



The near surface geology of the southern portion of the U.S.G.S. 1:100,000 scale Crestview quadrangle is a reflection of the conditions that exist in a structurally uneventful Eastern Gulf of Mexico Coastal Plain. The region consists of gently dipping, generally unconsolidated sequences of Miocene to Pleistocene siliciclastic sediments, with one minor exposure of Miocene carbonates in the northeastern portion of the study area.

Physiographically, this study area is comprised of gently sloping Neogene fluvo-deltaic siliciclastics of the Western Highlands, terraced Pleistocene-Holocene siliciclastics of the Gulf Coastal Lowlands, and various recent Neogene coastal terraces have been recognized in the area (Healy, 1975). Surface topography has been deeply incised by numerous streams, creating a dendritic drainage pattern. Some of the streams, particularly in the eastern portion of the study area, emerge from steep-sided conives. These features, called steepheads, are unique to western Florida and reflect the interaction between groundwater and thick, unconsolidated siliciclastics of the Citronelle Formation that sit atop impermeable clays of the underlying Alum Bluff Group.

The study area falls within two geomorphic provinces - the Southern Pine Hills District and the Dougherty Karst Plain District (Scott, in prep.). The vast majority of the mapped area lies in the Western Highlands portion of the Southern Pine Hills District. A very small portion in the northeastern-most corner of the map lies in the De Funik - Bonifay Karst Hills of the Dougherty Karst Plain District.

The Western Highlands and the Gulf Coastal Lowlands comprise the Southern Pine Hills District in the western Florida panhandle. The rolling topography of the Western Highlands formed primarily on the Citronelle Formation siliciclastic sediments. Alum Bluff Group siliciclastic sediments occur at the surface in the easternmost portion of the Western Highlands. The topography of the highlands is the result of fluvial processes eroding the Miocene Alum Bluff Group marine sediments and the Pleistocene Citronelle fluvo-deltaic sediments. Elevations range from more than 200 feet (60.4 meters) to approximately 25 feet (7.6 meters) above sea level.

The Gulf Coastal Lowlands extend from the Alabama-Florida state line eastward into Bay County where it grades into the Apalachicola Delta District. The Gulf Coastal Lowlands form a narrow band between the coastline and the Western Highlands. An indistinct scarp, possibly the western extension of the Body Scarp, in many places, marks the transition from the Western Highlands to the lowlands. The base of the scarp is approximately 40 feet (12.2 meters) developed, occurs at approximately 25 feet (7.6 meters), while the crest is at 100 feet (30.5 meters) elevation. Elevations within the coastal lowlands range from sea level to more than 50 feet (15.3 meters) on some dunes. The topography is flat to very gently rolling with an abundance of sand dunes and dune fields. Barrier islands are well developed from the state line eastward to southeastern Walton County where development has not been completed.

The Gulf Coastal Lowlands are underlain by undifferentiated Pleistocene and Holocene sediments (Scott, 1993 a, b, c; Campbell, 1993). These sediments consist of fine to coarse-grained quartz sands with varying percentages of silt, clay, and organic matter. In part, these sediments may contain locally and regionally reworked Citronelle sediments.

The sediments in the near surface in this area harbor a complex series of rapidly changing facies that can contain variable amounts of clay, sand, gravel, shell, *Ophiomorpha* burrows, and petrified wood. It is this combination of lithologic variability and rapid facies changes that often make it difficult to distinguish formal units. Consequently, many previous investigators have attempted to utilize fossils to establish formations and correlative facies. This practice has been highly criticized and shows no traces of fossils that may be age diagnostic. This same lithology was encountered in the northern portion of the Crestview quadrangle, where it was also included within the Byram Formation.

Previously named formations of the Alum Bluff Group such as the Shoal River, Oak Grove, and Chipola Formations are difficult to trace laterally without reliance on fossils. Due to similarities in lithologies of the units, sparse core control in the area, and limited exposures of the Alum Bluff Group, these formations have not been differentiated in this study.

The only unit within the Alum Bluff Group that is easily traced based strictly on lithology and is therefore considered on the cross sections, is the Bruce Creek Limestone. Summaries of previous work on these units can be found in Huddleston, 1984; Schmidt, 1984; Clark and Schmidt, 1982; Schmidt and Clark, 1980; and Vernon and Purj, 1956.

A veneer of Quaternary sediments and soils blankets much of the study area. 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 surficially mapped unit. If the Quaternary sediments are less than twenty feet (6.1 meters) thick, then the underlying stratigraphic unit appears on the map.

The Bridgeboro Limestone is the oldest unit encountered during this study. It is entirely a subsurface unit within the study area. The top of the unit is penetrated in wells with depths ranging from about 60 feet (18.3 meters) above sea level in the northeastern portion of the study area to approximately 200 feet (61 meters) below sea level in the southern portion of the study area. The unit dips gently to the southwest. Lithologically, the Bridgeboro Limestone is a white to yellow, fossiliferous, pocketstone, which contains numerous larger foraminifera (*Leptodicyclina* and *nummulitids*), bryozoa, and coralline algae (either as thin, encrusting laminae or small rhomboids).

A carbonate unit, designated here as the Byram Formation, conformably (?) overlies the Bridgeboro Limestone in the northeastern portion of the study area. This unit is encountered in the northwestern portion of the study area. The Byram Formation is approximately 40 feet (12.2 meters) thick and is developed above sea level, to over 160 feet (48.8 meters) below sea level. This unit only occurs in the northern portion of the study area and pinches out to the south and west. It is very thin within the area, attaining a maximum thickness of approximately 20 feet (6.1 meters).

This carbonate unit has traditionally been problematic for investigators and has been given numerous names, ranging from Chickasawby (Merritt, 1966) to Chickasawby-Chickasawby (Clark and Schmidt, 1982) to Marjano Limestone (Yon and Hendry, 1989). In an attempt to return to the original name, Chickasawby, and to remain consistent with prior mapping efforts in the Crestview quadrangle (Means, et al., 2000), the authors have continued with the use of the designation of Byram Formation for this unit. It should be pointed out, however, that additional work is needed in order to determine the exact extent of this unit.

The Byram Formation has been described north of this area as a white to tan, sandy, granular limestone or marl that contains abundant larger foraminifera, mollusks, and bryozoa. Within this study area, the Byram Formation is a tan to brown, saccharic dolostone. It has been highly altered and shows no traces of fossils that may be age diagnostic. This same lithology was encountered in the northern portion of the Crestview quadrangle, where it was also included within the Byram Formation.

(Means, et al., 2000). Based on biostratigraphic indicators found in unaltered Byram Formation in areas outside of this study area, its age has been determined to be Early Oligocene (Vickburgian).

Sediments of the Alum Bluff Group unconformably overlie the Byram Formation and Bridgeboro Limestone where these units occur in this study.

It attains a maximum thickness of over 260 feet (79.2 meters; W-8353) in the central portion of the study area. However, many of the cores drilled for this project terminate in Alum Bluff Group sediments; therefore total thickness of the unit cannot be determined in some areas. This unit occurs throughout the entire study area and can be seen in outcrop in many stream valleys in Walton and Holmes counties.

Lithologically, Alum Bluff Group sediments range from clayey sands and gravels to greenish, stiff, micaceous clays with variable admixtures of silt, sand, and shell. The lithologic similarity of Alum Bluff Group sediments and undifferentiated Coarse Clastic sediments noted in the northern portion of the Crestview quadrangle (Means, et al., 2000) often makes differentiation of the two units difficult. In the northern portion of the Crestview Quadrangle, Alum Bluff Group sediments interfinger with Coarse Clastics near the Yellow River. In this area, a distinctly different molluscan assemblage and a decrease in the clay content in the Coarse Clastics west of the Yellow River allows them to be differentiated from the Alum Bluff Group sediments east of the river. In the present study area, the lack of continuous deep core coverage combined with the absence of this distinct fauna, and an increase in clay content in the sediments, have led the authors to designate these sediments as Alum Bluff Group on the cross sections.

Huddleston (1984), and Akers (1972) looked at the faunal assemblages, primarily microfossils, and assigned the Alum Bluff to Middle to Late Miocene age. Jones et al. (1993) looked at strontium isotopic ratios in mollusks collected from exposures along the Shoal River and calculated a mean age of 12.4 million years (Ma), which agrees with other paleontologic dates.

The Bruce Creek Limestone of the Alum Bluff Group, as it occurs in this study area, is primarily a subsurface unit. One surface exposure (the type locality) is located in Bruce Creek in the eastern most portion of the study area. The Bruce Creek Limestone unconformably overlies the Bridgeboro Limestone in the southeastern portion of the study area, where the Byram Formation is missing. In the northern and eastern portions of the study area, the Bruce Creek Limestone intertongues with, and is overlain and underlain by, the Alum Bluff Group.

The Bruce Creek Limestone attains a maximum thickness of approximately 110 feet (33.5 meters) in the south-central portion of the study area. The top of the unit is encountered at elevations ranging from 55 feet (16.8 meters) above sea level to over 110 feet (33.5 meters) below sea level. The Bruce Creek Limestone thins and pinches out to the southwest.

The Bruce Creek Limestone is generally a white to light gray, molluscan calcareous sandy calcarenite. In rare instances, quartz sand can comprise up to 50 percent of the unit. The Bruce Creek Limestone contains planktonic and benthic foraminifera, echinoid spines, ostracods, and mollusk molds. Huddleston (1976) dated a microfossiliferous clay bed within the Bruce Creek Limestone as Middle Miocene.

The Citronelle Formation unconformably overlies the Alum Bluff Group throughout the entire study area. It is variable in thickness, ranging from just a few feet in the northern portion of the study area to over 300 feet (91.4 meters) thick in the western portion. It occurs at elevations up to 290 feet (88.4 meters) above sea level. The thickness of the Citronelle Formation may be attributed to erosion of material in the highland areas to the north and re-deposition in valleys to the south. The lithologic character

of the Citronelle Formation does not allow for easy differentiation between Citronelle Formation and re-worked Citronelle sediments. The Citronelle Formation consists of sands and gravels with varying amounts of clay. Lithologic "hardpan" development occurs in some areas. In the northeastern and southern portion of the study area, a unique facies of the Citronelle Formation occurs. This facies ranges in lithology from a clay and clayey sand to gravel with occurrences of numerous *Ophiomorpha* burrows and mollusk molds, indicating deposition in a marine environment. It is unclear how this unit relates to the Citronelle Formation, and for purposes of this study, it has been mapped as Citronelle Formation. Citronelle Formation has been considered a fluvo-deltaic sequence and this facies may reflect the nearshore marine environment of Citronelle Formation deposition.

For the most part, the Citronelle Formation is devoid of fossils, which makes age determination difficult. The formation has been suggested to be time transgressive (Sporhagen and Lamb, 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 that indicated a Quaternary age for the unit. Further study of Citronelle Formation fossils is needed to refine the age of this formation.

The Quaternary alluvium mapped in the river valleys in the study area is assumed to be Pleistocene or Holocene. This unit consists primarily of sands and gravels eroded from upland Citronelle Formation outcrops. Occasionally, traces of carbonized wood and carbonaceous horizons of peat and humate occur. This unit is restricted to river basins where other formations have not been exposed by erosion.

Approximately 70 percent of the study area falls within the boundary of Eglin Air Force Base. This area has been investigated with some unique challenges when doing fieldwork. Because Eglin Air Force Base has been heavily utilized as a training base for testing military ordnance for several decades, the potential for a wide variety of unexploded ordnance (UXO) exists within various areas of the base. This UXO may include large artillery, land mines, training bombs, flares, and various other highly dangerous materials.

All members of the FGS field crew underwent training in ordnance recognition, in case unexploded ordnance were encountered while in the field. Air Force Base personnel were contacted and cleared by EOD (Explosives Ordnance Disposal) crews prior to the beginning of work by survey personnel. Fortunately, no UXO was encountered while performing this work, because the base is highly active, and training missions occur frequently. FGS field crews were often excluded from large areas of the base for days at a time while these missions were being conducted. Additionally, certain areas of the base were completely restricted to survey personnel due to safety/security concerns.

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