

The Future of Our Beach

By John R. Brodman

Background. According to North Carolina's Department of Environment and Natural Resources, North Carolina has about 320 miles of oceanfront shoreline, ranking it seventh among the states behind Alaska, Florida, California, Hawaii, Louisiana and Texas. Approximately 315 miles are found on 23 barrier islands, and the remaining five or six miles are found on the emergent edge of the coastal plain between Carolina Beach and Fort Fisher and along a small portion of Oak Island. Most of North Carolina's oceanfront is in public ownership: 112 miles in National Seashores, 21 miles in National Wildlife Refuges, 11 miles in military facilities, nine miles in National Estuarine Research Reserve and eight miles in state parks.

The entire tidal shoreline in North Carolina, which includes the oceanfront shoreline and the shorelines of offshore islands, sounds, bays, rivers, creeks and inlets totals some 3,375 miles. The oceanfront shoreline on Bogue Banks is approximately 25.5 miles long, with about 5.5 miles of this located in Pine Knoll Shores.

North Carolina's barrier islands, including Bogue Banks, are part of a dynamic coastal system that is constantly changing as a result of natural forces like storms, wind, waves, currents, changes in sea level and human activity (such as construction and channel and inlet maintenance). According to the Carteret County Shore Protection Office, the number one man-made cause of beach erosion on Bogue Banks is the dredging of the Morehead City Port and Beaufort Inlet. Nevertheless, Bogue Banks has some situational advantages compared to barrier islands in other parts of the state, especially those in the north around Nags Head. Our island is located in what coastal marine scientists call a "sediment rich" environment, while many of the beaches in the northern outer banks, like the Hatteras and Oregon Inlet areas, are "sediment starved." We are protected to a certain degree by the shallow waters of Onslow Bay, by our southern exposure and by Shackleford Banks and Cape Lookout.

Also important is the fact that, as a result of complex geological forces, the southern parts of the coast are experiencing lower rates of shoreline subsidence than the north.

Pine Knoll Shores is protected by its relatively high elevation in comparison with some other areas on Bogue Banks and with many other barrier islands on the Atlantic seaboard. While our beaches have been influenced by a considerable amount of movement in the past, there is little geologic evidence to suggest that Pine Knoll Shores has been subjected to ocean overwash at anytime in the last 400 or 500 years. Thousands of years ago, what is now called Bogue Sound probably used to be a lot wider and deeper, but as Bogue Banks gradually migrated towards the mainland, the sound filled with sediment, the pace of migration slowed and Bogue Banks became home to a relatively stable maritime forest. Nevertheless, sand along our ocean beaches does migrate over time, in all directions. While we talk conceptually and abstractly about "static lines" and "setback" requirements, in reality there is nothing static about our dynamic coastal environment.

Future sea-level rise related to global warming also poses considerable threats to our coast. The topography of North Carolina's relatively low coastal plain means that even a relatively modest rise in sea level can spread far inland. Scientists estimate that a one meter (39 inch) rise in sea level could affect as much as 2,000 square miles of North Carolina's coastal plain and turn many of our barrier islands into an archipelago of high spots reachable only by boat. To put this into perspective, the Cape Hatteras lighthouse was 1,500 feet from the ocean when it was first built in 1870, but by 1999, just before it was moved, the ocean was at its base as the result of an estimated sea-level rise of only eight inches. Sea levels are expected to rise as glacial land ice melts, as warming oceans expand and as the coastal plain continues to subside. Climate models also predict that coastal storms will intensify as the earth

warms, exacerbating erosion caused by wind, currents and waves. Recorded sea levels in the past several decades in North Carolina have been rising by about 2.0 millimeters (mm) per year in the southern parts of the state to as much as 4.7 mm per year in Duck, with different rates of coastal subsidence accounting for the discrepancy. Most scientists expect this rate of sea-level rise to remain relatively constant or to increase slowly over the next several decades (until around 2030) and to accelerate beyond that.

While no one knows for sure how far or how fast sea levels will rise, the North Carolina Department of Environment and Natural Resources (NCDENR), the Coastal Resources Commission (CRC) and the North Carolina Division of Coastal Management (NCDCM) have been under pressure to look into this problem and its implications for the future. They convened a scientific panel and issued a report last year that contains three scenarios of projected sea-level rise to the year 2100, ranging from 0.38 meters (15 inches) to 1.4 meters (55 inches), with a middle or "base case" scenario of one meter (39 inches).

The CRC has taken a further step and is in the process of drafting a state sea-level policy that could lead to new rules. The current proposed policy would formally adopt the one meter anticipated rise in sea level by 2100 as the "planning benchmark" to be used for future construction permitting and land-use planning in coastal counties. If adopted, the policy would mandate that all new private development and public infrastructure be designed and constructed to avoid sea-level rise impacts for the life of the structures. The draft policy lacks specificity at this time, perhaps on purpose to allow the 20 Coastal Area Management Act (CAMA) counties and local governments some needed leeway in regulation and enforcement. The NCDCM is currently discussing the rule with the 20 coastal (CAMA) counties to seek more local input, and while it is unlikely to be adopted

(Continued on page 20)

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