

SECTION 5. EXISTING FISH AND WILDLIFE RESOURCES

Coastal ecosystems in North Carolina are influenced by a complex interaction of physical, chemical, hydrologic and biological processes. The biological communities present within coastal ecosystems depend on any number of these processes for survival and productivity. Sea turtles, for example, rely upon the physical, chemical and hydrologic parameters of the beach substrate to incubate and hatch eggs. Migratory birds and fish feed on macrofauna living in the wet portions of a beach; the macrofauna are non-uniformly distributed throughout the wet beach depending on precise physical and hydrologic features. Marine epifauna require hard substrates on the seafloor in order to maintain a sessile holdfast. Many fishery resources, both sessile and pelagic, have pelagic larval life stages that depend on tidal currents to transport larvae from spawning to nursery habitats. The influence of physical, chemical and hydrologic parameters on biological resources creates habitats that are dynamic both in space and time.

Many coastal habitats are storm-driven ecosystems, relying upon storms for habitat distribution and availability much like some forest systems are fire-driven ecosystems. Onslow Bay is known for its extensive areas of hardbottoms, which vary from flat algal meadows to high-relief reef complexes (Riggs et al. 1995, Riggs et al. 1996, Riggs et al. 1998). Recent research has shown that these hardbottom areas are continually subject to bioerosion by boring fauna, which breaks down the substrate and creates sediment. These areas then shift from high quality hardbottom habitat to more of a mixed hardbottom-softbottom community. Periodic storms subsequently wash away the bioeroded sediment and restore the hardbottom community (Riggs et al. 1996, Riggs et al. 1998). In a similar manner, pioneering vegetation and bare ground nesting shorebirds and waterbirds rely upon overwash to maintain bare sand habitats at inlets and barrier island interiors. The storm overwash washes away or buries more mature vegetation much the way storm waves remove bioeroded sediment from offshore hardbottoms, restoring the early succession habitat many coastal flora and fauna depend upon.

Bogue Banks Interior

The Bogue Banks present today is estimated to be 4000 to 7000 years old, maintaining a stable to accretionary geographic position for the last 4000 years (Moslow and Heron 1994, Steele 1980). In fact, Moslow and Heron (1994) state that the natural history of Bogue Banks "is unique within the Outer Banks, and contrasts sharply to that of the more common transgressive, storm-overwash-dominated barrier islands" (p. 58). Only the central portion of the island, where the island is narrowest, contains areas subject to overwash and storm breaches (and then only relatively rarely). Hurricane Hazel opened two inlets in eastern Emerald Isle in 1954, one at 2nd Street and the other between 19th and 23rd Streets (Pilkey et al. 1998).

The island's orientation shelters the barrier from northeasters but renders it more vulnerable to hurricanes from the south. During fair weather, the island is considered a low-energy environment with a mean tidal range of 0.89 meters (m; ~3 ft) (Moslow and Heron 1994). The island is one of the largest in North Carolina in terms of length and elevation, with interior elevations reaching 16 m (~52.5 ft) above sea level (Figure 2) and the island is sand-rich,

Figure 2 insert

containing a comparably high volume of sediment along almost its entire length (Moslow and Heron 1994, Steele 1980). New flood zone maps from the state of North Carolina and the Federal Emergency Management Agency (FEMA) for Bogue Banks designate the majority of the island as within the 500 year floodplain, with oceanfront areas subject to wave action and less frequent storm events. A few of the higher beach ridges in Emerald Isle and the Hoop Pole Creek are above the 500 year floodplain. (The new maps can be viewed in Appendix C.)

Most of Bogue Banks consists of shore-parallel beach ridges that are typically vegetated with maritime forest. Where the ridges are shore-oblique or curved, they generally indicate the historic presence of an inlet (Moslow and Heron 1994). Cheeseman Inlet, for example, was historically present in eastern Pine Knoll Shores/western Atlantic Beach and may have generated the recurved beach ridges prominent at the Theodore Roosevelt State Nature Reserve. The ridges are geomorphic features that determine the distribution of maritime forest and wetland communities on the island.

The maritime forest on Bogue Banks is the most abundant remaining on a North Carolina barrier island. Several of these tracts remain intact (Table 6), but by and large the maritime forest on the island is becoming fragmented as development continues. Individual property development tends to build structures within the forest, such as that along Oakleaf Road in Pine Knoll Shores, whereas larger scale developments may clear the vegetation for development (e.g., the Atlantic Beach amusement park or Bogue Banks Country Club golf course (Pilkey et al. 1998)). The dense maritime forest provides valuable habitat for migratory and resident songbirds, mammals, and reptiles.

Table 6. Significant tracts of maritime forest on Bogue Banks that are currently intact.

Area	Responsible Party	Approximate Area (acres)
Fort Macon State Park	NC Division of Parks and Recreation	414
Theodore Roosevelt State Natural Area	NC Division of Parks and Recreation	301
Hoop Pole Creek	North Carolina Coastal Federation (NCCF)	32
Regional Beach Access and State Park	Town of Indian Beach and NC Parks and Recreation	26
Emerald Isle Stormwater Management Site	Town of Emerald Isle and NCCF	41
Indian Beach Maritime Forest	Unknown	136
Salter Path Maritime Forest	Unknown	65

The troughs in between the beach ridges often contain freshwater wetlands, also oriented in a linear, east-west orientation. Table 7 lists the wetlands found on Bogue Banks by the National Wetlands Inventory (NWI) Program in 1983. Over 2000 acres of wetlands are distributed along the estuarine shoreline and interior portions of the barrier island. Excavated ponds and canals in several subdivisions accounted for another 165 acres as of 1983. Forested wetlands, both deciduous and evergreen, are found on approximately 167 acres of the island, concentrated in western and central Emerald Isle. An analysis conducted for the Town of Emerald Isle, which recently purchased a 41 acre tract immediately west of the Route 58 bridge, found that these forested wetlands were very high quality. Ecological evaluations of the property determined that the swamp forest was dominated by red maple (*Acer rubrum*), sweet gum (*Liquidambar styraciflua*), loblolly pine (*Pinus taeda*), red bay (*Persea palustris*), black willow (*Salix nigra*), and a thick understory of American holly (*Ilex opaca*), red bay, Atlantic white cedar (*Chamaecyparis thyoides*) and wax myrtle (*Myrica cerifera*). These wetlands areas support a diversity of wildlife, including American alligator (*Alligator mississippiensis*), white-tailed deer (*Odocoileus virginianus*), Carolina wren (*Thryothorus ludovicianus*), red-bellied woodpecker (*Melanerpes carolinus*), summer tanager (*Piranga rubra*), and yellow-bellied sapsucker (*Sphyrapicus varius*). Functional analyses of the wetlands found the estuarine marsh to be in the 93rd percentile of biological functionality, the maritime swamp forest ranked in the 73rd percentile, and the freshwater marsh scored in the 54th percentile (Moffatt and Nichol 2000).

Other landscape cover types present on Bogue Banks include scrub-shrub, professionally landscaped areas, impervious surfaces and bare ground. Scrub-shrub areas are commonly found adjacent to or intermixed with maritime forest (Figure 3). Approximately 328 acres of Bogue Banks is covered by scrub-shrub wetland communities (Table 7). Landscaped and impervious areas are indicative of development and generally provide significantly less habitat value to fish and wildlife resources than natural vegetation communities. Bare ground areas are concentrated along the oceanfront beaches and inlet areas.

Several areas on Bogue Banks have been set aside for public use and/or conservation. Fort Macon State Park in Atlantic Beach borders Beaufort Inlet. This ~414 acre park contains an historic fort and associated cultural resources, multiple dune ridges with dense forest and scrub-shrub vegetation, and extensive wetland communities on the soundside. The Theodore Roosevelt State Natural Area contains ~301 acres of maritime forest and estuarine wetlands along with one of the North Carolina Aquariums. This tract has also been designated as an Otherwise Protected Area (OPA) under the Coastal Barrier Resources Act (CBRA) by the United States Congress. Hoop Pole Creek in Atlantic Beach is a ~32 acre preserve of maritime forest, tidal creeks and estuarine wetlands purchased by the North Carolina Coastal Federation (NCCF) with a Clean Water Management Trust Fund grant. The Town of Indian Beach, the North Carolina Divisions of Parks and Recreation and Coastal Management own tracts totaling ~25 acres near Mile Marker 10 that functions as a state park and Regional Beach Access facility. The park contains densely vegetated maritime forest and scrub-shrub communities on a series of beach ridges directly adjacent to the oceanfront beach. The Town of Emerald Isle maintains several small parcels of land as local parks and public accesses to Bogue Sound, and may add a recreational component to a 41 acre tract of maritime forest and forested wetlands purchased for a stormwater treatment system in the western part of the town.

Table 7. Areas on or contiguous to Bogue Banks classified as wetlands on 1983 National Wetlands Inventory (NWI) maps. Wetland classifications are after Cowardin et al. (1979).

NWI Category	Description	Area (acres)
PSS1C	Palustrine, scrub-shrub, broad-leaved deciduous, seasonally flooded	1.05
PSS7A	Palustrine, scrub-shrub, evergreen, temporarily flooded	5.29
PFO7C	Palustrine, forested, evergreen, seasonally flooded	166.81
PEM1C	Palustrine, emergent, persistent, seasonally flooded	0.63
E1UB2M	Estuarine, subtidal, unconsolidated bottom, sand, irregularly exposed	10.23
E2EM1N	Estuarine, intertidal, emergent, persistent, regularly flooded	933.94
E2EM1P	Estuarine, intertidal, emergent, persistent, irregularly flooded	86.80
E2SS1P	Estuarine, intertidal, scrub-shrub, broad-leaved deciduous, irregularly flooded	158.23
E2SS7P	Estuarine, intertidal, scrub-shrub, evergreen, irregularly flooded	164.19
E2US2M	Estuarine, intertidal, unconsolidated shore, sand, irregularly exposed	478.92
E2US2P	Estuarine, intertidal, unconsolidated shore, sand, irregularly flooded	9.65
Total area of wetlands		~2020 acres



Figure 3. Bogue Banks has over 2000 acres of wetlands such as these in low-lying areas in between dune ridges. This predominantly scrub-shrub wetland is in Pine Knoll Shores near Mile Marker 4. Photo taken in March 2002 by USFWS.