A Triple Whammy at Cape Romain Refuge

This is the first of two articles about how sea-level rise is affecting two refuges in the South Carolina Lowcountry Refuges Complex in different ways. The second article, regarding Waccamaw National Wildlife Refuge, will appear in the January/February 2011 issue of Refuge Update.

By Bill O'Brian

The question posed to Sarah Dawsey en route to the loggerhead sea turtle nests she oversees is a simple one: How big is Cape Island?

Her reply is more complex: "It's about six miles long, and I don't know how wide anymore. All I know is, it's shrinking."

Cape Island, a barrier island in the Class I wilderness area at Cape Romain National Wildlife Refuge in South Carolina, is losing 20 to 25 feet of land every year on average. Since 1954, the island has shrunk by 24 percent as high tides, wind and powerful waves lift and relocate sand westward across the island.

"It's changing so fast that there are times when I don't know where I am. I don't recognize it exactly," says Dawsey, a wildlife biologist who grew up nearby and is in her 25th season at Cape Romain Refuge.

Cape Island and its turtle habitat are in peril because of a triple whammy: sea-level rise; insufficient sediment from the dammed Santee River to replenish its beaches; and an uptick in powerful storms in recent years. The erosion and westward relocation are "all about abrupt changes during high tides or storm events," says Raye Nilius, project leader at South Carolina Lowcountry Refuges Complex, which includes Cape Romain Refuge. "It's a spikey graph of change, not a slowly rising-bathtub scenario. It's a sort of herky-jerky movement."

Running Out of Island

Cape Island is the largest Atlantic loggerhead sea turtle nesting site north of Florida. This year, it had 1,043 nests holding more than 100,000 eggs and producing about 70,000 hatchlings – one in 1,000 of which will survive to adulthood.

This loggerhead sea turtle nest, protected by a cage, was overwashed on Cape Island at Cape Romain Refuge. Three months earlier, the nest was five to 10 feet from the mean high tide line. (Bill O'Brian/USFWS)

"Back in the day, when Cape Island had plenty of dune formations on it and some elevation, the sea turtles laid their eggs and those eggs were fairly safe," says Nilius. "Now, the island is very flat, it's very low in elevation, and the turtles are laying their eggs in areas that are subject to overwash and groundwater intrusion." When a nest is inundated in such a way, water permeates the egg shells and the embryos drown.

So, refuge staff and volunteers relocate almost two-thirds of nests to higher ground as part of a labor-intensive, $190,000-a-year turtle recovery effort. But they're running out of island.

"When I came to the refuge complex two years ago, climate change wasn't on the radar screen. Now, we're running as fast as we can to catch up with it," says Nilius. "We can't stop it."

One thing the refuge can do is help sustain the turtle population so that when the loggerheads' Cape Island habitat disappears in the future, the species will be hearty enough to find new nesting beaches in protected areas nearby.

Turtles aren't the only resource at Cape Romain Refuge imperiled by sea-level rise.

Salt Marsh Fragmentation

A recent Boston University study using new geospatial technology reported that the refuge's salt marshes are at risk, too. The study found that tidal creeks are plunging into the salt marsh along a straight channel, rather than meandering gently as they typically should. It's the result of a complicated combination of factors that involves sea-level rise, burrowing crabs and marsh substrate compaction. In other words,

Refuge staff and volunteers relocate almost two-thirds of loggerhead sea turtle nests to higher ground and fenced hatcheries, which wildlife biologist Sarah Dawsey calls "gardens of nests." (Steve Hillebrand)

This loggerhead sea turtle hatchling found on Cape Island was released into the Atlantic Ocean. (Bill O'Brian/USFWS)

says Nilius, salt marsh soil is sinking and sea level is rising.

Tidal creeks are extending into the refuge's marsh platform at the rate of about 6.2 feet per year, she says. "It's akin to forest fragmentation, except it's salt marsh fragmentation." One expert told a local newspaper that 20 to 50 percent South Carolina Lowcountry salt marsh, on and off the refuge, could become sand flats and open water lagoon within three decades.

Beyond that, Jacks Pond, a brackish-freshwater impoundment on the refuge's Bulls Island, is in jeopardy. The levee around the impoundment is only feet away from the eroding beach. When the Atlantic Ocean reaches the toe of the levee, the impoundment is likely to be lost, along with the habitat that supports wading birds, waterfowl, raptors, shorebirds and thousands of alligators.

Because little can be done to control sea-level rise, Nilius suggests that the refuge serve as an outdoor laboratory. "There are answers here at Cape Romain for many climate change questions," she says. "We just need scientists to help us find them." A hydrogeomorphic analysis of the refuge is set to begin in 2011, but Nilius hopes for more.

She also is considering upslope land acquisition. The refuge boundary has remained generally unchanged since establishment in 1932. With habitat disappearing, acquiring land inland – west of the Intracoastal Waterway – with the help of conservation partners makes sense to Nilius, to ensure habitat for current species in 30 or 40 years. "If we don't do that now," she says, "the land along this coast will be a subdivision or a golf course or an industrial plant, with no place for the turtles and birds."

Tidal creeks such as this one are extending into the refuge's salt marsh platform at the rate of about 6.2 feet per year and decimating marsh. (Bill O'Brian/USFWS)