THE ORANGEBURG AND PARLER SCARPS: SURFICIAL CONTACTS SEPARATING THE EOCENE, PLIOCENE, AND PLEISTOCENE SEDIMENTS IN ALLENDALE, SOUTH CAROLINA

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ABSTRACT

Detailed 1:24,000–scale geologic mapping has defined the areal and three-dimensional distribution of preserved Eocene, Pliocene, and Pleistocene depositional systems adjacent to the Savannah River in South Carolina. Mapping was conducted on the basis of surface exposures; observations of cuttings from power-auger and hand-auger holes; and on geomorphic expression, elevation, and soil types. The Cenozoic units are bound by a number of erosional scarps. In the Allendale area, the Orangeburg scarp toes at +60 m and the Parler scarp toes at +42.5 m. The Orangeburg scarp was formed by a sea level high stand associated with the Pliocene Duplin Formation deposits. The Parler scarp was formed by a subsequent, lower high stand associated with the early Pleistocene Marietta unit deposits. The geomorphic and stratigraphic expression of both scarps is modified by several factors. Those factors are: the river-dominated nature of the sediments from the Savannah River; the post-depositional erosion by the Savannah, Salkehatchie, and Coosawhatchie river drainages; and eolian erosion from Carolina bay formation.

Project Description

The geologic maps presented here are of the Allendale, Bull Pond, and Barton 7.5-minute quadrangles in Allendale, Barnwell, and Hampton counties, South Carolina. The drilling and field work was conducted in 2009-2010 for the STATEMAP part of the National Cooperative Mapping Program. The purpose is to create surface maps at 1:24,000-scale and accompanied by cross-sections that extend to a maximum depth of 46 m (150 ft) in most areas. These maps are part of a longer-term project to map the Savannah River drainage in South Carolina from the Fall line to the coast.

Geologic Context

The northern part of the map area is part of the Upper Coastal Plain and at the surface consists of the Eocene-aged Dry Branch Formation overlain by the Eocene-aged Tobacco Road Formation (both part of the Barnwell Group). In some areas the Miocene-aged Altamaha Formation (previously called the "Upland unit") overlies the Tobacco Road Formation. The central part of the map area is part of the Middle Coastal Plain where the Pliocene-aged Duplin Formation is exposed with "windows" of the Eocene deposits exposed through erosion. The southern part of the map area is part of the Lower Coastal Plain and is the Pleistocene-aged Marietta unit. The Coosawhatchie River's headwaters are in the Barton Quadrangle and extensively modify the surficial deposits. The western part of the map area is dominated by the Savannah River and its floodplain. Where possible, the floodplain deposits and river terraces were mapped and correlated to the marine-dominated formations. Quaternary-aged Carolina bays are near-ubiquitous in the map area.

Erosional scarps often mark the erosional shorelines for the inland limits of marine deposits in the Middle and Lower Coastal Plain in South Carolina (as seen in Colquhoun, 1969, 1974). The oldest recognized scarp is the Orangeburg Scarp, which is the boundary between the Upper and Middle Coastal Plain. The next younger recognized scarp is the Parler, and it divides the Middle Coastal Plain in to two units: The Pliocene Duplin Formation and the now Pleistocene Marietta unit (formerly Pliocene- with the change of the age of the Quaternary as per the International Stratigraphic Commission Stratigraphy, International Stratigraphic Chart, 2008).

Discussion and Results

The Orangeburg scarp (Johnson and DuBar, 1964) has been recognized as a physiographic feature in several southeastern US states- Georgia, South Carolina, North Carolina, and Virginia. It has been recognized as the inland erosional limit of the Pliocene Duplin Formation where it contacts older sediments of Eocene, and older, age. The elevation of the scarp has been noted as +190 to +215 ft (DuBar et al., 1974; Colquhoun, 1974) (+57.9 to +65.5 m). In the area around Allendale, South Carolina the toe of the Orangeburg scarp is the contact of the Duplin Formation and the Eocene Tobacco Road Formation and is mapped at +60 m (+191 ft) (Figure 1). The Eocene deposits are heavily incised with many large (1-4 km width) drainages. The Duplin Formation is deposited in several of these preexisting drainages.

The Parler scarp (Colquhoun, 1974) has been recognized as the inland erosional limit of the Pleistocene Marietta unit where it contacts the Pliocene Duplin Formation (Willoughby, 2002, 2003). Around Allendale the toe of the Parler scarp is mapped at +42.6 m (+141 ft) (Figure 1).

As seen on the maps in Figures 3, 4, and 5, the land surface in the area has been extensively modified by the formation of Carolina bays. Commonly the bays have formed on the flat surfaces of the formations. In some areas the bays have formed seaward of the scarps and impinged on the scarp face in several areas and in other areas the bays have also formed in several drainages. The alteration of the landscape by the bays, both the excavation and the associated deposit of the sand rims, has obscured or removed the scarps or complicated interpreting their location.

Due to the close proximity of the Savannah River, both the Duplin Formation and the Marietta unit deposits in this map area are fluvial-sourced sands and silts reworked by marine processes with no recognized macrofossils (unlike other areas of the state).

References

DuBar, J. R., Johnson, H. S., Jr., Thom, B., and Hatchett, W. O., 1974, *Neogene stratigraphy and morphology, south flank of the Cape Fear Arch, North and South Carolina, in- Oaks and DuBar, eds., Post-Miocene Stratigraphy, Central and Southern Atlantic Coastal Plain*, Utah State University Press, Provo, Utah.

Colquhoun, D. J., 1969, *Geomorphology of the Lower Coastal Plain of South Carolina*, South Carolina Division of Geology, Map Series 15, 36 p.

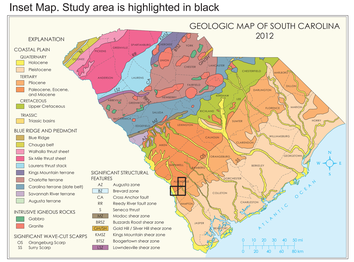
Colquhoun, D. J., 1974, *Cyclic surficial stratigraphic units of the Middle and Lower Coastal Plains, central South Carolina, in- Oaks and DuBar, eds., Post-Miocene Stratigraphy, Central and Southern Atlantic Coastal Plain*, Utah State University Press, Provo, Utah.

Johnson, H. S., Jr. and DuBar, J. R., 1964, *Geomorphic elements of the area between the Cape Fear and Pee Dee River*, North and South Carolina, Southeastern Geology, vol. 6, no. 1, p. 37-48.

Willoughby, R. H., 2002, Geologic map of the Fort Motte 7.5-minute quadrangle, Calhoun, Clarendon, and Orangeburg Counties, South Carolina, *South Carolina Geological Survey, Geological Quadrangle Map 8.*

Willoughby, R. H., 2003, Geologic map of the Fort Motte 7.5-minute quadrangle, Calhoun, Richland, and Sumter Counties, South Carolina, *South Carolina Geological Survey, Geological Quadrangle Map 10.*

Inset Map. Study area is highlighted in black



Allendale Quadrangle

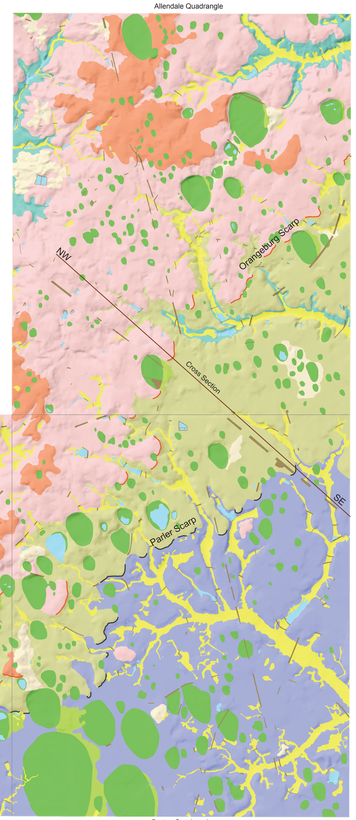


Figure 1. Map Compilation

Bull Pond Quadrangle

Barton Quadrangle

Figure 2. Compilation Cross-section

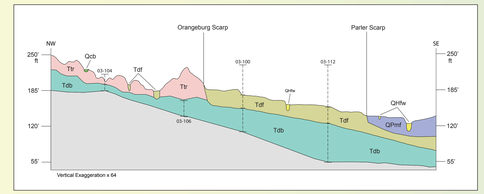


Figure 3. Bull Pond Quadrangle

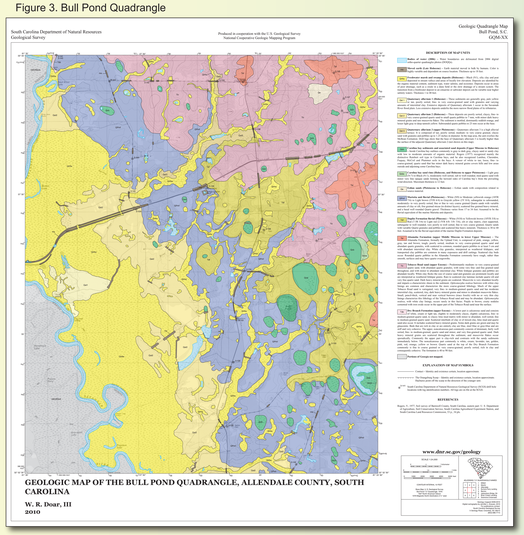


Figure 4. Allendale Quadrangle

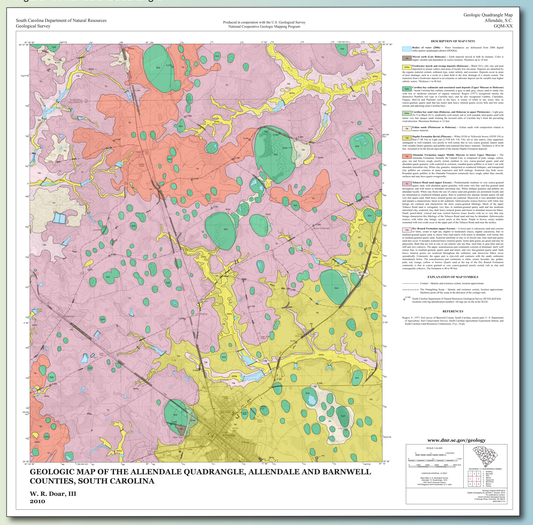
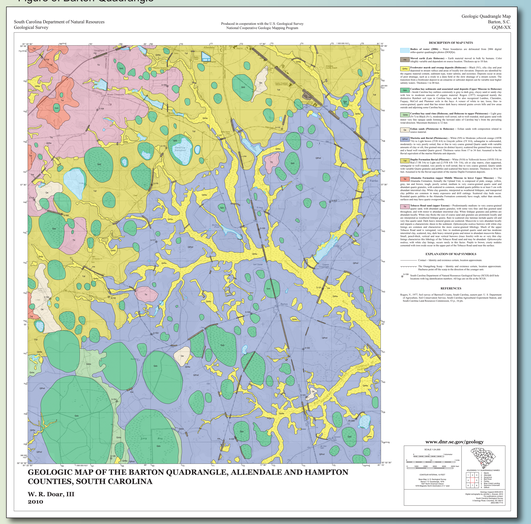



Figure 5. Barton Quadrangle