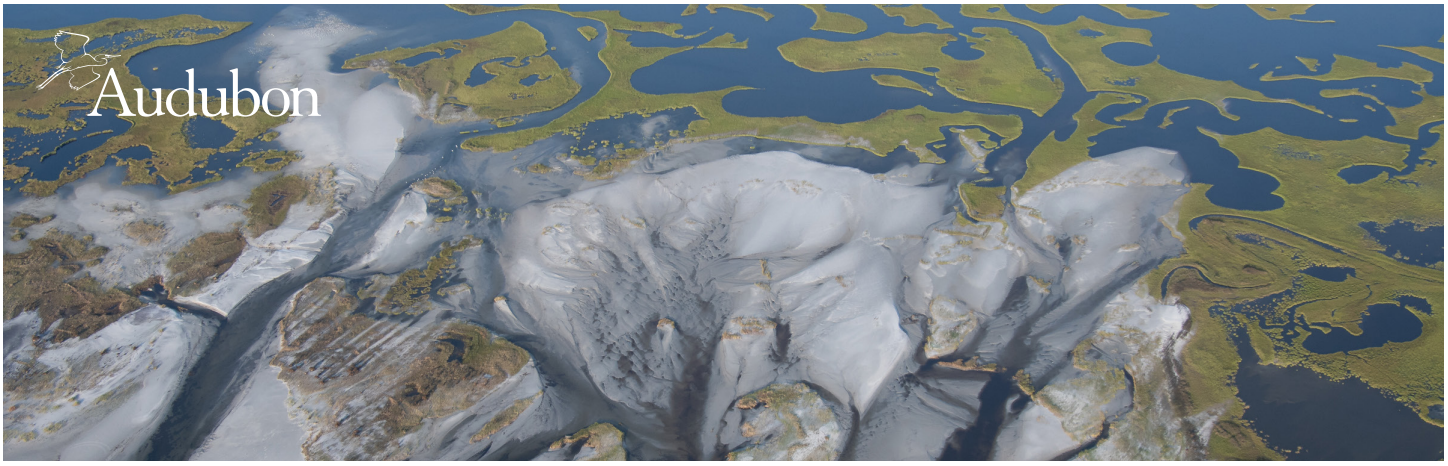


LESSONS FROM HURRICANE FLORENCE: *TOOLS TO PROTECT BIRDS AND PEOPLE*

October 14, 2018

One month ago, the Coastal Carolinas experienced firsthand the widespread impacts of Hurricane Florence. For birds and other wildlife, hurricanes serve to rework our coastal habitats, changing some areas through overwash and erosion, and renewing other habitats for species that are adapted to a dynamic coastline. However, as people have continued to develop and live in coastal areas, the destructive forces of hurricanes challenge the resilience of our coastal communities and the essential habitats upon which resident and migratory birds depend for their existence.

Climate change has further increased the destructive nature of hurricanes; sea levels are rising and waters are warmer, fueling more intense hurricanes in ways that we have not witnessed in the previous century. The United States has experienced an increasing number of billion dollar disaster events. From 1980-2017, there were 5.8 events per year, but from 2013-2017, there were 11.6.[1] As of this publication, damages from Hurricane Florence are estimated at $38-50 billion.[2] These damages were greater because of a changing climate: sea level rise since 1970 caused Hurricane Florence to significantly affect more than 11,000 additional homes, and if the same storm were to hit in 2050 the impact would be doubled.[3] As we are seeing, this hurricane season continues to have impacts with Hurricane Michael making landfall on the Florida Panhandle on October 10, 2018 as the strongest storm to hit the continental U.S. since 2004.

What is Natural Infrastructure?

"Natural infrastructure" is part of the solution to increase preparedness of all of our coastal communities. Unlike human-made infrastructure like seawalls, jetties, and groins, natural infrastructure protects communities from disasters by using the strengths of natural systems such as wetlands, barrier islands, and more. These approaches are becoming more common to manage storm water runoff and protect coastal communities from storm events and rising tides because they are cost-effective, provide habitat for wildlife, and enhance recreational opportunities.

Some benefits of natural infrastructure include:

- Coastal wetlands prevented $625 million in direct property damages during Hurricane Sandy.[4]
- In North Carolina's Outer Banks, living shorelines were more effective than bulkheads at protecting shorelines from Hurricane Irene; 75% of regional bulkheads were damaged.[5]
- The restoration of Elmer's Island in Louisiana added 1,000 acres of new barrier, dune, and beach habitat, which has protected coastal communities from storms, including a local port.[6] When tropical storm Cindy hit Elmer's Island, the impacts to birds may have been lessened because the recent restoration elevated nesting habitat.[7]

Resilient, healthy coastal ecosystems not only benefit birds, they also serve as the first line of defense for coastal communities facing stronger, more frequent storms and sea level rise. That is why Audubon is working to protect and restore natural infrastructure to help the Atlantic shoreline weather the impacts of climate change (See "What is Natural Infrastructure"). This document provides examples of the impacts of Hurricane Florence on some of the places where Audubon works along the coast, analyzes priority areas for investment, and outlines policies and programs that will help protect and restore natural infrastructure in the Coastal Carolinas for birds and communities in the face of future storms and sea level rise.

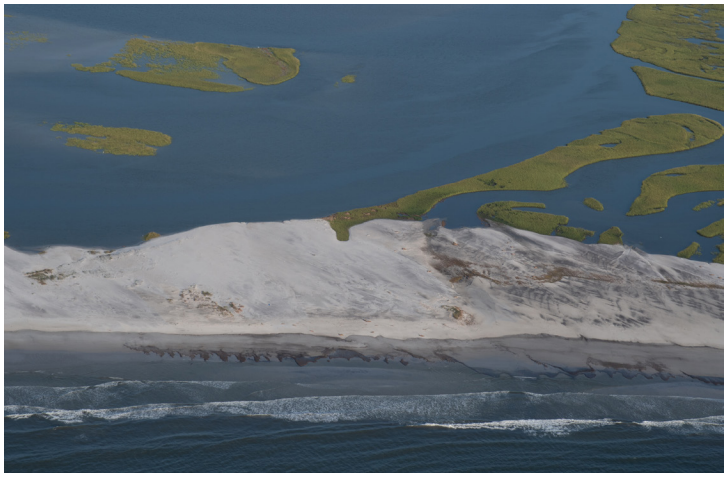
Photo Credit Walker Golder/National Audubon Society

HURRICANE FLORENCE IMPACTED PLACES WHERE WE WORK

LEA-HUTAFF ISLAND, NORTH CAROLINA:

Lea-Hutaff Island is one of the few undeveloped and unmodified barrier islands along the North Carolina coast. Located just a few miles north of Wilmington, NC, the 4-mile long island experienced the full force of Hurricane Florence: winds of 100 mph or more, raging surf, storm surge of more than 8 feet, and more than 20 inches of rain.

The effects of the storm were evident once the weather cleared. It is estimated that 90% or more of the island overwashed with the storm surge. Sand from the ocean beach and dunes was pushed to the sound or marsh side of the island, tall dunes once covered with sea oats were flattened, and peat from relic marshlands was visible on the ocean beach.



Hurricane Florence caused overwash on Lea Island, North Carolina.

American Oystercatchers nest on Lea-Hutaff Island.

The effects of the storm may seem harsh at first, but they are far from it. The natural processes of overwash and erosion are typical of barrier islands. The islands are dynamic and always have been. They absorb the energy from the wind and water, and buffer the mainland from the most harmful effects of the storm. Overwash also breathes new life into barrier islands and provides habitat for birds like terns, skimmers, and shorebirds that are adapted to take advantage of the bare to sparsely vegetated habitat on overwash areas.

Over time the dunes of Lea-Hutaff Island will build back and the cycle will continue.

PINE ISLAND, NORTH CAROLINA:

Audubon's Donal C. O'Brien, Jr. Sanctuary at Pine Island on the northern Outer Banks was at the northern edge of Hurricane Florence. Wind and rain were minimal, no worse than a typical nor'easter that may strike the outer banks several times each year. The flood waters in Currituck Sound peaked on September 19th, but did not reach the lodge or any of the main buildings. The docks and boathouse pictured here had minor flooding.

Robbie Fearn, Director of the Sanctuary, reported that egrets and herons were strolling the edge of the flood waters on the Pine Island great lawn, plucking out fish and eels where normally robins chase grasshoppers.

Pine Island underwater after Hurricane Florence caused drastic flooding.

The rich and productive marshes of Currituck Sound and the Pine Island Sanctuary did what marshes are supposed to do: be a sponge, buffer the uplands, and reduce the storm surge and flooding. This is one reason why we are working to save these marshes and lift and renovate our historic structures. This will help Pine Island endure and help our community and our country to understand, adapt to, and live with the dynamic nature of our ever-changing coast.

Through Audubon's efforts, Pine Island and Currituck Sound can be resilient in the face of future storms and change, serve as a refuge and birthplace for wildlife, and be an inspiration for others.

Photo Credit National Audubon Society's Risk Assessment Team; Emily Hampton/Audubon Photography Awards; Walker Golder/National Audubon Society

BOLSTERING NATURAL INFRASTRUCTURE TO HELP BIRDS AND COMMUNITIES

The coast of the Carolinas stretches 560 miles, from Corolla to the Savannah River. Rich and productive estuaries, vast marshes, and long, narrow barrier islands support a diverse array of birds and other wildlife, as well as abundant fisheries and shellfisheries. The region is also home to a rapidly growing population of more than 4.1 million people and resources and wildlife contribute to a robust economy. Every year in the Carolinas, 3.5 million people spend $1.4 billion viewing wildlife and commercial while combined, recreational fishing contributes $2.6 billion to the economy.[8,9,10]

Audubon's conservation, policy, and science teams assessed bird population trends, habitat types, and threats to places in the Carolinas where coastal birds breed, stop-over during migration, and spend the winter. Our analysis factored in historical data, existing research, Important Bird Areas, and current data on the distribution, abundance, and habitats of ten coastal "flagship" birds. We also mapped and projected the potential impact of sea level rise on marshes and identified important corridors for marsh migration (Figure 1). Marsh migration corridors are areas upland of current marshes that wetlands can grow into as rising seas drown or impact the current front line of vegetation. The corridors allow wetlands to "roll back" from the rising seas and spread in new areas, ensuring that vitally important wetland habitat continues in the future.

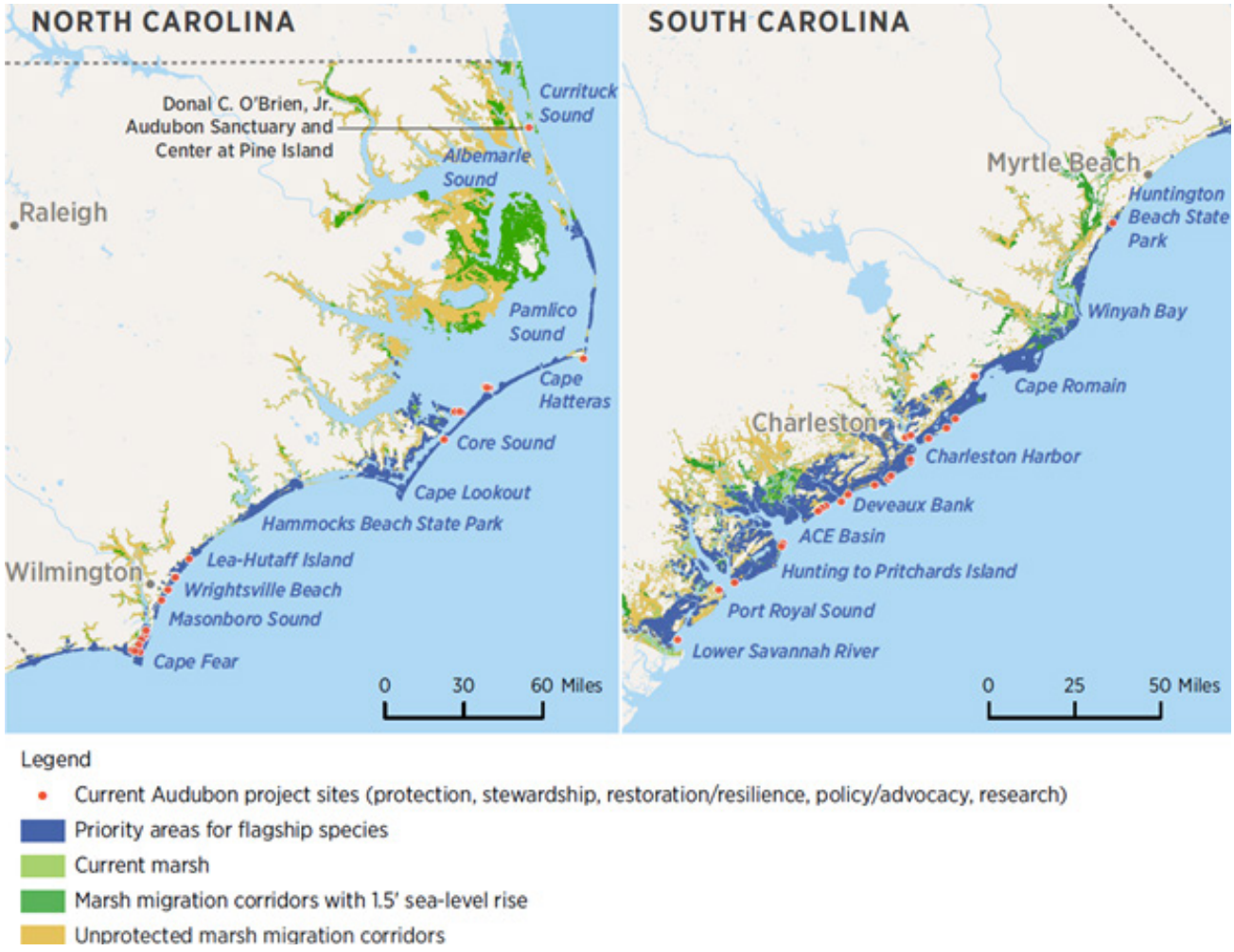


Figure 1: Priority areas for flagship species and sea level rise impacts on habitat

Photo Credit National Audubon Society

Brown Pelicans nesting on an island off of South Carolina.

Overall, we found that there are 304,968 acres of priority areas for flagship species that are vulnerable to sea level rise or hurricane damage and 625,945 acres of marsh migration corridors with 1.5 feet of sea level rise. These marsh areas, and undeveloped lands behind them that will give them space to grow into as seas rise, are important for birds, fisheries, and coastal communities. Wetlands act like sponges, absorbing rain and wave action, and they act as a first line of defense for communities located behind them. Protecting and restoring some of this natural infrastructure requires a significant investment, but the return includes increased public safety and taxpayer savings, and protection of fish, wildlife and natural resources.

There are actions that can be taken to strengthen natural infrastructure (such as marshes and wetlands) and better protect barrier islands, beaches, dunes, and spits. People from many walks of life are joining forces to restore and protect natural defenses. New techniques for strengthening and expanding marsh health are being tested on-the-ground, while a federal program that protects undeveloped islands and beaches from billions of dollars of federal development funding is being examined for ways it could be expanded.

RESTORING MARSHES AND ISLANDS TO ENHANCE HABITAT

Currituck Sound marsh restoration in North Carolina is an example of a natural infrastructure investment. In 2010, the US Army Corps of Engineers completed a multi-year, multi-stakeholder study and found marsh and submerged aquatic vegetation is disappearing, especially in mid-Currituck Sound. The study predicts 430 acres of marsh will disappear every 6 years, which is likely to steadily increase in coming years. Restored marsh sustains estuarine health and provides natural buffers that reduce storm and flooding impacts. Audubon will use the latest techniques, such as terraces and thin-layer sediment dispersal, in the mid-Currituck marsh complex to break wave energy, reduce marsh loss, allow new marsh to become established, and provide a zone where marsh can be restored.

Marshland within the Currituck Sound is steadily decreasing.

Another example of a much needed natural infrastructure investment is Crab Bank in South Carolina. Crab Bank is a narrow slice of sand in Charleston Harbor that historically supported up to 5,000 nesting birds and protects the local community from waves and storm surge. After erosion, less than 100 birds can nest on Crab Bank today and the local community is more exposed. Audubon and partners are encouraging the U.S. Army Corps of Engineers to renourish Crab Bank using dredged material from Charleston Harbor, rather than dumping the sand in the open ocean, where it serves no community or natural resource benefit. This sand would expand the island to a maximum of 79.4 acres, creating habitat and protecting the local community.

Crab Bank Seabird Sanctuary has lost so much land suitable for nesting that nesting birds have decreased from 5,000 less than 100.

In addition, the undeveloped lowlands of South and North Carolina where flood waters already reach on a regular basis will be the marshes of the future. Our analysis of the Carolinas found more than 300,000 acres of unprotected marsh migration corridors. Protecting these corridors at strategic locations along the coast will help ensure that the rich and productive marshes of the Carolinas can persist in the future.

Photo Credit Nolan Schillerstrom/Audubon South Carolina; NC Wetlands/Flickr CC (BY 2.0); Walker Golder/National Audubon Society

EXPANDING PROTECTIONS FOR BARRIER ISLANDS, BEACHES, AND OTHER COASTAL BARRIERS

Piping plovers and other shorebirds need open, undisturbed habitat for nesting.

Policies should also focus on protecting the remaining undeveloped barrier islands and flood prone coastal lowlands, promoting voluntary buyouts that benefit people and wildlife, and avoiding hardened structures. One mechanism to protect undeveloped areas is to expand the Coastal Barrier Resources Act (CBRA). This Act is a free-market tool that prohibits wasteful governmental spending of taxpayer dollars on new construction or federal flood insurance in undeveloped, high-risk coastal areas designated in the CBRA System. The U.S. Fish and Wildlife Service has recommended that more than 6,000 acres of islands, beaches, dunes, spits, wetlands and estuarine waters along the Carolinas be added to the System to protect these ecologically rich areas from costly federal development subsidies (5,592 acres along North Carolina and 378 acres along South Carolina.) Congress must act to implement the Service's recommendations.

PROMOTING AND IMPLEMENTING VOLUNTARY BUYOUTS

Some coastal properties have been repeatedly flooded by storms, while other properties are threatened by sea level rise, erosion and future storm damage. Paying to rebuild these flood-prone properties is costly, and acts to perpetuate the cycle of damage and loss without helping property owners relocate to less hazardous areas. Promoting voluntary buyouts is cost-effective, promotes public safety and enhances environmental protection. Purchasing vulnerable properties from willing sellers and placing permanent public open space easements on newly acquired land is less expensive than continuing to pay federal insurance claims and disaster relief to rebuild structures. Relocating structures also reduces the need for costly and recurring beach nourishment projects and the installation/ongoing maintenance of hardened structures like terminal groins. These structures may protect a small number of houses directly adjacent to them, but they accelerate sand loss and erosion further down the beach, risking nearby communities and wildlife habitat.

FUNDING PROTECTION AND RESTORATION OF NATURAL INFRASTRUCTURE

Audubon works closely with our partners across the federal and state governments on natural infrastructure and restoration projects, including: the U.S. Department of Agriculture Natural Resources Conservation Service; Department of Commerce National Oceanic and Atmospheric Administration; Department of Defense Army Corps of Engineers; Department of the Interior; Environmental Protection Agency; the North Carolina Clean Water Management Trust Fund and Division of Marine Fisheries; the South Carolina Conservation Bank; and the Department of Natural Resources. It is critical these agencies with natural infrastructure programs receive adequate funding to decrease future risks and increase preparedness of coastal communities, while benefiting fish and wildlife.

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Photo Credit Melissa Groo/Audubon Photography Awards