



Restoring the Gulf for Coastal Waterbirds: *A Long-term Vision*

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 Audubon



Cover:
ROYAL AND SANDWICH TERNS
IN FLIGHT
Photo by R. J. Wiley

This page:
AERIAL VIEW OF THE
CHANDELEUR ISLANDS, LA
Photo courtesy of U.S. Geological
Survey

TABLE OF CONTENTS

Executive Summary & Initiatives	3
Problems & Solutions	5
Map of Audubon's Stewardship & Project Sites	7
Project List	9
Florida	10
Alabama	14
Mississippi	16
Louisiana	19
Texas	23
Audubon Points of Contact	28
Table 1: Estimated Project Costs	29
Appendix 1: Gulf Coast Waterbirds, Seabirds and Shorebirds of Conservation Concern	30



Overview

Few images of the 2010 BP Deepwater Horizon disaster are as iconic as those of graceful birds struggling to survive through unthinkable cloaks of oil.

Thousands of birds from dozens of species succumbed when the oil flowed unabated, and untold thousands more have been and will continue to be adversely affected. In addition to catastrophic oil spill impacts, these birds, the Gulf of Mexico's ecosystems and the communities that depend on them have experienced decades of neglect and degradation. Available habitats have declined precipitously. Also contributing to this growing crisis are human alterations of the landscape, sea level rise, subsidence, reductions in water quality and inappropriate habitat management. Strategies exist to resolve these challenges in the Gulf, which will achieve near- and long-term restoration benefits for coastal waterbirds, their habitats and natural resource-dependent human economies, workforces and communities. Any effort to restore the Gulf, the function of its ecology, and its magnificent wildlife must include a comprehensive, coordinated approach to restoring these at-risk waterbirds and the critical habitats on which they depend.

OILED BROWN PELICAN NEAR
QUEEN BESS ISLAND, LA
Photo by Melanie Driscoll /
Audubon

Executive Summary & Initiatives

Audubon's Gulf Coast Initiative proposes a three-phased iterative approach to assure that coastal waterbirds, seabirds, and shorebirds are integral to the recovery plans implemented in the Gulf.

1. NEAR-TERM COASTAL RESTORATION

We must take immediate action to secure and improve existing shoreline and near-shore habitats that can support existing populations. This document identifies examples of shovel-ready conservation projects that would immediately expedite the recovery of habitats for Gulf Coast birds. With Gulf restoration funds, we have a unique opportunity to restore current habitats while acquiring and even creating new areas that can be managed toward supporting a mix of species across the full range of the Gulf.

2. ONGOING MONITORING AND STRATEGIC CONSERVATION PLANNING

The Deepwater Horizon response was hindered by the dearth of consistent data on and coordinated management of coastal birds in the region, despite many past conservation plans prescribing these measures. The Gulf requires a thorough review of existing bird data, surveys of birds and the condition of current and potential habitats across the Gulf, and modeling toward optimal bird habitat management. Audubon is poised to lead a consortium of agencies and organizations to develop this coordinated approach to restoration, lead conservation planning for high-priority sites in the region, and identify and prioritize habitats and management actions most important for birds across the northern Gulf of Mexico.

3. GULF SANCTUARY SYSTEM WITH LONG-TERM MANAGEMENT GOALS

We must integrate existing conservation lands and future acquisitions from willing sellers into a coastal sanctuary system to ensure the long-term stewardship and sustainability of Gulf Coast bird populations. This sanctuary system should combine ongoing habitat acquisition and restoration projects, well-funded scientific monitoring and science-based management, and innovative social marketing and public outreach. Federal, state, nonprofit and local entities must combine efforts to reach consensus on bird population goals for species breeding, wintering, migrating and feeding across the Gulf.

Funding for this three-phased approach should recognize both immediate needs for projects and the long-term needs for bird and habitat stewardship that will require either endowments or ongoing annual commitments for at least a decade.

The National Audubon Society realizes an historic calling to help recovery of Gulf Coast ecosystems for birds. The nation's first national wildlife refuges were in the region, focused on protecting vulnerable bird populations. Audubon wardens were on the front lines of battles to wrest respect for nature during lawless times. The challenges are different now but no less urgent. They call for the same bold action, far-reaching vision and committed investment.



PROBLEMS & SOLUTIONS FOR WATERBIRD RECOVERY AND CONSERVATION

PROBLEMS

- » Habitat loss due to subsidence, erosion, sea level rise, increased storm intensity, and development
- » Pollution, including oil spills, sewage, and excess nutrients
- » Human disturbance
- » Overcrowding of birds at nesting colonies, resulting in reduced productivity at some sites
- » Competition for prey from invasive species, commercial fishing operations
- » Predation: natural, from feral animals, human-amplified

SOLUTIONS

- » Preserving key sites from degradation
- » Restoring and creating additional sites for population expansion and shifts
- » Increasing understanding of management needs by federal and state agencies and land managers
- » Protecting key sites from human disturbance
- » Anticipating climate change impacts, identifying and protecting the most resilient sites, and managing habitats for the long-term future
- » Incentives and education for better management by private owners
- » Public understanding of why these sites are vulnerable, sensitive, cannot be disturbed
- » Ongoing data collection and analysis to identify trends, understand their causes, and direct resources toward conservation implementation

Problems & Solutions:

Making a Gulf-wide, Long-term Commitment to Waterbird Recovery and Conservation

The coastline of the Gulf of Mexico is one of the biologically richest in the world for diversity of species and productivity of ecosystems that contribute to human economy. The Deepwater Horizon disaster demonstrated anew how vulnerable the region is, and how little capacity government agencies and the environmental community have had to ensure protection of the Gulf's most significant sites and species.

Audubon has focused on the Gulf's abundant waterbird, seabird and shorebird populations as the most effective indicators of overall environmental quality. These birds are also charismatic species that can attract and sustain public concern for the ecosystem. For these birds, both the problems and the solutions are widely known and are summarized briefly on the following page.

SNOWY PLOVER
Photo by Gerry Ellis

SETTING A VISION & SHAPING A PLAN

Effective restoration, protection, and management will be accomplished by first setting species population goals and targets, then creating a vision and plan that will result in a mosaic of habitats necessary to meet those targets. Audubon will lead this process by assessing current regional bird population sizes, developing an atlas of sites, their current conditions, and prescriptive management needs, and then will develop a prioritization to ensure the most critical restoration needs receive resources as soon as they become available.

COOPERATIVE PLANNING & ACTION

The Gulf needs system-wide planning and cooperation to create a healthy and resilient landscape.

The call for cooperative action has never been more pressing. In the wake of the Deepwater Horizon disaster, significant funding to restore damages will flow toward habitat acquisition, conservation, and restoration in the Gulf of Mexico, yet coast-wide prioritizations of needs for these monies are still incomplete. In addition, the Deepwater Horizon disaster turned significant focus of the federal government to the Gulf of Mexico,



CHILD WITH HER BIRD STEWARDSHIP SIGN
Photo by Mozart Mark DeDeaux / Audubon

1. Hunter, W. C., W. Golder, S. Melvin, and J. Wheeler. 2006. Southeast United States Regional Waterbird Conservation Plan. U.S. Geological Survey, Patuxent, Maryland.

2. Niven, D. K. and G. S. Butcher. 2011. Status and trends of wintering coastal species along the northern Gulf of Mexico, 1965-2011. *American Birds* 65:12-19.

3. Couvillion, B. R., J. A. Barras, G. D. Steyer, W. Sleavin, M. Fischer, H. Beck, N. Trahan, B. Griffin, and D. Heckman. 2011. Land Area Change in Coastal Louisiana from 1932 to 2010: U.S. Geological Survey Scientific Investigations Map 3164, scale 265,000. U.S. Geological Survey, Reston, VA.

4. Pruner, R. A., M. J. Friel, and J. A. Zimmerman. 2011. Interpreting the influence of habitat management actions on shorebird nesting activity at coastal state parks in the Florida panhandle. 2010-11 study final report. Department of Environmental Protection, Florida Park Service Panama City, Florida.

as evidenced by the development of the Gulf Coast Ecosystem Restoration Task Force (GCERTF), charged with developing a restoration strategy for the Gulf of Mexico. The GCERTF has already identified that it will be challenging to direct resources toward conservation and restoration without a better understanding of the highest priority sites. In part, this is because conservation and restoration planning have been done at several scales, including the state-level, some regional planning (by groups such as Gulf of Mexico Alliance and Gulf Coast Joint Venture) and some planning for specific geographies (for example, planning for the Barataria-Terrebonne National Estuary). When habitats and projects have been prioritized at the local or state level, or for smaller geographies, however, it is more difficult to direct the funding toward the highest priority sites. Specifically, there is a risk, if planning and restoration are done by many entities in isolation, that the result will be a suite of habitats that still fails to meet the needs of all the species of conservation concern in the Gulf of Mexico. For instance, suites of bird species of conservation concern require a mosaic of habitats of varying successional stages to meet their needs during breeding season, migration, and winter. Until conservationists know what exists now, they will be unable to manage for an ideal mosaic to meet the needs of this suite of species of conservation concern.

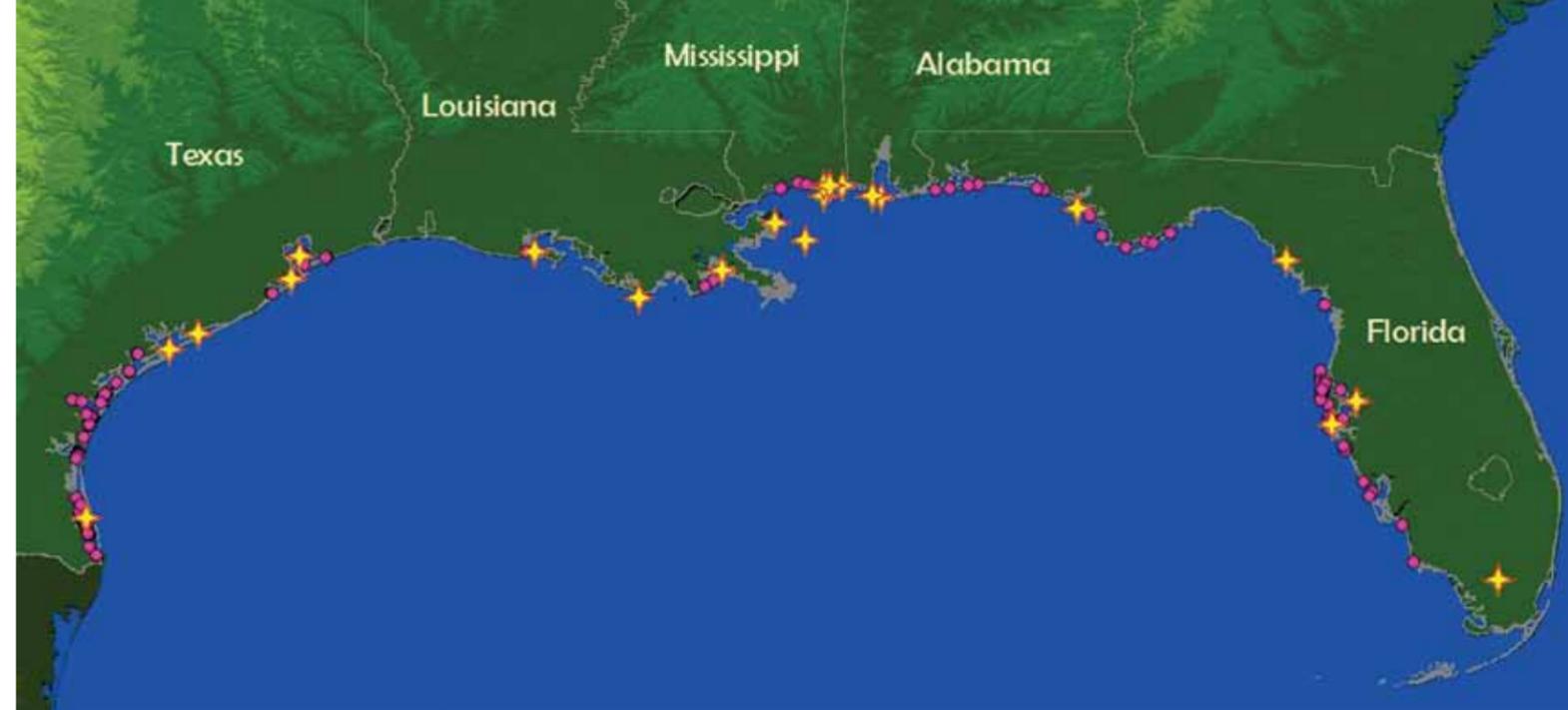
Restoration and protection of key habitats and sites across the Gulf of Mexico is a high conservation priority in the Southeast United States Regional Waterbird Conservation Plan.¹

Audubon is poised to lead a consortium of agencies and organizations to develop coordinated monitoring of waterbirds, lead conservation planning for high priority sites in the region, and identify and prioritize habitats and management actions most important for coastal waterbirds, seabirds, and shorebirds across the Gulf of Mexico.

Our 110 years of Christmas Bird Count data show bird population declines, especially since the 1960s, in beach-dependent birds and marsh birds.²

Recent analysis by U.S. Geological Survey shows over 1800 square miles of land loss in coastal Louisiana alone.³ We have identified 71 Important Bird Areas along the northern Gulf Coast, key sites supporting birds of conservation concern, as well as many species that are still common. However, we recognize that we must prioritize all potential sites in the region in order to focus our conservation work on the most important sites, as well as to work with partners to direct resources to the highest priority places.

Audubon also recognizes that coastal habitat protection will reverse declines in these species only in conjunction with ongoing management that is conducted within a monitoring framework. Even on public lands traditionally considered protected, birds suffer from overwhelming human disturbance, habitat modification, and predation by nonnative and human-amplified predator populations.⁴ As a result, nesting productivity is hard won at many sites, while birds struggle to forage and roost undisturbed to improve



MAP OF AUDUBON'S STEWARDSHIP & PROJECT SITES

Audubon stewardship locations to protect nesting and migratory waterbirds, seabirds, and shorebirds (pink circles) and Audubon-supported projects (yellow stars)

their survival and condition during migration and winter. Habitat management to control invasive species and plant native species with a focus on maintaining a mosaic of varying successional stages will improve habitat quality for species of conservation concern. Management of disturbance and predation through pre-posting nesting and wintering areas, predator control, and positioning professional and volunteer bird stewards as ambassadors for the birds during periods of potentially high disturbance will further reduce threats. Funding for additional law enforcement capacity for the highest priority sites will also result in better bird and habitat protection.

DECREASING HUMAN IMPACT BY INCREASING ENGAGEMENT

Protecting coastal birds is often about managing people. Most individuals do not mean harm to nesting, feeding or resting birds; they are simply not aware of the needs of these species, their habits, or the negative effects of disturbance. While law enforcement should intervene where appropriate, it has limited reach and is often not the best approach.

A Gulf-wide commitment to conservation of these coastal species will require a commitment to innovative engagements with the public.



VOLUNTEER STEWARD EDUCATING BEACHGOERS ABOUT NESTING BIRDS
Photo by Dave Kandz

VOLUNTEER STEWARDSHIP GROUPS

Volunteer stewardship groups, coupled with professional staff, have proven especially capable at educating beachgoers about the birds and reducing disturbance. Volunteers post signs at nesting colonies, engage interested beachgoers in discussion about the needs of nesting birds, and communicate with law enforcement when migratory bird

laws are not heeded. They regularly survey colonies to document disturbance events and nesting productivity. These citizens become advocates for the birds and the habitats that support them, occasionally advocating for changes in local ordinances when necessary to protect colonies that are at high risk for disturbance.

SOCIAL MARKETING TECHNIQUES

Pilot programs employing social marketing techniques for bird conservation, some initiated by Audubon, suggest that a Gulf-scaled investment in this kind of public engagement could prove highly successful. Social marketing is a specific educational approach that uses sophisticated marketing tools to develop messages, images, and options for the public that produce measurable changes in behaviors. A staple of the public health sector, social marketing has great promise for bird conservation where people's actions are adversely impacting birds. Campaigns rendered with professional marketing approaches and measurable results are not inexpensive, but their reach and long-term impacts could prove them among the most efficient ways to help sustain the bird populations along the Gulf.



SLOGAN AND IMAGE FOR AUDUBON NORTH CAROLINA'S BE A GOOD EGG SOCIAL MARKETING CAMPAIGN

ESTABLISHING INVESTMENT TRUST FOR LONG-TERM RESTORATION & DEFENSE

The establishment of a coastal bird adaptive management investment trust fund, along with an accepted safe withdrawal rate from the fund, will provide long-term support for these conservation strategies that are critical to long-term recovery of coastal bird populations. An investment trust fund of \$150–175 million could provide \$4.5 to \$7 million annually depending on sustainable returns on investment to supplement ongoing management and monitoring. It will be important to ensure that these monies are supplemental to existing investments in bird conservation at all levels. While funds to support coast-wide monitoring and management can be leveraged with existing levels of agency appropriations and volunteer support, a core amount of recurring funding above the existing level will be necessary for these species to persist across the Gulf Coast.



Projects to Support & Improve Gulf Coast Bird Populations

The following projects are representative of Audubon's Gulf Coast Initiative priorities.

These projects are compelling examples of meaningful acquisition, restoration, management, research, and outreach efforts that will have lasting benefits for the Gulf and its birdlife. These include species of conservation concern and encompass a diversity of colonial shrub-nesting waterbirds, colonial beach-nesting seabirds, solitary beach-nesting shorebirds, and a variety of migratory waterbirds and shorebirds (Appendix 1). While these projects are neither exhaustive nor ranked, they represent the types of projects in the five Gulf states that decision-makers should emulate when weighing RESTORE and Natural Resource Damage Assessment (NRDA) funding options—projects which will support new jobs and nature tourism, provide immediate ecological and economic services, while contributing to the long-term recovery and resiliency of the Gulf of Mexico.

WILSON'S PLOVER
Photo by Bill Stripling



Florida

At the easternmost boundary of the Gulf of Mexico, the Deepwater Horizon incident impacted Florida's resources in the form of oil on beaches and in marshes, as well as damage from disaster monitoring and response activities. Prior to the disaster, Florida's coastal habitats and Gulf waters were already degraded as a result of wildlife habitat loss and conversion, insufficient habitat management, and watershed impairment. For instance, the Lake Okeechobee watershed, much of which drains through the Caloosahatchee River into the Gulf of Mexico, is a major source of nutrient pollution. For true Gulf restoration, Audubon proposes projects for Florida that remedy these impacts: acquisition of coastal bird habitat from willing sellers, watershed protection, habitat restoration, habitat and wildlife management, and Everglades restoration. Beyond those cited below, additional projects that remedy these impacts and projects aimed at nutrient reduction and restoring freshwater flow to benefit coastal estuaries and the Greater Everglades Ecosystem would also be supported.

1. ALAFIA BANKS RESTORATION

At least 6800 feet of the islands' northern shoreline has eroded, in many places by more than 20 feet, as a result of ship wakes and storm waves. Trees that once supported nesting Brown Pelicans, Roseate Spoonbills, White Ibis, and Reddish Egrets have toppled, American Oystercatcher nests now regularly overwash, and sandbars used for foraging and roosting by waterbirds, seabirds and shorebirds have eroded. To combat this erosion, protect nesting trees, and provide a quiet water shoreline and benthic prey substrate for foraging, roosting and loafing, Audubon is nearing completion on the third of its breakwater construction projects, which will total 1675 linear feet. These preliminary reaches of breakwater are proving successful; however, erosion will continue until the full extent of the erosive shoreline is protected. The proposed project would complete the protection of the remaining 5125 feet of shoreline.

LIKELY IMPLEMENTING ENTITY OR PARTNERSHIP: National Audubon Society, Mosaic Fertilizer LLC, State of Florida

LOCATION OF PROJECT: Tampa, Florida

COST ESTIMATE: \$1.8 million

TIMEFRAME: Work could be phased, or completed within two years of total funding.

LINK TO INJURY: Increase nesting habitat availability for waterbird and seabird species impacted by the Deepwater Horizon oil spill and improve water quality supporting fish, shellfish, and other aquatic and intertidal food resources for wading birds, seabirds, and shorebirds.

BENEFITS AND RATIONALE: The two islands of the Alafia Bank in Tampa's Hillsborough Bay host 18 species of colonially nesting waterbirds and seabirds each spring. They are part of a globally significant Important Bird Area, being one of the most important coastal breeding sites in Florida for these species.

2. LOWER SUWANNEE RIVER & GULF WATERSHED CONSERVATION EASEMENT

This 46,500-acre less-than-fee project would buffer the adjacent Lower Suwannee National Wildlife Refuge (NWR), and thousands of acres of other coastal conservation lands managed by the State of Florida and the Suwannee River Water Management District. The proposal would preserve and sustain habitat for colonial nesting waterbirds and protect a vital tidal watershed for water quality and quantity values for one of the largest undeveloped river delta systems in the nation. Much of the easement would continue to be a private working forest, managed according to Best Management Practices and monitored by state, regional and federal agencies. Approximately 10 acres would be acquired in fee as a park to enhance public access to California Lake and its estuarine-connected streams.

LIKELY IMPLEMENTING ENTITY OR PARTNERSHIP: The Conservation Fund, State of Florida, Suwannee River Water Management District, U.S. Fish and Wildlife Service, Dixie County, Private Landowner

LOCATION OF PROJECT: Dixie County, Florida

COST ESTIMATE: \$21–25 million

TIME FRAME: TBD but could begin in 2013

LINK TO INJURY: Increase nesting and foraging habitat availability for wading bird, waterbird and seabird species impacted by the Deepwater Horizon oil disaster. Improve water quality supporting fish, shellfish, and other aquatic and intertidal food resources for all species. Protect and sustain a landscape of coastal public conservation lands similar to those damaged by the oil spill.

BENEFITS AND RATIONALE: The project will not only protect important nesting and foraging habitat for colonially shrub-nesting birds, like Wood Stork, but also forested wetlands will provide nesting habitat for Swallow-tailed Kite. The project will also improve water quality in foraging habitat for coastal shorebirds and seabirds. Watershed conservation will preserve, sustain and restore tens of thousands of acres of forested

wetlands, tidal wetlands and their ecological connections to tidal marsh, submerged sea grass beds, native oyster beds and the myriad of shore and sea birds, Gulf Sturgeon, Manatees, imperiled sea turtles, and other species and habitats damaged by the oil spill which require such Gulf Coast habitats to survive. It will preserve historical freshwater flows to sustain tidal habitats.

3. GREAT TAMPA BAY ROOKERY ISLANDS RESTORATIONS

In addition to Alafia Banks, several smaller rookery islands in the Greater Tampa Bay region are suffering similar erosion as a result of storms and boat wakes, threatening the nesting and roosting habitat of waterbirds and seabirds. These sites include Dogleg Key, Sand Key Dune on West Bird Island, the Dot Dash Bird Islands, and Cortez Key Bird Sanctuary. To combat this erosion, protect nesting trees, and provide a quiet water shoreline and benthic prey substrate for foraging, roosting and loafing, Audubon is proposing the construction of 3250 feet of breakwaters comprised of reef balls and/or wave attenuation devices.

LIKELY IMPLEMENTING ENTITY OR PARTNERSHIP: National Audubon Society, State of Florida, Pinellas County, Manatee County, Tampa Bay National Estuary Program, Sarasota Bay National Estuary Program

LOCATION OF PROJECT: Tampa, Florida

COST ESTIMATE: \$750,000

TIME FRAME: Work could be phased, or completed within two years of total funding.

LINK TO INJURY: Increase nesting habitat availability for colonially nesting waterbirds and seabirds and improve water quality to support fish, shellfish, and other aquatic and intertidal food resources for wading birds, seabirds and shorebirds.

BENEFITS AND RATIONALE: These islands collectively host 16 species of colonially nesting waterbirds and seabirds each spring, and contribute to the bird diversity and abundance of several Important Bird Areas in the region.

4. EVERGLADES RESTORATION: TAMIAMI TRAIL NEXT STEPS

This project presents an opportunity to improve Gulf water quality on the southwest Florida coast and Florida Bay, both of which suffer when too much or too little freshwater is delivered by the system's current engineering. This project's components will help water managers better time water deliveries to the coastal system, to more closely emulate the natural hydrologic regime. The Tamiami Trail project would add 5.5 miles of bridging to facilitate unconstrained flows of water to Northeast Shark River Slough in Everglades National Park, which would benefit important nesting colonies of wading birds, coastal waterbirds and shorebirds.

LIKELY IMPLEMENTING ENTITY OR PARTNERSHIP: U.S. Department of the Interior

LOCATION OF PROJECT: Everglades National Park, Florida

COST ESTIMATE: \$320 million

TIME FRAME: Construction duration is 3.7 years which could be phased, final planning and design is nine months.

LINK TO INJURY: Improve estuarine and coastal water quality, improving coastal ecosystem function and foraging habitat for coastal waterbirds, seabirds and shorebirds.

BENEFITS AND RATIONALE: Bridging Tamiami Trail will remove the barriers to sheetflow that have dissected Northeast Shark River Slough. This slough historically began north of Tamiami Trail and continued all the way to the 10,000 Islands region along the Gulf Coast. Reconnecting this natural pattern and hydrating this region of the Gulf Coast will prevent further salt water intrusion and improve habitat in this mangrove labyrinth benefiting coastal waterbirds, seabirds, and shorebirds.

5. SHELL ISLAND INHOLDINGS ACQUISITION

Portions of Shell Island are owned by the Florida Park Service and by Tyndall Air Force Base; however, previously platted, but unbuilt lots and road rights-of-way fragment the ownerships and present challenges for habitat and imperiled species management. Acquisition of these inholdings and rights-of-way from willing sellers would be strategic, benefitting the management of the entire island.

LIKELY IMPLEMENTING ENTITY OR PARTNERSHIP: State of Florida (Florida Park Service), Department of Defense, Bay County Audubon

LOCATION OF PROJECT: Panama City, Florida

COST ESTIMATE: \$10 million

TIME FRAME: TBD

LINK TO INJURY: Increase barrier island habitat and encourage coastal dynamism benefitting impacted coastal waterbird, seabird, and shorebird species.

BENEFITS AND RATIONALE: Acquisition of these inholdings and rights-of-way would improve the ability to manage and protect nesting Snowy and Wilson's Plovers, Least Terns, and Black Skimmers, as well as migratory shorebirds such as Piping Plover and American Oystercatcher.



Alabama

Audubon's focus in coastal Alabama is habitat acquisition from willing sellers, restoration, management and monitoring of coastal beaches, dunes, interdune, subtidal, and other wetland habitats that will be directly beneficial to nesting, stopover, and overwintering activities of coastal bird species of conservation concern. Both Dauphin Island and Bon Secour National Wildlife Refuge are Important Bird Areas, and both will likely qualify as globally important for birds of conservation concern when more data are acquired.

1. COASTAL ALABAMA LAND PROTECTION

Acquisition of approximately 1500 acres of beach, dune, marsh, and maritime forest habitats will help secure adequate control over lands and expand the ability of managers at Weeks Bay Foundation, Bon Secour National Wildlife Refuge, the State of Alabama, and other partners to manage for nesting and migratory birds. Restoration of tidal flows on some tracts will restore the natural hydrology that maintains coastal habitats and the nutrients and sediments on which coastal waterbirds and shorebirds rely.

LIKELY IMPLEMENTING ENTITY OR PARTNERSHIP: U.S. Fish and Wildlife Service, Weeks Bay Foundation, Alabama Department of Conservation and Natural Resources State Lands Coastal Division, Partnership of Gulf Coast Land Conservation, Weeks Bay Foundation, Mobile Bay Audubon Society, Alabama Coast Heritage Trust

LOCATION OF PROJECT: Mobile, Baldwin County, Bon Secour National Wildlife Refuge, Weeks Bay National Estuarine Research Reserve, Alabama

COST ESTIMATE: Combination of acquisition and restoration estimated at \$15–25 million.

TIME FRAME: a) acquisition duration is six months to two years for all tracts and b) restoration of tidal flow project completion is up to five years

LINK TO INJURY: Increase habitat availability and suitability for coastal waterbirds, seabirds, and shorebirds in the zone of impact.

BENEFITS AND RATIONALE: The project would be directly beneficial to coastal waterbirds, seabirds, and shorebirds throughout the year by increasing the amount of

well-managed maritime and intertidal habitats from the littoral zone to beaches and dunes to coastal forests. This additional managed habitat could provide new nesting opportunities for Snowy Plovers, which currently number fewer than 25 pairs in Alabama.

2. DAUPHIN ISLAND BEACH RESTORATION AND PROTECTION

This extensive beach/dune system represents the natural state of this coastal ecosystem for the region but is threatened by coastal erosion and human impacts. The City of Dauphin Island and its partners will restore and manage 150–200 acres of beaches, dunes, interdune marshes, and maritime forest habitats on the east end of the island. Restoration of beach may include shoreline stabilization and beach renourishment. Habitat restoration through invasive species control will be the focus of the efforts in the maritime forests of the Dauphin Island Bird Sanctuary on which Neotropical migrants depend.

LIKELY IMPLEMENTING ENTITY OR PARTNERSHIP: The island's beach/dune system is managed by the Dauphin Island Sand and Beach Board. Partners include Dauphin Island Bird Sanctuaries, Inc., supported by the Mobile Bay and Birmingham Audubon Societies and the National Audubon Society through the Pascagoula River Audubon Center in Mississippi.

LOCATION OF PROJECT: Dauphin Island, Alabama

COST ESTIMATE: \$5–10 million

TIME FRAME: TBD

LINK TO INJURY: Increase habitat area and quality for coastal waterbirds, seabirds, and shorebirds in the zone of impact.

BENEFITS AND RATIONALE: Dauphin Island is world-renowned for its importance to migratory birds, including waterbirds and shorebirds. The project is directly beneficial to nesting, stopover, and overwintering activities particular to nesting and migratory shorebirds, but would also improve ecosystem function and foraging opportunities for waterbirds and seabirds that nest on islands in coastal Mobile County, as well as for those that migrate through or over winter on Dauphin Island.



Mississippi

Audubon's work in Mississippi targets the acquisition, restoration, management and monitoring of barrier islands and coastal beaches, marshes, and maritime habitats that will be directly beneficial to nesting, stopover, and overwintering activities of coastal bird species of conservation. Since the 1970s, Audubon has worked to steward and monitor one of the largest Least Tern colonies along the Gulf Coast and has worked with local, state, and federal agencies to protect sensitive coastal habitats for coastal waterbirds. This work includes design and management of a number of dredged material management sites that can be managed to support both colonial and solitary nesting species.

1. GRAND BAY NERR/NWR LAND ACQUISITION & HABITAT RESTORATION

The total target acreage for land acquisition from willing sellers is estimated to be as much as a few hundred acres, including a combination of pine flatwood, marsh, estuarine and shoreline habitats. Restoration activities include invasive species control, prescribed burning, and hydrologic restoration.

LIKELY IMPLEMENTING ENTITY OR PARTNERSHIP: The National Estuarine Research Reserve (NERR) is managed through a state/federal partnership led by the Mississippi Department of Marine Resources and the U.S. Fish and Wildlife Service. Other cooperating partners include the Mississippi Secretary of State Office, Mississippi State University, the University of Southern Mississippi and The Nature Conservancy.

LOCATION OF PROJECT: Moss Point, Mississippi

COST ESTIMATE: \$75–100 million

TIME FRAME: TBD

LINK TO INJURY: Increase habitat availability and suitability for nesting and migratory shorebirds, marshbirds, and Neotropical migrants in coastal and estuarine habitats impacted by the oil spill.

MIXED FLOCK OF TERNS AND SKIMMERS
Photo by Karen Westphal / Audubon

BENEFITS AND RATIONALE: The project would broaden continuity in habitat management in this important estuarine and shoreline ecosystem to support greater numbers of nesting and migratory seabirds and shorebirds in the region.

2. GULF ISLANDS NATIONAL SEASHORE HABITAT ACQUISITION

The project would acquire selected inholdings within two of five barrier islands located in the Mississippi District component of the National Seashore. These inholdings currently interfere with access for visitors, park personnel and others that visit or monitor these sites. A total of 218 acres are targeted for acquisition from willing sellers, including a combination of upland, marsh, estuarine and shoreline habitat.

LIKELY IMPLEMENTING ENTITY OR PARTNERSHIP: U.S. National Park Service

LOCATION OF PROJECT: Mississippi Sound, Mississippi

COST ESTIMATE: \$5–10 million

TIME FRAME: TBD

LINK TO INJURY: Increase availability of critical habitat for nesting and migratory shorebirds and seabirds in coastal and estuarine habitats.

BENEFITS AND RATIONALE: Acquisition will be directly beneficial to nesting, stopover, and overwintering activities of coastal waterbirds, seabirds, and shorebirds of conservation concern by allowing land managers to provide more appropriate restoration and protection.

3. GRAVELINE SHORELINE ACQUISITION AND PROTECTION

Acquisition of 100 acres of unique shoreline, dune, and marsh habitats from willing sellers will protect a wide diversity of shorebird and marshbird populations throughout the year. The site also supports nesting for the threatened diamondback terrapin and endangered Kemp's ridley sea turtle.

LIKELY IMPLEMENTING ENTITY OR PARTNERSHIP: The Mississippi Department of Marine Resources is the logical state entity that can work to secure acquisition of the property.

LOCATION OF PROJECT: Gautier, Mississippi

COST ESTIMATE: \$500,000–\$1,000,000

TIME FRAME: TBD

LINK TO INJURY: Increase availability of critical habitat for migratory and nesting shorebirds and marshbirds in coastal and estuarine habitats.

BENEFITS AND RATIONALE: As an unusual confluence of beach and marsh in coastal

Mississippi, the site has the potential to support solitary nesting shorebirds, like Wilson's Plover, with improved management and protection. The site also supports a diverse community of migratory shorebirds and provides foraging opportunities for several waterbird and seabird species of conservation concern.

4. JACKSON COUNTY DREDGED MATERIAL SITE MANAGEMENT

The active management of approximately 650 acres within three existing dredged material containment sites can be modified to maximize the succession of habitats that can be established to support a variety of shorebirds, waterbirds, and Neotropical migrants. These on-shore sites near the coastline undergo a cycle of use tied to dredging for associated channels. By excavating existing dredged materials, the layout of these sites can be reset to maximize their use by birds. With appropriate design, subsequent dredging and disposal episodes can further this goal. Managing the appropriate mix of sediment and vegetation can develop these areas into important nesting locations for target species of shorebirds, wading birds, and waterbirds.

LIKELY IMPLEMENTING ENTITY OR PARTNERSHIP: The Jackson County Port Authority owns these sites that are managed by the U.S. Army Corps of Engineers through their Dredged Material Management System. Audubon has exclusive access to some sites for the purposes of monitoring bird use.

LOCATION OF PROJECT: Pascagoula, Mississippi

COST ESTIMATE: Initial re-establishment of capacity estimated to be \$1,000,000. An additional \$500,000 is required for adaptive management of the sites.

TIME FRAME: TBD

LINK TO INJURY: Increase habitat extent and quality for nesting and migratory waterbirds and shorebirds.

BENEFITS AND RATIONALE: Through improved management, spoil sites could provide novel nesting and foraging opportunities for coastal waterbirds, seabirds, and shorebirds. This could substantially increase state populations of species of conservation concern such as Wilson's Plover, American Oystercatcher, Gull-billed Tern, and others. Once at 6000 pairs along mainland coastal Mississippi, Least Tern populations currently hover at about 2000 pairs despite protection, and may now be limited by space with increased human encroachment into coastal environments. Managing dredged material would provide a new opportunity to elevate Least Tern populations in Mississippi.



Louisiana

In Louisiana, the four major sub-basins of the Mississippi River Delta damaged by their proximity to the Deepwater Horizon oil spill are the Terrebonne, Barataria, Breton, and the Bird's-Foot Delta. Audubon recognizes that sediment diversion projects in each of the sub-basins are the most effective long-term means of rebuilding and sustaining wetlands in the face of subsidence, erosion and sea level rise, and in protecting habitat in the event of future oil spills. Many short-term interventions to rebuild marsh and barrier islands are arguably unsustainable into the future without additional input of riverine resources. The long-term future of southeast Louisiana and its communities will depend upon reversing the loss of coastal lands and reestablishing the river's natural delta-building function.

Several sediment diversion projects have been authorized by Congress; these projects are in the design phase and are included in Louisiana's Comprehensive Master Plan for a Sustainable Coast (2012). These diversions are a critical component to achieving the long-term, comprehensive restoration envisioned by the plan and should be considered for funding in the near-term to jumpstart the delta building processes.

The project list offered below does not directly address diversions in Louisiana at this time, but instead attempts to capture a suite of compatible additional projects that also support Important Bird Areas and critical habitat for populations of nesting and migratory waterbirds, seabirds, and shorebirds.

1. BRETON NWR - CHANDELEUR ISLANDS RESTORATION

Once having dunes with crests at 19 feet, the Chandeleur Islands today are flattened and degraded by repeated hurricane surges over the past decade. They form a once self-sustaining island system that sits far from the current mainland on an elevated sandy shelf. By using a dredge to access nearby sources of available sediment, this project will advance restoration work already completed on the north end and increase sediment budgets to shoals at the southern end (such as at Curlew, Gosier, East Breton, and Free Mason Islands).

LEAST TERN CHICKS
Photo by Erik I. Johnson /
Audubon

LIKELY IMPLEMENTING ENTITY OR PARTNERSHIP: Louisiana Coastal Protection and Restoration Authority or Department of Interior

LOCATION OF PROJECT: Breton NWR, Louisiana

COST ESTIMATE: \$70 million

TIME FRAME: 3–5 years

LINK TO INJURY: These islets were oiled during the peak of the nesting season. Recent storms and hurricanes both before and after the oil spill have decreased the size and height of these islands, increasing the risk of oiling to nesting waterbirds.

BENEFITS AND RATIONALE: The islands, although diminished in size, still provide critical nesting, migratory, and wintering habitat for many species of conservation concern. Breton is the second oldest refuge in the NWR system, and once supported the largest nesting colonies of Royal and Sandwich Terns in the world. It also supports regionally important nesting sites for Reddish Egret and American Oystercatcher, as well as critical wintering habitat for Piping Plover.

2. BILOXI MARSH SHORELINE PROTECTION

The project, as outlined in the Mississippi River – Gulf Outlet Ecosystem Restoration Plan, would armor up to 30 miles of some of the fastest eroding marsh in Louisiana where Biloxi Marsh interfaces with Chandeleur Sound and Lake Borgne. Shoreline sections to stabilize will be based on erosion rates, likelihood of breakthrough to interior bays, and habitat suitability. Using living oyster reefs wherever possible would provide ecosystem and economic services, and reduce wave energy.

LIKELY IMPLEMENTING ENTITY OR PARTNERSHIP: Louisiana Coastal Protection and Restoration Act, perhaps with assistance from The Nature Conservancy. Mississippi River Gulf Outlet restoration plan was developed by U.S. Army Corps of Engineers.

LOCATION OF PROJECT: Breton Sound to Lake Borgne, Louisiana

COST ESTIMATE: \$30 million

TIME FRAME: 1–2 years

LINK TO INJURY: These marshes, bird-nesting islands and their occupying waterbirds, seabirds, and shorebirds were directly oiled during the spill.

BENEFITS AND RATIONALE: The Biloxi Marsh supports about one third of the breeding American Oystercatcher population in Louisiana, as well as many colony sites for waterbirds and seabirds, but is eroding quickly. Retreating marsh and oyster reef shoreline would be stabilized, with enhanced foraging and nesting opportunities for birds and other wildlife, while systematic deltaic restoration is designed and implemented in the region.

3. BAY RONQUILLE ISLANDS RESTORATION

These projects would restore 11,000 linear feet of barrier island dunes and beach and 259 acres of marsh on Cheniere Ronquille to improve additional restoration outcomes and protect nesting islands within Barataria Bay. As this barrier island system and its shoals are disappearing quickly, restoration should be initiated relatively soon. Bay islets would also be armored with artificial oyster reef to reduce wave energy and provide foraging habitat for birds, and enlarged by adding sediment and crushed oyster shell. Additions of vegetation like black mangrove and smooth cordgrass would anchor sandier parts of these islets and provide nesting habitat for shrub-nesting waterbirds. These projects are components of the Louisiana Coastal Area (LCA) Barataria Basin Barrier Shoreline and have been proposed in the 2012 Louisiana State Master Plan's 1st Implementation Period.

LIKELY IMPLEMENTING ENTITY OR PARTNERSHIP: Louisiana Coastal Protection and Restoration Authority

LOCATION OF PROJECT: Barataria Bay, Plaquemines Parish, Louisiana

COST ESTIMATE: a) Cheniere Ronquille Barrier Islands Restoration: \$40 million; b) Bird Nesting Bay Island Restoration: \$6 million

TIME FRAME: 1–2 years

LINK TO INJURY: The shoreline and islands in Barataria Bay were extensively oiled during the Deepwater Horizon oil spill at the peak of the nesting season when young birds were fledgling, but still not able to fly, leading to mortality or injury. Restoration would improve nesting habitat and also begin to reverse the long-term habitat degradation and erosion this region has experienced.

BENEFITS AND RATIONALE: These projects would restore dune and marsh habitat, stabilize unvegetated island remnants, and reduce storm surge in the Barataria Basin. The projects consist of adding beach, dune, and back barrier marsh habitat to restore the physical form and function of the barrier island system and the bay islands and marshes it protects, providing critical habitat for birds of high conservation concern and improves long-term sustainability of the Barataria estuary. With the right mix of habitat, this project would provide nesting habitat for solitary and colonial beach-nesting birds, and provide foraging habitat for nearby colonies of shrub-nesting and migratory waterbirds and shorebirds.

4. RACCOON ISLAND RESTORATION AND PROTECTION

A series of projects along the Isle Dernieres would rebuild heavily eroded barrier islands to provide dune, beach, and back barrier marsh habitat and reduce storm surge and wave attenuation in the Terrebonne Basin, and would simultaneously provide important nesting habitat for seabirds of conservation concern. Here, Raccoon Island currently supports the largest colonial nesting bird colony in Louisiana, but its landmass is shifting, and the island is only partially protected from past restoration efforts. Mammalian predation has been problematic on these islands in recent years, reducing colonial waterbird nesting success, and should be addressed during the restoration process.

LIKELY IMPLEMENTING ENTITY OR PARTNERSHIP: State of Louisiana through Coastal Protection and Restoration Authority and Louisiana Department of Wildlife and Fisheries

LOCATION OF PROJECT: Terrebonne Bay, Louisiana

COST ESTIMATE: \$30 million

TIME FRAME: 1–2 years

LINK TO INJURY: These marshes and bird nesting islands were oiled during the spill and clean-up activities disrupted bird nesting.

BENEFITS AND RATIONALE: Stabilizing these barrier islands would provide critical nesting islands for seabirds, such as Royal Tern, which only breed at a small number of sites in the state, Black Skimmer, and Least Terns. It also provides critical wintering habitat for the endangered Piping Plover and other migratory shorebirds. This and similar projects are part of the Terrebonne Basin Barrier Shoreline plan and highlighted in the 2012 Louisiana State Master Plan 1st Implementation Period.



Texas

Coastal waterbird management has a long history in Texas and has been formalized through the Texas Colonial Waterbird Society, a partnership among federal, state, academic, and non-governmental organizations, which has been formally monitoring coastal waterbird nesting sites annually since 1968. Audubon manages or leases many of these islands for the protection of nesting birds, overseen by colony wardens. From the Laguna Madre to Sabine Lake, these islands support globally important bird populations, including 80% of the Reddish Egrets in the U.S. Despite great efforts to protect these birds, many islands are deteriorating, under increasing threat of human encroachment, and suffer from changes in water quality affecting foraging habitats. RESTORE and NRDA dollars could benefit many of these islands, which currently serve as important refugia away from the immediate impacts of the Deepwater Horizon oil, and could serve as a source population for regions to the east heavily impacted.

5. GULF SHORELINE PROTECTION - FRESHWATER BAYOU TO SOUTHWEST PASS

Shoreline protection using breakwaters would protect 17 miles of beachfront and dunes. This project would thereby preserve the integrity of the shoreline and reduce wave attenuation of the beach front, also protecting thousands of acres of adjacent coastal marshes.

LIKELY IMPLEMENTING ENTITY OR PARTNERSHIP: Audubon Louisiana, State Coastal Protection and Restoration Authority likely in conjunction with U.S. Army Corps of Engineers

LOCATION OF PROJECT: Southeastern Vermilion Parish, Louisiana

COST ESTIMATE: \$96–113 million

TIME FRAME: TBD

LINK TO INJURY: Some oiling was seen on these beaches and oil clean-up activities caused disturbance to beach-nesting birds.

BENEFITS AND RATIONALE: The project would ensure the maintenance of an isolated (from humans) beach that supports high densities of nesting Wilson's Plovers and globally significant numbers of Piping Plovers. This is also an important site for other migratory shorebirds that depend on the close proximity between beaches and marshes that provide high quality foraging habitat during different tidal stages. Much of the shoreline fronts Audubon's 26,000-acre Rainey Sanctuary protected since 1924 and part of a globally significant Important Bird Area.

1. GALVESTON BAY BIRD NESTING ISLANDS RESTORATION

The Vingt-et-un chain of islands and Smith Point Island have lost significant acreage due to erosion and subsidence. Dredge spoil material will be strategically added to Vingt-et-un and Smith Point Islands to increase elevation and prevent overwash of ground nesting birds. Shrubs and other vegetative plantings will be added to stabilize sediment and provide nesting sites for shrub-nesting colonial waterbirds. A structure to reduce wave action/intensity on the southern edge of Smith Point will likely be needed. Jigsaw and Rollover Islands are located along the Gulf Intracoastal Waterway (GIWW) and receive high energy waves from passing ships and barges, causing a substantial erosion problem. The islands need the protection of a low breakwater built between the island and GIWW. The islands also need to have material added to the top to raise the elevation and provide additional nesting habitat for the terns and skimmers who use the sites. A low rock berm at Rollover Pass Island will result in permanent protection of critically important wildlife habitats by eliminating the effects of wave energy on unprotected island shorelines.

LIKELY IMPLEMENTING ENTITY OR PARTNERSHIP: Audubon Texas, Houston Audubon

WILSON'S PLOVER NEST
Photo by Erik I. Johnson /
Audubon

Society, Army Corps of Engineers and/or Galveston Bay Estuary Program

LOCATION OF PROJECT: Galveston Bay, Texas

COST ESTIMATE: \$10–30 million

TIME FRAME: Each set of islands would take about one year to restore

LINK TO INJURY: Restoration would support critical nesting sites for ground nesters like skimmers, terns, and American Oystercatcher, as well as shrub nesters like spoonbills and pelicans, serving as source populations for species that were directly injured by the oil spill.

BENEFITS AND RATIONALE: Despite being bordered by one of the largest metropolitan areas in the country, Galveston Bay remains an important location for colonially nesting waterbirds and seabirds. Nesting rookeries in Sabine Lake to the east are quickly disappearing and East Matagorda Bay to the southwest has little nesting habitat, making large productive rookery islands in Galveston Bay a source population for recolonizing other sites to the south and neighboring populations in Louisiana. Even smaller islands in the bay have been vital to waterbirds in the past, including the Vingt-et-un chain of islands, Smith Point Island, Jigsaw Island, and Rollover Island, but these are gradually being destroyed by erosion. Heavy ship and barge traffic creates wakes that continually assault shorelines, but the abundance of channels ensures a steady supply of dredge material for restoration work. Galveston Bay is dotted with smaller islands, many of which support birds of high conservation concern like Black Skimmers, Least Terns, Royal Terns, and Gull-billed Terns. Jigsaw Island supported over 3500 pairs of Royal and Sandwich Terns, but in 2012 there were no terns nesting on the islands and only 300 pairs of Laughing Gulls. Many terns and smaller egrets in the Rollover chain are clustered on small, low lying sites that are highly susceptible to over wash. The islands in this bay are ideal candidates for restoration work, as local non-profit organizations partner well together on projects and there is an expansive volunteer base.

2. SOUTH DEER ISLAND ACQUISITION

South Deer Island is an 81-acre island located in West Bay that supports 40 acres of salt marsh and a central ridge of elevated shrub habitat for nesting waterbirds. This site, along with adjacent North Deer and West Bay Bird Island (located in San Luis Pass) are the only remaining natural islands in the Galveston Bay area.

LIKELY IMPLEMENTING ENTITY OR PARTNERSHIP: Audubon Texas, Houston Audubon Society, The Nature Conservancy, Galveston Bay Foundation

LOCATION OF PROJECT: Galveston Bay, Texas

COST ESTIMATE: \$1 million

TIME FRAME: 1 year

LINK TO INJURY: Critical site for American Oystercatcher, White Ibis, White-faced Ibis, diamondback terrapin

BENEFITS AND RATIONALE: The island is an important nesting and feeding site for a

variety of waterbirds, seabirds and shorebirds of conservation concern including Reddish Egret, Royal Tern, and American Oystercatcher. A healthy population of diamondback terrapins also uses the site and they are listed as a medium priority species in the State Wildlife Action Plan. The coastal marsh vegetation along the island armors shorelines from erosion, filters pollutants, enhances water quality, and promotes primary production. Acquisition of South Deer Island would ensure that this site is properly managed and would therefore continue to provide these ecological services in addition to directly benefitting species of conservation concern.

3. SUNDOWN ISLAND RESTORATION

Beginning in 2007, Sundown Island lost its beneficial source of supplemental dredge spoil material, because the U.S. Army Corps of Engineers realigned the Gulf Intracoastal Waterway. High energy waves driven by wind, storms, and passing ship wakes are causing accelerated erosion to multiple areas on the island. The only limit to continued and increased success of nesting waterbirds on Sundown Island is space. If the island is to continue and thrive in its current location, erosion control armoring will need to be placed around all or nearly all of the island's perimeter.

LIKELY IMPLEMENTING ENTITY OR PARTNERSHIP: Audubon Texas, Coastal Bend Bays and Estuary Program.

LOCATION OF PROJECT: Matagorda Bay, Texas

COST ESTIMATE: \$15 million

TIME FRAME: One year

LINK TO INJURY: Largest and most productive colonial waterbird nesting site in Matagorda and San Antonio Bays. There are very few nesting islands available in the upper and middle coasts; restoration of this site is important to sustaining regional populations, especially for Sandwich and Royal Terns, Reddish Egrets, and Brown Pelicans.

BENEFITS AND RATIONALE: Based on Audubon's survey of Important Bird Areas, the most urgent priority for barrier island intervention is Sundown Island in the Matagorda Bay system of Texas. In the 1960s, the Corps of Engineers created this 200-acre island using sand spoil from dredging the Matagorda ship channel outside of Port O'Connor. Sundown Island proved vital in the recovery of Texas Brown Pelicans, which here have grown from two breeding pairs in 1987 to a healthy 2509 breeding pairs in 2010. In 2010, the island was used by an estimated 14,233 pairs of 16 species of colonially nesting waterbirds and seabirds, including many of conservation concern. The island has been managed by a National Audubon Society coastal warden since 1987 who supports the island and the birds by planting vegetation, managing predators, monitoring human disturbance throughout the breeding season (February–August), and conducting essential outreach and education to the community and to partners. With the trajectory of land loss, stewardship is not enough to preserve this important nesting island; today, Sundown Island is only 64 acres—and the rate of loss grows exponentially.

4. MATAGORDA BAY NEW ISLAND CREATION

Matagorda and neighboring San Antonio Bay have lost many of their rookery island sites over time to erosion. Ample foraging habitat is available, but there are simply no islands with nesting habitat for either ground or shrub nesters. Islands that do remain are low in elevation and prone to washouts during storms or high tide events. Possible sites to build new islands exist where the remains of old rookeries still provide higher elevations on the bay floor.

LIKELY IMPLEMENTING ENTITY OR PARTNERSHIP: U.S. Fish and Wildlife Service, U.S. Army Corps of Engineers, Audubon Texas, Coastal Bend Bays and Estuary Program

LOCATION OF PROJECT: Matagorda Bay, Texas

COST ESTIMATE: \$12–30 million

TIME FRAME: 3–5 years to develop plans and implement

LINK TO INJURY: Nesting waterbirds of conservation concern harmed by the spill, like Royal Terns, Brown Pelicans, and Reddish Egrets

BENEFITS AND RATIONALE: The increasingly limited number of intact and undisturbed nesting sites in Texas limits population growth, especially along the central coast. Yet, these islands support some of the most important nesting grounds in the Gulf for some species including Reddish Egret. Overcrowding on existing islands is apparent, causing reduced nesting success for less dominant species. Providing new nesting islands would reduce issues associated with overcrowding and provide opportunities for population increases for coastal waterbird populations. Once the project is approved and implemented, it will take five to ten years for the island to become suitable for shrub-nesting waterbirds. As a demonstration of potential success, a 7-acre island was built in 2003 (Evia Island) and immediately became nesting habitat for several species of terns with over 4000 pairs of Royal and Sandwich Terns today, as well as shrub-nesting birds like Reddish Egret starting in 2006.

5. LOWER LAGUNA MADRE RESTORATION AND MANAGEMENT

Nesting habitat and site suitability can be significantly degraded by a variety of factors including establishment and spread of invasive species, lack of sufficient native vegetation, and invasion of sites by predators. Scientific study of the system to develop management plans and best practices can target restoration and management efforts that will restore nesting habitat and nesting colony sites most effectively. Restoration of native vegetation can be beneficial but is most effective when paired with removal of invasive species. Invasive species and predators can be devastating to colonial waterbirds and other shorebird populations, and populations of both have steadily increased in important nesting sites as a result of human activities. Managing for both can make a measurable difference in the success of birds using a site, but can require expensive management tools requiring study, implementation of management, and monitoring to guide adaptive management at those key sites, both in terms of populations of undesirable species and the response of nesting success in birds.

LIKELY IMPLEMENTING ENTITY OR PARTNERSHIP: Audubon Texas, Coastal Bend Bays and Estuary Program

LOCATION OF PROJECT: Lower Laguna Madre, Texas

COST ESTIMATE: \$500,000–\$1,000,000

TIME FRAME: 3–5 years at a minimum; ongoing or periodic long-term management actions may be necessary

LINK TO INJURY: Increased nesting substrate and reduced predation pressure at these important nesting islands would improve population growth and lead to recruitment of individuals into other nesting sites, including those directly impacted by the spill.

BENEFITS AND RATIONALE: Nesting habitat will be improved for colonial waterbirds through the removal of invasive plant species and replanting of native species. Invasive animal species and predators can cause failure of an entire nesting island, affecting a dozen or more species simultaneously. Across the Laguna Madre, colony failures due to predator pressures continue to occur with increasing frequency. Predators, like coyotes, raccoons, skunks, and foxes, although native to the region, have experienced population increases and have expanded to previously unavailable sites (like nesting islands) because of human activity and development, causing the predator-prey system to no longer be balanced. Controlling predator populations would result in immediate increases in nesting success especially at targeted sites.



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MIXED GROUP OF SKIMMERS
AND SANDPIPERS
Photo by George Willson

TABLE 1: ESTIMATED PROJECT COSTS

State	Project Title	Cost Est Low	Cost Est High
Gulf-wide	Gulf-wide Waterbird Conservation Trust Fund	\$150,000,000	\$175,000,000
FL-1	Alafia Banks Restoration	\$1,800,000	\$1,800,000
FL-2	Lower Suwannee River and Gulf Watershed Conservation Easement	\$21,000,000	\$25,000,000
FL-3	Great Tampa Bay Rookery Islands Restorations	\$750,000	\$750,000
FL-4	Everglades Restoration: Tamiami Trail Next Steps	\$320,000,000	\$320,000,000
FL-5	Shell Island Inholdings Acquisition	\$10,000,000	\$10,000,000
AL-1	Coastal Alabama Land Protection	\$15,000,000	\$25,000,000
AL-2	Dauphin Island Beach Restoration and Protection	\$5,000,000	\$10,000,000
MS-1	Grand Bay NERR/NWR Land Acquisition and Habitat Restoration	\$75,000,000	\$100,000,000
MS-2	Gulf Islands National Seashore Habitat Acquisition	\$5,000,000	\$10,000,000
MS-3	Graveline Shoreline Acquisition and Protection	\$500,000	\$1,000,000
MS-4	Jackson County Dredged Material Site Management	\$1,000,000	\$1,500,000
LA-1	Breton NWR-Chandeleur Islands Restoration	\$70,000,000	\$70,000,000
LA-2	Biloxi Marsh Shoreline Protection	\$30,000,000	\$30,000,000
LA-3a	Cheniere Ronquille Barrier Island Restoration	\$40,000,000	\$40,000,000
LA-3b	Bay Ronquille Bird Nesting Islands Restoration	\$6,000,000	\$6,000,000
LA-4	Raccoon Island Restoration and Protection	\$30,000,000	\$30,000,000
LA-5	Gulf Shoreline Protection: Freshwater Bayou to Southwest Pass	\$96,000,000	\$113,000,000
TX-1	Galveston Bay Bird Nesting Islands Restoration	\$10,000,000	\$30,000,000
TX-2	South Deer Island Acquisition	\$1,000,000	\$1,000,000
TX-3	Sundown Island Restoration	\$15,000,000	\$15,000,000
TX-4	Matagorda Bay New Island Creation	\$12,000,000	\$30,000,000
TX-5	Lower Laguna Madre Restoration and Management	\$500,000	\$1,000,000
TOTALS	ALL	\$915,550,000	\$1,046,050,000

APPENDIX 1: GULF COAST WATERBIRDS, SEABIRDS AND SHOREBIRDS OF CONSERVATION CONCERN

Included for each species is their annual status (R = resident/year-round; B = breeding; M = migration; W = winter), Audubon WatchList 2007 status (R = Red; Y = Yellow), foraging guild (W = colonial shrub-nesting waterbird; S = colonial beach-nesting seabird; B = solitary beach-nesting shorebird; M = migratory shorebird), U.S. Fish and Wildlife Service 2008 status (T & E = Threatened & Endangered; BCC = Bird of Conservation Concern), U.S. Shorebird Conservation Plan 2004 status (I = Highly Imperiled; H = High Concern; M = Moderate Concern), and SE U.S. Waterbird Plan 2006 status (C = Critical Recovery; I = Immediate Management; M = Management Attention; S = Stewardship Species).

Species	Scientific Names	Status	Guild	Audubon WatchList	U.S.Fish and Wildlife Service	U.S. Shorebird Conservation Plan	South-east U.S. Waterbird Plan
Brown Pelican	<i>Pelecanus occidentalis</i>	R	W				S
Reddish Egret	<i>Egretta rufescens</i>	B, M	W	R	BCC		I
Black-bellied Plover	<i>Pluvialis squatarola</i>	M, W	M			M	
Snowy Plover	<i>Charadrius nivosus</i>	B, M	B, M	Y	BCC	I	
Wilson's Plover	<i>Charadrius wilsonia</i>	B, M, W	B, M	Y	BCC	H	
Piping Plover	<i>Charadrius melodus</i>	M, W	M	R	T & E	I	
American Oystercatcher	<i>Haematopus palliatus</i>	R	B, M		BCC	H	
Willet (eastern and western)	<i>Tringa semipalmata</i>	B, M, W	B, M			M	
Marbled Godwit	<i>Limosa fedoa</i>	M, W	M	Y	BCC	H	
Ruddy Turnstone	<i>Arenaria interpres</i>	M, W	M			H	
Red Knot	<i>Calidris canutus rufa</i>	M, W	M	Y	BCC	I	
Sanderling	<i>Calidris alba</i>	M, W	M	Y		H	
Semipalmated Sandpiper	<i>Calidris pusilla</i>	M	M	Y	BCC	M	
Western Sandpiper	<i>Calidris mauri</i>	M, W	M	Y		H	
Dunlin	<i>Calidris alpina</i>	M, W	M		BCC	M	
Short-billed Dowitcher	<i>Limnodromus griseus</i>	M, W	M		BCC	H	
Least Tern	<i>Sternula antillarum</i>	B, M	S	R	BCC/T & E		M
Gull-billed Tern	<i>Gelochelidon nilotica</i>	R	S	Y	BCC		M
Common Tern	<i>Sterna hirundo</i>	B, M	S		BCC		I
Royal Tern	<i>Thalasseus maximus</i>	R	S				S
Sandwich Tern	<i>Thalasseus sandvicensis</i>	B, M	S				M
Black Skimmer	<i>Rynchops niger</i>	R	S	Y	BCC		M



The Audubon Mission

To conserve and restore natural ecosystems, focusing on birds, other wildlife, and their habitats for the benefit of humanity and the earth's biological diversity.

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