Revision of the Pleistocene Dorchester and Summerville Scarps, the inland limits of the Penholoway terrace, central South Carolina

W. R. Doar, III and Ralph H. Willoughby

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ABSTRACT

Doar, W. R., III (doarw@dnr.sc.gov), and Ralph H. Willoughby South Carolina Department of Natural Resources, Geological Survey, 5 Geology Road, Columbia, SC 29212

Geomorphic boundaries of marine Pleistocene terraces (toes of scarps) in South Carolina were examined from 1:24,000 topographic maps, areal photographs, and new 1:24,000* geologic maps. Did the Dorchester Scarp at its type location face a Pleistocene estuary or the Pleistocene Atlantic Ocean? Colquhoun (1962) interpreted the Dorchester Scarp as formed by a marine Pleistocene highstand at 75 ft elevation and as the boundary between the Wicomico and Penholoway terraces. Colquhoun (1962) also interpreted the Summerville Scarp as formed by a marine Pleistocene highstand at approximately 75 ft elevation and as the boundary between the Penholoway and Talbot terraces.

Relationships show: 1) that the Dorchester Scarp at Four Hole Swamp is the boundary between older barrier-island deposits beneath the Wicomico terrace and younger estuarine deposits of the Penholoway terrace; 2) that the Summerville Scarp at Lincolnville is the boundary between older beach deposits beneath the Wicomico terrace and the younger beach deposits beneath the Penholoway terrace; and 3) that a barrier island core separated the two scarps formed during the same Pleistocene highstand. A modern analog is Hilton Head Island. It contains two Pleistocene barrier-island cores separated by successively lower scarps formed during successively lower highstands. The mainland behind the island has two estuarine shoreline scarps in the back-barrier system. Both barrier-island and estuarine scarps were formed during the same highstands, with successive reoccupation of the back-barrier estuarine systems.

*Produced through NCGMP STATEMAP

REMARKS

Researchers have divided the Lower Coastal Plain of South Carolina by geomorphic features since before 1910. Features found at similar elevations in South Carolina and features in adjacent states in the southeastern U.S. have been termed escarpments (scarps) and terraces. The scarps and terraces are erosional and depositional features at the surface related to the highest preserved elevation of a previous sea level. Along the Lower Coastal Plain of South Carolina these scarps are the erosional contacts between prior sea level high-stands and later, slightly lower, high-stand deposits preserved as terraces. Delineating these scarps and terraces has been the goal of many researchers over the past century.

Cooke (1936) produced the first complete set of prior shoreline maps. These maps correspond well to known scarps and terraces. Colquhoun (1965) proposed some revisions of these shorelines (Fig. 1) and produced a rough map and cross section in the Summerville area (Fig. 2). He later revised his assignments. His work has left some confusion as to the nature and arragnment of the Pleistocene terraces and scarps for South Carolina. A brief history of these assignments is shown in the scarp and terrace charts (Fig. 3, Fig. 4).

Recent 1:24,000 geologic mapping has revealed the need to revise these assignments. The proposed revisions to the scarps and terraces are shown in figures 3, 4, and 5.

Results from the new mapping and a reevaluation of geomorphology along the Lower Coastal Plain have produced a new map of the Pleistocene terraces of South Carolina. On this map, the same sea level event produced the Dorchester and Summerville Scarps. The Summerville Scarp is the later, ocean-fronting, scarp produced with the progradation of the Summerville/Pinopolis barrier (Weems and Lemon, 1987; McCartan and others, 1990) southward in front of the Dorchester Scarp shoreline. The area of Four Hole Swamp is the sound created by this southward progradation of the barrier. This left an area for the Penholoway estuarine sediments to deposit between the barrier island core and the former headland-attached beach of the Wicomico terrace (Fig. 6). Today's Hilton Head Island is a similar arrangement (Fig. 7) These changes create the need to adjust the terrace placements in th.e Summerville area, by extending the Wicomico terrace eastward to the Summerville Scarp, narrowing the Penholoway terrace, and adjusting the younger terraces and scarps seaward of them to reflect these new changes. These changes are incorporated into the revised map and stratigraphic column presented here.

References:

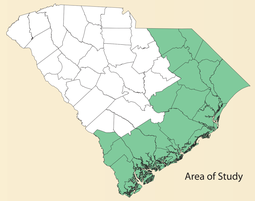
Colquhoun, D. J., 1962; On Surficial Sediments in Central South Carolina- A Progress Report, Geologic Notes, vol 6, no 6, p 63-80, South Carolina State Development Board.

Colquhoun, D. J., 1965; Terrace Sediment Complexes in Central South Carolina- Atlantic Coastal Plain Geological Association Field Conference, 1965: University of South Carolina Press, 62p.

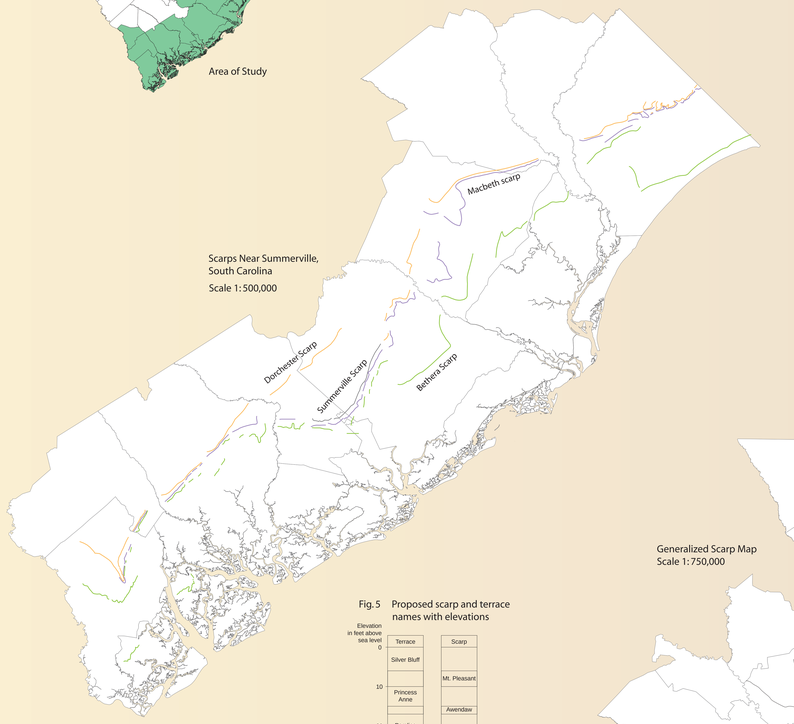
Cooke, C. W.; 1936; Geology of the Coastal Plain of South Carolina: US Geological Survey Bulletin 867; 196p.

McCartan, L., Weems, R. E., and Lemon, E. M., Jr., 1990, Quaternary Stratigraphy in the Vicinity of Charleston, South Carolina, and its Relationship to Local Seismicity and Regional Tectonism, p. i-iv, A1-A39, in Studies Related to the Charleston, South Carolina, Earthquake of 1886 Neogene and Quaternary Lithostratigraphy and Biostratigraphy: US Geological Survey Professional Paper 1367.

Weems, R. E., and Lemon, E. M., Jr, 1987; Geologic Map of the Moncks Corner Quadrangle, Berkeley County, South Carolina: US Geological Survey Geologic Quadrangle Map GQ-1641.



Area of Study



Scarps Near Summerville, South Carolina

Scale 1:500,000

Schematic diagram of Pleistocene Lower Coastal Plain terrace systems

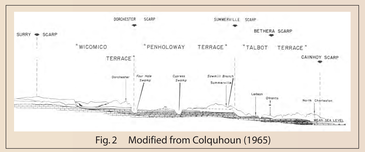
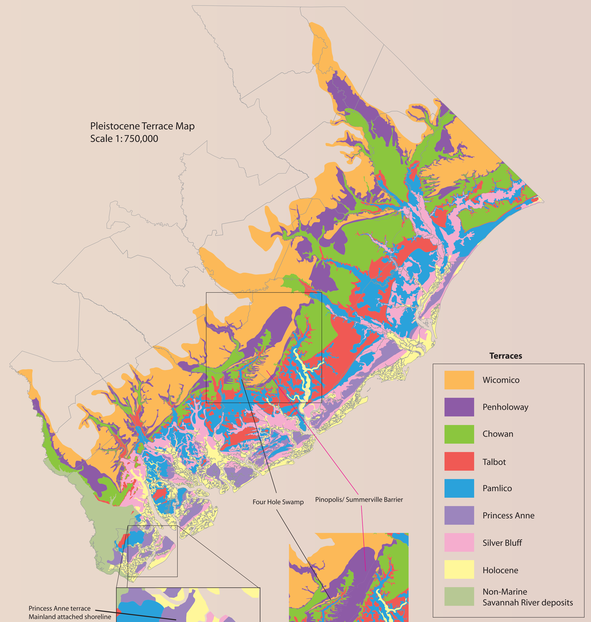


Fig. 2 Modified from Colquhoun (1965)

Pleistocene Terrace Map
Scale 1:750,000



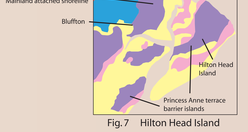


Fig. 7 Hilton Head Island

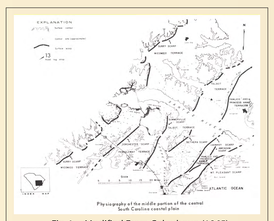


Fig. 1 Modified From Colquhoun (1965)

Generalized Scarp Map
Scale 1:750,000

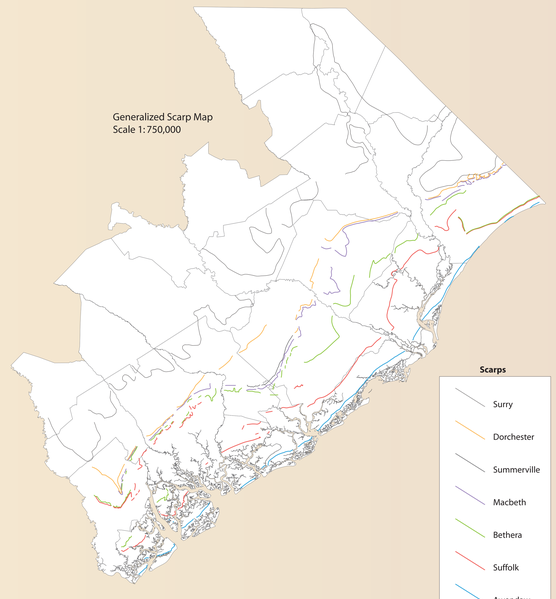


Fig.5 Proposed scarp and terrace names with elevations

Elevation in feet above sea level	Terrace	Scarp
0	Silver Bluff	
10	Princess Anne	Mt. Pleasant
20	Pamlico	Awendaw
30	Talbot	Suffolk
40		Bethera
50	Chowan	
60		Macbeth
70	Penholoway	
80	Wicomico / Waccamaw	Dorchester & Summerville
90		
100		Surry

Fig.3 History of Scarp names

Elevation in feet above sea level	Johnson 1907	Wentworth 1930	Cooke 1936	Flint 1940	Richards 1950 - 1962	Hoyt & Hails 1974	Colquhoun 1991	Doar proposed
0								
10		scarp			Mt. Pleasant	Silver Bluff	Mt. Pleasant	Mt. Pleasant
20		scarp				Princess Anne	Awendaw	Awendaw
30	scarp	Suffolk	Pamlico	Suffolk	Suffolk	Pamlico	Cainhoy	Suffolk
40		scarp	Talbot			Talbot	Bethera	Bethera
50							Summerville	
60	scarp	scarp						Macbeth
70	scarp		Penholoway			Penholoway	Dorchester	Dorchester & Summerville
80								
90								
100	scarp	Surry	Wicomico	Surry	Surry	Wicomico	Surry	Surry

Fig.4 History of terrace names

	Shattuck 1901	Johnson 1907	Sloan 1908	Stephenson 1912	Cooke 1936	Malde 1959	Colquhoun 1965	DuBar & others 1974	Hoyt & Hails 1974	McCartan & others 1984	Huddleston 1988	Owens 1989	Colquhoun 1991	Weems & Lemon 1993	Doar proposed
Recent	recent	currently forming terrace	coast sands	recent	recent	no data	Modern	Wister Island	Holocene	Q1	Holocene	Holocene	Holocene	Holocene	Holocene
			Sea Island Wadmalaw (north) Edisto Complex						Silver Bluff		Silver Bluff		Silver Bluff		Silver Bluff
	Talbot	lowest terrace					Princess Anne	Socastee	Princess Anne	Q2	Princess Anne	Wando	Princess Anne	Wando	Princess Anne
			Wadmalaw (south) Edisto Complex	Pamlico	Pamlico	Pamlico			Pamlico	Q3	Pamlico		Pamlico		Pamlico
			Acabee Complex				Pamlico				Talbot				
			Ten Mile Sands	Talbot	Talbot	Ladson	Talbot	Canepatch	Talbot	Q4	Penholoway		Talbot	Ten Mile Hill beds	Talbot
	Wicomico	second terrace	no data	Chowan	Penholoway	Penholoway	Penholoway	Waccamaw	Penholoway	Q5	Wicomico	Socastee	Penholoway	Ladson	Chowan
		next higher terrace		Wicomico	Wicomico	no data	Wicomico		Wicomico	Q6		Pamlico	Wicomico	Penholoway	Penholoway
Older												Wicomico		Wicomico / Waccamaw	Wicomico / Waccamaw

Relative Time Sclae