Geomorphology and Soil Survey

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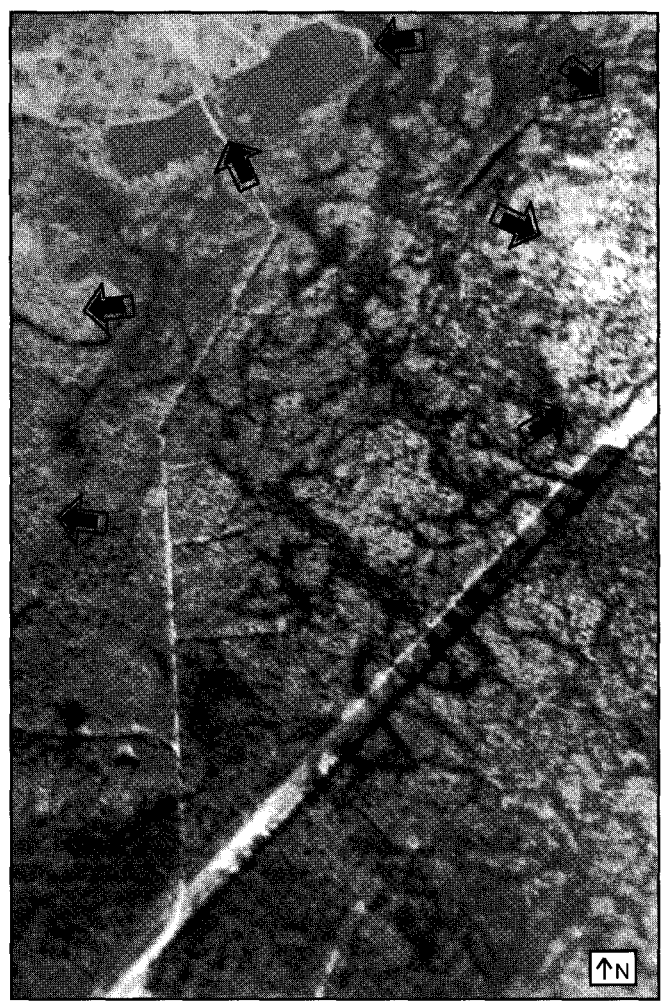
The Coosawhatchie River, through erosion and downcutting, carved a fluvial valley through the Wicomico and Pamlico marine terraces during the late Pleistocene-Holocene period. The floodplain is relatively small and immature compared to the major river systems of the South Carolina Lower Coastal Plain. Consequently, the classic geomorphic features of a larger fluvial system are subtly expressed. The study area is composed of two weakly developed terraces, distinguished primarily by flooding frequency and surface sand size. The soils of the lower terrace consist of highly variable loamy and clayey Pamlico and recent fluvial sediments over older sandy fluvial beds. The soils of the upper terrace along the western edge of the floodplain consist of clayey and loamy Pamlico sediments with an alluvial surface layer. Small amounts of sediment from sandy, upland Wicomico deposits are delivered via short, well-dissected drainageways. The underlying stratigraphy consists of unconsolidated Quaternary and Pliocene marine and fluvial sediments blanketing semilithified Miocene through Cretaceous marine sediments (Colquhoun 1965, 1974; Dubar 1971; Hughes and others 1989).

The floodplain's relief—approximately 2 m—is characterized by a distinct microtopography of convex hummocks and scoured swales. The fluvial geomorphology is the result of the low gradient, anastomosing river's inability to completely erode the residual Pamlico sediments and to move the coarse component of its sediment load. The sandy bed load is left behind as channel bars and small natural levees. These curvilinear, low ridges are composed primarily of siliceous, loamy, fine sands. The floodplain, exposed to temporal variations in discharge, experiences relatively short, intense flooding periods and an extensive period of lower discharge. The scoured branching channel networks are formed through avulsion, as main channel banks divert flood flows onto the floodplain surface and as the water table rises above the land surface. The sloughs' soils are composed of silts and clays, deposited by overbank flooding. Floodwaters tend to persist in swampy, shallow pools on the very poorly drained, low-permeability soils. On the Coosawhatchie River floodplain, generalized soil horizons and subsurface stratigraphy consist of a thick, loamy surface layer underlain by interbedded, silty, slackwater deposits and lenses of point bar and channel sands, surrounding reworked relict islands of Pamlico terrace material.

Soils on the study site were mapped during the 1970's as one unit—the Santee Association (U.S. Department of Agriculture, Soil Survey Staff 1980). A more detailed characterization of the floodplain was necessary to better understand the site history and hydrologic controls on surface and subsurface water, and to determine the distribution of elements in nutrient cycling studies. Samples collected from representative horizons at approximately 100 locations and analyzed for physical and chemical properties were used to generate a detailed soils map (fig. 1.1).



Aerial photo of study area showing the anastomosing channels dissecting the incompletely eroded marine terrace, the limits of which are marked with arrows.

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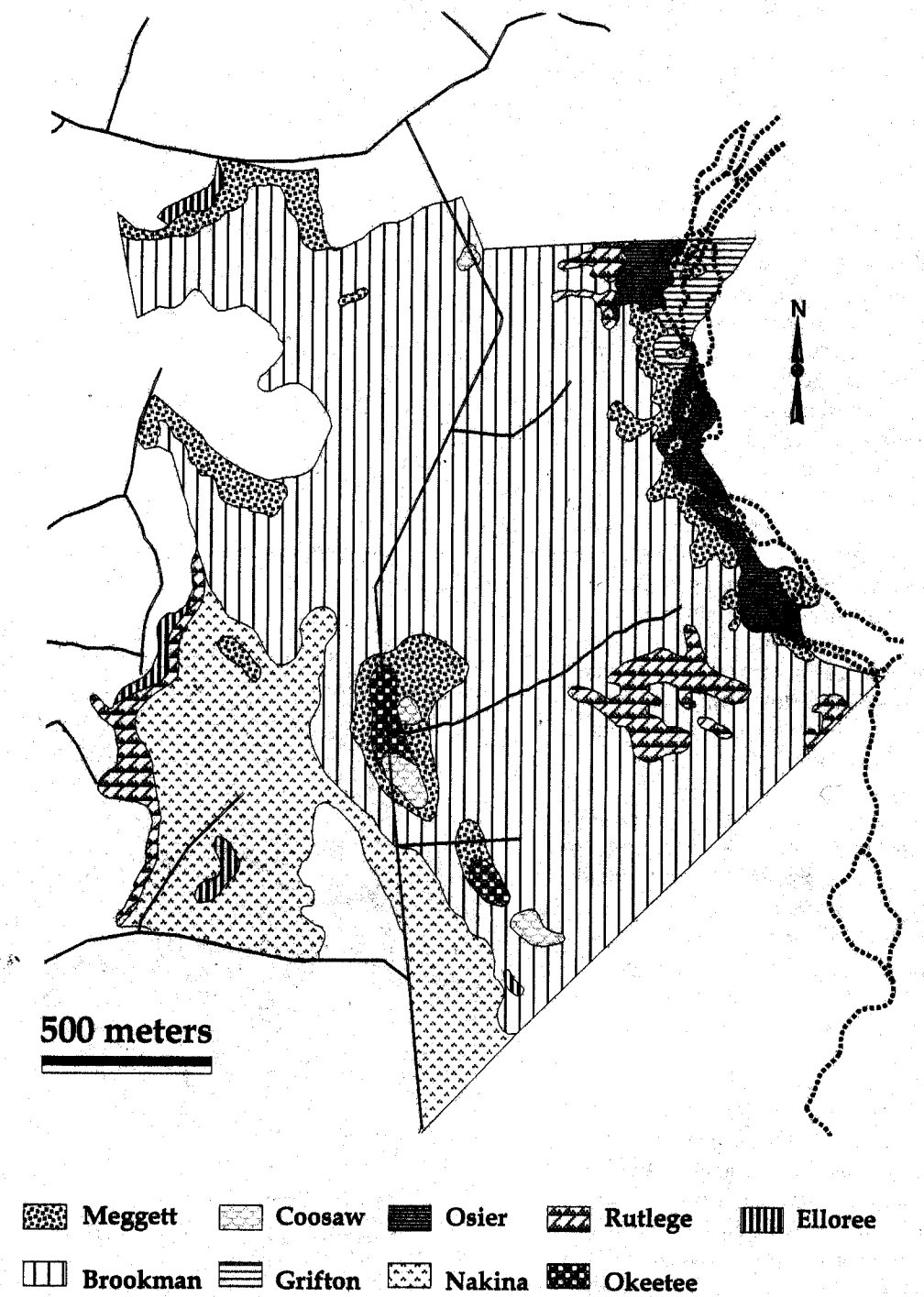

Figure 1.1—Soil series map of the Coosawhatchie Bottomland Ecosystem Study site, South Carolina.

Nine soil series were identified, with the most clayey subsoils thinning towards the river, where sandy lithologic discontinuities increase. The majority of the site was classified in the Brookman series—a fine, mixed, thermic, Typic Umbraqualf (fig. 1.2). These soils have thick, black, loamy surface layers and dark gray, clayey subsoils. Scoured areas have higher silt content. Less important was the Meggett series: a fine, mixed, thermic, Typic Albaqualf found on areas slightly higher in elevation (< 1 m) than the rest of the floodplain, located on large islands and adjacent to upland areas. Black or dark gray surface layers are < 25 cm thick in the Meggett series. The Nakina series is a fine-loamy, siliceous, thermic, Typic Umbraqualf in the western part of the study area, adjacent to the upland. Surface layers consist of black loam to approximately 50 cm in depth. Comprising a total of approximately 20 percent of the area is soils characteristic of the Okeetee, Coosaw, Elloree, Grifton, Osier, and Rutlege series. All are composed of siliceous, sandy, and sandy loam surface layers; however, the Osier and Rutlege series are devoid of leached E and argillic B horizons. This lack of profile development in the Osier and Rutlege series supports a recent fluvial origin, whereas the Okeetee, Coosaw, Elloree, and Grifton series exhibit well-developed horizons and are composed of older terrace sediments.

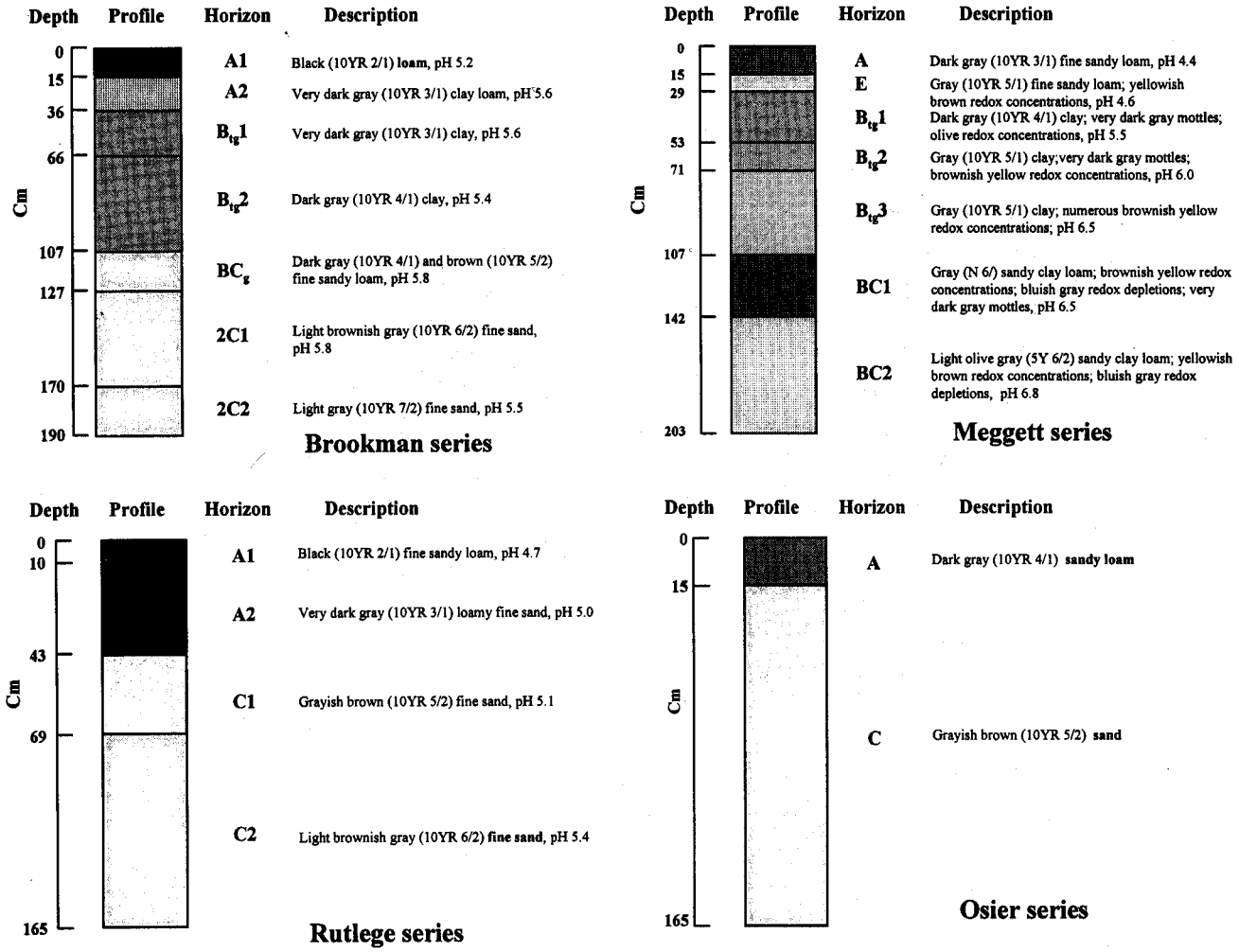

Figure 1.2—Four representative soil series illustrating the variety of horizon development in soils on the Coosawhatchie Bottomland Ecosystem Study site, South Carolina.