Coastal erosion field trip at the Sea Grant's Mid-Atlantic Regional Meeting with North Carolina Sea Grant Specialist Spencer Rogers

By

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During Sea Grant's Mid-Atlantic Regional Meeting at the end of March 2018, a group of coastal scientists took advantage of the location on the Outer Banks of North Carolina to view the recent impacts of multiple nor'easters that had wreaked havoc on the coast (Figure 1). "Nor'easters" is the term used for the extratropical cyclones that form during the months between October and April, typically, when cold, dry continental air meets warmer air from the Atlantic Ocean. These storms intensify as they move northeast along the coast, bringing large storm surges and increased wave energy resulting in flooding and beach erosion. Coastal resiliency and flood insurance rates are critical issues to local communities. The Community Rating System, FEMA flood maps, and the Biggert-Waters Flood Insurance Reform Act of 2012 all play a part in determining the flood insurance rates for homeowners in North Carolina.

Spencer Rogers, North Carolina Sea Grant's (NCSG) Coastal Construction and Erosion Specialist, acted as the local guide to explain the physical processes that occur along the coast. Rogers has over 40 years of experience with NCSG and has worked with property owners, builders, engineers, and government to develop hurricane-resistant construction methods, understand shoreline erosion alternatives, and implement marine construction techniques. In attendance were Amy Williams of New Jersey Sea Grant, Danielle Swallow of Delaware Sea Grant, and Kathleen Fallon of New York Sea Grant.

Heading towards the north end of the island, the first stop on the tour was

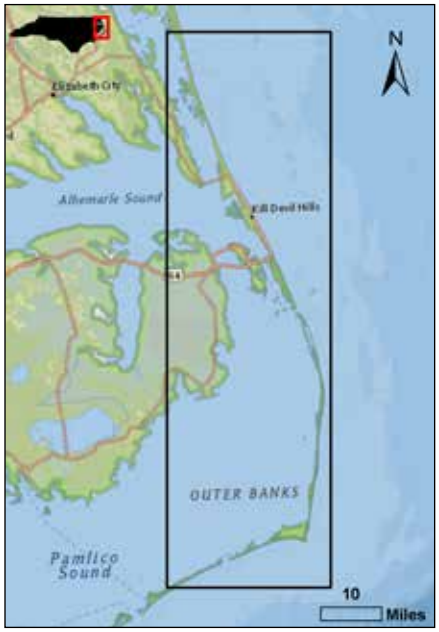


Figure 1. Map of North Carolina's Outer Banks. Field trip area outlined in the box.

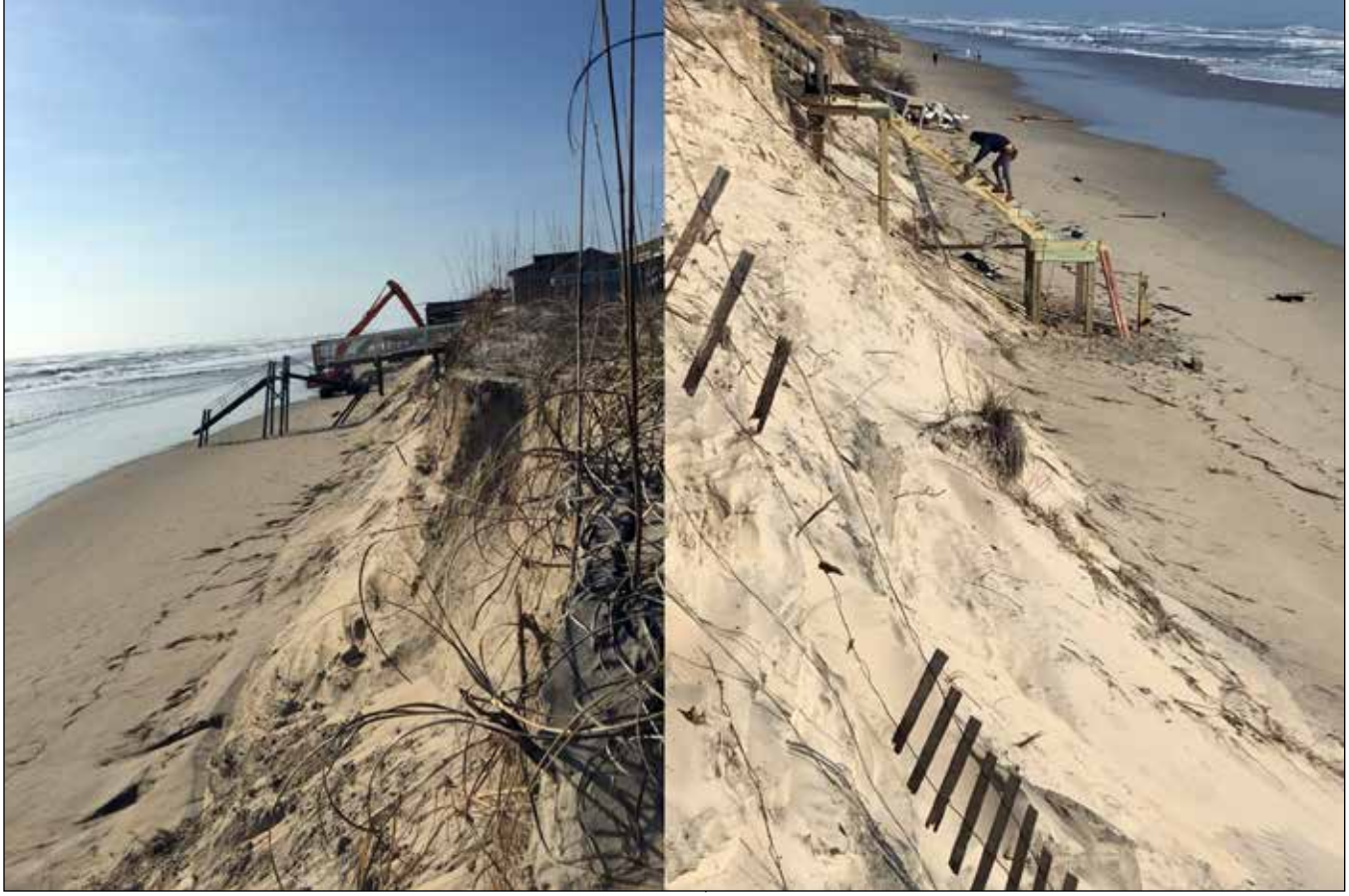
a site in Currituck County just south of the Currituck National Wildlife Refuge. Rogers had been contacted by a property owner to take a look at the damage the last nor'easter caused to the walkway and dunes (Figure 2). Besides the walkway having a major scarp, the steps to the beach were destroyed and the dune was drastically eroded. Just to the south, the group witnessed a bulldozer destroying a dune while trying to modify the slope of the scarp; most likely hired by a local homeowner unaware of regulations and lacking a big-picture perspective on coastal resiliency.

Next was a stop along the bay side of Portside Drive to view a living shoreline sill that had been implemented by placing six-inch wood boards with ½- to 1-inch gaps between them (Figure 3). This design facilitated wave attenuation while allowing living organisms and water to pass through to the shore. The area was planted with cordgrass (genus *Spartina*) and juncus (genus *Juncus*) for habitat and stabilization, however only the juncus succeeded.

Traveling further south, the group stopped at the Hilton Garden Inn to view the edge effects of a dune project at the border of two towns (Figure 4). On one side, American beachgrass (*Ammophila breviligulata*) had been planted to increase the stability of the sediment. Looking at the vegetated and unvegetated dunes in the two towns, two distinct environments could be observed in close proximity.

The group stopped at a local surfing spot near Kitty Hawk where the dunes and dune fencing had been destroyed (Figure 5). The gap in the fence not only allowed for overwash to cause sediment movement, but was also encouraging foot traffic as seen in the photo. Next stop was a local joint for lunch. While waiting for the delicious seafood, Rogers used paper napkins to describe the erosional problems and shifting nature of the dynamic Oregon Inlet and illustrate how the project was designed to try to stem the erosion. The bridge itself needed to be adapted for the loss of sand. The lesson was as enjoyable as the Shrimp Burger was.

The group then went to Jennette's Pier in Nags Head to check out the windmills and "Spencer's Beach," which is a large wave tank used for educating visitors



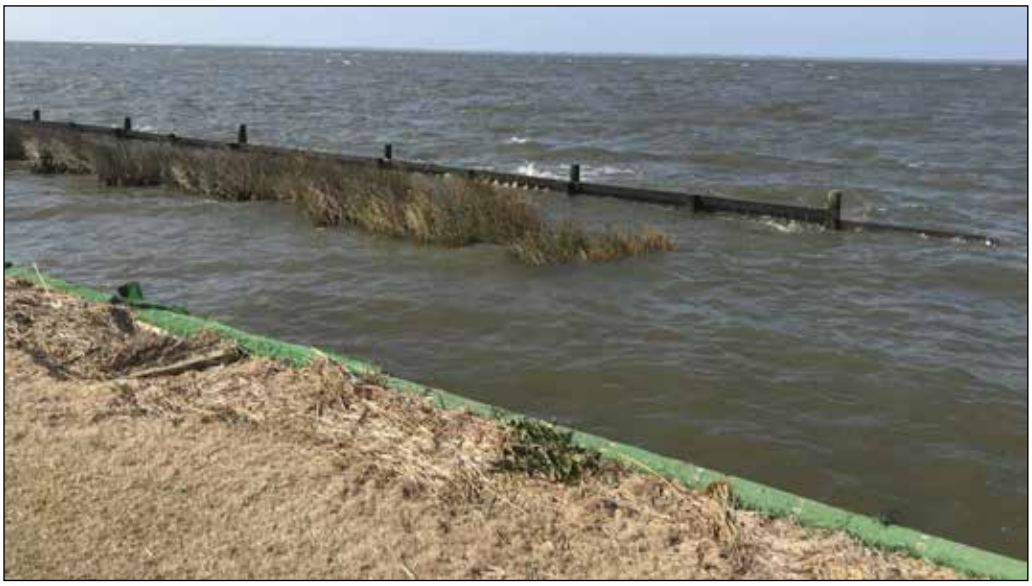
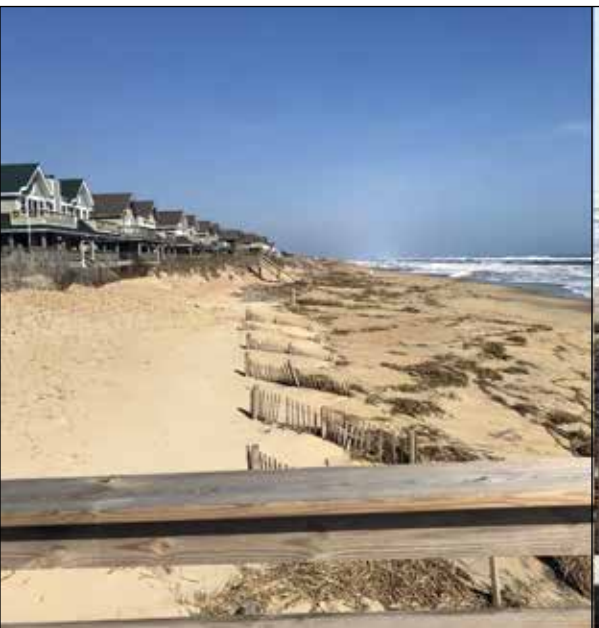
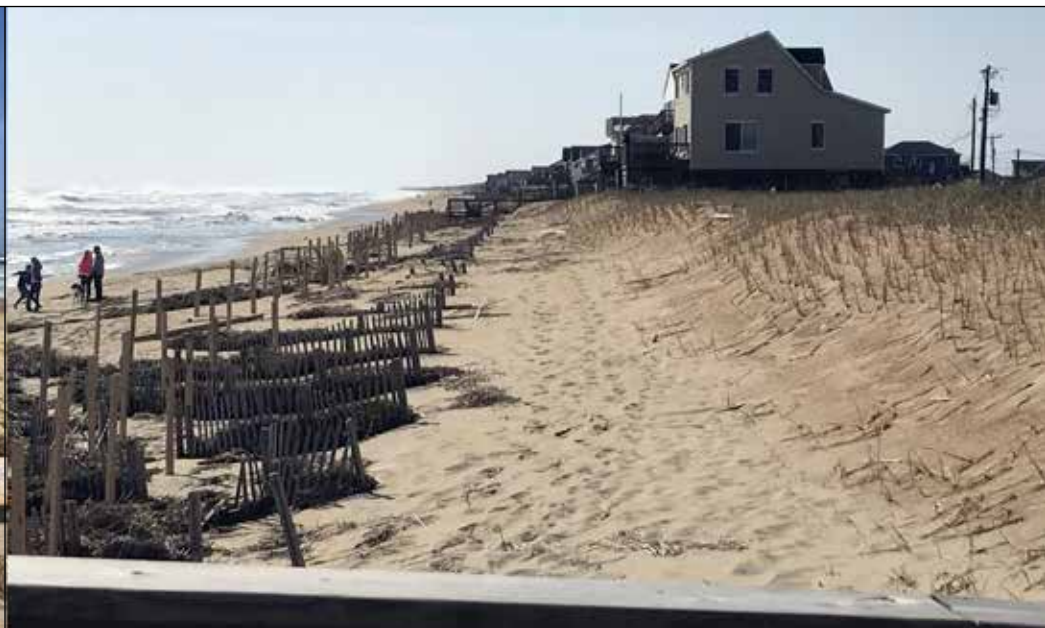


Figure 2 (above). Erosion of dunes and damaged walkovers on private property in Currituck County.

Figure 3 (left). Living shoreline of fencing and plants on bay side.

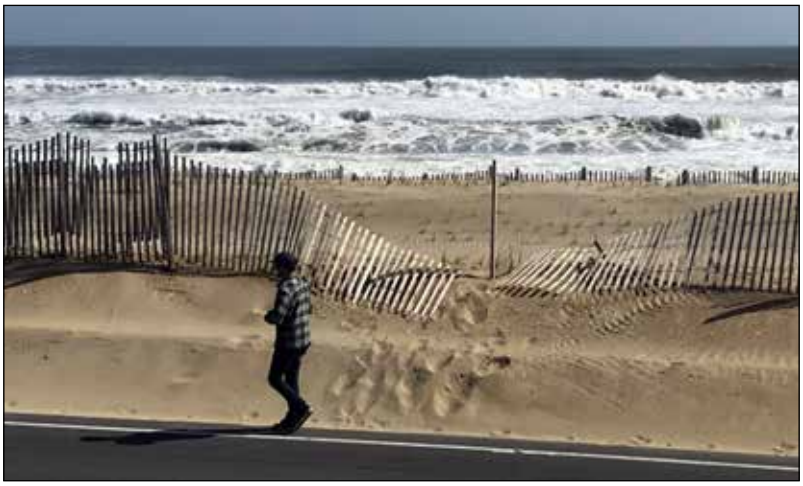
Figure 4 (below). Edge effect of dune planting at the border of two towns.

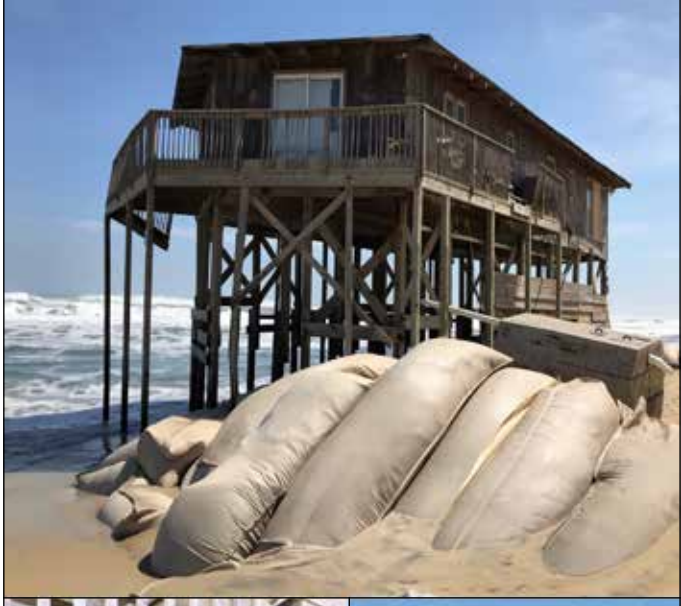




about sediment dynamics (Figure 6). The pier was teeming with people and gave a great perspective to look at beach dynamics up and down the coast.

The group continued their travels south towards Rodanthe. The high erosion rates and lack of dunes in this area has resulted in major overwash and run-up of water under elevated buildings. One solution was to add to add a dune under the houses, however this resulted in a loss of parking; therefore, it was not an ideal trade-off for the homeowners who underappreciate the risks of safely maintaining homes here. Many houses were exposed to the elements so the infrastructure had to be creatively connected to electric wires





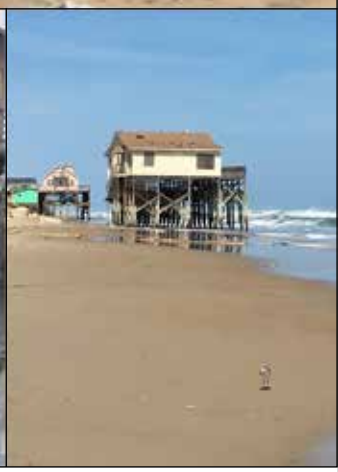
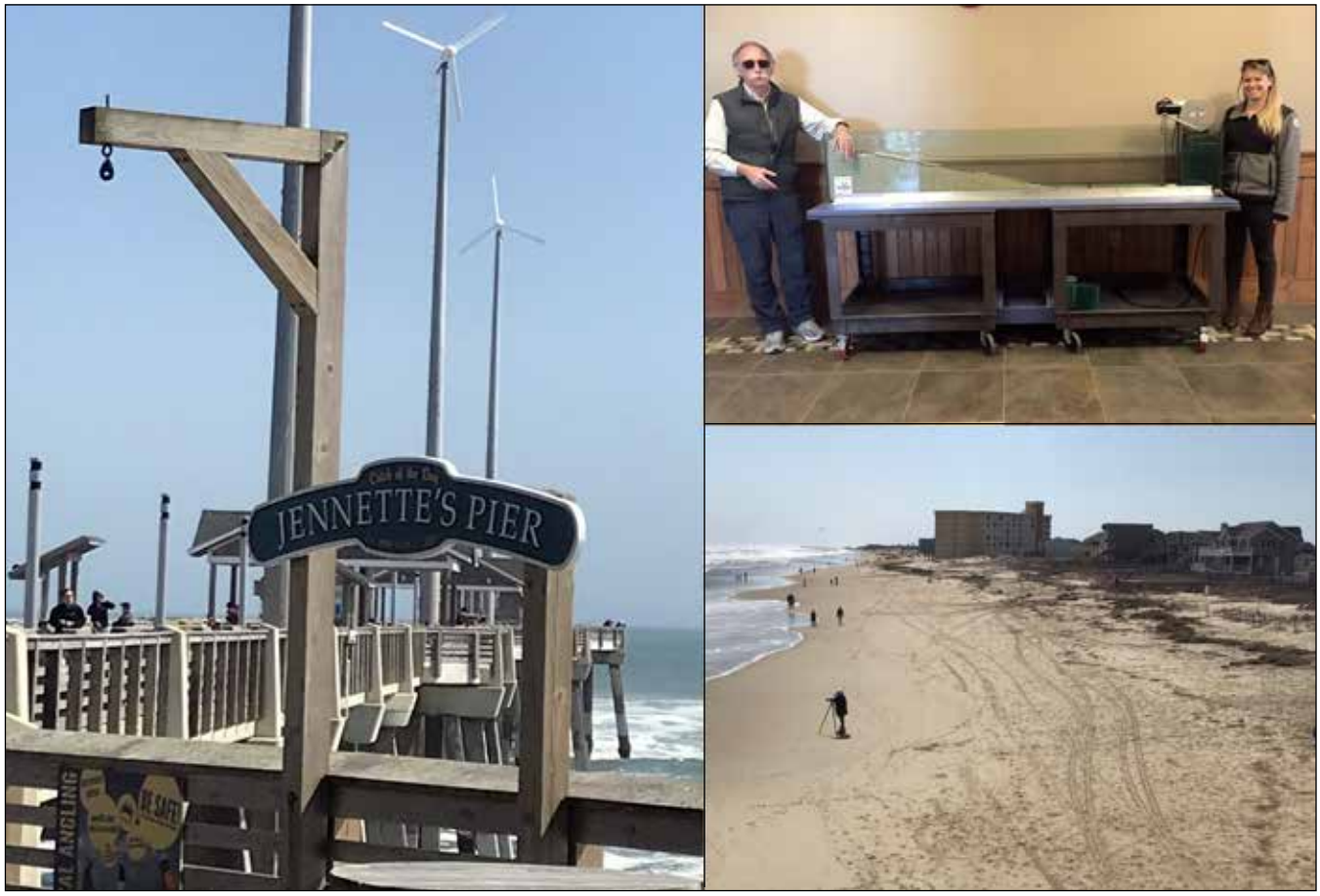


Figure 6 (below). Windmills at Jennette's Pier (left), Spencer Rogers and Kathleen Fallon at "Spencer's Beach" wave tank (right top), and the view to the south of the pier (right bottom).

Figure 7 (right). Lack of dunes and high erosion caused overwash in Rodanthe and results in creative methods of securing septic systems and electrical connections.



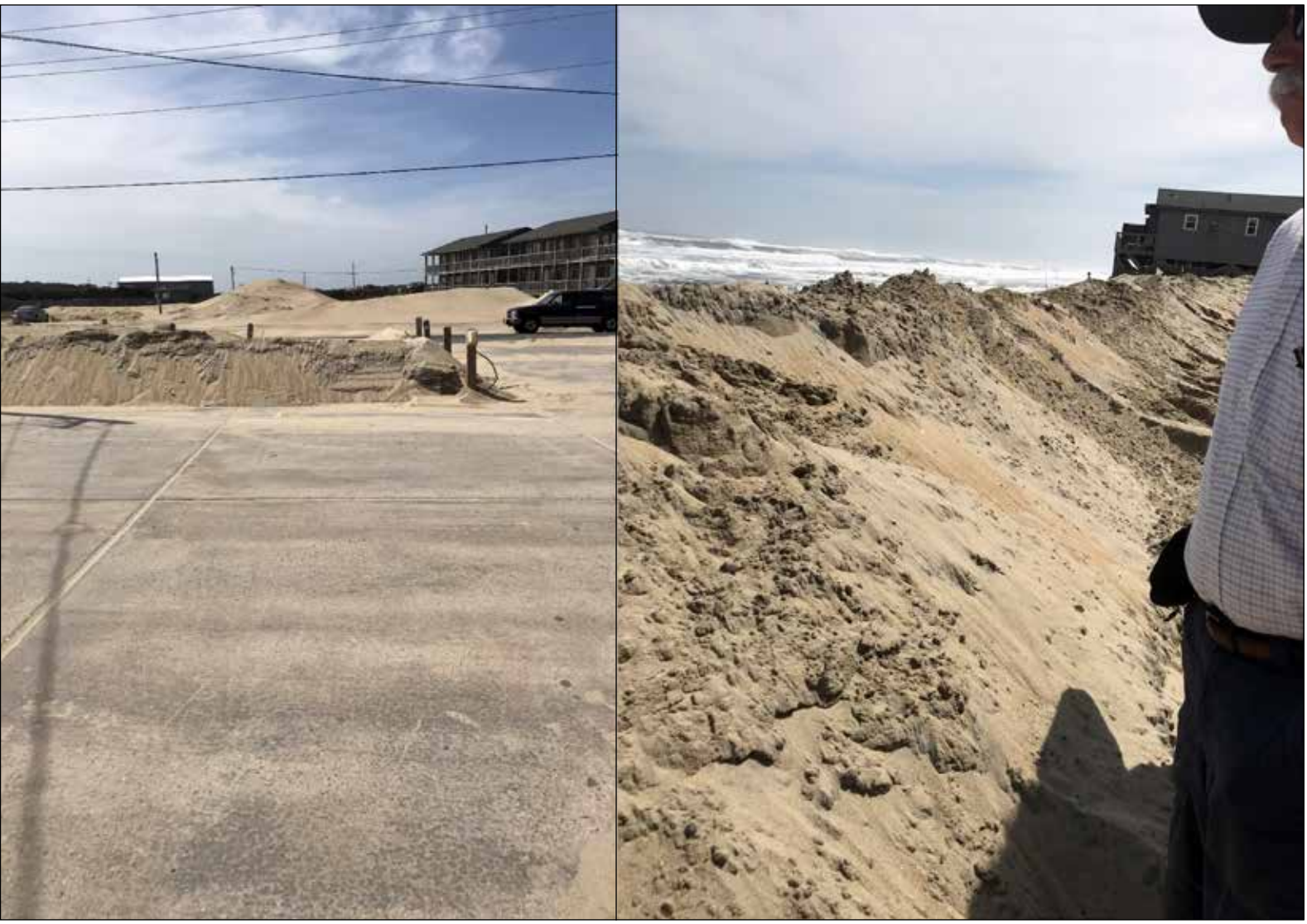
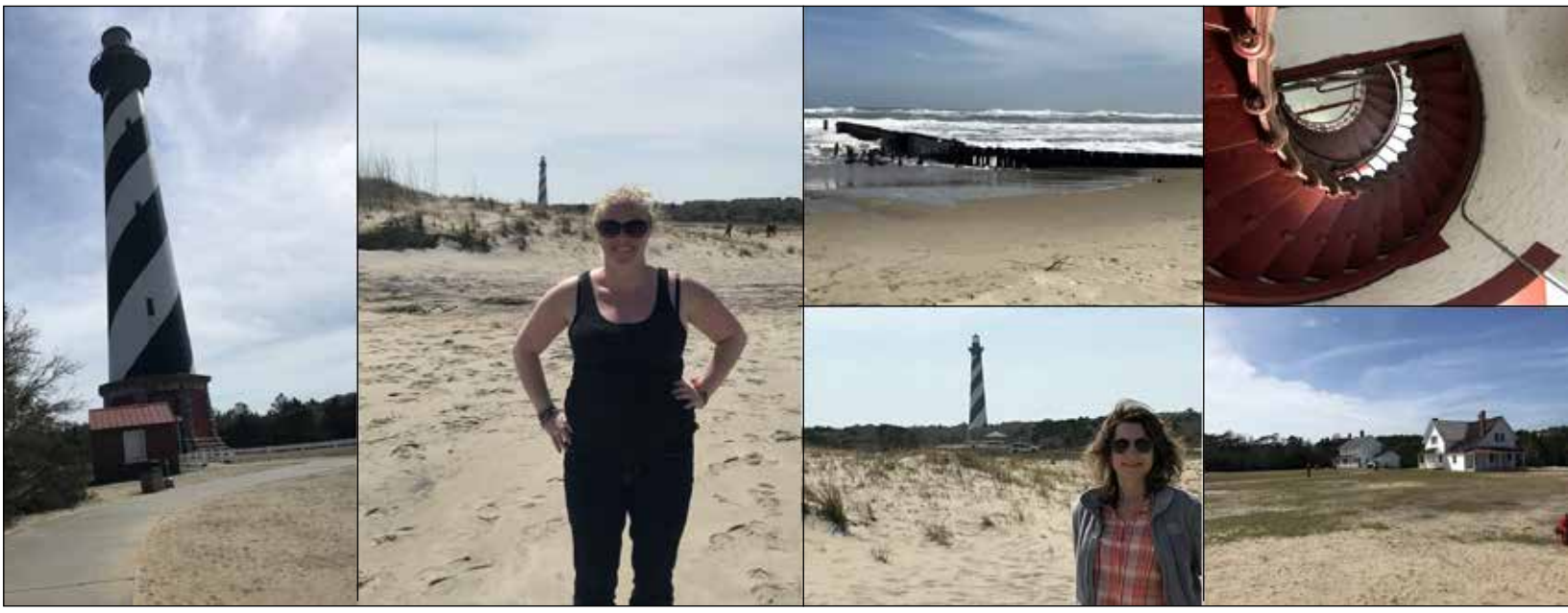


Figure 8. Temporary sand pile along the road to keep sand out of the streets (left). Temporary sand piles on the beach front to protect the houses from overwash (right).

Figure 9. Scenes from Cape Hatteras Lighthouse.



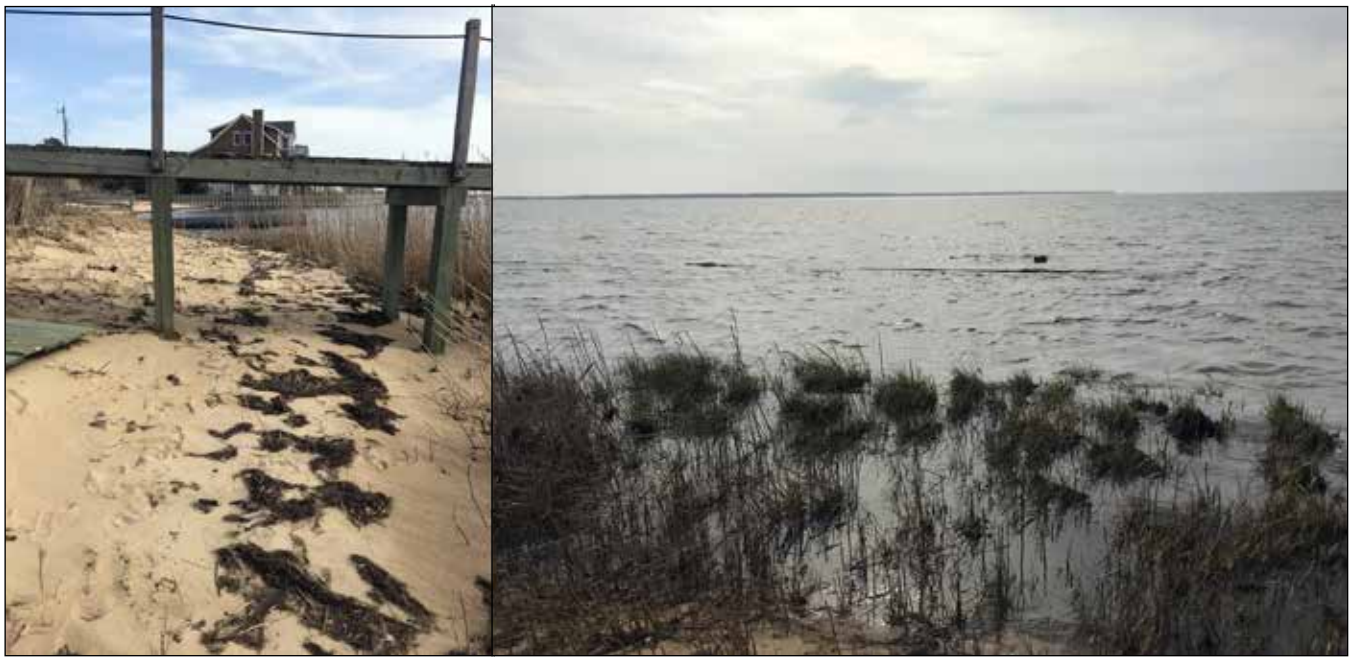


Figure 10. Long-standing living shoreline for erosion control and sediment accretion.

and sewer pipes. The innovative solutions are just temporary fixes compared to Mother Nature's wrath (Figure 7). Other methods to stem erosion and prevent overwash were to build temporary piles of sand along the roadside to keep the sand off the streets and to place sand back onto the beach front (Figure 8).

Before the trip was over, the group had to head down to Cape Hatteras to see the lighthouse (Figure 9). The original structure was placed near the ocean in a highly erosional location. Despite the efforts of a now collapsing wooden jetty, the sediment erosion continued to occur at the base of the lighthouse, resulting in the structure eventually being moved landward in order to preserve the historical monument. In the picture attached, Williams is standing in the original location of the lighthouse, to give a perspective of the distance it was moved. To add some cultural education to the tour, the group took a walk over to the lighthouse to see the historical buildings that housed the lighthouse keeper and family. Inside the lighthouse, the original latitude and longitude location was etched in stone on the side of the entranceway with a paper hung next to it with the current location.

On the way back to the conference, one last stop was made just south of Jockey's Ridge State Park to view a long-standing living shoreline on a private property where a wooden sill with gaps was used to help accrete a sandy beach (Figure 10).

The trip gave a first-hand experience of erosion at the Outer Banks and many examples of adaptations to that erosion, from living shorelines to dune construction and retreat. This dynamic area will continue to be studied for a very long time.

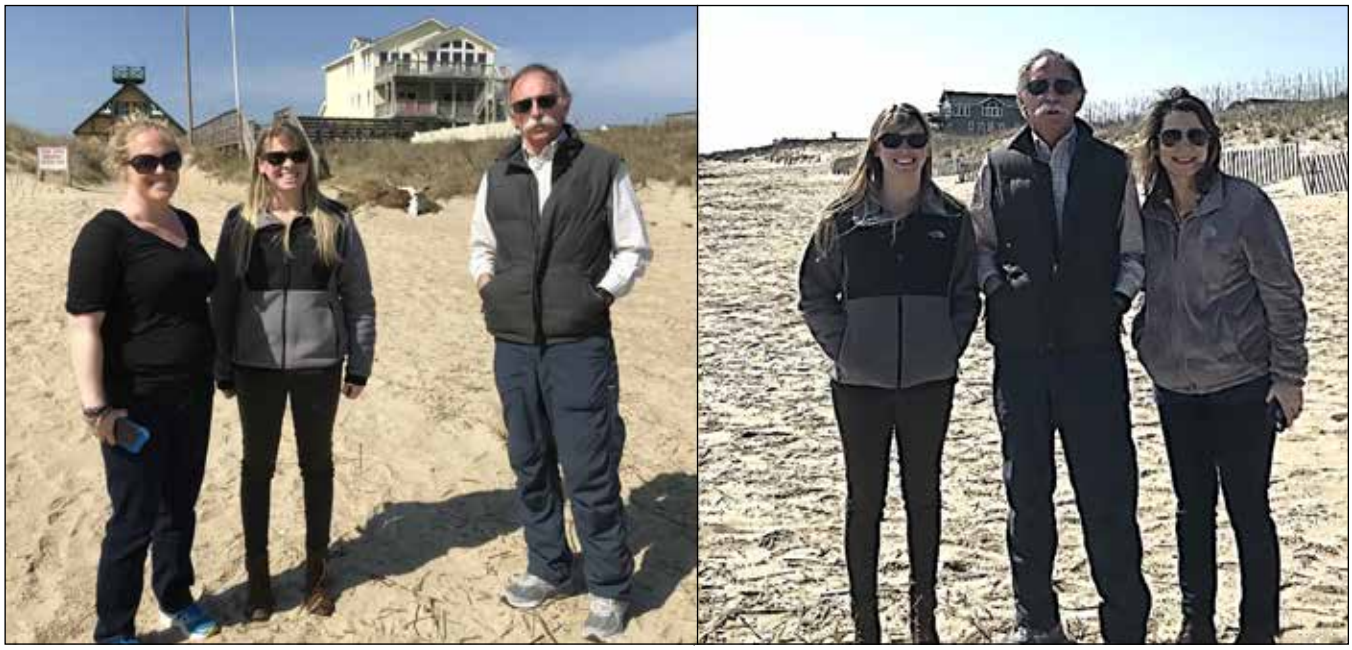


Figure 11. The Sea Grant coastal scientists thank Spencer Rogers for his tour.