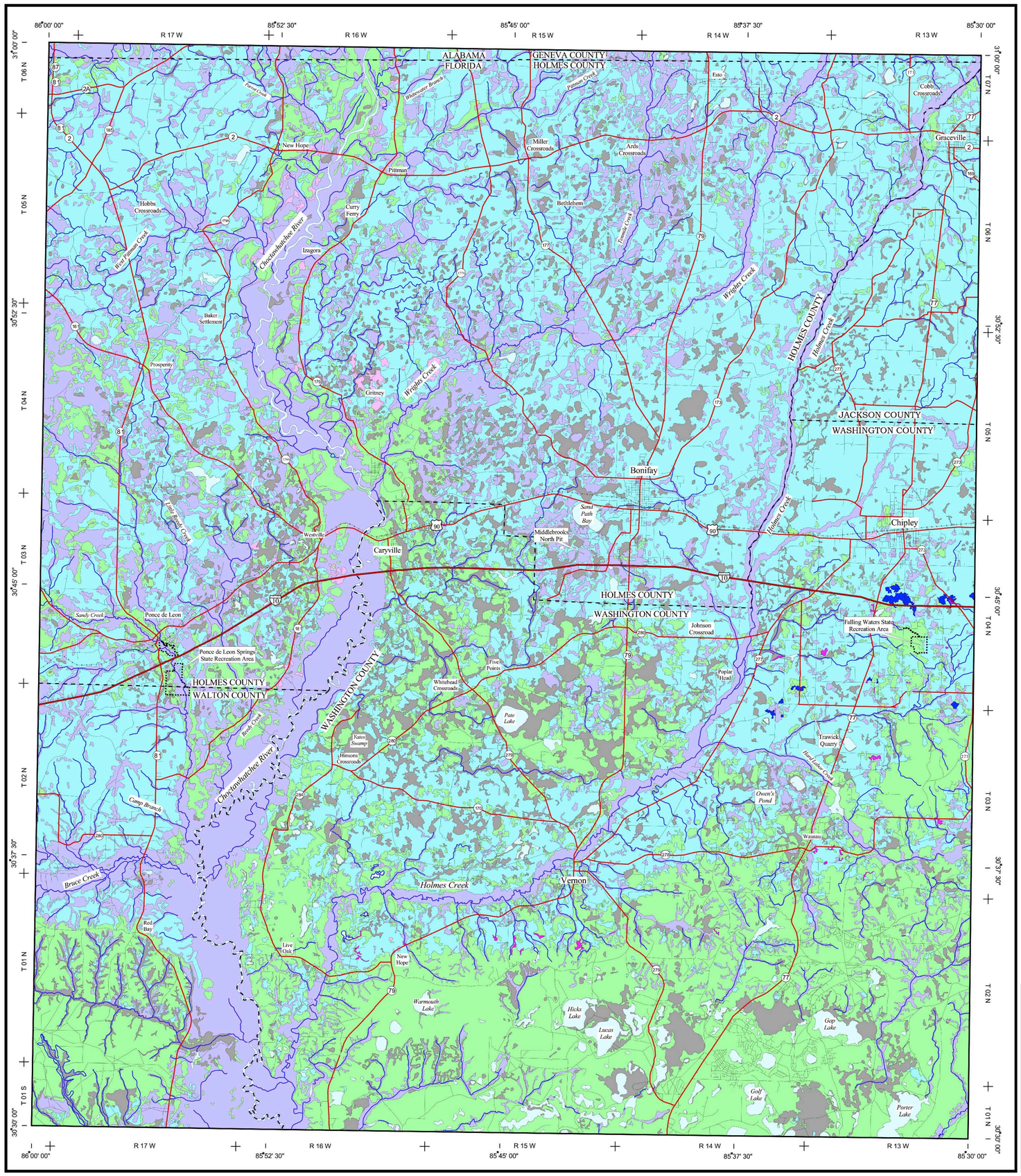
Faulted exposure of Citronelle Formation, Middlebrooks North Pit.
Location: T04N, R15W, S11, SW 1/4 of NE 1/4.
Photo by Richard Green.

Channel-fill (Citronelle Formation on Alum Bluff Group), Middlebrooks North Pit. Location: T04N, R15W, S11, SW 1/4 of NE 1/4.
Photo by Richard Green.

OPEN FILE MAP SERIES NO. 91-02

SURFICIAL SEDIMENTS MAP OF THE WESTERN HALF OF THE U.S.G.S. 1:100,000 SCALE MARIANNA QUADRANGLE, NORTHWESTERN FLORIDA

BY RICHARD C. GREEN, P.G., #1776, WILLIAM L. EVANS III, P. G.,
JONATHAN R. BRYAN, DAVID T. PAUL, AND MABRY M. GABOARDI, 2002



Surficial sediments and soils of the western half of the U.S.G.S. 1:100,000 scale Marianna quadrangle are composed primarily of five lithologic components: quartz sand, loam, muck, clay, and limestone. Combinations of these components constitute the seven sediment units represented on this map.

Data utilized in creating this map were derived from a variety of sources, including United States Department of Agriculture Soil Surveys, field observations, cores and well cuttings, surface samples, and hand-augered samples. Sediment types shown on this map represent soil from within the upper 6.6 feet (two meters) of land surface.

Between 25 and 100 different soil types are recognized, depending on the county, by the United States Department of Agriculture (Duffee, Allen, and Ammons, 1979; Huckle and Weeks, 1965; Overing and Watts, 1989; Sullivan, et al., 1975). In these soil surveys, soil types were categorized based on factors such as slope, moisture content, texture, distribution of organic matter, acidity and other physical properties. In order to organize these soil types into meaningful lithologic units for this map, soil types were grouped based on shared characteristics. Therefore, the reader is urged to consult the soil surveys for more detailed information about soils in the map area.

The Sand, Loam, and Clay unit is predominant throughout much of the study area. As defined here, this sediment type contains greater than 52 percent quartz sand, greater than 27 percent clay particles, and less than 11 percent silt particles. This unit is most often found where the Alum Bluff Group is either exposed or near the surface.

Quartz sand is the most common sediment type in the southern portion of the study area. In this area, this sediment type is generally associated with the Citronelle Formation. It should be noted that each sediment type shown on this map contains at least some quartz sand. Additionally, in many places, the unit mapped as sand contains minor percentages of organic material and clay.

Sand and Loam is a unit of quartz sand and loam in which the sand concentration is greater than 52 percent. It commonly occurs along rivers and creeks throughout the study area, including the Choctawhatchee River, Wrights Creek, and Holmes Creek basins.

Muck, slowly decaying organic material containing varying amounts of sand and silt, is generally confined to swampy regions and drainage basins. There are several large accumulations of this sediment type in the map area. Muck is often seen in areas where the Citronelle Formation is thin or missing, or in areas where sediments of the Alum Bluff Group cause the ponding of surface water.

Loam, which is defined as "soil material that is 7 to 27 percent clay particles, 28 to 50 percent silt particles, and less than 52 percent sand particles" (Overing and Watts, 1989), is present in only a few isolated areas, but is often a component of other units.

Loam and Clay is one of the least significant units in terms of coverage and is defined as having less than 52 percent sand particles and more than 27 percent clay particles. This sediment type is generally confined to the Choctawhatchee River basin and a small area north of the confluence of Wrights Creek and the Choctawhatchee River.

Sand, Loam, Clay, and Limestone is the sediment unit of smallest aerial extent and is most common near the Falling Waters State Recreation Area. This unit commonly contains variable amounts of quartz sand, loam, and clay in addition to limestone. It is most often seen in areas where the Marianna Limestone or Bridgeboro Limestone is near the surface.

Acknowledgements

The authors would like to thank Joseph Middlebrooks of Bonifay, Ronald Taylor of the Florida Department of Agriculture's Forestry Service, Chuck Mathis of the American Forest Management LLC, Tommy Garret of the Forest and Lake Management Service, and Nelson Minor, Public Works Director for the Washington County Public Works Department for allowing the FGS access to their properties as well as providing valuable advice pertaining to the study area. Jim Balsillie and John Phillips also provided field labor as well as lab time.

Selected Bibliography

Akers, W.H., 1972, Planktonic foraminifera and biostratigraphy of some Neogene formations, northern Florida and Atlantic Coastal Plain: Tulane Studies in Geology and Paleontology, v. 9, no. 1-4, p. 1-9.

Bryan, J.R., 1991, Stratigraphic and paleontologic studies of Paleocene and Oligocene carbonate facies of the eastern Gulf Coastal Plain: Ph.D. Dissertation, University of Tennessee, Knoxville, 324 p.

Bryan, J.B., and Huddlestun, P.F. 1991, Correlation and age of the Bridgeboro Limestone, A coralgal limestone from southwestern Georgia: Journal of Paleontology 65: p. 864-868.

Cagle, J.W., Jr., 1963, Geologic map of Escambia County, Alabama: Geological Survey of Alabama Map 26.

Campbell, K., 1993, Geologic map of Holmes County, Florida: Florida Geological Survey Open-File Map Series 24.

Clark, M.W., and Schmidt, W., 1982, Shallow stratigraphy of Okaloosa County and vicinity, Florida: Florida Geological Survey Report of Investigations No. 92, 51 p.

Coleman, J.M., 1976, Deltas: Process of deposition & models for exploration: Continuing Education Publication Company, 102 p.

Cook, C.W. 1923, The correlation of the Vicksburg Group: U.S. Geological Survey Professional Paper 133, p.1-19.

Cook, C.W., 1929, Geology of Florida: Florida Geological Survey 20th Annual Report, p. 29-227.

Cook, C.W., 1939, Scenery of Florida interpreted by a Geologist: Florida Geological Survey Bulletin 17, 118 p.

Cook, C.W., 1945, Geology of Florida: Florida Geological Survey, Bulletin 29, 339 p.

Copeland, C.W., Rheams, K.F., Neathery, T.L., Gilliland, W.A., Schmidt, W., Clark, W.C., and Pope, D.E., 1988, Quaternary geologic map of the Mobile 4 degree by 6 degree quadrangle, United States: U.S. Geological Survey, scale 1:1,000,000.

Duffee, E.M., Allen, W.J., and Ammons, H.C., 1979, Soil survey of Jackson County, Florida: United States Department of Agriculture, Soil Conservation Service in cooperation with University of Florida Institute of Food and Agricultural Sciences and Experiment Stations Soil Science Department, 157 p., 76 maps.

Green, R.C., Evans III, W.L., Means, G.H., Gaboardi, M.M., Paul, D.T., Campbell, K.M., and Scott, T.M., 2001, Surficial and bedrock geology of the southern portion of the U.S.G.S. 1:100,000 Scale Crestview Quadrangle, Northwestern Florida: Florida Geological Survey, Open-File Map Series 90, 2 maps.

Healy, H.G., 1975, Terraces and shorelines of Florida: Florida Geological Map Series No. 71, scale: 1:1,900,800.

Huckle, H.F., and Weeks, H.H., 1965, Soil survey of Washington County Florida: United States Department of Agriculture, Soil Conservation Service in cooperation with University of Florida Agricultural Experiment Stations, 199 p., 108 maps.

Huddlestun, P.F., 1984, The Neogene Stratigraphy of the central Florida Panhandle: Ph.D. Dissertation, Florida State University, Tallahassee, 210 p.

Huddlestun, P.F., 1988, A revision of the lithostratigraphic units of the coastal plain of Georgia, the Miocene through Holocene: Georgia Geologic Survey Bulletin 104, 12 p.

Huddlestun, P.F., 1993, A revision of the lithostratigraphic units of the coastal plain of Georgia, the Oligocene: Georgia Geologic Survey Bulletin 105, 152 p.

Isphording, W.C., 1976, Multivariate mineral analysis of Miocene-Pliocene Coastal Plain sediments: Transactions of the Gulf Coast Association of Geological Societies, v. 26, p. 326-331.

Isphording, W.C., 1977, Petrology and stratigraphy of the Alabama Miocene: Transactions of the Gulf Coast Association of Geological Societies, v. 27, p. 304-312.

Isphording, W.C., Lamb, G.W., 1971, Age and origin of the Citronelle Formation in Alabama: Geological Society of America Bulletin, v. 82, p. 775-780.

Johnson, L., 1888, The structure of Florida: American Journal of Science, 3rd Series, v.36, p.230-236.

Jones, D.S., Mueller, P.A., Hodell, D.A., and Stanley, L.A., 1993, 87Sr/86Sr geochronology of Oligocene and Miocene marine strata in Florida in Zullo, V.A., Harris, W.B., Scott, T.M., and Portell, R.W. eds., The Neogene of Florida and Adjacent Regions: Proceedings of the Third Bald Head Island Conference on Coastal Plains Geology, Hilton Head Island, 1992: Florida Geological Survey, Special Publication No. 37, p. 15-16.

Manning, E.M, and Macfadden, B.J., 1989, Pliocene three-toed horses from Louisiana, with comments on the Citronelle Formation: Tulane Studies in Geology and Paleontology, v. 22, p. 35-46.

Mansfield, W.C., 1938, Oligocene faunas from the lower and upper beds on the A.L. Parrish Farm, Washington County Florida: Washington Acad. Of Science Journal Vol. 28, p. 93-107

Mansfield, W.C., 1940, Mollusks of the Chickasawhay Marl: Journal of Paleontology, Vol. 14, p. 171-226.

Marsh, O.T., 1966, Geology of Escambia and Santa Rosa Counties, western Florida panhandle: Florida Geological Survey Bulletin 46, 140p.

Matson, G.C. and Clap, F.G., 1909, A preliminary report on the geology of Florida with special reference to the stratigraphy: Florida Geological Survey Second Annual Report, p. 21-173.

Means, G.H., Green, R.C., Bryan, J.R., Scott, T.M., Campbell, K.M., Gaboardi, M.M., and Robertson, J.D., 2000, Surficial and bedrock geology of the northern portion of the U.S.G.S. 1:100,000 Scale Crestview Quadrangle, Northwestern Florida: Florida Geological Survey Open-File Map Series 89, 2 maps.

Miller, J.A., 1986, Hydrogeologic framework of the Floridan Aquifer System in Florida and in parts of Georgia, Alabama, and South Carolina: Regional Aquifer-System Analysis: Unites States Geological Survey Professional Paper 1403-B, Washington, 91 p., 33 plates.

Moore, W.E. 1955, Geology of Jackson County: Florida Geological Survey Bulletin 37, 101p.

Murray, G.E., 1961, Geology of the Atlantic and Gulf Coastal Province of North America: Harper and Bros. New York, 692 p.

Osborne, W.E., Szabo, M.W., Copeland, C.W., Jr., and Neathery, T.L., 1989, Geologic map of Alabama: Geological Survey of Alabama Special Map 221.

Otvos, E.G., 1988, Pliocene age of coastal units, northeastern Gulf of Mexico: Transactions of the Gulf Coast Association of Geological Societies, v. 38, p. 485-494.

Otvos, E.G., 1994, Mississippi's revised Neogene stratigraphy in northern Gulf context: Transactions of the Gulf Coast Association of Geological Societies, v. 44, p. 542-554.

Otvos, E.G., 1998, Citronelle Formation, northeastern Gulf Coastal Plain: Pliocene stratigraphic framework and age issues: Gulf Coast Association of Geological Societies Transactions, v. 48, p. 321-333.

Overing, J.D, and Watts, F.C., 1989, Soil survey of Walton County, Florida: United States Department of Agriculture, Soil Conservation Service, 139 p., 90 maps.

Puri, H.S., 1953, Contribution to the Study of the Miocene of the Florida Panhandle: Florida Geological Survey, Bulletin 36, 345 p.

Puri, H.S., and Vernon, R.O., 1964, Summary of the geology of Florida and a guidebook to the classic exposures: Florida Geological Survey Special Publication 5, revised, 312 p.

Raymond, D.E., Copeland, C.W., and Rindsberg, A.K., 1993, Post-Miocene sediments of the shallow subsurface of coastal Alabama: Geological Survey of Alabama Circular 168, p. 1-34.

Reves, W.D., 1961, The limestone resources of Washington, Holmes and Jackson Counties, Florida: Florida Geological Survey Bulletin 42, 121 p.

Schmidt, W., 1984, Neogene stratigraphy and geologic history of the Apalachicola Embayment, Florida: Florida Geological Survey Bulletin 58, 146 p.

Schmidt W., and Clark, M.W., 1980, Geology of Bay County, Florida: Florida Geological Survey, Bulletin 57, 96 p.

Schmidt, W. and Coe, C., 1978, Regional Structure and Stratigraphy of the Limestone Outcrop Belt in the Florida Panhandle: Florida Geological Survey, Report of Investigation No. 86, 25 p.

Scott, J.C., 1966, Geologic map of Geneva County, Alabama: Geological Survey of Alabama Map 54.

Scott, T.M., 1992, A geological overview of Florida: Open File Report No. 50, 78 p.

Scott, T.M., 1993, Geologic map of Walton County, Florida: Florida Geological Survey Open-File Map Series 17.

Scott, T.M., (in preparation) Geomorphic map of Florida: Florida Geological Survey, scale 1:750,000.

Scott, T.M. (editor and compiler), Campbell, K.M., Rupert, F.R., Arthur, J.A., Green, R.C., Means, G.H., Missimer,T.M., Lloyd, J.M., Duncan, J.G., 2001, Geologic map of Florida: Florida Geological Survey, Map Series 146.

U.S. Department of Agriculture, Natural Resources Conservation Service, 2002, Soil Survey Geographic (SSURGO) data base for Geneva County, Alabama: United States National Cooperative Soil Survey; Digital On-Line Database.

Sullivan, J.L., Weeks, H.H., Duffee, E.M., Thomas, B.P., Ammons, H.C., Harrell, M.L., 1975, Soil survey of Holmes County, Florida: United States Department of Agriculture, Soil Conservation Service, 61 p., 37 maps.

Szabo, M.W., and Copeland, C.W., Jr., 1988, Geologic map of Alabama, southwest and southeast Sheets: Geological Survey of Alabama Special Map 220.

Veach, O. and Stephenson, L.W., 1911, Preliminary report on the Geology of the coastal plain of Georgia: Georgia Geological Survey Bulletin 26, 466 p.

Vernon, R.O., 1942, Geology of Holmes and Washington Counties, Florida: Florida Geological Survey Bulletin No. 21, 161 p.

Vernon, R.O., and Puri, H.S. 1956, A summary of the geology of the panhandle Florida and guidebook to the surface exposures: Florida Geological Survey G.S.A. Field Trip, 83 p.

Yon, J.W., Jr., and Hendry, C.W., Jr., 1969, Mineral resource study of Holmes, Walton and Washington Counties: Florida Geological Survey Bulletin 50, 161 p.

NOTES:

This map was created using FDEP databases and data obtained from the Florida Geological Survey. It was completed September 30, 2002, by the Florida Department of Environmental Protection, Division of Resource Assessment & Management, Florida Geological Survey, Geological Investigations Section. This document was prepared for the STATEMAP component of the National Cooperative Geologic Mapping Program under U.S.G.S. assistance award number 01-HQ-PA-0003 for the presentation of the geologic information shown and is not intended to replace site-specific or use-specific investigations. The Florida Geological Survey does not guarantee this document to be free from errors or inaccuracies and disclaims any responsibility or liability for inappropriate change of scale or interpretations or decisions based thereon. For more information please contact:

Rick Green or William L. Evans, III
Florida Geological Survey
Gunter Building MS #720
903 W. Tennessee Street
Tallahassee, FL 32304-7700
850/488-9380

LEGEND FOR SURFICIAL SEDIMENTS MAP

- Sand, Loam, and Clay
- Sand
- Sand and Loam
- Muck
- Loam
- Loam and Clay
- Sand, Loam, Clay, and Limestone

- Interstate
- Primary / Secondary road
- Local road
- Railway
- Rivers and Streams
- Recreation Area
- County Line
- Water

COOPERATIVELY FUNDED BY THE FLORIDA GEOLOGICAL SURVEY AND THE U.S. GEOLOGICAL SURVEY, NATIONAL COOPERATIVE GEOLOGIC MAPPING PROGRAM, UNDER U.S.G.S. ASSISTANCE AWARD NUMBER 01-HQ-PA-0003. THE VIEWS AND CONCLUSIONS CONTAINED IN THIS DOCUMENT ARE THOSE OF THE AUTHORS AND SHOULD NOT BE INTERPRETED AS NECESSARILY REPRESENTING THE OFFICIAL POLICIES, EITHER EXPRESS OR IMPLIED, OF THE U.S. GOVERNMENT.

1 0 1 2 3 4 5 Miles

1 0 1 2 3 4 5 6 7 8 Kilometers

SELECTED PHOTOGRAPHS FROM STUDY AREA

Photo 1
Richard Green standing in front of faulted Citronelle Formation in the Middlebrooks North Pit. Location: T04N, R15W, S11, SW 1/4 of NE 1/4.
Photo by William L. Evans, III.

Photo 2
William L. Evans III in front of channel-fill. (Citronelle Formation on Alum Bluff Group). Location: T05N, R15W, S02, SW 1/4 of SE 1/4.
Photo by Richard Green.

Photo 3
Close-up photo of channel-fill seen in photo 2. (Citronelle Fm.)
Photo by Richard Green.

Photo 4
Bridgeboro Limestone exposed in upper section of Trawick Quarry. Location: T04N, R14W, S36, NW 1/4 of SE 1/4.
Photo by Richard Green.

Photo 5
Close-up photo of Bridgeboro Limestone exposure in Trawick Quarry showing rhodoliths. (Black scale bar is 1" long.)
Photo by Richard Green.

Photo 6
Marianna Limestone exposure, Trawick Quarry. Location: T04N, R14W, S36, NW 1/4 of SE 1/4.
Photo by Richard Green.

Photo 7
Upper facies of Ocala Limestone with Asterocyclina and Lepidocyclina spp. White Construction Company, Jones Quarry, Northeast of study area. Location: T06N, R11W, S32, SE1/4.
Photo by Richard Green.

Photo 8
Lower facies of Ocala Limestone exposed along the eastern bank of the Choctawhatchee River. Approximate location: T07N, R16W, S29, NW 1/4 of NW 1/4.
Photo by Richard Green.

Photo 9
Truncated channel-fill in the Middlebrooks North Pit. Location: T04N, R15W, S11, SW 1/4 of NE 1/4.
Photo by Richard Green.

Photo 10
Channel-fill in the Middlebrooks North Pit. Location: T04N, R15W, S11, SW 1/4 of NE 1/4.
Photo by Richard Green.

Photo 11
Faulted and fractured Citronelle Fm. on top of Alum Bluff Group, Middlebrooks North Pit. Location: T04N, R15W, S11, SW 1/4 of NE 1/4.
Photo by Richard Green.

Photo 12
William L. Evans III with clay-filled fractures in Holmes County borrow pit. Location: T04N, R15W, S29, NW 1/4 of NW 1/4.
Photo by Richard Green.

Photo 13
Close-up photo of clay-filled fracture seen in photo 12.
Photo by Richard Green.

Photo 14
Jon Arthur with clay-filled fracture in Washington County Pit. Location: T03N, R15W, S15, SW 1/4 of SW 1/4.
Photo by Richard Green.

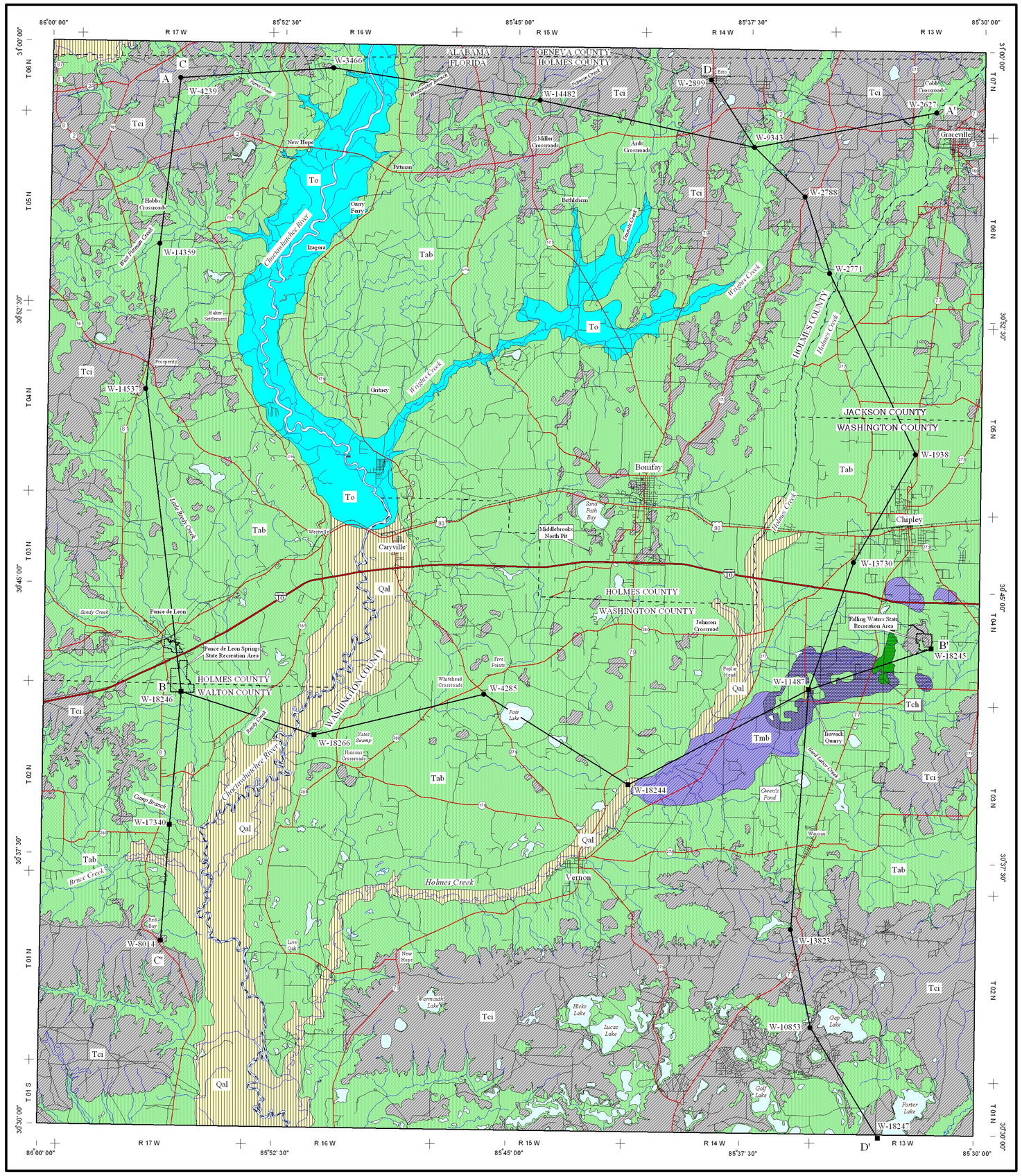
Photo 15
Clay-filled fractures in pit wall, Middlebrooks North Pit. Location: T04N, R15W, S11, SW 1/4 of NE 1/4.
Photo by Richard Green.

Photo 16
View of surface trace of clay-filled fractures seen in photo 15.
Photo by Richard Green.

OPEN FILE MAP SERIES NO. 91-01

GEOLOGIC MAP OF THE WESTERN HALF OF THE U.S.G.S. 1:100,000 SCALE MARIANNA QUADRANGLE, NORTHWESTERN FLORIDA

BY RICHARD C. GREEN, P.G., #1776, WILLIAM L. EVANS III, P. G.,
JONATHAN R. BRYAN, DAVID T. PAUL, AND MABRY M. GABOARDI, 2002



LEGEND FOR GEOLOGIC MAP AND CROSS SECTIONS

Quaternary

Holocene

- Qal — Quaternary Alluvium

Tertiary

Pliocene/Pleistocene

- Tci — Citronelle Formation

Miocene

- Tab — Alum Bluff Group
- Tabb — Alum Bluff Group, Bruce Creek Limestone
- Tch — Chattahoochee Formation

Oligocene

- Tbr — Bridgeboro Limestone
- Tmb — Marianna/Bridgeboro Limestone

Eocene

- To — Ocala Limestone

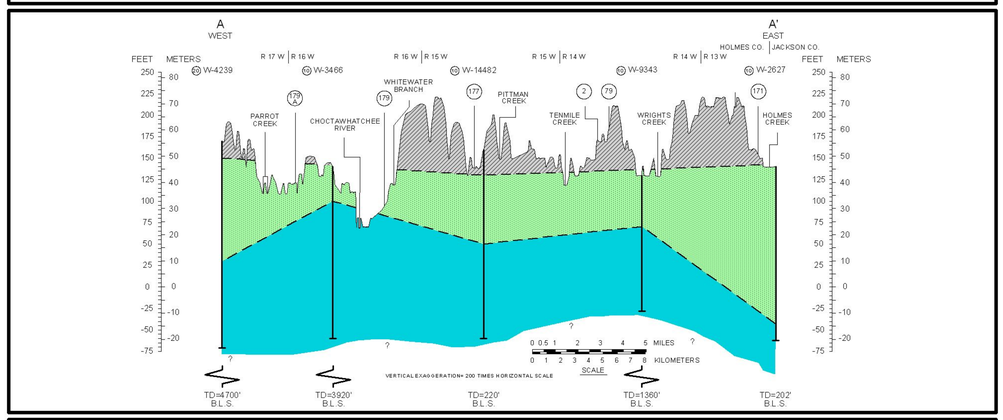
- Interstate
- Primary / Secondary road
- Local road
- Railway
- Rivers and Streams
- Recreation Area
- County Line
- Cross Section Line
- Core
- Cuttings
- Water
- Cuttings Interval
- Core

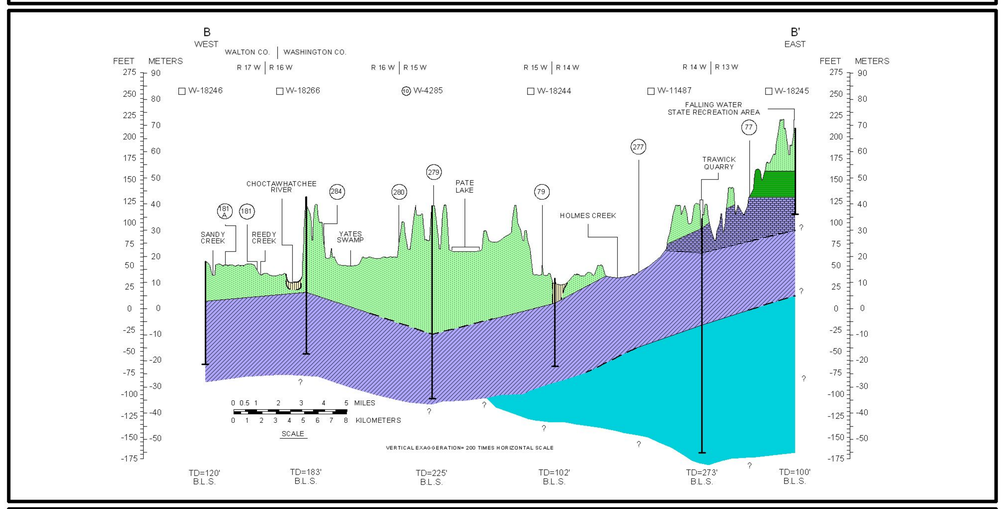
1 0 1 2 3 4 5 Miles

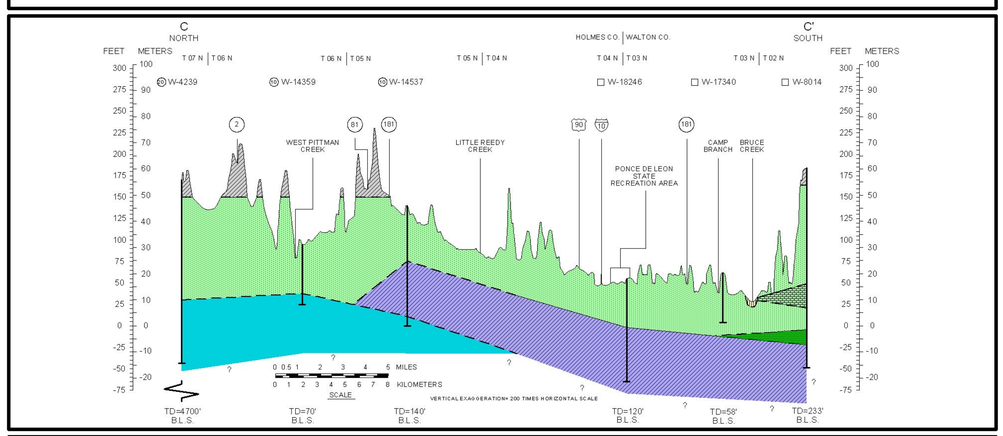
1 0 1 2 3 4 5 6 7 8 Kilometers

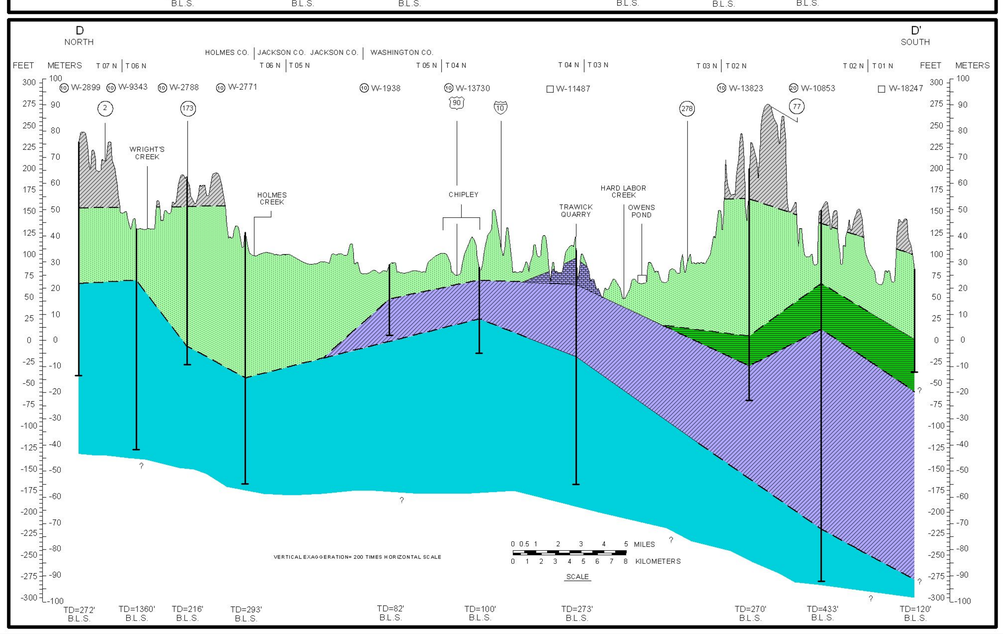
N

COOPERATIVELY FUNDED BY THE FLORIDA GEOLOGICAL SURVEY AND THE U.S. GEOLOGICAL SURVEY, NATIONAL COOPERATIVE GEOLOGIC MAPPING PROGRAM, UNDER U.S.G.S. ASSISTANCE AWARD NUMBER 01-HQ-PA-0003. THE VIEWS AND CONCLUSIONS CONTAINED IN THIS DOCUMENT ARE THOSE OF THE AUTHORS AND SHOULD NOT BE INTERPRETED AS NECESSARILY REPRESENTING THE OFFICIAL POLICIES, EITHER EXPRESS OR IMPLIED, OF THE U.S. GOVERNMENT.









The near surface geology of the western half of the U.S.G.S. 1:100,000 scale Marianna quadrangle is composed of carbonate and siliciclastic sediments ranging from Eocene to Holocene. Within the study area, geologic influences are a combination of fluvio-deltaic and marine deposition, erosion of sediments as a result of eustatic changes in sea level, and dissolution of underlying carbonates. The Chattahoochee Arch has also influenced the geology in the study area.

Several relict Neogene coastal terraces have been recognized in the area (Healy, 1975). Surface topography has been incised by numerous streams, often creating a dendritic drainage pattern. Some streams emerge from steep sided ravines, called steepheads. These features, unique to western Florida, reflect the interaction between groundwater and thick, siliciclastics which at stop impermeable clays of the underlying Alum Bluff Group.

According to Scott (in prep.), the study area lies within two geomorphic provinces - the Southern Pine Hills District, and the Dougherty Karst Plain District. These two provinces have been subdivided by Scott (in prep.) into six physiographic units. The Southern Pine Hills District is comprised of the Western Highlands and the Gulf Coastal Lowlands, while the Dougherty Karst Plain District consists of the DeFuniak Springs-Bonifay Karst Hills, Choctawhatchee Valley, Marianna Karst Plain, and the Vernon Karst Hills.

The southwestern portion of the study area is bound by the Western Highlands, (Scott, in prep.). The topographically high features of the Western Highlands are remnants of a larger delta plain that blanketed older Miocene deposits in Late Pliocene or Early Pleistocene time. The topography of this area is the result of erosion of Miocene Alum Bluff Group marine sediments and Pliocene Citronelle Formation fluvio-deltaic sediments. Elevations range from more than 290 feet (88.4 meters) to 25 feet (7.6 meters) above mean sea level (MSL).

West of the study area, the Gulf Coastal Lowlands unit extends from the Alabama-Florida state line eastward into Bay County where it grades into the Apalachicola Delta District. The Gulf Coastal Lowlands forms a narrow band between the coastline and the Western Highlands, and is present in the south-central portion of the study area, along the Choctawhatchee River valley. An indefinite scarp, possibly the western extension of the Cody Scarp, in many places, marks the transition from the Western Highlands to the Gulf Coastal Lowlands. The base of the scarp, when the scarp is well developed, occurs at approximately 25 feet (7.6 meters) above MSL, while the crest is at 100 feet (30.5 meters) above MSL. Elevations within the coastal lowlands range from sea level to more than 50 feet (15.3 meters) above MSL on some dunes. The topography is flat to very gently rolling with an abundance of swamps except in dune fields. Relict barrier islands are well developed from the Alabama-Florida state line eastward to southeastern Walton County where development is not as complete.

The Choctawhatchee Valley is an erosional feature of the Choctawhatchee River and runs through the DeFuniak Springs-Bonifay Karst Hills province along the river valley conveyance. Much of the Choctawhatchee Valley is comprised of Quaternary alluvium in the flood plain of the Choctawhatchee River. Elevations of this unit range from 90 feet (27.4 meters) above MSL near the Alabama-Florida state line, to 30 feet (9.1 meters) above MSL near the southern part of the study area.

The DeFuniak Springs-Bonifay Karst Hills is the largest physiographic unit in the study area and covers much of the western portion of the Dougherty Karst Plain District. This unit extends from eastern Holmes County and northeastern Walton County, east to the Jackson-Holmes County line, south into Washington County, and north into Alabama (Scott in prep.). Elevations of this hilly terrain range from more than 250 feet (76.2 meters) to less than 100 feet (30.5 meters) above MSL. The landscape is very similar to that of the Southern Pine Hills District, but has scattered sinkholes and solution features that increase in number eastward in the physiographic unit. Alum Bluff Group and Citronelle Formation sediments overlie carbonate rocks of Eocene to Miocene carbonates in this province. Carbonates are at or near the surface in some stream valleys and low-lying areas and consequently, the area is often one of karst development.

The Marianna Karst Plain, located east of Holmes Creek, is a region of low rolling hills, sinks and depressions that extend north into Alabama (Scott, in prep.). This lowland has resulted from fluvial deposition and erosion by rivers and streams and underlying karst activity. Elevations of the Marianna Karst Plain range from 150 feet (45.7 meters) to 75 feet (22.9 meters) above MSL.

The southern portion of the study area is bound by the Vernon Karst Hills, an area of generally high elevations ranging from 275 feet (83.8 meters) to 75 feet (22.9 meters) above MSL. The province is comprised of Citronelle Formation sediments overlying Alum Bluff Group clays. Where these siliciclastic sediments are thin, dissolution of the underlying carbonates has led to the formation of localized karst features.

Near-surface sediments in the study area include a complex series of rapidly changing facies that may contain clay, sand, gravel, shell, and petrified wood. Erosion and subsequent re-deposition of overlying sediments from the Citronelle Formation and Alum Bluff Group contributes to this lithologic variability and sometimes makes it difficult to distinguish formational units. An additional complicating factor for geologic mapping is the fact that there is a transition zone between the primarily siliciclastics sediments of the Gulf Coastal Plain of the Mississippi Embayment to the west, and the predominantly carbonate sediments of the Florida Platform to the east within the study area (Green, et al., 2001).

Many previous investigators have attempted to utilize fossils to establish formations and correlative facies within this region, a practice which has led to confusion within the literature regarding lithostratigraphy. In particular, units such as the Shoal River Formation, Oak Grove Sand, and Chipola Formation of the Alum Bluff Group are difficult to trace laterally without utilizing fossils. These units are not differentiated in this study due to a combination of similarities in lithologies and sparse core control. Summaries of previous work can be found in Huddlestun (1984, 1988; and 1993), Schmidt (1984), Clark and Schmidt (1982), Schmidt and Clark (1980), Vernon and Puri (1956), and Vernon (1942).

Much of the study area is blanketed by a veneer of Quaternary sediments and soils (Copeland, et al., 1988). For this reason, the authors have adopted the policy of mapping the first named geologic unit within twenty feet (6.1 meters) of the surface. If the Quaternary sediments attain a thickness greater than twenty feet (6.1 meters), then they appear as the mapped unit on the geologic map. If the Quaternary sediments are less than twenty feet (6.1 meters) thick, then the underlying stratigraphic unit appears on the map.

A positive structural feature exists to the north and northeast of the study area. This feature, called the Chattahoochee Anticline by Veach and Stephenson (1911) and Puri and Vernon (1964), and named the Chattahoochee Arch by Murray (1961), is a broad high mapped in the tri-state area of Alabama, Florida and Georgia. This high brings Oligocene and Eocene units to the surface (Schmidt and Coe, 1978; Schmidt, 1984; Huddlestun, 1993).

The Eocene Ocala Limestone is the oldest unit cropping out in Holmes and Washington Counties. Much of the northern portion of the study area is underlain by the Ocala Limestone, and where erosion has cut through overlying siliciclastics, it often crops out along major streams and rivers. The Ocala Limestone consists of an upper and lower facies. The lower Ocala Limestone is exposed at the Florida-Alabama border on the east bank of the Choctawhatchee River and extends southward into northern Holmes County. It is exposed intermittently along the river banks and channel bottom. The facies consists of poorly indurated to well indurated, greenish-gray, glauconitic, sandy wackestone which may contain foraminifera, molds of mollusks, and echinoids. The upper, and more typical, Ocala Limestone facies is exposed in stream channels south of the confluence of Whitewater Branch with the Choctawhatchee River. This limestone ranges from a light yellow to white, poorly to moderately indurated, moderately to highly porous, micro-fossiliferous, partially recrystallized packstone. Where weathered, the Ocala Limestone may be silicified. The lower facies of the Ocala Limestone is equivalent to Vernon's (1942) members of the Moodys Branch Formation, while the upper facies is equivalent to the Crystal River Formation of Puri (1953). The top of the Ocala Limestone ranges from 100 feet (30.5 meters) above MSL in W-3466 (cross section A-A') to 50 feet (15.3 meters) below MSL in W-2627 (cross section A-A'). According to Miller (1986), the Ocala Limestone ranges from 200 feet (61 meters) thick in the northwestern part of the study area to 400 feet (122 meters) thick in the southwestern portion of the study area. The Ocala Limestone is unconformably overlain by the Marianna Limestone in the southern portion of the study area, and is unconformably overlain by Alum Bluff Group sediments in the northern portion of the study area.

The Early Oligocene (Vicksburgian) Marianna Limestone (Matson, and Clap, 1909) disconformably overlies the Ocala Limestone throughout the southern portion of the study area. In the east-south-central portion of the study area, it is gradationally overlain by the Bridgeboro Limestone (cross sections B-B' and D-D'). The Marianna Limestone is at or near the surface in the northeastern portion of Washington County. The best exposure of the unit may be seen at the Trawick Quarry southwest of Chipley (see W-11487, cross section B-B'). The Marianna Limestone ranges in color from white to cream to light gray. It is a soft, chalky, fine grained, poorly indurated packstone, often containing abundant foraminifera. In the subsurface, the Marianna Limestone is often highly dolomitized and devoid of fossils. Where dolomitization occurs, the Marianna Limestone is a saccrosic, poorly to moderately indurated, fine-grained unit composed of dolomite rhombs. The top of the Marianna Limestone ranges from approximately 75 feet (22.9 meters) above MSL to 30 feet (9.1 meters) below MSL, and the unit attains a maximum thickness of 250 feet (76.2 meters) in W-10853 (cross section D-D').

The Bridgeboro Limestone conformably overlies the Marianna Limestone and is unconformably overlain by the Chattahoochee Formation. It is at or near the surface in isolated areas of northeastern Washington County and is also exposed by mining activities in the Trawick Quarry southwest of Chipley. The Bridgeboro Limestone is a wackestone to packstone which contains numerous rhodolithe. Except for the presence or absence of rhodolithe, the carbonates of the lower Bridgeboro Limestone are very similar lithologically to the underlying Marianna Limestone and the Suwannee Limestone. In many of the wells used in this report, the lithologic samples consist of cuttings only. Where identification of these two units is problematic due to dolomitization and lack of core control, the authors have designated these carbonate units as Tertiary Marianna-Bridgeboro Limestone undifferentiated (Tmb) in cross sections and on the geologic map.

In the Trawick Quarry, the Bridgeboro Limestone is a white to yellow, fossiliferous packstone containing numerous rhodolithe, larger foraminifera (Lepidocyclina and Nummulites), bryozoans, and coralline algae (either as thin, encrusting laminae or small rhodolithe). Huddlestun (1993) mapped this unit as the Bridgeboro Limestone (Duncan Church Beds). Bryan and Huddlestun (1991) have determined the age of the Bridgeboro Limestone, based on the occurrence of larger diagnostic foraminifera, mollusks, and bryozoa, to be Early Oligocene (Vicksburgian). The top of the Bridgeboro Limestone ranges from 125 feet (38.1 meters) above MSL in W-18245, to 95 feet (29.0 meters) above MSL in W-11487 (cross section B-B') where the unit reaches a maximum thickness of 31 feet (9.5 meters).

The Byram Formation conformably overlies the Bridgeboro Limestone west of the study area in the eastern portion of the U.S.G.S. 1:100,000 scale Crestview quadrangle (Means, et al., 2000, and Green et al., 2001). The Byram Formation crops out at Natural Bridge just west of the northern portion of the present study area. In the subsurface, however, it appears to pinch out to the west of cross section C-C' in the current study area. The Byram Formation is a white to tan, moderately indurated, sandy, glauconitic wackestone that contains abundant larger foraminifera, mollusks, and bryozoans. Poor core control in the westernmost portion of the study area, combined with extensive dolomitization of the carbonates, makes differentiating the Byram Formation within this area problematic. As such, the Byram Formation has not been identified within the study area.

Due to the influence of the Chattahoochee Arch, the Byram and other Oligocene and younger lithologies may not be present in the north portion of the study area. The Byram was recognized in several exposures in Jackson County by Puri and Vernon (1964); however, Moore (1955) included the Byram within the younger Suwannee Limestone. Vernon (1942) included all limestone below the Tampa Limestone and above the Marianna Limestone as Suwannee Limestone in Holmes and Washington Counties due to their lithologic similarity. This unit has traditionally been problematic for investigators, and has been called numerous formations ranging from Chickasawhay (Marsh, 1966) to Chattahoochee/Chickasawhay (Schmidt and Coe, 1978; Clark and Schmidt, 1982) to Marianna Limestone (Yon and Hendry, 1969). A detailed study is needed to determine the exact affinity of this unit.

The Suwannee Limestone was originally identified in the study area by utilizing molluscan fauna (Mansfield, 1938, 1940; Cooke, 1939). Vernon (1942) stated that this correlation may be questionable because of the poor preservation of these organisms, and he defined the Suwannee Limestone in Holmes and Washington Counties as "all limestone beds lying below the Tampa (Chattahoochee Formation) and above definite Marianna Limestone" (Vernon, 1942). The stratigraphic unit which Cooke, Mansfield and Vernon referred to as the Suwannee Limestone has been mapped by previous investigators under many different names (Reves, 1961). Further analyses of cores and cuttings by these authors have concluded the unit mapped as Suwannee Limestone by previous authors is likely either Bridgeboro Limestone or undifferentiated Marianna-Bridgeboro Limestone. An excellent section of Bridgeboro Limestone may be seen underlying the Chattahoochee Formation in W-18245 (cross section B-B'), a core taken from Falling Waters State Recreation Area.

Lower Miocene sediments have been redefined numerous times since the name Tampa was first applied by Johnson (1888). Puri (1953) described the Tampa sediments as "Tampa stage". Scott, et al., (2001) mapped these sediments as Chattahoochee Formation in this area and his nomenclature is adhered to by these authors. The Chattahoochee Formation, which unconformably overlies the Marianna Limestone (cross section D-D') or Bridgeboro Limestone (cross section B-B') and is unconformably overlain by the Alum Bluff Group, is predominately a brownish-gray, moderately indurated, sandy packstone to wackestone in southern and eastern Washington County. In the subsurface, the top of the Chattahoochee Formation is encountered in wells at elevations ranging from 160 feet (48.8 meters) above MSL in W-18245, (cross section B-B') to approximately MSL in W-18247, (cross section D-D'). It attains a maximum thickness of 50 feet (15.2 meters) in W-10853 (cross section D-D').

Sediments of the Miocene Alum Bluff Group unconformably overlie the Chattahoochee Formation. The Alum Bluff Group occurs throughout most of the study area and can generally be seen in outcrop at topographic elevations below 150 feet (45.7 meters) MSL. The unit attains a maximum thickness of 180 feet (54.9 meters) in W-2627, (cross section A-A'). Lithologically, Alum Bluff Group sediments range from clayey sands and gravels, to greenish, stiff, micaceous clays with variable admixtures of silt, sand, and shell. Huddlestun (1984) and Akers (1972) looked at faunal assemblages, primarily microfauna, and assigned the Alum Bluff Group a Middle to Late Miocene age. Jones et al. (1993) determined the strontium isotopic ratios in molluscan fossils collected from exposures along the Shoal River and calculated a mean age of 12.4 Ma, which agrees with other paleontologic dates.

The Bruce Creek Limestone of the Alum Bluff Group is present only in the southwestern portion of the study area. It thickens and dips gently to the southwest towards Crestview (Huddlestun, 1984; Schmidt, 1984). In the present study area, the Bruce Creek Limestone was identified in only one well (W-8014, cross section C-C'), where it is a yellowish gray, moderately indurated, clayey, phosphatic, molluscan-molidic packstone to wackestone with abundant foraminifera. In W-8014, the top of the unit is located at a depth of 45 feet (14.6 meters) above mean sea level and has a maximum thickness of 26 feet (7.9 meters). Huddlestun (1984) dated a microfossiliferous clay bed within the Bruce Creek Limestone as Middle Miocene. The occurrence of other age-diagnostic planktonic foraminifera corroborates this date.

The Pliocene-Pleistocene Citronelle Formation, which consists of sands and gravels with varying amounts of clay, unconformably overlies the Alum Bluff Group throughout much of the study area. It is variable in thickness, ranging from just a few feet in the central portion of the study area, where it may be seen in isolated hills, to over 110 feet (33.5 meters) thick in the northern portion of the study area. Post-depositional erosion of Citronelle Formation sediments has left numerous isolated hills in the region between the Choctawhatchee River and Holmes Creek. Many of these hills appear to be composed of Citronelle Formation sediments; however, some of them undoubtedly are comprised of re-worked sediments derived from the Citronelle Formation.

The Citronelle Formation is generally devoid of fossils, which makes age determination difficult. The formation has been suggested to be time-transgressive (Injhordng and Laudy, 1971) and is considered to be, at least in part, Pliocene. Manning and MacFadden (1989) described two species of horses from Citronelle Formation sediments in Louisiana, both of which suggest an Early Pliocene age for the Citronelle. Marsh (1966) reported pollen within the Citronelle Formation in Santa Rosa County indicated a Quaternary age for the unit. Further study of Citronelle Formation fossils is needed to refine the age of this formation.

Clay-filled fractures were observed in numerous road cuts and pits throughout the study area. These fractures most commonly occurred in the lower Citronelle Formation, near the contact with the Alum Bluff Group (see photographs 11 through 16 on accompanying Surficial Sediments map). The exact cause of these fractures is not completely understood. It is postulated, however, that these clay-filled fractures are a result of Citronelle Formation deltaic deposition on Alum Bluff Group clays, followed by deformational processes common to deltaic systems, such as slumping, differential weighting, mudflows, or clay diapir formation. An excellent discussion of these processes can be found in Coleman (1976). Evidence for small-scale faulting is seen in a pit north of I-10, located in the Bonifay area (see photographs on accompanying Surficial Sediments map). Another possible explanation of these fractures could be overlying sediment collapse as a result of dissolution of the underlying carbonates.

The Quaternary alluvium mapped in river valleys is assumed to be Pleistocene or Holocene. This unit consists primarily of clays, sands and gravels eroded from upland Citronelle Formation and Alum Bluff Group outcrops. Occasionally, traces of carbonized wood and carbonaceous horizons of peat and laminate occur. This unit is restricted to river basins.

Numerous silicified carbonate boulders and smaller weathered limestone "float" occur intermittently along roads, ditches and fields in the northern portion of the study area. These boulders were called Glendon Limestone, which is exposed in Geneva County, Alabama just north of the study area, by Cooke (1923). However, extensive silicification and obliteration of diagnostic fossils, makes determination of exact affinities of these boulders difficult. The majority of these carbonates which appear to be either in situ, or not far removed from their former stratigraphic position, are located at the general latitude and longitude where the Ocala Limestone is exposed in the Choctawhatchee River. Therefore, it is suggested that these boulders may represent remnant portions of weathered and silicified Ocala Limestone.

NOTES:

This map was created using FDEP databases and data obtained from the Florida Geological Survey. It was completed September 30, 2002, by the Florida Department of Environmental Protection, Division of Resource Assessment & Management, Florida Geological Survey, Geological Investigations Section. This document was prepared for the STATEMAP component of the National Cooperative Geologic Mapping Program under U.S.G.S. assistance award number 01-HQ-PA-0003 for the presentation of the geologic information shown and is not intended to replace site-specific or use-specific investigations. The Florida Geological Survey does not guarantee this document to be free from error or inaccuracies and disclaims any responsibility or liability for inappropriate change of scale or interpretations or decisions based thereon. For more information please contact:

Rick Green or William L. Evans, III
Florida Geological Survey
Gunter Building MS #720
903 W. Tennessee Street
Tallahassee, Fl. 32304-7700
850/488-9380