GEOLOGY OF THE GEORGIA COAST

The barrier islands of Georgia have the distinct appearance of being split in a north-south plane with their uplands connected by marsh. The reason for this appearance is that there really are two sets of barrier islands, each formed during distinctly different geological times. The islands making up the western side of the chain were formed about 35,000 to 40,000 years ago, and those to the east date back only 4,000 to 5,000 years. The older islands formed the beaches when the sea level was about 6 feet above the present level -before the formation of the fourth and last great continental ice sheet of the Pleistocene epoch. Enough sea water was frozen into that last big freeze to lower the sea level 300 to 500 feet, placing the shoreline near the present edge of the continental shelf, approximately 80 miles offshore.

About 18,000 years ago, the ice sheets began to melt and the sea level rose rapidly until 4,000 to 5,000 years ago, when the rate of ascent diminished to 4 to 6 inches each century. Along with the rise in sea level, newly formed barrier islands (Holocene islands) began migrating westward toward the older islands (Pleistocene islands). The westward migration of these islands occurred and still is occurring as the advancing seas continue to erode the eastern-facing beaches and redeposit the sediments into the marshes and lagoons behind the islands. The way the sediments are redistributed during island migration is well described by Pilkey and Leatherman in their classic 1979 text The Beaches Are Moving.

The newer Holocene islands over time have become variously juxtaposed to their Pleistocene counterparts (see illustration at right). The islands directly south of the Savannah River (Tybee, Wassaw, and the north end of Ossabaw) and those south of the Altamaha River (Little St. Simons and Sea Island) are more separated from their Pleistocene counterparts than the other Holocene islands. The inward advancement of these islands has been impeded by the far more copious output of sediments by the Savannah and the Altamaha Rivers relative to the other smaller rivers. Where the smaller rivers produced less sediment, the Holocene islands have migrated closer and, in some cases, have become attached to the older islands.

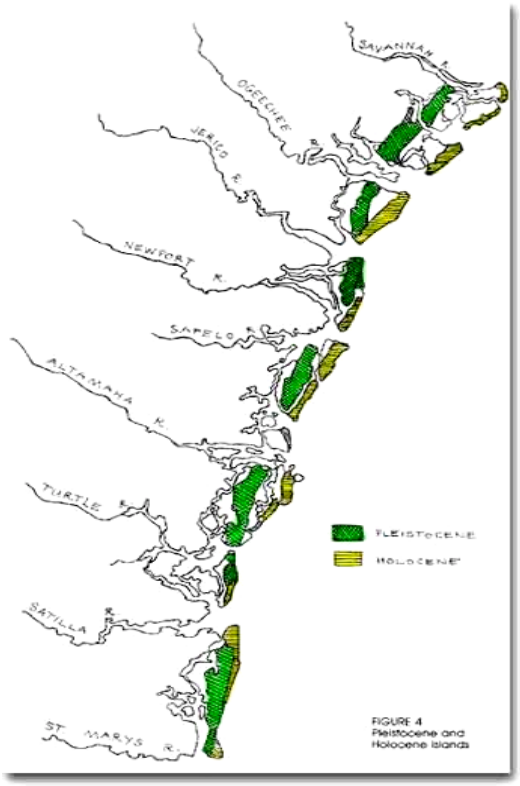

FIGURE 4
Pleistocene and Holocene Islands

Today sea level continues to rise in this area, but at an increased rate of 12 to 14 inches per century. Pilkey feels that the accumulation of carbon dioxide in the atmosphere over the past 50 years is elevating the atmospheric temperature (the "greenhouse effect") and is further melting the ice caps, contributing to the rate of sea level rise. With the increase in the rise of the sea level, erosion predominates across the Atlantic seashore. The prevailing erosion of the eastern beaches of the barrier islands is evidence of this trend. The many attempts to save developed frontage property and restore the retreating beaches through the use of seawalls, jetties, and groins are well reviewed by Pilkey, who demonstrates how such methods, instead of stabilizing the beaches, often accelerate their loss.

Through the action of prevailing winds, waves, and tidal currents, dynamic changes in the shape and size of barrier islands occur constantly, especially at the ends of the islands where they come in contact with inlets or narrow bodies of water between the islands. Generally, the southern ends of the islands tend to accrete (build up by deposition), while growth on the northern ends is irregular and often interspersed with erosion.

The north ends of the barrier islands show complicated patterns of growth and erosion which vary from island to island. Large reservoirs of sand in the form of shoals often are seen at the mouths of the inlets, resulting from complex interactions between tidal and longshore currents. Through the action of the southerly-directed longshore currents and wave refraction, the shoals tend to drift downward and inward toward the upper parts of the islands south of the inlets. The frequent incorporation of inlet shoals to the north gives the Georgia barrier islands their characteristic drumstick shape, with the upper ends thicker. Occasionally, a shoal near a barrier Island becomes stable enough to support vegetation, and acts as a wave shelter to the beach. Again, suspended sediments tend to fall out in the quieter waters between the shoal and the beach, which can eventually form a marsh connecting the newly made beach front onto the older shore. Any number of shoals may likewise become attached to an island, creating a corduroy pattern of old dune ridges interspersed with marshes and lowlands. Such areas are often eroded back by storms only to re-form over time.

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