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Crisis at the Edge of the Tide

THE DECLINE OF SALTMARSH BIRDS ON THE ATLANTIC COAST

By Mitschka Hartley and Aimee Weldon

Credit: Jack Flanagan/Flickr

▲ The United States has a large proportion of the world's saltmarsh habitat, such as this one in Milford Point, Conn., and the highest rates of endemism. However, much of this habitat has been lost or degraded due to anthropogenic factors, including human development and mosquito control.

For centuries, tidal marshes on the East Coast of the United States have quietly existed. These saltmarsh ecosystems dominated by cordgrasses and their wildlife inhabitants are well adapted to twice-daily tidal flooding.

Yet, many people view salt marshes as wastelands — too wet or muddy to produce anything but mosquitoes. In fact, salt marshes deliver many direct benefits to society beyond the habitat they provide for millions of birds and other wildlife. They provide the primary nursery habitat for most fish and shellfish found on the East Coast, supporting a commercial and recreational fishing industry worth \$214 billion annually and 1.8 million jobs (NMFS 2017). Salt marshes also improve water quality by removing sediments and pollution from coastal rivers and bays.

Perhaps most importantly, salt marshes protect human infrastructure from flooding due to hur-

ricanes and other storms. In 2012, Superstorm Sandy caused at least 72 deaths and nearly \$50 billion in flood damages, mostly from storm surge. But coastal wetlands prevented more than \$625 million in property damage during Sandy (Narayan et al. 2017). As the frequency and intensity of hurricanes and coastal storms increases with a warming climate (Mousavi et al. 2011), people are becoming more aware of the vulnerability of coastal communities and property and more appreciative of the natural benefits of wetlands, beaches and oyster reefs that increase coastal resiliency by absorbing wave energy and reducing flooding.

But tidal marshes are being threatened along the Atlantic. Accelerated sea level rise — at a rate 3 to 4 times the global average in some places — may be pushing tidal marsh bird populations, especially those in the Northeastern U.S., over a tipping point, unless something can be done soon (Salenger et al. 2012).



Recognizing this crisis, the Atlantic Coast Joint Venture Management Board in 2016 approved a strategic focus on coastal marsh ecosystems and adopted three flagship species: black rail (*Laterallus jamaicensis*), saltmarsh sparrow (*Ammospiza caudacuta*) and American black duck (*Anas rubripes*).

Black ducks are one of the most visible, widespread and well-known denizens of tidal marshes, especially during winter when they are concentrated in salt marshes from Canada to North Carolina. Black ducks primarily use regularly flooded low marsh and mudflats. Saltmarsh sparrow and black rail nest almost exclusively in high marsh, making the trio excellent representatives of many other species of waterfowl, shorebirds, wading birds and landbirds that depend on coastal marsh habitats.

Many models indicate that as the sea level rises, the quantity of low marsh will be stable or increase — at least for a number of decades. However, the news is not good for the saltmarsh sparrow and eastern subspecies of black rail. The U.S. Fish and Wildlife Service recently proposed listing the eastern black rail as threatened under the federal Endangered Species Act, and the saltmarsh sparrow is under review for potential listing. The high marsh habitat needed by these two species — and their populations — have been declining, and many models predict drastic reductions in future decades.

The value of tidal marshes

Tidal marshes have often occupied the same coastal areas favored by human settlements, stretching back to the late 1600s. Vast salt marshes greater than 10,000 acres once covered lands that now support some of the largest U.S. cities on the East Coast — including New York and Boston. They have a long history of being ditched, drained and filled for agriculture, housing, transportation networks and mosquito control. In these urban areas today, these ecosystems occupy only 10 to 20 percent of their original area.

Many of the historic losses and threats to saltmarsh ecosystems still affect wildlife populations today: tidal restrictions from roads and rail lines limit the tidal extent and function of



Credit: Paul J. Fusco / CT DEEP-Wildlife

◀ The saltmarsh sparrow, the only breeding bird species endemic to the Northeastern U.S., has adapted to tidal floods in its high-marsh breeding habitat.



Credit: Bob Gress

◀ The eastern black rail population, now estimated to be 450 to 1,300 breeding pairs along the Atlantic and Gulf coasts, is one of the most secretive and rarely seen birds in North America.

▼ Most American black ducks spend the winter in salt marshes and mud flats along the Atlantic Coast.



Credit: Jim Clark



Credit: U.S. Fish and Wildlife Service

▲ Biologists band a captured saltmarsh sparrow in Rhode Island as part of a long-term study of salt marsh birds coordinated by the Saltmarsh Habitat Avian Research Program.

many salt marshes and development continues to encroach upon marsh ecosystems. Invasive plant species such as *Phragmites australis* colonize less saline areas behind tidal restrictions, dominating many former salt marshes.

Many of the stressors affecting salt marshes have stabilized or decreased in recent decades due to policies that increased protection of wetlands from being filled, drained or developed — yet populations continue to decline. Precipitous declines of both species began in the 1990s around the time that rates of sea-level rise began to accelerate on the East Coast and around the world.

Hiding in the salt marsh

Black rails and saltmarsh sparrows nest in the tallest, densest high-marsh vegetation they can find. Even the most ardent birdwatchers rarely see these secretive breeders. They require what is known as high-marsh habitat for nesting — a salt marsh ecosystem that lies just beyond the reach of daily flooding and is typically inundated only during storms or higher-than-average spring tides. High marsh can occupy extensive land areas but is most common along the margin where salt marsh transitions to upland forest or shrubs.

The rails place their nests on the ground and the sparrows use patches of stubby, whorled grass (Shriver et al. 2007, Spautz and Nur 2002). It's a difficult tradeoff — nests higher up are less prone to flooding but more likely to be found by predators (Greenberg et al. 2006).

A recent breeding status assessment compared the historic and current distribution of black rails and

reported that the species is now absent from most Northeastern states. Its range has contracted south by 280 miles — from Massachusetts to New Jersey, where the species is still present along with a few pairs in Maryland and Delaware (Watts 2016). Surveys at 284 points in North Carolina, which formerly supported a high abundance of black rails, reported only four rails in 2017. In the status assessment, the bird's current population along the U.S. Atlantic and Gulf Coast states was estimated to be 450 to 1,300 breeding pairs, with three states — South Carolina, Florida and Texas — accounting for more than 75 percent of the total.

Interestingly, more black rails have been counted at Elliott Island — one of the most remote outposts on Maryland's Eastern Shore on the Chesapeake Bay — than anywhere else in the U.S. Some 100 calling birds were observed in June 1954 (Watts 2016), and more than 40 birds per year have been heard there every decade since, until the 1990s when things started changing.

In the 2000s, biologists counted only 12 birds, and then just two birds in 2010. From 2012 to 2015, a single bird was observed; and in 2016, not one black rail was found on Elliott Island. Over the same period, black rails disappeared from saltmarshes across much of the East Coast, especially Northeastern states. Since 2014, state, federal, and non-governmental partners surveyed more than 6,000 coastal locations to understand the status and distribution of black rail in the eastern U.S. and uncovered an alarming loss of more than 90 percent of their historical population.

The saltmarsh sparrow — the only breeding bird species endemic to the Northeastern U.S. — seems to be fighting the same losing battle to rising tides along the Atlantic Coast. Biologists estimate their population is declining at a rate of 9 percent per year, resulting in a population loss of 80 percent since 2000. If this trend continues, the population could collapse within 50 years (Correll et al. 2017). Currently, fewer than 50,000 individuals remain throughout the species' range (Wiest et al. 2018).

The saltmarsh sparrow manages to successfully fledge young even if nests are flooded repeatedly, as long as the eggs don't float out of the nest cup



and nestlings are able to climb up in the vegetation above the nest. However, more than a foot of sea-level rise in the Chesapeake Bay over the last century — nearly twice the global average — has resulted in more frequent nest inundation and failure, overwhelming the species' highly adaptive traits

Turning the tide

This year, the ACJV is scheduled to complete its Salt Marsh Conservation Business Plan focused on recovering habitat for these imperiled birds. The plan identifies the factors thought to be limiting their populations and the activities and estimated funding needed to reach desired population levels. It also will establish and prioritize a set of actions, research needs and measurable indicators to assess progress and identify gaps in conservation efforts. Along with the plan, ACJV partners are developing tools and maps to focus attention on areas where efforts are likely to be most effective and exploring innovative approaches to accelerate salt marsh conservation.

One strategy is to protect upland areas surrounding remaining tidal marshes. Anthropogenic activity and development around marshes lowers marsh bird community integrity and productivity (DeLuca

et al. 2004). Buffer areas with gradual elevation change may allow wetland habitats to migrate as the sea level rises.

The Nature Conservancy recently produced maps identifying the most resilient salt marshes from Virginia to Maine and the best potential marsh migration corridors for strategic land protection efforts (Anderson and Barnett, 2017). Although marsh migration is already happening in the Southeastern and Mid-Atlantic states, the process may not be fast enough or result in enough high marsh to sustain black rails and saltmarsh sparrows (Schieder et al. 2017). As part of its plan, the AJCV hopes to develop experimental methods to manage this process and improve the odds of converting upland borders into high-quality salt marsh by either clearing trees at the marsh edge or controlling invasive phragmites to ensure colonization by native species.

Another promising strategy is restoring tidal flow, which is recognized as one of the most effective ways to restore salt marshes in places where flow has been restricted by roads, under-sized culverts and other development. Installing larger culverts or small bridges can be costly, but could provide



Credit: Bill Wakeley

◀ To help restore black rail and saltmarsh sparrow populations along the U.S. East Coast, partners in the Atlantic Coast Joint Venture plan to increase healthy and resilient tidal marshes such as Lieutenant Island on Cape Cod, Mass.



Partners in the Atlantic Coast Joint Venture

The Atlantic Coast Joint Venture is a partnership of agencies and organizations focused on the conservation of habitats for native birds in the Atlantic Flyway of the United States, from Maine to Puerto Rico. Partners jointly determine priority species and habitats, set common goals, and cooperate on conservation planning, modeling, habitat delivery, research, and monitoring.

Along with 16 state wildlife agencies, its partners include:

- The U.S. Fish and Wildlife Service
- National Park Service
- USDA Natural Resources Conservation Service
- U.S. Geological Survey
- American Bird Conservancy
- Ducks Unlimited
- National Audubon Society
- The Nature Conservancy

significant long-term benefits for marsh resiliency if the alterations are maintained.

In areas where marshes are being drowned by a combination of surface subsidence, sea-level rise and lack of sediment supply, marsh surfaces can be sprayed with sediment from nearby channel-dredging, then planted with native grasses as necessary to raise the surface elevation and enable vegetation to keep up with sea-level rise. This thin-layer-deposition method is already being used in several projects along the Atlantic and Pacific Coasts; but, it is expensive and practical only for fairly small areas, no more than dozens of acres.

Where marsh quality has been degraded due to phragmites' invasion, spraying herbicide may be the cheapest and fastest way to restore native marshes. However, keeping the tall grass under control will likely require repeated herbicide applications.

Lastly, some high-priority areas have water control structures that could be used to prevent nest inundation for species at risk. Strategic use of tide gates could dampen impacts of the highest tides and storm surges that are responsible for many nest losses, while allowing unobstructed tidal flow the rest of the year. This promising strategy has not been tested but is currently being explored by ACJV partners.

In all cases, creation and restoration of quality high-marsh habitat should be the goal of any practice designed to benefit the most imperiled birds.

Saltmarsh resiliency

Today, salt marshes have not disappeared or turned into vegetation-less mudflats, though models suggest that could eventually happen in many places. Through focused, collaborative conservation efforts, ACJV partners are working to improve the resiliency of saltmarsh bird species and turn the tide of population declines, just as partners did for the American bald eagle (*Haliaeetus leucocephalus*) from the 1960s to the 1990s and red-cockaded woodpecker (*Dryobates borealis*) from the 1990s to the present.

The ACJV's conservation efforts for black rails and saltmarsh sparrows will likely provide benefits to many other taxa — including waterfowl, shorebirds and wading birds — that flock to these habitats by the millions each year. These efforts also will support vital habitat for commercially important fish and shellfish and the millions of jobs associated with that industry.

Healthy and resilient tidal marshes promise a wide array of benefits beyond those for wildlife, from providing recreation and tourism opportunities to reducing flooding and protecting the hundreds of billions of dollars' worth of homes, roads and other public works up and down the Atlantic Coast, where they are often the only thing separating tens of millions of people from the forces of the sea. ■



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The findings and conclusions in this article are those of the authors and do not necessarily represent the views of the U.S. Fish and Wildlife Service.