

## **Sea level at N.C. coast could be 7 feet higher by 2100**

Sunday, March 14, 2010  
Greensboro News-Record

**By ORRIN H. PILKEY and ROB YOUNG**

The current sea level rise of about one-eighth inch per year is not perceptible to the casual observer. And because it's not visible, it doesn't impress. But anyone who frequents the coast can see much evidence of recent sea level change.

For example, entire island communities have disappeared from parts of the Chesapeake Bay. On Portsmouth Island on North Carolina's Outer Banks, a cemetery used by early English settlers has become a salt marsh, while the old pipes that are supposed to drain surface water runoff from South Carolina's Charleston Peninsula are now partially blocked at high tides.

All indications are that we should be alarmed about the future of sea level rise and should be doing something about it now.

We must act now by responding to the challenges of sea level rise in a planned and rational way, taking a long-term view. If we don't start planning now, a huge "natural disaster" is facing us. It comes down to accepting the challenge of the rising sea or ignoring it until it is too late and we drive over the cliff.

### **Islands in danger**

The Cape Hatteras National Seashore in North Carolina is a chain of thin, low barrier islands with a low sand supply. Sea level rise is already narrowing the width of the islands (by shoreline erosion on both sides).

Thanks to a lifetime of studies by Stan Riggs, professor of geology at East Carolina University, these may be the best understood barrier islands in the world. Riggs believes the islands may "collapse" or disappear, possibly within the next few decades. With each increment of sea level rise, the possibility of collapse increases. He anticipates that in a storm of sufficient duration and intensity, a large number of new inlets could open up, simultaneously isolating the eight small tourist villages within the National Seashore. If Riggs is right, a large portion of the Outer Banks will become a long, submerged sandbar quite similar to Louisiana's Isles Dernieres after Hurricane Katrina.

Sadly, the North Carolina Department of Transportation has not heeded this warning. A multimillion-dollar bridge spanning Oregon Inlet, a part of the National Seashore, will be rebuilt in the exact location of the current Bonner Bridge even though it is likely to go to sea within the life span of the bridge.

### **Saga of the lighthouse**

The saga of the Cape Hatteras Lighthouse has all the elements that will face society as a whole in a time of sea level rise.

This lighthouse was built 1,600 feet back from the shoreline but the base of its foundation was only 6 feet deep, well above sea level. This meant that had the shoreline moved past the lighthouse, the structure would have toppled over.

First lit in 1880, this black-and-white spiral-striped lighthouse, the second on the site, had become virtually the symbol of the state of North Carolina by the mid-20th century. In a 1980 storm, waves swirled around the base of the structure, and it appeared to be on the way to join the list of felled lighthouses. It was saved by a quick-thinking National Park Service that tore up a nearby parking lot and threw it into the roiling surf while the storm raged. The erosion-threatened structure was finally moved 2,000 feet back from the shoreline in the summer of 1999.

The move came after an onerous two-decades-long societal debate that holds lessons for erosion-threatened communities everywhere. Even though the structure was "protected" by a steel groin and a large sandbag seawall, it was clearly in danger of falling into the sea in a big storm. It was also clear that sea level rise was a factor in the shoreline retreat.

The Outer Banks of North Carolina are currently thinning at a rapid rate (several feet per year), as are most of the world's coastal barrier islands, by erosion on both sides, a sure sign of an expanding ocean. Beach nourishment at Cape Hatteras had been tried but it didn't take, and the large seawall approach was rejected by the National Park Service, which had recently adopted a policy of letting nature roll on at the shoreline.

Despite its obvious precarious existence, there was strong resistance in local communities to moving the lighthouse. Experts were found who testified that the lighthouse would fall apart if it were moved and others who testified that the lighthouse was in no particular danger from the sea. Politicians refused to seek federal money for the move. Local proponents of the move were ostracized, and violence was threatened against workers who might be involved in the relocation.

Local resistance may have stemmed primarily from a concern of local politicians that the move would draw international attention to the erosion problem, which might hurt local real estate sales. Some may have been worried that if the idea weren't stopped at the outset, relocation of structures would become the norm for all oceanfront development. We wish this were the case. The eventual move certainly brought the expected international attention, but real estate sales, especially for beachfront property, continued to prosper.

The logjam of resistance to the move was finally broken by a joint National Academy of Engineering and National Academy of Sciences panel, which concluded that the lighthouse had to be moved if it was to be saved and that moving it could be accomplished by off-the-shelf technology. They were right.

## Conclusions and outlook

*It's not just sea level rise.* Storm surge, storm waves, shoreline erosion, groundwater salinization, and infrastructure destruction will force a retreat from the shoreline long before actual inundation occurs.

*Assume a minimal sea level rise of 7 feet by 2100 for planning purposes.* This is not a prediction; it is a scenario, a recommendation. But a rise of this magnitude is a real possibility.

*Three feet of sea level rise will doom much, if not most, barrier island development.* Maintaining the static shoreline required to keep sandy barrier islands in place is economically, environmentally and oceanographically impossible with a 3-foot rise in sea level.

*Immediately prohibit the construction of high-rise buildings in areas vulnerable to future sea level rise.* Buildings placed in future hazardous zones should be small and movable or disposable.

*Relocation of buildings and infrastructure should be a guiding philosophy.* Instead of making major repairs on infrastructure such as bridges, water supply and sewer and drainage systems, when major maintenance is needed, go the extra mile and place them out of reach of the sea.

*Stop government assistance for oceanfront building.* Those who invest in vulnerable coastal areas need to assume responsibility for that decision. If you stay, you pay.

*Stop asking only coastal engineers for a solution to coastal erosion.* Coastal engineers are selling a product. They are not likely to suggest that the community relocate property. This would put them out of business.

*Get the Corps off the shore.* The U.S. Army Corps of Engineers has too long a history of checkered competence, high-cost construction and inefficiency due in significant part to its close dependence on Congress for pork barrel funding.

Sea level rise does not have to be a natural catastrophe. It could be seen as an opportunity for society to redesign with nature, to anticipate the changes that will occur in the future and to respond in such a fashion as to maintain a coast that future generations will find both useful and enjoyable.

The science tells us that the world's shorelines will look different a hundred years from now. These changes need not end the coastal economy as we know it. But preserving our coastal resources and the businesses that depend on them will require insightful and long-term planning. Beginning an honest assessment of how we may deal with inevitable future sea level rise can help ensure that our coastal communities remain the vibrant places that they are today.

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