

North Carolina's barrier islands act as a large sand dam, separating the open water of the Atlantic Ocean from the semi-enclosed waters of the estuarine system. The string of sand barriers, built and maintained by the higher energy levels of the oceanic system, serve as an energy buffer, largely protecting the back-barrier estuarine system from extremely high-energy oceanic conditions.

Associated with barrier islands are small holes through the sand dam known as inlets that historically have allowed shipping of goods and movement of people (figures 1-2 and 1-11). Inlets are more appropriately called "outlets" because their main function is to allow riverine fresh water that flows off the land to pass through the barrier island sand dam and discharge into the ocean, which is the ultimate base level. However, once an outlet is open, then it also functions as an inlet because strong astronomical tides create water level differentials resulting in active tidal exchange of ocean water through inlets and into adjacent estuaries. The regularity and strength of tidal currents produced by this tidal pumping maintains an inlet/outlet system of the short-term scale of hours to years. Storm pumping, resulting from major storm tide events, maintains an inlet/outlet system on the longer-term scale of years to centuries.

Thus, there are two sources of water that feed the estuarine system.

1. Gravity causes fresh water in rivers to flow downhill into the estuaries and ultimately to the oceans.
2. Ocean water is pumped through the inlets by astronomical and storm tides.

Consequently, estuaries act as great mixing basins where the two water masses intermix to form the following general salinity gradients.

1. Fresh water in the upstream or riverine portions
2. Low-brackish water in the inner estuaries
3. High-brackish water in the outer estuaries and inlets
4. Normal sea water salinity in the offshore oceanic regions

The interplay between the regularity of astronomical tides, irregularity of wind tides, and vast array of brackish waters characterizing the estuarine system largely determines what coastal plant and animal communities occur within the estuarine systems and where they thrive.



Figure 1-2. This satellite image shows the Sea-View site locations. The image is a joint product of the NASA Landsat Project Occupancy Office, Goddard Space Flight Center, and the U.S. Geological Survey EROS Data Center. Figure is modified from Figure 2-1-3, p. 19 in Riggs and Ames (2003).

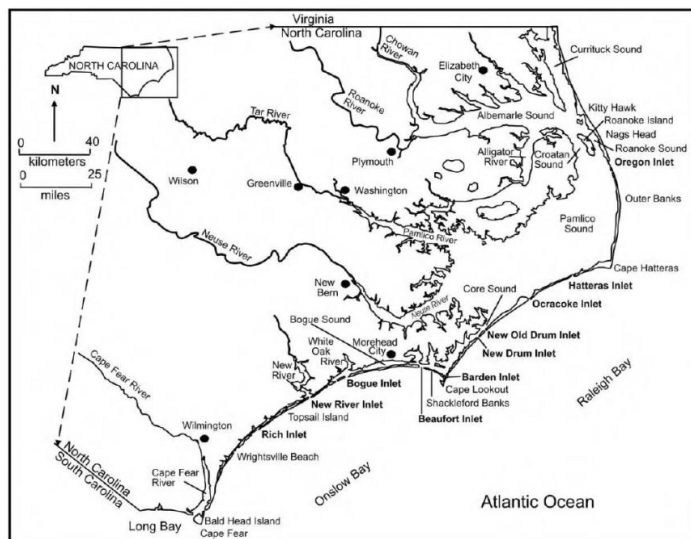


Figure 1-11. Location map shows major towns and coastal features for the North Carolina coastal system. Figure 2-1-2, p. 18 in Riggs and Ames (2003).