



Audubon FLORIDA

HURRICANE IRMA

Assessment Report



This assessment provides a detailed early look at the impacts of Hurricane Irma to the critical bird and wildlife habitats of the affected areas in Florida. Early recovery projects are included, as well as recommendations for overall resiliency priorities for the natural and built landscapes of the state’s coasts.

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Cover: Houses on Florida’s Vilano Beach built for the ocean view are now too close for comfort. A sea wall protected some parts of the beach from Hurricane Irma but not all.

Photo: Andrew Moore



ANGELO GARIBALDI/SHUTTERSTOCK



Hurricane Irma on the verge of making landfall on the Florida coast.

NASA

Introduction

Hurricanes have been a part of our lives in many coastal areas for as long as we have historical records. For birds and other wildlife, hurricanes serve to rework our coastal habitats, destroying some areas while often providing sand and sediment to actually build others. However, as we 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; waters are warmer, thus fueling more intense hurricanes in ways that we haven't witnessed in the previous century.

The summer of 2017 was unprecedented in recorded history, with three major hurricanes, Harvey, Irma, and Maria, hitting the Gulf Coast states, multiple Caribbean islands and Dominica in a

single season. The long-term impact of these storms on critical island, wetland, and coastal forest habitats is still unfolding, as are efforts to maintain community resilience in their aftermath. Audubon has been providing coastal stewardship in all five of our Gulf States, Mexico, and several Caribbean islands for years. We are uniquely qualified to assess the impacts of the hurricanes on birds, wildlife, and coastal communities, and to provide leadership to inform long-term recovery on a local, regional, and Gulf-wide level.

This rapid assessment provides a detailed early look at the impacts of Hurricane Irma to the critical bird and wildlife habitats of the affected areas in Florida. Early recovery projects are included, as well as recommendations for overall resiliency priorities for the natural and built landscapes of the state's coasts.

+ Priority Actions

While final assessments are still underway, non-governmental organizations and government agencies have begun working to mitigate the negative impacts from the storms. Objectives of the response are as follows:

- Restore critical waterbird nesting islands and beaches to support bird habitat and protect communities;
- Restore or establish coastal barrier islands to protect communities from future storm surges and establish critical wildlife habitat;
- Restore shorelines and habitats suffering from storm-related erosion, using natural infrastructure techniques such as living shorelines and native plant restoration;
- Establish a voluntary buy-out program that reconnects floodplains to river systems, addresses future headwater threats, and saves taxpayer funds;
- Replace infrastructure important for erosion control, management activities, and nesting;
- Enhance stewardship capacity on islands and beaches to protect nesting habitat;
- Rapidly assess effects from the storm on the upcoming avian breeding season; and
- Using science, engineering, and stakeholder processes, work with communities to design a future more resilient to storms and storm surge while also enhancing wildlife habitat.

Recovery efforts must focus on near- and long-term solutions that will restore critical coastal habitats impacted by the storm and make the Gulf Coast resilient to future storms. The tables that accompany this report outline recommended projects to be implemented by NGOs, government agencies, and universities.

IRMA

Overview

Shorebirds, seabirds, and long-legged wading birds depend on Florida's vast array of coastal habitats—sandy beaches, sand and mudflats, and mangrove islands—for year-round nesting, feeding, and resting. Wind and rain delivered by tropical weather systems are a fact of life for all of Florida's bird residents and visitors but their resilience in the face of these storms is compromised by continued coastal development, increasing human beach recreation, and coastal armoring with seawalls. In 2017, three tropical weather systems significantly impacted Florida's coastal nest success and habitat, the latter for years to come. Tropical Storm Cindy made landfall in Louisiana on June 22 but heavy rain and winds battered Florida Panhandle nests. Hurricane Harvey made landfall on August 25 in Texas and again on August 29 in Louisiana, with storm surge battering western Florida Panhandle beaches.



Most devastatingly, Hurricane Irma made landfall in the middle Florida Keys and again at Marco Island on September 10, pounding the interior Florida peninsula and both Gulf and Atlantic coasts as she passed northward through the state and into South Georgia. With peak wind gusts of 142 mph recorded in Naples, the center of the storm path passed approximately 2.5 miles west of Audubon's Corkscrew Swamp Sanctuary and continued across the state to exit in northeast Florida. Not only was this

storm powerful, it was also vast, causing impacts to the entire peninsula of Florida and its natural resources. From toppled tropical hardwood hammocks in the Keys to critically eroded beaches in Jacksonville, the natural-resource impacts from this storm were widespread and extensive.

Coastal Impacts

Audubon staff partnered with the Florida Fish and Wildlife Conservation Commission to rapidly assess visible impacts to 87 sites important to nesting and migratory shorebirds and seabirds and 24 important wading bird rookery sites throughout the Florida peninsula and the Florida Panhandle. Storms Cindy and Harvey caused Black Skimmer and Least Tern egg and chick mortality at six sites in the western Panhandle. Hurricane Irma made landfall at the end of the nesting season, causing major habitat impacts and some mortality to late-nesting wading birds in Southwest Florida. Of the 87 coastal beach sites assessed, 34% suffered harmful erosion, primarily in Collier, Lee, Nassau, Duval, and St. Johns counties. Of the wading bird rookery sites assessed, 62% suffered damage that may significantly affect tree-nesting birds primarily in Hillsborough, Pinellas, Manatee, and Collier counties.

Interestingly, because many beach-nesting species prefer open sandy areas with little vegetation, there were some sites that had storm impacts that improved the habitat by burying or salt-killing vegetation. Approximately 22% of assessed coastal beach sites saw some improvement in habitat condition because of this successional reset.

Saltmarsh habitats fared very well, performing the storm surge attenuation functions for which they are renowned. Cordgrass marshes were largely unimpacted, and effects to mangrove marshes were limited. Even in Florida Bay, where staff expected catastrophic torsion of mangroves comparable to that seen after Hurricane Wilma, trees showed only modest windburning, which will recover within a season.



PAT AND DORIS LEARY

Audubon worried for Florida's wintering shorebirds in the face of Irma. This Piping Plover from Nova Scotia was found safe in Northeast Florida two days post-storm.

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JOHN LONDON

Audubon has managed the Alafia Bank Sanctuary (owned by the Mosaic Company and Port Tampa Bay) for more than 50 years.

The Richard T. Paul Alafia Bank Sanctuary and Critical Wildlife Area, located in eastern Tampa Bay, annually hosts up to 13,000 nesting pairs of 18 shorebird, seabird, and wading bird species. The Sanctuary hosts Florida's largest Roseate Spoonbill colony and one of the largest Reddish Egret colonies in the state. The shorelines and wading bird nesting trees protected by the existing breakwaters survived the storm with minimal impacts, while erosion and significant tree damage occurred only along the north shore of Sunken and Bird Islands where protective breakwater structures have not been installed.

More than 20 mature native trees used by nesting Brown Pelicans, Roseate Spoonbills, Reddish Egrets, and other large waders were uprooted along the shoreline and a 10-foot-high escarpment on a land bridge between the two islands, in addition to damaged limbs on interior trees. The Alafia Bank continues to experience rapid loss of critical habitat along the northern shoreline not protected by the offshore breakwaters. Events like Hurricane Irma exacerbate and accelerate this process and will continue to do so until we are able to complete the breakwater array, at an estimated cost of \$2.1 million.



Storm overwash cleared vegetation from Julia's Island—an improvement for Least Tern nesting—but it also reduced the island's elevation, leaving nesting birds more vulnerable to seasonally high tides and storm events.

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Julia's Island is a paddle or ferry ride from downtown St. Augustine in St. Johns County. The island was created by dredge spoil deposition, and for the past 5 years, Least Terns, Wilson's Plovers, and American Oystercatchers have nested on the island. Active nest sites were posted by St. Johns County Audubon members in partnership with Audubon Florida,

and in 2016 and 2017 bird stewards were transported by ferry to Julia's Island to chaperone active nests and educate the public about beach-nesting birds. Hurricane Matthew's waves overwashed the island in Fall 2016, and the island was again overwashed when Hurricane Irma passed through Florida in September 2017. On the bright side, new sand de-

posited onshore and vegetation killed by salt water provide beach habitat preferred by beach-pioneer species such as Least Tern. On the downside, overwash has reduced the height of the island so that beach-nesting birds are far more vulnerable to seasonal high tides and tropical weather systems in the future.

A Tale of Two CWAs



ROOKERY BAY NERR

The Second Chance Critical Wildlife Area (CWA) is a U-shaped offshore shoal located south of Marco Island along Florida's Southwest Gulf Coast. The shoal has supported annual nesting of Least Terns, Black Skimmers, and Wilson's Plovers on a partially vegetated, elevated sand platform since it emerged from the Gulf less than 10 years ago. Nesting success improved dramatically following establishment of the CWA in 2016. As Hurricane Irma passed directly over the CWA, waves breached the U-shape of the shoal, dragging the elevated nesting area into the Gulf and leaving a tidal inlet unlikely to fill in quickly. On the north end of nearby Marco Island, the peninsular Big Marco Pass CWA was breached by waves at a narrow point but filled in quickly following Irma's passage. In contrast to offshore Second Chance, the northern two miles of the peninsula received loads of wave-driven new sand that covered sandspur grass and other thickly vegetated areas that hide predators from the view of nesting shorebirds. New sand deposits are a big win for Big Marco Pass CWA.

Audubon's recommendations for projects to repair damage resulting from Irma, and making these habitats and species more resilient in the face of future storms:

Restoration of Damaged and Lost Habitat

Project Name	Type	Location	Brief description	Amount (estimate)
Alafia Bank	Shoreline erosion protection	Tampa Bay	Install wave break along remainder of unprotected north shoreline.	\$2,100,000
Julia's Island	Restoration	St. Augustine, St. Johns County	Sand/spoil placement to increase height above sea level.	>\$500,000
Nassau/Amelia rakes	Restoration and erosion protection	Nassau County, Northeast Florida	Install bags of oyster shells around perimeter of existing rakes to trap sediment and decrease erosion.	>\$100,000
Florida Bay Islands	Replacement signage	Monroe County	Replacing lost signage protecting rookery islands such as Sandy Key.	\$25,000
Critical Wildlife Areas	State law enforcement funding	Monroe, Collier, Lee, Sarasota, Manatee, Hillsborough, Levy, Franklin, Nassau, Duval, St. Johns, Volusia counties.	Managing disturbance at new critical wildlife areas will require education of boaters about the new protections for these sites. Florida Fish and Wildlife Conservation Commission officers provide outreach and enforcement for these sites, but staffing levels have not kept pace with population growth and tourism growth in the last decade. Controlling disturbance at the sites where these birds nest is one hazard we are able to ameliorate, making uncontrollable tropical system impacts less catastrophic on a population level.	\$2,000,000
St. Joseph Sound rookery islands	Restoration	Intercoastal Waterway, Pinellas County	Breakwater protection of eroding rookery islands in Greater Tampa Bay.	\$1,000,000

Total

\$5,725,000

Everglades

As the largest subtropical wetland ecosystem in North America, the Everglades acts as South Florida's first line of defense against storms like Hurricane Irma, and moderates the impacts of extreme weather, such as flooding and drought. Coastal and freshwater wetlands in the U.S. are estimated to provide \$23.3 billion per year in storm protec-

tion. Each 2.7 miles of wetlands reduce storm surge by a foot, and one acre of wetlands holds up to 1.5 million gallons of floodwaters.

According to the National Oceanic and Atmospheric Administration, the cost of natural disasters in the U.S. has exceeded \$1.2 trillion since 1980, not including hurricanes Harvey, Irma, and Maria. Recent storm events demonstrate the

wisdom of proactively investing in infrastructure like Everglades restoration projects that protect natural lands and provide water managers critical flexibility to reduce flood damage and risk throughout South Florida. In addition to the benefits for resiliency, the Everglades, including its national parks, national wildlife refuges, and other federal and state lands, serve as places of recreation, and are key economic drivers for Floridians.



Audubon Florida Director of Research Dr. Jerry Lorenz inspects a floating mangrove island in Florida Bay with damage from Hurricane Irma.

PETER FREZZA/AUDUBON FLORIDA

Impacts from Irma

Hurricane Irma impacted many ongoing projects throughout the Greater Everglades Ecosystem. Estimates of damage to projects currently under construction include:

- C-111 South Dade: \$1.75 million
- Biscayne Bay Coastal Wetlands: \$100,000
- Picayune Strand: \$100,000
- C-44 Reservoir: \$1.35 million
- Kissimmee River: \$2 million

Funding is also needed to repair damages to national parks and refuges, which already have significant maintenance backlogs and cannot afford to absorb the costs of hurricane recovery.



JULIE HILL-GABRIEL/AUDUBON FLORIDA

Everglades Restoration Projects to Improve Resiliency

In addition to repairing damages to projects under construction, post-Hurricane Irma recovery efforts should focus on investing in Everglades restoration projects that can improve the resilience of Florida in the face of future storms. Below are projects that could receive immediate federal funding and provide critical infrastructure improvements to respond to Hurricane, flood, drought, wildfire, or othernatural disasters.



PETER FREZZA/AUDUBON FLORIDA

U.S. Army Corps of Engineers Everglades restoration projects:

- Central Everglades Planning Project: Levee removal and canal backfill at L-67 extension
Beginning work on southern features of the Central Everglades Planning Project will allow more water to move from the Water Conservation Areas and south into Everglades National Park. This effort of delivering more fresh water south will push back against intruding salt water that threatens Florida's underlying aquifers which provide drinking water to millions of residents and businesses, strengthening South Florida's resiliency against storms



CELESTE DE PALMA/AUDUBON FLORIDA

and other climate impacts. Cost: \$9.2 million

- Everglades Agricultural Area Reservoir: Project planning
The current water management system in the Everglades was stressed to the limit in 2017 by high water levels as a result of record rainfall and Hurricane Irma. This project will store a minimum of 240,000 acre/feet of water, as directed by the Florida Legislature, to add critical capacity to hold water in the Central Everglades. The water that is stored in the reservoir can then provide a source of fresh water in dry and drought conditions. Cost: \$1.5 million
- C-111 South Dade: Finish project construction Remaining flood control features of this project will allow fresh water to move into Taylor Slough and hydrate Florida Bay without the risk of flooding private property. In turn, this project will help reconnect the freshwater flow from the north into Everglades National Park and improve the salinity balance of water in Florida Bay, which is so important for the commercial and recreational fishing



MAC STONE

In the aftermath of Hurricane Irma, the University of Florida reported that all 44 active Everglade Snail Kite nests on Lake Okeechobee were destroyed.

industry in the Florida Keys. The three final components of this project are under construction.

Cost: \$2 million

- **Biscayne Bay Coastal Wetlands:** Complete the first phase Restoring wetlands that restore fresh-water flow into Biscayne Bay and Biscayne National Park near urban Miami will help attenuate storm surge and other impacts from future hurricanes. Cost: \$32 million
- **Broward County Water Preserve Areas:** Complete design for C-11 Impoundment This project, which includes a wetlands buffer and two reservoirs, provides system-wide benefits to the Everglades. By expanding the acreage of wetlands around urbanized areas, it will increase this important defense against future storm impacts. Increased water storage is achieved through the capture and storage of rainwater, which also helps prevent water from seeping out of the Everglades into urban areas. Cost: \$3.5

million

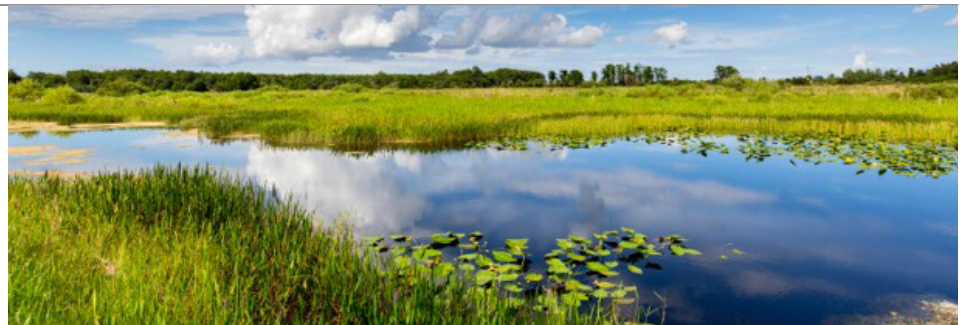
- **Picayune Strand:** Construction of SW protection features By directly restoring 55,000 acres of wetlands and benefiting nearly 100,000 acres of habitat, the Picayune Strand project will reverse decades of drainage and destruction of a vital region of the Western Everglades. It will also help restore the watershed for Big Cypress National Preserve, Everglades National Park, the Ten Thousand Islands and Rookery Bay estuaries, which were impacted by Hurricane Irma. In order to restore this land that was at the center of a quintessential Florida swampland real estate scam, more than 19,000 individual parcels of land were purchased by the Florida Department of Environmental Protection. 90% of the project is complete. The remaining features are designed to protect neighboring communities from flooding, which could in turn enhance their flood protection during future storms. Cost: \$2.5 million for design and \$35-\$40 million for construction

- **Kissimmee River Restoration:** Complete construction In order to accommodate navigation in the 1960s, the Kissimmee River was channelized, changing the river's meandering path and draining its floodplain that historically reached two miles wide and was frequently inundated with water. The result is that rainfall in the surrounding floodplain is diverted rapidly into Lake Okeechobee. Hurricane Irma raised lake water levels by more than three feet and Lake Okeechobee is now at its highest level in more than a decade. Kissimmee River Restoration is underway to restore 20,000 acres of wetlands and 44 miles of historic river channel, which will help attenuate the flow of water from the Kissimmee River into Lake Okeechobee. Cost: \$3 million
- **Indian River Lagoon South** The C-44 reservoir project will provide 60,500 acre/feet of new water storage capacity to capture, store, and treat local basin runoff before it flows into the St. Lucie estuary. This and other reservoirs will improve the overall health of the estuary, making it more resilient to storm and high-water impacts. Cost: \$50 million to complete construction on the C-44 Reservoir; \$3 million for design of the C-23/C-24 south component; \$3

million for design of the C-25 component

U.S. Department of the Interior restoration projects:

- Tamiami Trail Next Steps project: Road-raising component
Tamiami Trail has acted as a dam to the natural Everglades north to south flow of water since its construction in 1928. A one-mile bridge on this roadway completed in 2012 has begun to increase the amount of fresh water that flows south. The next 2.6-mile bridge is under construction, but additional roadway improvements that will help increase the amount of water that can flow under the bridge are not yet funded. Cost: \$23 million
- Cape Sable Dams Restoration Phase II: Raulerson canal construction
Located at the southern tip of the Florida peninsula in Everglades National Park, manmade canals in



Wetlands like those pictured here at the Arthur R. Marshall Loxahatchee National Wildlife Refuge, help attenuate extreme weather impacts like those brought on by Hurricane Irma.

IAN SHIVE

this area have resulted in significant salt water intrusion and coastal erosion, impairing critical fishing habitat. Through plugging canals and the construction of dams, this project seeks to reverse these impacts and improve the fishery. A stated purpose of the project is to bring about greater resilience to the Cape in the face of sea-level rise and the possibility of more frequent and intense hurricanes. Hurricane Irma's landfall over Cape Sable further demonstrated the importance of restoring this area that acted as a buffer to storm surge that protected other

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Audubon Florida biologist Michelle Robinson investigates debris washed up on Sandy Key, an important bird rookery in Everglades National Park.

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