



**To:** *Deepwater Horizon* Natural Resource Damage Assessment Trustees  
**Date:** July 9, 2012  
**Subject:** A Portfolio of Early Restoration Projects  
**From:** Environmental Defense Fund  
National Audubon Society  
National Wildlife Federation  
The Nature Conservancy  
Ocean Conservancy  
Oxfam America

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The Gulf of Mexico suffered significant and long-term environmental impacts in the wake of the 2010 *Deepwater Horizon* oil spill. As recovery continues, it is critical that the injured resources and lost services be restored through a process that is comprehensive and scientifically based and that considers both cumulative and complementary projects to support true restoration across the Gulf – from coastal wetlands to marine waters and from Texas to Florida.

We are a group of conservation, environmental and social equity organizations that have worked to support long-term recovery in the region for decades. As your agencies continue to chart the best path for restoring the Gulf environment, we encourage you to consider input from a variety of groups and weigh approaches that account for possible economic and community impacts in the region.

We recognize that as trustees for the *Deepwater Horizon* Natural Resource Damage Assessment (NRDA), you have a task that is critically important to the well-being of the Gulf region, both now and in the future. As you continue to navigate this daunting effort, we offer you tools that we hope will be useful in shaping a comprehensive approach to restoration.

- [Recommended policies and guidelines for restoring the Gulf environment](#). This broad set of guiding principles and criteria for early restoration projects is designed to help you evaluate which projects will be most helpful for the environment, communities and economies of the Gulf region.
- [Portfolio of restoration projects](#). This portfolio of model restoration projects is an example of what a comprehensive, integrated suite of NRDA projects might look like. The portfolio provides examples of the types of projects that meet the criteria described above and that support a comprehensive approach to restoration. Because we do not have detailed information about the results of damage assessment studies, we have taken a broad approach based on exposure to oil and publicly available information on injury to natural resources and lost services. (See [Figure 1](#) and [Figure 2](#).)
- [Project matrix](#). The project matrix is a supporting analytical tool that breaks down the geography and beneficiaries of individual projects in the portfolio.

We recognize that the specific mix of projects in a program for early restoration must take into account many factors, including the results of damage assessment studies. Given the proximity of the *Deepwater Horizon* blowout to Louisiana and the critical importance of the Mississippi River Delta to the productivity of the Gulf ecosystem, we anticipate that restoration of coastal wetlands in this area will be a prominent part of the early restoration program. Beyond that, we are looking for an integrated restoration program that has a representation of projects across the Gulf, from Florida to Texas, and that creatively addresses injury to resources and lost services in the marine waters of the Gulf of Mexico.

We understand that restoration is a dynamic process and that there are a number of elements at play that will influence the landscape of future NRDA-related work. These elements include outstanding governmental claims, as well as ongoing restoration programs and initiatives in all five Gulf Coast states.

Most recently, Louisiana released a 50-year, \$50 billion plan aimed at making its ecosystems sustainable in the long-term. Our project portfolio is intended to complement these efforts; we are offering a model of what well-rounded restoration might look like.

Our hope is that this packet will be the beginning of a dialogue and that we can continue to support you in this important work.

The following two graphics broadly characterize the content of the projects described in our portfolio.

### Project Focal Area

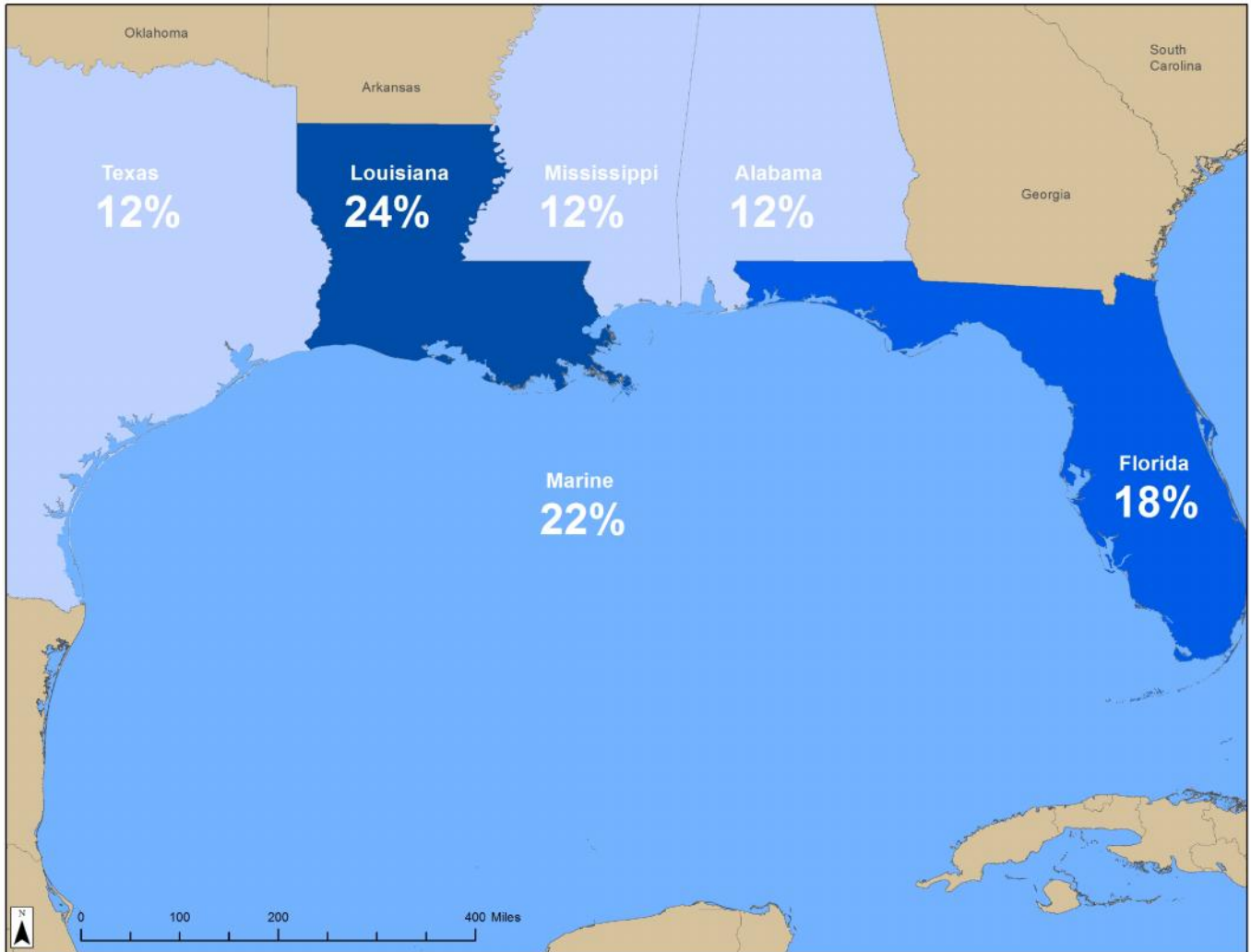


Figure 1. Percentages of early restoration projects by number with primary focus on resources or services within a specific state or the marine environment.

## Primary and Secondary Restoration Targets

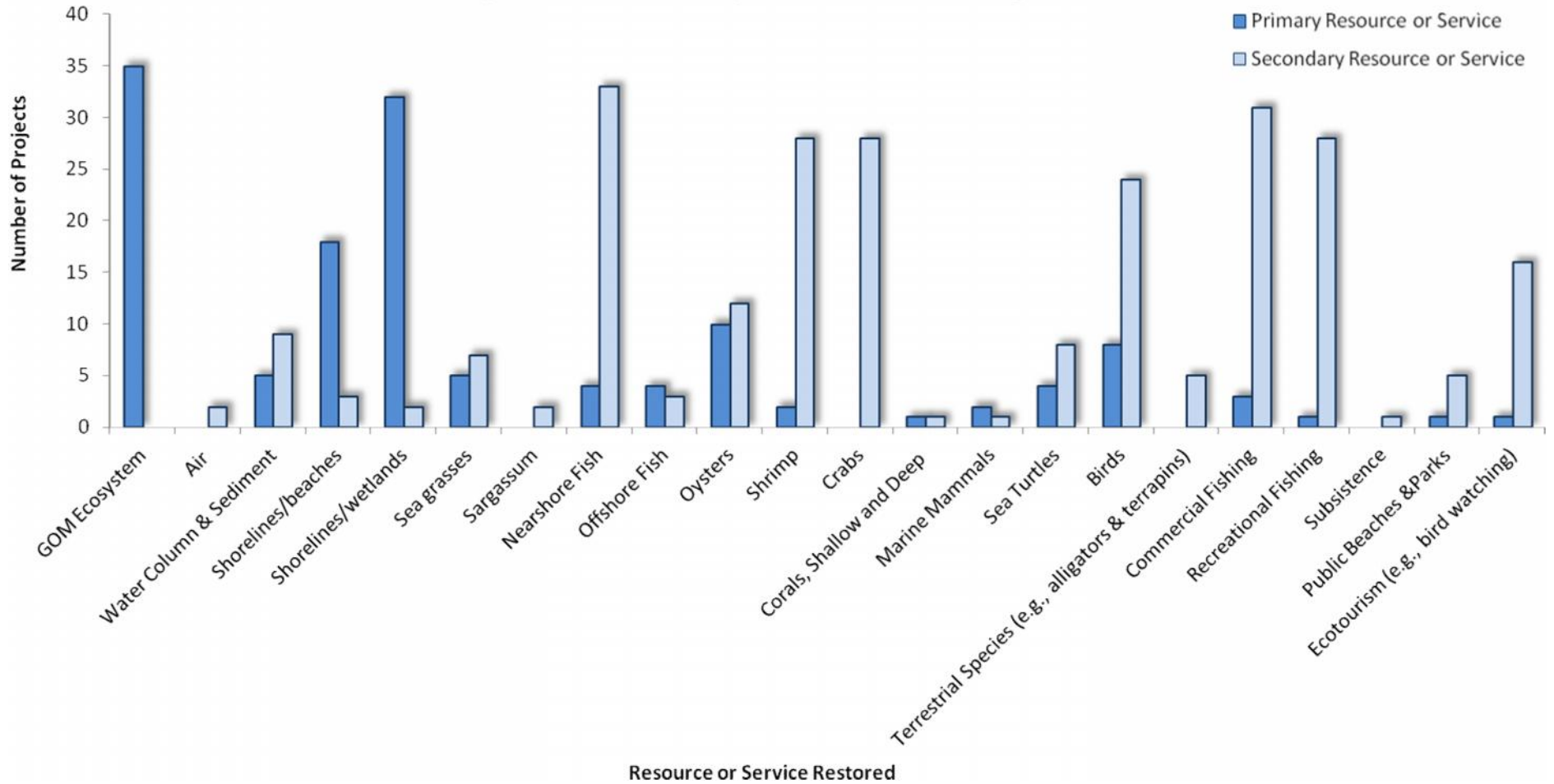


Figure 2. Primary and secondary resources or services restored by early restoration projects.

## Criteria

### **Policies and Guidelines for Environmental Restoration Funding in the Gulf of Mexico**

These principles and criteria can and should be applied to both early and long-term restoration projects.

#### **Core Principles:**

1. Restoration will contribute to a healthy, productive and biologically diverse coastal and marine ecosystem that is the backbone of the economic and cultural well-being of the Gulf region.
2. Restoration uses an ecosystem approach based on an understanding of factors that control the populations of species or conditions of habitats found in coastal and marine areas.
3. Restoration priorities and activities will be re-evaluated as information on the extent and significance of injury to natural resources is obtained from the NRDA and from other scientific sources.
4. Restoration activities will be subject to independent, scientific review within the timeframe required by other evaluations and decision-making processes.
5. Restoration will include meaningful public participation and National Environmental Policy Act (NEPA) compliance at all levels throughout the process.
6. Restoration will facilitate accountability and reflect public ownership of the process by timely release of and reasonable access to information and data.
7. Long-term scientific monitoring programs and decision support tools will be established to assess performance of restoration activities, allow for adaptive management and measure the health of the Gulf ecosystem on a continuing basis.

#### **Project Selection Criteria:**

1. Priority will be given to restoration projects that facilitate recovery of injured natural resources and lost services by addressing systemic problems facing the ecosystem, including historical degradation.
2. Priority will be given to restoration of natural resources and ecosystem services that have economic, cultural and subsistence value to people living and working along the Gulf Coast.
3. Extra consideration should be given to projects that increase the resilience of socially vulnerable communities.
4. Priority will be given to projects that benefit multiple species or resources.
5. Restoration activities should have clear, measurable and achievable end points.
6. Possible harmful effects on non-target resources and services should be considered when evaluating proposed restoration activities.

7. Competitive, innovative, collaborative and cost-effective proposals for restoration projects will be encouraged.
8. Projects that are scalable may be funded in part, provided that the funded component stands alone in terms of its benefits even if the rest of the project is not funded.
9. Project sponsors will demonstrate due diligence. The due diligence process will include scientific, technical, economic and social evaluation of design, design alternatives and implementation of the effort.
10. Priority will be given to restoration projects that integrate workforce development and job creation benefiting people who live and work in the area, including disadvantaged and underemployed populations.\*

\*Beyond project-by-project consideration, NRDA trustees have an opportunity to implement and influence policies that maximize economic benefits for local communities during the construction and maintenance of NRDA-financed ecosystem restoration projects. Analysis by Oxfam America found that restoration projects could create as many as 28 jobs for every million dollars invested, including a significant number of jobs that local underemployed and disadvantaged workers could potentially access with additional skills training. This comes at a time when coastal areas and industries are feeling lingering impacts from the oil spill and the national economic downturn.

The state trustees should devise procurement policies that encourage contractors and subcontractors to hire workers who live and work in the impacted coastal areas, especially from among disadvantaged and underemployed populations impacted by the oil spill, such as commercial fishers and their families. Furthermore, trustees should develop procurement policies that encourage contractors to work with local workforce development agencies and programs to train and identify qualified local workers when they make new hires. By fostering geographically, culturally and linguistically accessible training programs, the trustees and relevant workforce agencies working with industry can help provide local workers access to new reasonable-wage livelihoods and skills as well as help contractors meet new demands for skilled labor.

Resources already exist to train workers for these new jobs. NRDA trustees in Alabama, Florida, Louisiana and Mississippi should be encouraged to work with their state workforce agencies, as well as the U.S. Department of Labor (DOL), industry and community stakeholders, to identify new partnerships and necessary actions to utilize what remains of the \$27 million in DOL oil spill National Emergency Grants (NEGs) given to these states to train and place oil spill impacted workers. State officials across the region have detailed similar situations of having large quantities of unspent NEG funds but difficulty spending such funds. The Gulf states' trustees and workforce agencies and the DOL, working together and with industry and local stakeholders, could develop programs to train thousands of workers for new jobs and skills tied to ecosystem restoration and protection.

# Project Portfolio

## Restoration Portfolio

Projects are organized by state from east to west for coastal or estuarine projects, followed by gulfwide and marine projects. The project numbers are for organizational purposes and are not meant to indicate any priority or ranking.

[Florida](#) | [Alabama](#) | [Mississippi](#) | [Louisiana](#) | [Texas](#) | [Gulfwide and Marine](#)

### FLORIDA

#### 1. Gibsonton Fish Farm

**Proposed Restoration Project:** The National Audubon Society and the Southwest Florida Water Management District's Surface Water Improvement and Management Program have identified this area for acquisition and a project to create and restore habitat, including recontouring several ponds that lie on more than 60 acres into a cascading wetland system that will cleanse stormwater and highway runoff from nearby developed areas. The wetlands will have a freshwater-to-saltwater habitat gradient as water flows "downstream" through a series of intertwined ponds and creeks, finally mixing with tidal inflows from Tampa Bay.

**Likely Implementing Entity or Partnership:** South Florida Water Management District, state of Florida, National Oceanic and Atmospheric Administration (NOAA), others with the resources to implement the project

**Location of Project:** Gibsonton, Fla.

**Cost Estimate:** Acquisition \$750,000; restoration \$750,000

**Timeframe:** TBD

**Link to Injury:** Water quality; fish, shellfish and shorebirds in coastal or estuarine habitats

**Benefits and Rationale:** Broadly beneficial to coastal or estuarine ecosystem and resources through stormwater cleansing as well as creation of upstream shallow-water wetlands and tidal ponds for foraging birds; oligohaline creeks vital as redfish, shrimp and crab nursery zones; and oyster beds that are important habitat for blue crabs, mullet and wintering shorebirds.

#### 2. Tierra Verde Shore

**Proposed Restoration Project:** East of Shell Key on Tierra Verde and adjacent to Boca Ciega Bay is an undeveloped 20-acre property ideal for estuary shoreline and coastal hammock restoration. Mangroves, cordgrass marshes and oyster beds could be planted to stabilize the sandy shore and the uplands could be planted with native hammock vegetation.

**Likely Implementing Entity or Partnership:** State of Florida, NOAA, others with resources to implement the project

**Location of Project:** Tierra Verde, Fla. (east of Shell Key)

**Cost Estimate:** Acquisition \$12 million; restoration \$1 million

**Timeframe:** TBD

**Link to Injury:** Coastal, estuarine and beach habitats; shorebirds and seabirds

**Benefits and Rationale:** Acquisition of the property will prevent further degradation of coastal habitats (beach and estuarine) by excluding development on what is now undeveloped property. Planting of mangroves, cordgrass and oyster beds will stabilize and restore estuarine and wetland habitats and benefit a variety of species using those habitats, including shorebirds and seabirds. It will also buffer and help prevent degradation to Shell Key County Preserve, a spectacular undeveloped barrier island owned by the state of Florida and managed by the county for nesting seabirds and migrating and wintering shorebirds.

**Other:** Migrating and wintering songbirds will benefit from native hammock vegetation planted in uplands.

### 3. **Alafia Bank Shoreline Habitat Project – Phase 2**

**Proposed Restoration Project:** This project will restore a portion of the eroding shoreline on the north side of the National Audubon Society's Alafia Bank Bird Sanctuary in eastern Hillsborough Bay. The Pinellas County Environmental Fund and the National Fish and Wildlife Foundation (NFWF) funded phase 1, constructed in the summer of 2011. Phase 2 will install an additional 550 feet of reef barrier in the form of linear arrays of specially engineered wave attenuation devices along the north shore, intercepting ship wakes and storm waves and preventing further erosion loss to mangroves and other trees used for nesting that are being undermined and lost during storm events. The project will build on phase 1 and include engineering and wave studies, engineering design plans, permit applications and construction of the project, plus follow-up monitoring as required by permits.

**Likely Implementing Entity or Partnership:** State of Florida, NOAA, U.S. Department of Interior (DOI), others with resources to implement the project

**Location of Project:** Alafia Bank Bird Sanctuary, Pinellas County, Fla.

**Cost Estimate:** \$250,000

**Timeframe:** TBD

**Link to Injury:** Coastal, estuarine and beach habitats; herons and other wading birds; oysters and other shellfish and fishes; lost services such as ecotourism

**Benefits and Rationale:** Alafia Bank Bird Sanctuary in eastern Hillsborough Bay is the nesting place for approximately 50 percent of Florida's roseate spoonbills and 8,000 to 15,000 pairs of waterbirds of 17 species. The project will (1) protect one of the most important bird nesting colonies in Florida from loss of nesting trees; (2) provide oyster attachment structure, allowing oyster filtering to cleanse the water entering Hillsborough Bay from the Alafia River; (3) create essential fisheries habitat; and (4) provide feeding areas for nesting, wintering and migrating birds.

**Other:** Alafia Bank Bird Sanctuary is managed by the National Audubon Society through a long-term lease with Mosaic Fertilizer LLC. The project will advance goals of the Tampa Bay Estuary Program Comprehensive Conservation Management Plan (to conserve bay habitats and to protect and



restore fish and wildlife communities and their habitats in Tampa Bay), the Florida Endangered and Threatened Species Management Wildlife Conservation Plan, the U.S. Shorebird Conservation Plan and the U.S. Fish and Wildlife Service (USFWS) Coastal Program.

#### **4. Flint Rock Land Acquisition Project, Jefferson and Wakulla Counties, Fla.**

**Proposed Restoration Project:** The project consists of land acquisition and restoration activities to restore and prevent further degradation to the watershed of the St. Marks National Wildlife Refuge (NWR) and adjacent Apalachee Bay. Restoration of the tract will involve methodical harvesting of nonnative off-site pines and conversion to on-site species; a sustainable, uneven-aged management regime for pines; and elimination of both hardwoods and cypress harvests. The land tract is included in a recently approved boundary expansion for the refuge, and the DOI USFWS already has the authority to acquire them. The refuge would manage and restore the lands according to their guidelines and priorities.

**Likely Implementing Entity or Partnership:** DOI USFWS and Florida Fish and Wildlife Conservation Commission (FFWCC)

**Location of Project:** Situated adjacent to the St. Marks NWR, Aucilla Wildlife Management Area (WMA) and Wacissa Conservation Area in Jefferson and Wakulla counties, Fla.

**Watershed or Basin:** St. Marks NWR, Apalachee Bay, Gulf of Mexico

**Affected Area (acres):** 68,000

**Cost Estimate:** \$30 million; funding available \$1 million

**Timeframe:** Time to implementation: 0–3 months; time to completion: 1–5 years until project planning, design and resource acquisition are completed and the project is included in a regional plan

**Link to Injury:** Coastal or estuarine habitats, water quality, herons and other wading birds

**Benefits and Rationale:** The refuge spans more than 43 miles of coastline, and restoration and management of its uplands bear directly on the integrity of the Apalachee Bay estuarine system. Improved management of upland forests will reduce runoff and improve water quality, thus helping to maintain wetland habitats for a variety of species, including herons and other wading birds. There are more than 98 species of nesting birds onsite. This area is critical habitat for more than 10 of the most vulnerable bird species from the oil spill, including the brown pelican, great blue heron, snowy egret, reddish egret, piping plover, roseate spoonbill, American oystercatcher, snowy plover, Caspian tern, least tern and common loon.

**Other:** The refuge provides an extensive wintering ground for a large variety of waterfowl and functions as an important travel and migration corridor, foraging ground and rest-over point for numerous trans–Gulf of Mexico Neotropical migrant bird species. This area is vital to the survival of hundreds of species, some of which are federally endangered or threatened. Listed Endangered Species Act (ESA) vertebrate species documented on the tract include eastern diamondback rattlesnake, flatwoods salamander, American alligator, wood stork, white ibis, little blue heron and Florida black bear. The project is identified by FFWCC as a strategic habitat conservation area, including such species as American swallow-tailed kite, limpkin and Florida black bear.

The project ranks high in analyses by the state of Florida (e.g., FFWCC's strategic habitat conservation areas, Florida Natural Areas Inventory's habitat conservation priorities).

## 5. Large-Scale Seagrass Restoration and Protection

**Proposed Restoration Project:** This project would implement a comprehensive approach to restoring and protecting seagrass habitat in the Panhandle. Submerged aquatic vegetation has been damaged throughout this area from recovery and other vessel traffic, boom placement and other response and recovery efforts in ecologically sensitive areas. This project would expand emergency restoration efforts to develop a comprehensive restoration effort in the areas that are of significance for habitat, water quality improvement and erosion control. The project would employ a range of activities including mapping, planting of seagrass, restoration of sea beds, access restriction and outreach and education.

**Likely Implementing Entity or Partnership:** NOAA

**Location of Project:** Specific locations in the Panhandle could include Perdido Bay, Big Lagoon, St. Joe Peninsula and St. Andrew Bay. This project is completely scalable (in terms of budget, level of effort, geographic scope, etc.) and therefore could be expanded across the Gulf where the need for seagrass restoration has been identified.

**Cost Estimate:** \$5 million for identified Panhandle projects

**Time Frame:** Time to implementation: 7–12 months; time to completion: 1–5 years

**Link to Injury:** Seagrass beds injured due to contamination and spill response, water quality, shellfish, nearshore fishes

**Benefits and Rationale:** Restoration of seagrass beds and other submerged aquatic vegetation has been identified as a priority by all the Gulf states because these resources are an essential component of healthy, productive and biodiverse aquatic ecosystems. Experiences with seagrass restoration in large estuaries such as Tampa Bay have demonstrated the significant ecosystem and human service values of this type of restoration and conservation activity.

## 6. Living Shorelines and Oyster Reef Restoration in Pensacola Bay, Fla.

**Proposed Restoration Project:** This project will create up to 8 miles of living shorelines in the East Bay area of the greater Pensacola Bay region. Living shoreline projects apply natural principles and construction elements that create habitat and provide other services important for estuarine functioning, including structural and foraging habitat for economically important estuarine fishes, vertebrates and invertebrates; increased light penetration for seagrass; and decreased wave energy and shoreline erosion. Living shorelines are being created throughout the Gulf of Mexico and may include restoration or establishment of oyster reefs. This living shoreline project will include installation of materials to provide structure suitable for development of oyster reef habitat and will serve as a natural approach to controlling shoreline erosion. The project will apply the most appropriate substrate for oyster larvae to settle and colonize, ultimately providing nursery habitat for commercially and recreationally important finfish and shellfish; furnishing forage and nesting areas for birds; and promoting shoreline protection by dampening wave energy, decreasing shoreline erosion, stabilizing sediments and decreasing turbidity. This project provides a comprehensive, science-based approach to restoration that includes pre-restoration monitoring, project design and permitting as well as implementation and monitoring of restoration activities.

The project will apply the expertise and lessons learned through years of experience by project partners as well as the ongoing living shoreline and oyster reef restoration projects in Alabama, Mississippi, Louisiana, Texas and Florida. Additional expertise and experience will be drawn from the many projects successfully funded through the national partnership between The Nature Conservancy and NOAA's Community-based Restoration Program.

**Likely Implementing Entity or Partnership:** DOI USFWS in partnership with The Nature Conservancy, Dauphin Island Sea Lab, USFWS Wildlife Service Coastal Program, Earth Ethics, Emerald Coastkeeper, Santa Rosa County Cooperative Extension Service and NOAA.

**Location of Project:** This project is located in East Bay (part of the greater Pensacola Bay region), Santa Rosa County, Fla. Approximately 8 miles of living shoreline and oyster reef restoration will be established in the East Bay area of the Pensacola Bay region and the Yellow River Marsh Aquatic Preserve. The project is complementary to the repair and restoration of Rattlesnake Bluff Road, a source of significant sedimentation to the Yellow River and Pensacola Bay in Okaloosa and Santa Rosa counties. In addition, this project is adjacent to the eastern boundary of the 100-1000: Restore Coastal Alabama project, which is building 100 miles of oyster reef and promoting and protecting 1,000 acres of coastal marsh and seagrass.

**Cost Estimate:** \$10 million over 5 years

**Timeframe:** Time to implementation: 7–12 months; time to completion: 1–5 years. Project planning and design are currently in progress.

**Link to Injury:** This restoration project contributes to making the environment and the public whole by restoring oyster reefs that historically were widespread throughout the Pensacola Bay area. Restoration will be planned for areas where science points to a high likelihood of success. The project will apply the most appropriate substrate for oyster larvae to settle and colonize, ultimately providing nursery habitat for commercially and recreationally important finfish and shellfish; furnishing forage and nesting areas for birds; and promoting shoreline protection by dampening wave energy, decreasing shoreline erosion, stabilizing sediments and decreasing turbidity.

Consistent with Section 1006 of the Oil Pollution Act, this project will achieve the following:

- Contribute to making the environment and the public whole by restoring oyster reefs that historically were widespread throughout the Pensacola Bay area.
- Address impacts of the *Deepwater Horizon* oil spill on oyster reefs and associated ecosystem services, including sustainable harvest; fish production; water filtration; nitrogen removal; protection of shorelines and marshland; nursery habitat for commercially and recreationally important fishes and invertebrate species; and food sources for a variety of species, including coastal birds.
- Restore oyster reef habitat in a substrate-limited water body as well as surrounding essential fish habitat; increase benthic productivity from oyster reef biodeposits to sediment; enhance recruitment and production of fish and mobile crustaceans; promote removal of suspended inorganics, phytoplankton and detrital particles, thereby reducing turbidity and improving water quality; and dissipate wave energy, thereby protecting the shoreline and wet flatwood community on adjacent lands.
- Comply with the NEPA's Minor Project Activities NOAA Administrative Order (NAO) 216-6 6.03.c.3(c) and Restoration Actions NAO 216-6 6.03.b2 and NAO 216-6 6.03.b3 through its status as a minor amelioration in which restoration actions will not have significant impacts on the human environment but are intended to restore an ecosystem and habitat.

**Benefit and Rationale:** Beyond restoring oyster reefs, this project will provide critical nursery habitat for numerous finfish and shellfish stocks and federal trust species, including Gulf sturgeon, gray snapper, gag grouper, sea trout, blue crab and stone crab. Additionally, the restoration efforts for this project will provide habitat for transient birds and reptiles that were affected by the oil spill, including black skimmers, brown pelicans, common terns, great blue herons, great egrets, least terns, royal terns, tricolored herons and sea turtles. This project will not only help in the recovery of these displaced populations specifically, but it will invest in their long-term habitat needs, providing areas for resting, forage and shelter into the future. Additionally, living shorelines provide immediate and cumulative impacts. The benefits are immediate because the structure instantly provides habitat for numerous and diverse species and stabilizes shorelines. In addition, living shoreline projects provide accessible opportunities for outreach into the community to directly involve and educate a diversity of people of all ages and abilities and from varied backgrounds.

**Other:** This project is on the state of Florida's short list for consideration of early NRDA funding, since it meets state project criteria. The project area is also being studied by the U.S. Department of Defense as part of a preferred airspace corridor for technologically advanced weapons development and testing for the military. Protection of the project will help establish this corridor, which may eventually provide connectivity from the Gulf of Mexico inland to Eglin Air Force Base.

This restoration project is expected to provide economic value to the Pensacola Bay area. Crews will be needed to construct and deploy the living shoreline technologies that create the foundation for recovery of oyster reefs. Based on the experience of a similar project in Alabama funded by the American Recovery and Reinvestment Act of 2009 (ARRA), this effort is expected to provide immediate jobs for Florida residents affected by the oil spill.

## 7. Rattlesnake Bluff Road and Riverbank Restoration Project

**Proposed Restoration Project:** This project will stabilize Rattlesnake Bluff Road and nearby eroded riverbank sites in order to reduce sediment pollution to the Yellow River and Pensacola Bay and provide a reliable thoroughfare for the public. We will work with local, state and federal experts to determine the most effective methods for restoring these sites with road restoration options including culvert replacement, soil and outlet stabilization and paving, as well as riverbank restoration options including riverbank stabilization, revegetation and other standard riparian stabilization techniques.

**Likely Implementing Entity or Partnership:** DOI USFWS, NOAA, FFWCC, Northwest Florida Water Management District

**Location of Project:** Rattlesnake Bluff Road (also called Eglin RR 211) is located in Okaloosa and Santa Rosa counties, Fla. This project is located near the city of Pensacola.

**Cost Estimate:** \$3 million. In-kind contributions expected from Eglin Air Force Base, USFWS, NOAA, Northwest Florida Water Management District and FFWCC.

**Link to Injury:** Consistent with Section 1006 of the Oil Pollution Act, this project will achieve the following:

- Contribute to making the environment and the public whole by restoring and rehabilitating Rattlesnake Bluff Road, an unpaved road that contributes significant sediment pollution to the Yellow River, its tributaries and Blackwater Bay (which ultimately drains to Pensacola Bay) by replacing three to 13 undersized culverts and stabilizing sediments and erosion along the entire course of the road.

- Address sediment pollution degrading riverine, marine and estuary wetlands, freshwater wetlands and subtidal habitats, as well as critical habitat for the federally threatened Gulf sturgeon.
- Compensate for degradation or loss of riverine, marine and estuary wetlands; freshwater wetlands; and subtidal habitats, as well as impacts to federally threatened Gulf sturgeon. The project will compensate for these effects by reducing sedimentation to the above habitats located within the lower 25 miles of the Yellow River and Blackwater Bay. Reduced sediment pollution and improved habitat will further restore or improve estuarine habitats, such as oyster reefs and salt marsh, that support the area's fishery, as well as restoring critical habitat for federally threatened Gulf sturgeon within this area.
- Apply in a consistent manner to the long-term restoration needs of high-priority riverine and estuarine habitats as described in Florida's State Wildlife Action Plan (2005) as well as the federal Gulf Sturgeon Recovery/Management Plan (1995).

**Benefit and Rationale:** The Rattlesnake Bluff Road and Riverbank Restoration Project will provide habitat restoration and rehabilitation of more than 25 miles of river affecting approximately 4,000 acres of riverine, marine and estuary wetlands; freshwater wetlands; and subtidal habitats, as well as critical riverine and estuarine habitat for the federally threatened Gulf sturgeon.

The project will also benefit eight fishes listed among Florida's rare and imperiled species: Gulf sturgeon, alligator gar, Alabama shad, speckled chub, ironcolor shiner, bluenose shiner, spotted bullhead and speckled darter. This project will also benefit at least three freshwater mussel species (narrow pigtoe, Southern sandshell and Choctaw bean).

**Other:** This project is on the state of Florida's short list for consideration of early NRDA funding because it meets state project criteria. The project is supported by the U.S. Department of Defense (Eglin Air Force Base), USFWS, NOAA and FFWCC.

The restoration and rehabilitation of Rattlesnake Bluff Road is expected to employ approximately 20 people in full- or part-time construction work. Once completed, the restored area will provide increased retention and assimilation of runoff and substantially reduce sediment pollution entering the river and estuary via the road. Reduced sediment pollution and improved habitat will further restore or improve estuarine habitats such as oyster reefs and salt marsh, which support the area's fishery, state park and other public resources, contributing millions of dollars to the state's economy.

## 8. St. Vincent and Lake Wimico Ecosystem Project

**Proposed Restoration Project:** The 69,453-acre St. Vincent Sound-to-Lake Wimico Ecosystem project is a mosaic of pine uplands, wet prairies and hardwood and cypress swamps that flank portions of three rivers, coastal bluffs and salt marshes fronting directly on St. Vincent Sound. Fee acquisition of the project will forge an interconnected watershed and conservation area of more than 900,000 acres that includes Apalachicola River WMA, Apalachicola River Wildlife and Environmental Area, Apalachicola National Forest, Tate's Hell State Forest, Box-R WMA, Apalachicola Bay National Estuarine Research Reserve and St. Vincent NWR. The project's importance in connecting a landscape complex of this magnitude – encompassing a huge store of terrestrial, freshwater and estuarine biodiversity – has few rivals in the southeastern U.S. Located in Franklin and Gulf counties, Fla., the project spans two ecologically significant estuaries along the Gulf of Mexico: St. Vincent Sound, including a portion of Apalachicola Bay (with an annual oyster harvest of major economic importance) and St. Joseph Bay (with important sport fishing and scallop industries). Protection of land and waters in the project area (under just two ownerships) will assist in restoring

and enhancing the water quality, water quantity and seasonal timing of freshwater flows that support the ecological balance, structure and functioning of both estuaries. Acquisition and ecological restoration of the tract will also protect the watershed of the Apalachicola, Brothers and Jackson rivers and the entire shoreline of Lake Wimico, all of which feed and sustain the estuaries.

**Likely Implementing Entity or Partnership:** DOI, NOAA or both

**Location of Project:** Franklin and Gulf counties, Fla. The project site is between the towns of Apalachicola and Port St. Joe.

**Cost Estimate:** \$100 million, fee simple acquisition

**Link to Injury:** Consistent with Section 1006 of the Oil Pollution Act, this project will achieve the following:

- Contribute to making the environment and the public whole by acquiring more than 69,453 acres of restorable terrestrial communities that buffer and protect freshwater flows to high-quality estuarine habitats on St. Vincent Sound and Lake Wimico in the Florida Panhandle. This project is important for adaptation to rising sea level and protection of imperiled estuarine, freshwater, wetland and forest habitats, including approximately 8 miles of shoreline.
- Address the impacts of the oil spill by protecting the land and waters within this large, landscape-scale watershed, thereby preserving water quality and quantity as well as seasonal timing of freshwater flows. Such flows support the ecological balance, functioning and community structure of estuarine systems that include oyster reefs and seagrass beds and species such as wading birds, Gulf sturgeon and several species of sea turtles.
- Compensate for impacts to water quality through restoration of terrestrial resources that function as the watershed for an array of near-coastal estuarine systems, including Apalachicola Bay, St. Vincent Sound, Lake Wimico and St. Joseph Bay. Specifically targeted are communities historically dominated by longleaf pine (mostly flatwoods and sandhill) that are now in commercial silvicultural operations (pine plantations) that allow runoff of surface water containing fertilizer, herbicides and pesticides.
- Work in a consistent manner to provide permanent means of protecting the estuarine systems, freshwater sources, wildlife, fishes, oysters, scallops and crabs that are the economic lifeblood of the region and the underpinnings of the ecology of the nearshore Gulf of Mexico. The project will help to restore a sustainable system of lands and waters to stabilize, maintain and enhance the seafood industry and tourism throughout the region.

**Benefit and Rationale:** The project area supports exceedingly high species richness and has long been identified as a regional and national exemplar of biodiversity. The project protects habitat for several federally listed vertebrate species including Gulf sturgeon; eastern indigo snake; loggerhead, Kemp's ridley, leatherback and green sea turtle; piping plover; arctic peregrine falcon; red-cockaded woodpecker; bald eagle; and wood stork, as well as manatee and Florida black bear. The project also supports populations of two globally imperiled plant species, Chapman's rhododendron and telephus spurge, that are also listed as endangered by both the USFWS and the state of Florida. The project would also contribute to the habitat available for a variety of other wildlife including Neotropical migratory birds, wintering waterfowl, rails, woodcocks and nesting wood ducks.

The commercially and economically valuable estuarine species associated with the tract include stone crabs, oysters, scallops, pink shrimp, speckled sea trout, red fish, pompano, snapper, grouper and many others. With the threat of climate change affecting coastal habitats, the project provides a critical corridor for inland migration of species adapting to sea-level rise.

**Other:** This project is on the state of Florida's short list for consideration of early NRDA funding because it meets state project criteria. The project area is also being studied by the U.S. Department of Defense as part of a preferred airspace corridor for technologically advanced weapons development and testing for the military. Protection of the project area will help establish this corridor, which may eventually provide connectivity from the Gulf of Mexico inland to Eglin Air Force Base.

## 9. **Threatened Coral Recovery in Florida, Broward, Miami-Dade and Monroe Counties, Fla.**

**Proposed Restoration Project:** Populations of shallow-water *Acropora* (staghorn and elkhorn) coral have been declining since the late 1970s and the species were listed as threatened under the ESA in May 2006. The decline has been caused by natural threats, including diseases, coral bleaching and hurricanes, and by localized human threats including pollution. As populations have declined, the chance for successful reproduction has declined as well. This project aims to aid in the recovery of these species through propagating coral colonies in underwater nurseries and outplanting them to degraded reefs along the Florida Reef Tract. The long-term goal of the project is to increase *Acroporid* larval production and genetic diversity by increasing the likelihood of successful reproduction between genetically distinct colonies located on outplanted restoration sites.

This project began in 2004 with a pilot study in the Upper Keys nursery and has been incrementally scaled up to encompass the entire Florida Reef Tract from Broward County south to the Dry Tortugas. There are currently more than 10,000 *Acroporid* corals being maintained within the nurseries, 5,000 of which will be outplanted back to natural reefs in the winter of 2011–2012. Following that initial large-scale outplanting, a significant number of coral fragments will remain in nurseries for future propagation and outplanting. Requested funding will allow this project to continue for an additional five years. Throughout those five years, the nurseries will be maintained as production-level propagation facilities to provide healthy coral fragments for outplanting to the surrounding reefs. This extension of the project will allow for an additional 3,000 corals per year to be outplanted on the reefs.

**Likely Implementing Entity or Partnership:** NOAA, Florida Department of Environmental Protection or both

**Location of Project:** Broward County, Fla. The proposed project will be implemented at multiple sites along the Florida Reef Tract in the Florida Keys, extending from the Dry Tortugas north to offshore of Dania Beach in Broward County.

**Affected Area (acres):** 6,178

**Cost Estimate:** \$4.6 million; funding available: \$900,000

**Timeframe:** 0–3 months to implement; 1–5 years to complete. Project planning, design and permitting are completed.

**Link to Injury:** Coral reefs, nearshore fisheries, crustaceans, shoreline stabilization

**Benefits and Rationale:** Benefits include recovery of a threatened coral species, increased coral cover and three-dimensional structure at the restoration reef. Restoration of this site will provide critical habitat for fishes and other reef inhabitants, improving the fitness and resiliency of this unique reef community.

**Job Creation and Economic Value:** This project will employ an estimated 58 people either in newly created jobs or through retaining qualified staff members who have been working on coral restoration projects, equating to 134,495 labor hours or 14 full-time equivalents. As coral ecosystems decline, the ecosystem services that people depend on also diminish. Coral reefs and associated habitats provide fishery resources that represent a critical source of food for people. During a 12-month period from June 2000 to May 2001, reef-related expenditures generated \$1.3 billion in sales in Miami-Dade County and \$504 million in Monroe County, Fla.

**Other:** Coral reefs are an important target in the state of Florida's wildlife action plan known as Florida's Wildlife Legacy Initiative. Much of the reef targeted in this proposal is located within the Florida Keys National Marine Sanctuary, and other portions are located within two national parks, Biscayne and Dry Tortugas. In a 2002 *Acropora* workshop in which recommendations for *Acropora* restoration techniques were identified, it was noted that "coral mariculture, aquaculture and other propagation techniques, along with transplantation and reattachment of dislodged *Acropora* fragments, may provide a feasible strategy to rebuild degraded *Acropora* populations."

## **ALABAMA**

### **10. 100-1000: Restore Coastal Alabama**

**Proposed Restoration Project:** Mobile Bay, with the fourth-largest drainage basin in the U.S., has experienced significant loss of oyster reefs, coastal marsh and seagrass beds. Despite these challenges, Mobile Bay represents one of the largest potential areas for outright restoration, replacement and enhancement of these lost habitats due to the size of the estuary, historical distribution of oysters in the bay, high natural oyster spat sets and warm water for fast growth. Engaging in ecosystem-scale restoration is a critical first step in addressing impacts from the oil spill in order to help habitats, wildlife and fisheries of importance across Alabama and the Gulf both immediately and for the long term. The Nature Conservancy, as part of the 100-1000: Restore Coastal Alabama partnership, proposes to build 100 miles of intertidal oyster reefs, which will in turn protect and promote the growth of more than 1,000 acres of coastal marsh and seagrass. These living shoreline projects apply natural principles and construction elements that create habitat and provide other services important for estuarine functioning. They provide substrate for oyster larvae to settle and colonize, creating structural and foraging habitat for economically important estuarine fishes, vertebrates and invertebrates. Other benefits include increased light penetration for seagrass and decreased wave energy and shoreline erosion.

**Likely Implementing Entity or Partnership:** State of Alabama, USFWS or both, in partnership with The Nature Conservancy, Alabama Wildlife Federation, Ocean Foundation, National Wildlife Federation, Alabama Coastal Foundation, Mobile Baykeeper and Mobile County Wildlife and Conservation Association

**Location of Project:** Mobile Bay, Ala. (Baldwin County)

**Cost Estimate:** \$95 million (\$19 million per year for 5 years)

**Timeframe:** Time to implementation: 4–6 months; time to completion: 6–10 years. Project planning and design are in progress and the project is included in a number of federal, regional and state habitat and wildlife conservation plans.

**Link to Injury:** Consistent with Section 1006 of the Oil Pollution Act, this project will achieve the following:



- Contribute to making the environment and the public whole by restoring, rehabilitating or replacing reef, coastal marsh and seagrass habitats used by people, wildlife and fisheries.
- Address impacts of the *Deepwater Horizon* oil spill on oyster reefs and associated ecosystem services, including sustainable harvest; fish production; water filtration; nitrogen removal; protection of shorelines and marshland; nursery habitat for commercially and recreationally important fishes and invertebrate species; and food sources for a variety of species, including coastal birds.
- Compensate for impacted oyster reefs, coastal marshes and seagrass beds while providing shelter and forage for finfish, shellfish, shorebirds, coastal birds, marine reptiles and marine mammals.
- Work in a consistent manner to restore fish and shellfish stocks and the livelihoods inextricably linked with them, as well as enhance the resiliency of coastal Alabama and its communities.
- Achieve cost-effective results. Cost analyses have already been completed as part of the ARRA project for three specific types of oyster reefs. Broad-scale implementation can be completed in a cost-effective manner based on this information and other demonstrations across the Gulf.

**Benefits and Rationale:** Mobile Bay – with an average depth of 10 feet – is one of the shallowest bays of its kind. It is also the fourth-largest estuary in the United States and plays an important role in sheltering and nurturing the finfish, shrimp, crabs and oysters that are vital to Gulf communities. In the northern Gulf of Mexico, oyster reefs form living breakwaters that help protect the soft coastal marsh shorelines from erosion and storm damage. In addition, the protected areas of marsh and seagrass landward of the reefs serve as critical foraging areas for wading birds, shorebirds and coastal waterfowl.

Globally, 85 percent of reefs have been lost, making reefs the most severely impacted marine habitat on the planet. The northern Gulf of Mexico is one of the few remaining locations where oysters have the potential to regain their foothold. Mobile Bay represents one of the largest potential areas for outright restoration, replacement and enhancement of these lost habitats due to the size of the estuary, historical distribution of oysters in the bay, high natural oyster spat sets and warm water for fast growth. Engaging in restoration efforts for the oyster reef, seagrass bed and coastal marsh habitats is an important first step in addressing the chronic degradation of coastal Alabama and the northern Gulf and reviving commercial finfish and shellfish populations.

By restoring coastal nursery habitats, this project will provide essential fish habitat for numerous finfish and shellfish stocks. The restoration efforts for this project will help transient species, including black skimmers, brown and white pelicans, tricolored herons, great egrets, Forrester's terns, royal terns, sea turtles and others affected by the oil spill. Along coastal Alabama, more than 155 birds, 12 sea turtles and one marine mammal survived the oiling. Another 735 birds, 117 sea turtles and eight marine mammals were collected dead.

This project will not only help in the recovery of these populations specifically but will also invest in their long-term habitat needs, providing areas for resting, forage and shelter into the future. Several federal trust species occur in and around the project sites. The upland areas adjacent to the project sites serve as stopover and resting areas for Neotropical migrants on their migratory flight paths – but they are currently eroding. Given the current lack of habitat and lack of community diversity at the project locations, the oyster reefs will serve as shelter, forage and resting sites for several avian species. Mississippi Sound provides critical habitat for the endangered Gulf sturgeon; it, as well as the Alabama sturgeon, is found within and migrating through Mobile Bay. Healthy nearshore benthic

habitat will enhance the foraging grounds of these fish as well as those of the endangered small-toothed sawfish and saltmarsh topminnow.

**Other:** The project has support from the Alabama Department of Conservation and Natural Resources (ADCNR), the USFWS Coastal Program Office and NOAA's Restoration Center. Other non-agency partners include Alabama Wildlife Federation, Auburn University, Boat People SOS, Coastal Conservation Association of Alabama, Coastal Land Trust, Daniel Foundation, Dauphin Island Sea Lab, Ducks Unlimited, Envision Coastal Alabama, Hand Arendall LLC, Hands On South Alabama, J.L. Bedsole Foundation, Mobile Area Education Foundation, Mobile United, Mobile County Wildlife and Conservation Association, National Wildlife Federation, Oxfam, Partners for Environmental Progress, Sierra Club Mobile Bay Group, Grand Hotel, University of South Alabama and Weeks Bay Foundation.

This project will create economic value through hiring of crews to construct and deploy a variety of oyster reef breakwaters. Based on the experience of the Alabama NOAA-ARRA project, this effort is expected to provide at least 50 immediate full-time jobs over the five-year project period. In addition to the construction workforce, the project will require researchers, educators and managers.

## 11. Mobile Causeway Hydrologic Restoration Project

**Proposed Restoration Project:** The Mobile-Tensaw Delta, the terminus of the fourth-largest watershed in the continental United States in terms of water volume, empties into Mobile Bay, contributing to one of North America's largest, most productive and most diverse estuarine systems. The delta's importance lies in the connection between the riverine and coastal ecosystems. The dike-like Mobile Bay Causeway has reduced the delta's critical ecosystems services, including habitat functioning, productivity and species and habitat diversity.

This project will involve reconnecting tidal exchange in the Mobile-Tensaw Delta by bridging Justin's Bay and Chocolatta Bay to address upstream and downstream modifications that have altered ecological productivity.

**Likely Implementing Entity or Partnership:** Alabama Department of Transportation in partnership with The Nature Conservancy and Dauphin Island Sea Lab

**Location of Project:** Justin's and Chocolatta bays along the Mobile Causeway in Mobile and Baldwin counties, Ala.

**Cost Estimate:** \$70 million

**Timeframe:** Time to implementation: 7–12 months; time to completion: 6–10 years

**Link to Injury:** The most effective means of addressing injuries to species, habitats, ecosystem services and economic losses associated with the oil spill is to fortify and restore the estuarine ecosystems that are the primary drivers of biodiversity and productivity in the Gulf. The Mobile Bay estuarine system contributes to the economic and environmental health of the entire Gulf. Restoration of the hydrologic connectivity between the Mobile-Tensaw Delta and Mobile Bay would significantly increase the opportunities for recovery of key Gulf species by improving habitat, water quality and ecosystem functioning of this vital estuarine system.

**Benefits and Rationale:** The existing roadway has altered saltwater and freshwater exchange, impacting coastal marsh and seagrass habitats north and south of the causeway and thus, the finfish, shellfish and wildlife that depend on these habitats. Hydrologic modifications have had a significant impact on the natural flow and quality of water that drains from the headwaters, impeding

freshwater inflows to the Gulf's estuaries. Restoring the function of the Mobile-Tensaw Delta, which receives 20 percent of our nation's freshwater supply, will have widespread beneficial effects throughout the Gulf ecosystem.

## 12. Oyster Shell Recycling in Mobile and Baldwin Counties

**Proposed Restoration Project:** Globally, oyster reefs are the single most impacted marine habitat (with an 85 percent loss). The Gulf of Mexico supports the only remaining significant wild oyster harvest in the world and has some of the best examples of the few remaining reefs. Across the Gulf, The Nature Conservancy is currently compiling known contemporary and historical oyster reef information to identify key areas for large-scale restoration. Despite significant loss of oyster reefs, Mobile Bay, with the fourth-largest drainage basin in the United States, represents one of the largest potential areas for outright restoration, replacement and enhancement of this lost habitat. The Nature Conservancy proposes engaging local businesses and the public in this restoration through an oyster shell recycling program. This program will engage restaurants and the general public, serving as a nexus between education and restoration, and between oyster restoration and local communities, while addressing impacts from the oil spill. Effective oyster shell recycling programs have been implemented in several areas, including New Hampshire, Maryland and South Carolina. This project will use information from those and other programs to develop an oyster shell recycling program suitable for Alabama. Initial calculations estimate that participation from approximately 50 restaurants would yield enough oyster shell for 1 to 2 miles of reef restoration per year.

**Likely Implementing Entity or Partnership:** Alabama Department of Natural Resources

**Location of Project:** This project will be located in Mobile and Baldwin County, Ala. Additional geographic regions within the state and surrounding areas will be brought into the program over the course of the project as funding allows.

**Cost Estimate:** \$6.4 million over 5 years

**Link to Injury:** Consistent with Section 1006 of the Oil Pollution Act, this project will achieve the following:

- Contribute to making the environment and the public whole by collecting oyster shells discarded by the public and recycling them for projects to restore the natural resources used by people, wildlife and fisheries.
- Address impacts to oyster reefs and associated ecosystem services by engaging businesses and the public.
- Compensate for affected oyster reefs by recycling rather than discarding this limited resource, which can then be used for restoration projects.
- Work in a consistent manner to restore fish and shellfish stocks and the livelihoods inextricably linked with them, as well as enhance the resiliency of coastal Alabama and its communities.
- Secure a cost-effective way to recycle a crucial resource that is currently taken to landfills, while educating and engaging businesses and the public around the connection between their food and the natural resources needed to support them.

**Benefit and Rationale:** Restoration of oyster reefs in Mobile Bay will provide essential fish habitat for numerous finfish and shellfish stocks. The oyster shell recycling program will provide a previously

uncaptured source of shells for restoration projects. Those shells will then be used in local reef restoration projects to help transient species such as black skimmers, brown and white pelicans, tricolored herons, great egrets, Forrester's terns, royal terns, sea turtles and other species affected by the oil spill. Several federal trust species occur in and around the project sites. The upland areas adjacent to the project sites serve as stopover and resting areas for Neotropical migrants on their migratory flight paths. The Mississippi Sound is critical habitat for the endangered Gulf sturgeon; this species, as well as the Alabama sturgeon, is found within and migrating through Mobile Bay. Healthy nearshore benthic habitat will enhance these species' foraging grounds as well as those of the endangered small-toothed sawfish and saltmarsh topminnow.

**Other:** Oyster shell recycling project supporters include The Nature Conservancy, Alabama Coastal Foundation, Mobile Baykeeper and Ocean Foundation. Other initial partners include the Cole Foundation Trust and the Grand Hotel in Fairhope, Ala.

Given the nature of a shell recycling program, the project is expected to create jobs. Additionally, involvement of high-visibility local restaurants is critical to kicking off a long-term strategy for a sustained oyster shell recycling program. Engaging these restaurants and developing staff training programs for interacting with customers will be critical in raising public awareness and connecting coastal restoration initiatives with seafood consumption. This staff training will be developed to be an ongoing and iterative process. Outreach materials and a tracking mechanism will be developed to evaluate involvement.

### **13. Lower Alabama River Diadromous Fish Passage**

**Proposed Restoration Project:** Due to the impacts of the oil spill on fisheries and marine habitats in the Gulf of Mexico, it is imperative to implement feasible restoration of key ecological processes of freshwater habitats that are intertwined with the whole marine, estuarine and freshwater system. Many species of fish move from coastal habitats into the freshwater rivers to complete their life cycle or take refuge when conditions in the Gulf are not appropriate. Dams are well known to impede movements of diadromous fish across river systems, including those that flow to the northern Gulf of Mexico. The Nature Conservancy, working in collaboration with the U.S. Army Corps of Engineers (USACE) and several other agencies and partners, will modify lock operations on the two lowermost dams on the Alabama River and measure the effectiveness these changes have at improving the passage of migratory fish across approximately 400 river miles. The Nature Conservancy proposes to expand the fish passage efforts to maximize benefits for a suite of valuable fish species by maintaining the attraction flow pumps and expanding the monitoring and assessment phase of this project over the next five years to include additional diadromous fish or their surrogates.

**Likely Implementing Entity or Partnership:** Alabama Department of Natural Resources, NOAA, or both

**Location of Project:** Claiborne and Millers Ferry locks and dams (Mobile and Cahaba rivers, Ala.), within multiple counties

**Cost Estimate:** \$1.25 million (\$250,000 per year for 5 years)

**Link to Injury:** Consistent with Section 1006 of the Oil Pollution Act, this project will achieve the following:

- Contribute to making the environment and the public whole by restoring and rehabilitating connectivity between riverine habitats and estuarine habitats used by wildlife and fisheries as nursery and foraging habitat, especially for diadromous finfish.

- Address impediments to migration, reproduction and feeding for multiple species of fish, including Gulf sturgeon, striped bass, American eel and Alabama shad.
- Compensate for impacted and degraded riverine and estuarine habitats as well as impacts to the federally threatened Gulf sturgeon.
- Apply in a consistent manner to the long-term restoration needs of high-priority riverine and estuarine habitats as described in Alabama's State Wildlife Action Plan.
- Provide feasible and cost-effective restoration of fish and wildlife over 400 river miles by using low-cost techniques for moving fish past barriers. The project will likely require informal federal consultation under the ESA. The project is in compliance with categorical exclusions described in the NEPA and thus will not require formal NEPA consultation.

**Benefit and Rationale:** Improved migration from Mobile Bay past Claiborne and Millers Ferry locks and dams will allow access to historical spawning and feeding grounds for target fish species potentially impacted by the oil spill. These diadromous species include Gulf sturgeon (listed as threatened), striped bass, Alabama shad, American eel, striped mullet, Atlantic needlefish, Gulf menhaden and skipjack herring. The improved connectivity of a combined 400 miles of large river habitat makes this effort one of the longest fisheries restoration efforts possible in the Gulf Coastal Plain and includes access to the Fall Line shoal habitat, an area crucial for the life cycle of many fish and mollusks. Structural and operational modifications at Claiborne Lock and Dam and Millers Ferry Lock and Dam have the potential to benefit more than 50 species of fish; numerous mussel species; and the overall ecosystem that stretches from the Gulf of Mexico across Mobile Bay, through the Alabama River and upstream to the free-flowing Cahaba River.

**Other:** The Alabama River Fish Passage Working Group was formed in 2009 and the Corps of Engineers agreed to operate navigation locks specifically to benefit fish passage. With state and federal partners, Auburn University began assessing the effectiveness of these efforts in 2010 by tracking tagged fish. However, funding will run out in 2011. Recent funding from NOAA and The Nature Conservancy allowed the Corps of Engineers to install water pumps in the navigation locks at Claiborne and Millers Ferry locks and dams. It is crucial to maintain the pumps, operate the navigation locks and continue tracking fish to test effectiveness and provide feedback on how to maximize benefits for the fisheries and the people dependent on them.

Based on the numbers of jobs created by similar projects in the past, this effort is expected to provide at least four immediate part-time jobs over the five-year project period to conduct research, analyze data and maintain equipment. Of the nation's seafood supply, 35 percent comes from the Gulf of Mexico. Recreational, commercial and subsistence fishing have a large economic impact and depend on the freshwater rivers in this project area.

## 14. Coastal Land Protection in Mobile and Baldwin Counties, Ala.

**Proposed Restoration Project:** The Nature Conservancy has proposed to acquire critical coastal properties in Mobile and Baldwin counties, Ala. The landscape of coastal Alabama is dominated by several striking geographic features, notably the major estuary of Mobile Bay and its vast wetland delta formed by the confluence of the Alabama and Tombigbee rivers with the Perdido River, the Escatawpa River and, to the south, a well-developed chain of barrier islands along the Gulf of Mexico coastline that protects the Mississippi Sound and other smaller estuaries. A series of overlapping terrestrial, freshwater aquatic and unique marine sites fit together to form a complex and diverse landscape. The primary threats to this project area include altered hydrologic regime and degraded water quality, altered fire regime, incompatible forestry practices, urbanization and other development. Conservation partners have worked over the last several decades to protect more

than 100,000 acres in Alabama's coastal counties. This project would add to these efforts to preserve and protect water quality and provide habitat for the vast array of wildlife on the Gulf Coast. Protection of our parks, forests, local recreation areas, refuges and other lands is a strong, permanent investment that is crucial to our natural heritage. This project addresses protection of numerous coastal sites identified in Alabama's wildlife action plan, *Conserving Alabama's Wildlife: A Comprehensive Wildlife Strategy*, while complementing other restoration efforts occurring in Mississippi Sound and Mobile Bay. It also aligns with the habitat goals of the Mobile Bay National Estuary Program's Comprehensive Conservation Management Plan.

**Likely Implementing Entity or Partnership:** Alabama Department of Natural Resources

**Location of Project:** Mobile and Baldwin counties, Ala.

**Cost Estimate:** \$125 million (\$25 million per year for 5 years)

**Link to Injury:** Consistent with Section 1006 of the Oil Pollution Act, this project will achieve the following:

- Contribute to making the environment and the public whole by acquiring lands that provide coastal habitat protection for the Gulf of Mexico's critically important bays, estuaries, barrier islands and coastal rivers. Such acquisitions ultimately provide habitat to animals, plants and wetlands; improve water quality; protect and restore coastal fisheries; and support heritage-based tourism and recreational opportunities for people.
- Address habitat protection and provide new recreational opportunities; additional protected lands may become part of national wildlife refuges, state parks, nature preserves or recreational areas. Alabama ranks last in percentage of protected lands in the southeast with approximately 4 percent of state land area in protected status.
- Compensate for loss of coastal wetlands and other important habitats; degradation of water quality; and loss and impairment of oyster reefs, seagrass beds and other submerged habitats.
- Apply land acquisition and management in a consistent manner at several landscape-scale sites in coastal Alabama, including Perdido River; Fort Morgan Peninsula (Baldwin County); the Mobile Delta; and Grand Bay Savanna, Dauphin Island (Mobile County). Acquisition efforts are underway for several high-priority tracts that are currently available in these areas.

**Benefit and Rationale:** The high productivity of coastal Alabama draws a suite of animals, including manatees, sea turtles, diamondback terrapins and coastal mammals from raccoons to black bears. Many of these species are protected at the state and federal levels. Great blue herons, great egrets, clapper rails, willets, woodcock and snipe nest along these coasts as well, in the salt marsh and slash pine flatwoods near the salt marsh ecotone. These areas were greatly impacted by Hurricane Katrina and the more recent *Deepwater Horizon* oil spill. In addition to the coastal birds and shorebirds, the Gulf of Mexico area is heavily used by migratory waterfowl, including mallards, wood ducks, green-winged teal, blue-winged teal, mergansers, scoters, canvasbacks and redheads, as well as numerous Neotropical migrants. It is critical to preserve these lands and waters for present and future generations.

**Other:** Public agency partners and supporters include USFWS, ADCNR, Alabama Forever Wild Land Trust, USDA Forest Service, NOAA and Baldwin and Mobile counties. Private partners include The Nature Conservancy, Coastal Land Trust, Weeks Bay Foundation, Alabama Forest Resource Center, National Audubon Society, Dauphin Island Bird Sanctuary, Alabama Coastal Heritage Trust, Sierra Club and private landowners.

Healthy populations of a diverse array of shorebirds, waterfowl and Neotropical migratory songbirds along the Alabama coast have come to form the basis for a significant ecotourism industry attracting thousands of visitors annually. Initiatives such as the Alabama Coastal Birding Trail, Alabama Coastal BirdFest and Dauphin Island Bird Festival have been credited by chambers of commerce and tourism officials with generating millions of dollars in revenues and supporting many jobs in coastal Alabama. Additionally, acquisition of coastal wetland habitats such as salt marshes plays a vital role in ensuring that 35 percent of the nation's seafood comes from the Gulf of Mexico, including 70 percent of the shrimp and 35 percent of the oysters.

## **MISSISSIPPI**

### **15. Ecosystem Restoration of Gulf Coast Natural Areas**

**Proposed Restoration Project:** This project would result in direct restoration of 3,622 acres of coastal habitat and enhance thousands of additional acres. It would restore those acres that are in Coastal Preserve Program lands to a condition that can be maintained through routine program management. Native trees and other native vegetation would be planted on 353 acres to accelerate natural recovery. Hydrological restoration via removal or replacement of ditches and collapsed culverts would result in natural, historical sheet flow across the coastal preserve landscape. A shoreline protection program would significantly increase the longevity of a 50-acre marsh restoration site begun in 2003.

**Likely Implementing Entity or Partnership:** Mississippi Department of Environmental Quality with Mississippi Department of Marine Resources (MSDMR)

**Location of Project:** All three coastal counties

**Cost Estimate:** \$7.8 million

**Timeframe:** Time to implementation: 1–5 months; time to completion: 1–5 years

**Link to Injury:** The project addresses coastal lands and habitats that were directly affected by oil contamination, while taking a comprehensive ecosystem view in restoring hydrologic functioning and natural processes to an entire coastal area to improve its resilience and productivity.

**Benefits and Rationale:** Restoring the natural processes of the coastal wetlands and making them more resilient and productive will result in multiple benefits of improved water quality, habitat enhancement and storm buffering. This project will provide significant economic benefit in terms of commercial and recreational fisheries and associated tourism. Wetlands are one of the most important Gulf habitats. Species sustained by wetlands include most of the important commercially fished species, including shrimp, crabs, spotted sea trout, red drum and bull minnows. State and federally listed species in the area include Gulf sturgeon and some species of sea turtles.

### **16. Living Shorelines Wetlands Restoration Projects, Mississippi Gulf Coast**

**Proposed Restoration Project:** Loss of coastal marsh from shoreline erosion is a major problem across the entire Gulf coast. In Mississippi, estuarine marshes are considered to be imperiled. Three areas of rapidly eroding wetlands shorelines, totaling 2.25 miles, were selected for this work, based on either public ownership of lands or willing private landowners. In each area, demonstrated shoreline erosion has sometimes exceeded 250 linear feet over 50 years. Oyster-based living shorelines structures will be placed along selected wetlands. These structures will prevent further

erosion and should accrete sediments, leading to re-creation of lost marsh habitat. In addition, the living shoreline structures themselves will create marine habitat.

**Likely Implementing Entity or Partnership:** MSDMR

**Location of Project:** Harrison and Jackson Counties, Miss.

**Cost Estimate:** \$2.25 million

**Timeframe:** Time to implementation: 0–3 months; time to completion: 1–5 years

**Link to Injury:** Some areas of the eroding shoreline and marsh were directly impacted by the oil spill and response and recovery efforts. Over the long term, establishment of an oyster reef and a wetlands corridor will enhance habitat and sustain species of finfish and shellfish that were injured by oil contamination. It is hoped that successful completion of these pilot projects will stimulate interest in further wetlands restoration.

**Benefits and Rationale:** By protecting and restoring coastal marsh, one of the most important habitats on earth, this project will protect and restore habitat for marine fish and invertebrates and migratory and resident seabirds. These species include most of the important commercially fished species such as shrimp, crab, spotted sea trout, red drum and bull minnows. State and federally listed species in the area include Gulf sturgeon and some species of sea turtles, but these species are unlikely to use this habitat. In addition to the positive effects on coastal marshes, the living shorelines structures themselves also provide habitat for oysters, mussels and other marine fish and invertebrates.

## 17. Restoration and Enhancement of Coastal Marsh and Forests in Coastal Mississippi

**Proposed Restoration Project:** Mississippi has a very successful coastal preserve system, which has preserved thousands of acres of coastal marsh and transitional forests over the past 25 years. These lands are owned by the Public Lands Division of the Secretary of State and managed by the Department of Marine Resources. While acquisition funding has typically been available, restoration funding has not, leaving a backlog of restoration needs. This project will seek to address restoration and enhancement needs on coastal lands. A number of these restoration projects are included in the Mississippi Coastal Improvement Plan (MSCIP). Completion of this project would expand the efforts of this and other federal and state programs by restoring 1,000 acres of compromised coastal marsh to full functioning. Long-term scientific monitoring of project sites will also be conducted to measure the effectiveness of the project and apply lessons learned elsewhere.

**Likely Implementing Entity or Partnership:** Present partners include MSDMR, USACE, MSCIP and The Nature Conservancy. Other partners with appropriate authority and expertise will be engaged in project implementation over time.

**Location of Project:** All three coastal counties have sites needing restoration and enhancement. The MSCIP projects will be taken into account and final site decisions and priorities will be determined by the coastal preserve manager.

**Cost Estimate:** \$13.6 million



**Timeframe:** Time to implementation: 4–6 months; time to completion: 1–5 years. The time required to complete this project will depend on the number of sites selected and the complexity of the restoration activities.

**Link to Injury:** This project will restore coastal marsh impacted by a variety of problems over time. Some of the coastal lands suffered direct contamination with oil and damage from response and recovery efforts. Most of the lands have been degraded through other means, including Hurricane Katrina, invasive species and pollution.

**Benefits and Rationale:** This restoration will improve wildlife habitat, increase coastal resilience, restore natural functioning and improve storm attenuation. These coastal marshes are prime habitat for many important marine fishes and invertebrates and also serve as important habitat for migratory birds.

## 18. Bay St. Louis and Biloxi Bay Oyster Reef Restoration

**Proposed Restoration Project:** The subtidal oyster reef habitats in coastal Mississippi have degraded over time due to poor riverine water quality, questionable land use practices in watersheds, shoreline hardening and natural processes such as hurricanes. Substantial expanses of suitable bottom area exist in all Mississippi bays and estuaries. The proposed project is to construct up to 30 acres of subtidal oyster reef habitat in Bay St. Louis and up to 70 acres in Biloxi Bay using natural oyster shell on suitable water bottoms. Careful scientific monitoring will document long-term progress. Restoration of oyster reefs in Bay St. Louis began in 2007 with the construction of a 2-acre pilot project. In 2009, a larger, 14-acre project was constructed nearby. Sampling of both reefs in early 2011 showed fully functional reefs that are contributing to the productivity and biodiversity of the bay. Suitable water bottoms exist in the bay for further restoration. Restoration of oyster reefs in Biloxi Bay began in 2007 with the construction of a 10-acre pilot project. The reef was later expanded to 22 acres. Sampling of the reefs in early 2011 showed fully functional reefs that are contributing to the productivity and biodiversity of the bay. Suitable water bottoms exist in the bay for further restoration.

**Likely Implementing Entity or Partnership:** Mississippi Department on Marine Resources, NOAA or both

**Location of Project:** Bay St. Louis and Biloxi Bay, Miss.

**Cost Estimate:** \$375,000 for Bay St. Louis; \$875,000 for Biloxi Bay

**Link to Injury:** Consistent with Section 1006 of the Oil Pollution Act, this project will achieve the following:

- Contribute to making the environment and the public whole by restoring subtidal oyster reefs in Bay St. Louis, Miss., through construction of new reefs with natural shell or other suitable materials.
- Address impacts of the *Deepwater Horizon* oil spill on oyster reefs and associated ecosystem services, including sustainable harvest; fish production; water filtration; nitrogen removal; protection of shorelines and marshland; nursery habitat for commercially and recreationally important fishes and invertebrate species; and food sources for a variety of species, including coastal birds.
- Apply in a consistent manner long-term plans to restore Mississippi's subtidal oyster reefs as outlined in federal and state restoration plans.

- Achieve proven, cost-effective results. These projects utilize established methods already in use in all Gulf of Mexico states that have produced scientifically validated, long-term results. No problems are anticipated with the NEPA process for this project, since no listed species will be affected. Listed species in the area, primarily Gulf sturgeon and sea turtles, are very rare and highly mobile. Deployment of natural shell will produce very short-term and localized turbidity. Permits needed will be applied for through MSDMR and, if need be, USACE. State permits typically take 30 days or less to obtain.

**Benefit and Rationale:** Restoration of subtidal oyster reefs produces increased biomass and species diversity along with a shift to important sport fish, including spotted sea trout, white sea trout, black drum and southern kingfish (ground mullet). Resident and migratory shorebirds will also benefit.

**Other:** Restoration of coastal habitats in Mississippi is supported by the Governor's Gulf of Mexico Commission, the Secretary of State and the Hancock County Board of Supervisors. State agency supporters include the Department of Marine Resources, the Department of Environmental Quality and the University of Southern Mississippi. Corporate supporters include Chevron and DuPont.

Commercial fishing, sport fishing, kayaking, wildlife observation and other nature-based activities are extremely important in southern Mississippi. Restoration of coastal habitats will enhance all of these activities. The proposed efforts will produce a number of immediate jobs while enhancing water-based employment in the long term.

## 19. Wetlands Stabilization and Oyster Restoration, Hancock County, Miss.

**Proposed Restoration Project:** The Nature Conservancy has proposed to stabilize up to 15.5 miles of retrograding wetland shoreline by restoring up to 60,000 feet of intertidal oyster reef habitat in Hancock County, Miss., using living shoreline techniques. Pressure on coastal wetlands has increased dramatically in recent decades, and a significant portion of Mississippi's coastal habitats has been degraded or destroyed due to both natural and anthropogenic causes. Mississippi's estuarine marshes have been listed as imperiled within the state, and oyster reefs, adjacent to many estuarine marshes, are listed as vulnerable. Coastal population growth and associated development have directly impacted habitats and exacerbated impacts of recent storm events, including Hurricanes Katrina (2005), Gustav (2008) and Ike (2008). Hancock County Marsh Coastal Preserve, located in extreme southwestern Mississippi, is the second-largest marsh in the state. The majority of the state's oyster beds (approximately 70 percent) occur nearby in the western portion of Mississippi Sound. Over the last 50 years, approximately 376 acres of estuarine marsh have been lost along a 15.5 mile length of coastline from Bayou Caddy to Heron Bay within the preserve. This proposed living shoreline project will apply natural principles and construction elements that create habitat and provide other services important for estuarine functioning. It will provide substrate for oyster larvae to settle and colonize, creating structural and foraging habitat for economically important estuarine fishes, vertebrates and invertebrates. Other benefits will include increased light penetration for seagrass and decreased wave energy and shoreline erosion. These living shorelines will be created along 15.5 miles of shoreline from Bayou Caddy west to the mouth of the Pearl River, creating up to 60,000 feet of habitat. Local substrate conditions are ideal for the use of living shorelines to prevent erosion and habitat loss. In some areas, marsh accretion may occur, allowing for additional future restoration of salt marsh.

**Likely Implementing Entity or Partnership:** MSDMR, NOAA, or both

**Location of Project:** Hancock County, Miss.

**Cost Estimate:** \$18.8 million

**Link to Injury:** Consistent with Section 1006 of the Oil Pollution Act, this project will achieve the following:

- Contribute to making the environment and the public whole by stabilizing an eroding wetland shoreline to prevent further land loss and restoring complex oyster reef habitat that provides economic and recreation opportunities for the public
- Address impacts of the *Deepwater Horizon* oil spill on oyster reefs and associated ecosystem services, including sustainable harvest; fish production; water filtration; nitrogen removal; protection of shorelines and marshland; nursery habitat for commercially and recreationally important fishes and invertebrate species; and food sources for a variety of species, including coastal birds
- Work in a manner consistent with state and federal conservation restoration and recovery plans. MSDMR will manage federal permit applications; as the state wetland permitting agency, MSDMR is self-permitting. MSDMR will apply for a general use permit USACE; approval is anticipated within 90 days. The Nature Conservancy is consulting with NOAA's National Marine Fisheries Service (NMFS) on the NEPA process; no problems are anticipated.

**Benefit and Rationale:** Hancock County Marsh Coastal Preserve is known for its extensive marshes, rare habitats (e.g., shell middens) and abundance of waterfowl; several state-listed species occur here, including the American oystercatcher, saltmarsh topminnow and diamondback terrapin. Restoration of oyster reefs will provide much-needed habitat (according to MSDMR, oyster reefs were in decline by approximately 90 percent following Hurricane Katrina in 2005) and re-establish ecosystem services. These services include habitat and nursery grounds for invertebrate and fish species, reduction of wave energies, improved water quality, sediment trapping, substrate stabilization, carbon sequestration and reduction of storm surges. Finally, by stabilizing and restoring wetland habitats, the project will protect and increase valuable nursery habitat for commercially important fisheries (shrimp, sport finfish, menhaden, blue crab and oyster).

**Other:** MSDMR, Hancock County Board of Supervisors and the coastal preserves manager have all given their support to this project.

Based on experiences in previous projects of similar scale, organizers expect approximately 25 jobs to be created over the project's construction phase. The five years of ensuing monitoring would provide jobs to local researchers, graduate students and educators. Additionally, the Mississippi Sound economy is based largely on the seafood and ecotourism industries. Stabilization of the Hancock County Marsh Coastal Preserve and construction of oyster reefs will benefit charter boat operations, subsistence fishing, recreational fishing, commercial fishing, kayaking, bird watching and general tourism.

## LOUISIANA

### **20. Sub-Basin Restoration Projects**

**Overview:** The four damaged sub-basins of the Mississippi River Delta are the Barataria, Breton, Terrebonne and the Bird's-Foot Delta. Sediment diversion projects in each of the sub-basins are the most effective means of rebuilding and sustaining wetlands in the face of subsidence, erosion and sea level rise. Other interventions to rebuild marsh and barrier islands are unsustainable 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. This section first addresses coastal land loss and delta-building across all four sub-basins. Subsequent sections (20a, 20b, 20c and 20d) discuss additional restoration project components for each sub-basin.

**Summary:** 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 projects should be considered for funding in the NRDA process. For the reasons described below, it is essential to include affected stakeholders in project evaluation and to consider ways in which those projects may fit into a broader suite of restoration efforts affecting stakeholders.

**Project Rationale and Link to Injury:** One of the most important underlying challenges in long-term restoration of coastal resources in the oil-spill impact area is the separation of the Mississippi River from its delta, whose wetlands were created by the river's natural processes. Through construction of navigation and flood risk-management structures, federal resource management policies turned off those natural processes. Land-use practices, canal building for energy extraction and other activities further impaired delta-building processes. Today, sea level rise, subsidence induced by fluid withdrawal, increased hurricane frequency and possibly increased strength and decreased sediment load in the river add to the stresses on the delta. The result is that within 50 to 100 years the entire Mississippi River Delta wetlands landscape—including ecosystems, human communities and local economic activities—could be lost. Continued loss of delta wetlands will impede the resilience of coastal resources harmed by the Deepwater Horizon oil spill and impair the sustainability of NRDA restoration projects. And efforts to protect communities with levees and to raise structures will need sufficient wetland and barrier island platforms to improve effectiveness.

**Proposed Restoration Projects:** Projects have been proposed for each of the Mississippi River basins in *Louisiana's Comprehensive Master Plan for a Sustainable Coast* (2012). These projects should be considered as part of a Gulf-wide restoration approach, but they may have significant short-term socioeconomic impacts that require the stakeholder involvement and consideration of transitional measures discussed under Crucial Considerations, below. For example, some proposed projects implement the Mississippi River Gulf Outlet (MRGO) Ecosystem Restoration Plan, which is designed to ameliorate and reverse damage done to the marshes of Louisiana's Orleans and St. Bernard parishes as a consequence of MRGO dredging and failure to maintain its channel dimensions. These areas received heavy oiling on their seaward flanks. Overall restoration efforts would also address barrier islands, back-bay colonial bird nesting islands, marsh creation and oyster reef habitat.

**Benefits and Rationale:** Sediment and freshwater from the river will build new wetlands, help sustain marsh creation and barrier island projects and help maintain the health and elevation of existing marshes. Diversion of river water through marshes may also reduce nitrogen and phosphorus loading in the Gulf, helping to reduce the size of the hypoxic zone.

**Crucial Considerations:** Well-designed diversion projects are expected to yield long-term results and efficiency in restoring wetlands and stemming land loss. Some projects, however, could have short-term adverse impacts on coastal communities and certain livelihoods. For example, redirecting freshwater into estuaries will lower salinities, which could affect local fishermen by redistributing fisheries for oysters, shrimp and blue crabs. In order to achieve the greatest overall benefits from restoration, it is important to understand the social and economic consequences—especially for already-vulnerable, impacted human populations—while recognizing that failure to reverse land loss will lead to more severe flooding and vulnerability to extreme weather events.

In evaluating diversion projects, it is essential to share knowledge with affected stakeholders and to understand their concerns and challenges. As part of the effort to maximize overall restoration

benefits, it is desirable to support community-developed efforts that will help coastal communities and the seafood industry adapt to future changes in the coastal system. Adaptation is especially important in low-income and disadvantaged coastal communities that depend on oyster harvesting and other fishing enterprises for economic security and that—not unreasonably—fear significant changes from diversion projects.

If sediment diversions are selected as restoration projects, the trustees should consider additional projects that can ameliorate some of the impacts or otherwise benefit affected communities dependent on these resources, such as providing access to equivalent resources elsewhere, with an eye to the challenges facing the most vulnerable populations. That is, every effort should be made to facilitate transitions for communities that already were injured by the oil spill.

As detailed in the 2012 state master plan, estimated project costs in this category for mid-Barataria, mid-Breton and eastern Terrebonne total \$690 million.

## 20a. Sub-Basin Project: Barataria Basin Recovery

**Proposed Restoration Project:** Recovery projects restore system function through pulsed sediment diversion, marsh creation, backfilling oil and gas canals and restoring subsiding forested ridge habitat. Point of injury restoration is included for barrier islands and back-bay colonial bird nesting islands. Total cost estimate is \$378 million.

**Project Components in addition to projects discussed in section 20 (above):**

### 1) **Cheniere Ronquille Barrier Island Restoration**

The project consists of constructing 11,000 linear feet of dunes or beach and 259 acres of marsh platform contiguous with the northern side of the Gulf of Mexico shoreline on Cheniere Ronquille in Plaquemines Parish.

**Likely Implementing Entity or Partnership:** As appropriate

**Location of Project:** Barataria Bay Shoreline, La.

**Cost Estimate:** \$40 million

**Timeframe:** 1–2 years

**Link to Injury:** Extensive oiling occurred on this shoreline with concomitant exposure to beach and salt marsh organisms, including endangered piping plovers.

**Benefits and Rationale:** The goals of this project include restoring dune and marsh habitat as well as stabilizing remaining unvegetated portions. The project consists of beach, dune and back barrier marsh habitat creation to restore the physical form and functioning of the barrier island and shoreline and to provide critical habitat. It also addresses long-term sustainability of these features of the estuary.

**Other:** The project is a component of the larger Louisiana Coastal Area (LCA) Barataria Basin Barrier Shoreline.

### 2) **Restore Bird Nesting Islands in Bay Ronquille**

The project consists of armoring the islets with artificial oyster reef to reduce wave energy and augmenting the islets with sediment to increase the size of the vegetated platforms. The goal is to

double the footprint of the islets by installing reef block some distance from shore. The new reef wave barrier should form a nearly completed circle around the islet with the westward-facing end opening into the waters of Barataria Bay, providing a secluded open water area that protects juvenile foraging and fledging birds. The project will also deposit earthen material (sand) either from nearby sources or barged in from other sources within the confines of the reef. Crushed oyster shell will be deposited as nesting substrate at an elevation of at least 3 feet to increase nesting success in the face of extreme tides. Finally, the project will plant black mangrove and smooth cordgrass (if necessary) to ensure habitat for nesting wading birds.

**Likely Implementing Entity or Partnership:** As appropriate

**Location of Project:** Barataria Bay, La.

**Cost Estimate:** \$6 million

**Timeframe:** 1–2 years

**Link to Injury:** The islets were extensively oiled at the height of the nesting cycle when young birds were fledging. Birds were killed or injured, and vegetation, especially mangrove, was killed or weakened, contributing to increased erosion.

**Benefits and Rationale:** Several small islands, formerly the rim of Bay Ronquille, are disappearing as the small bay becomes indistinguishable from Barataria Bay to the north and the Gulf of Mexico to the south. Vegetated with smooth cordgrass and black mangrove, they are only remnants, now measuring a total of 19.46 acres (Tern Island, 3.33 acres; Pelican Island One, 6.24 acres; Pelican Island Two, 3.75 acres; and Cat Island, 6.14 acres), and will disappear entirely. These small, remote islands support nesting colonies of hundreds of brown pelicans, various herons, egrets (including reddish egrets), ibis, roseate spoonbills and various terns.

**Other:** Nearby Queen Bess Island was armored and augmented with sediment more than 30 years ago and continues to provide vital nesting habitat, demonstrating that the concept is workable and cost effective, and would directly address injury. Substituting vertical oyster reef for rocks would increase the value of the project for marine resources and ecosystem services.

3) **Grand Liard Marsh and Ridge Restoration**

The project consists of creating and nourishing 468 acres of marsh and associated edge habitat for aquatic species through pipeline sediment delivery and restoring 14,500 linear feet of the Grand Liard ridge to reduce wave and tidal setup and provide fallout habitat for Neotropical migrant birds adjacent to Grand Liard Bayou in Plaquemines Parish, La.

**Likely Implementing Entity or Partnership:** As appropriate

**Location of Project:** Middle Barataria Estuary, La.

**Cost Estimate:** \$36 million

**Timeframe:** 1–2 years

**Link to Injury:** The link to injury is indirect; the project would extend the longevity of the entire estuary while work proceeds on systemic restoration via reintroduction of deltaic processes.

**Benefits and Rationale:** The goals of this project include restoring a surge barrier in lower Plaquemines, restoring marsh and restoring stopover habitat for Neotropical migratory birds.

**Other:** Without significant input of new sediment, distributary ridges along the lower river have subsided, and without input of freshwater they have been inundated with salt. As a result, they no longer support the chenier forests that once provided surge attenuation and stopover habitat for trans-Gulf migratory birds.

4) **Canal Backfilling for Wetland Restoration**

The project extends backfilling of modern canals in the Barataria Preserve based on a pilot project in 2001 and successful backfilling work done in 2010. The goal is to restore hydrology as well as swamp, marsh and ecosystem functioning in the Jean Lafitte National Historical Park and Preserve.

**Likely Implementing Entity or Partnership:** DOI-NPS

**Location of Project:** Middle Barataria Estuary, Barataria Preserve unit, Jean Lafitte National Historical Park and Preserve, La.

**Cost Estimate:** \$12 million

**Timeframe:** 1–2 years

**Link to Injury:** The link to injury is indirect; past oil and gas canal dredging compromised the hydrological integrity of the entire estuary.

**Benefits and Rationale:** Canal backfilling has never been used comprehensively to restore estuarine function at the landscape level. Earlier work has demonstrated rapid conversion of spoil banks to marsh habitat, decreased tidal interchange and increased shallow water habitat with submerged and emergent vegetation.

**Other:** This project would test the efficacy of this relatively cost-effective means of offsetting prior oil and gas injury.

## 20b. Sub-Basin Project: Breton Basin – MRGO Ecosystem Restoration

**Proposed Restoration Project:** Recovery projects restore system function through pulsed sediment diversion and point of injury restoration is included for barrier islands and back-bay colonial bird nesting islands, marsh creation and oyster reef habitat restoration. Some of the project components implement the multi-component Mississippi River Gulf Outlet (MRGO) Ecosystem Restoration Plan, which is designed to ameliorate and reverse some of the damage done to the marshes of Orleans and St. Bernard parishes as a consequence of the dredging of the MRGO and failure to maintain its channel dimensions. These areas received heavy oiling on their seaward flanks. Total cost is estimated at \$100 million.

**Project Components in addition to projects discussed in section 20 (above):**

1) **Biloxi Marsh Shoreline Protection Engineered Oyster Reef (Living Shoreline) and Rock Revetment**

The proposal is to armor up to 30 miles of the eroding Biloxi Marsh interface with Chandeleur Sound and Lake Borgne. Shoreline sections should be chosen based on rate of retreat, likelihood of breakthrough into interior bays and habitat suitability. Wherever possible, living reef structures should be used in place of or in combination with rock. Shoreline armoring with artificial oyster reefs provides not only a substrate to which oysters can attach, grow and reproduce, but also a vertical structure that attenuates wave energy. The vertical profile of these reefs mimics that of many of

Louisiana's natural reefs prior to their being heavily fished and reduced to nearly two-dimensional structures.

**Likely Implementing Entity or Partnership:** As appropriate.

**Location of Project:** Breton Sound to Lake Borgne, La.

**Cost Estimate:** \$30 million

**Timeframe:** 1–2 years

**Link to Injury:** The Biloxi Marshes received direct oiling from the spill.

**Benefits and Rationale:** Retreating marsh and shell reef shoreline would be stabilized, offsetting oil damage and prolonging the life of this vital estuarine habitat while systemic deltaic process restoration is designed and implemented.

**Other:** This project would create living oyster reef shoreline, with enhanced benefits to wildlife and estuarine organisms. This is a part of the MRGO Ecosystem Restoration Plan.

## 2) **Breton NWR – Chandeleur Islands Restoration**

This project will use pipeline delivery of sediment to continue restoration of the main island and build on work already completed at the north end. Specific NRDA-related add-ons to this project might include adding pumped material to shoals at Curlew, Gosier or East Breton to speed up reemergence of critical colonial bird nesting islands.

**Likely Implementing Entity or Partnership:** As appropriate

**Location of Project:** Breton NWR, La.

**Cost Estimate:** \$70 million

**Timeframe:** 1–2 years

**Link to Injury:** The islands received direct oiling from the spill, as did many of the organisms that nest or otherwise depend on the islands.

**Benefits and Rationale:** The islands had been severely compromised by recent hurricanes and were slowly recovering when the spill hit. Chandeleur and Breton islands are critical habitat for nesting birds and wintering piping plovers and provide protection to submerged aquatic vegetation behind the islands, which is vital nursery grounds for various estuarine organisms, Kemp's ridley sea turtles and wintering diving ducks.

**Other:** Breton is the second-oldest refuge in the NWR system has supported the largest nesting colonies of royal and sandwich terns in the world.

## 20c. Sub-Basin Project: Terrebonne Basin Recovery

**Proposed Restoration Project:** Project components focus on restoration of system function through re-introduction of Atchafalaya River water and sediment and restoration of injured resources – nesting colonial waterbirds and barrier islands and marshes. All will contribute to the broader LCA Terrebonne Basin Barrier Shoreline Project. Total cost is estimated at \$30 million.



**Project Components in addition to projects summarized in section 20 (above):**

**1) Raccoon Island Restoration and Protection**

Raccoon Island currently supports the largest colonial nesting bird colony in Louisiana. This project proposes to extend the life of the barrier island and create additional habitat, including dune and back barrier marsh.

**Likely Implementing Entity or Partnership:** As appropriate

**Location of Project:** Terrebonne Bay, La.

**Cost Estimate:** \$30 million

**Timeframe:** 1–2 years

**Link to Injury:** The island received direct oiling from the spill, as did many of the organisms that nest or otherwise depend on the island.

**Benefits and Rationale:** The island had been severely compromised by recent hurricanes and was slowly recovering when the spill hit. The island is critical habitat for nesting birds and wintering piping plovers.

**Other:** This is a component of the LCA Terrebonne Basin Barrier Shoreline Project, authorized by Congress. The goal of the project is to decrease the continuing degradation and deterioration of the Isles Dernieres (Raccoon Island, Whiskey Island, Trinity Island, East Island and Wine Island) and Timbalier Islands (Timbalier Island and East Timbalier Island) and to maintain the integrity of the shoreline between Point au Fer and Lake Pelto.

## **20d. Sub-Basin Project: Bird's-Foot Delta Recovery**

Bird's-Foot Delta is not sustainable in the face of massive subsidence. Diversion projects upstream of the Bird's-Foot (see first section of Louisiana projects) is expected to create freshwater delta habitat of comparable extent and quality. In the meantime, the Bird's-Foot provides vital habitat for wintering ducks and geese and a host of essential freshwater ecosystem services. The following project components contribute to that objective.

**Proposed Restoration Project: Pass a Loutre Dredging, Beneficial Use and Crevasse Opening**

The project would reopen Pass a Loutre to flow by dredging the channel, beneficially placing the sediments in Delta Refuge and Pass a Loutre WMA, and opening crevasses into open areas on either bank.

**Likely Implementing Entity or Partnership:** DOI-USFWS

**Location of Project:** Louisiana Delta NWR and Pass a Loutre WMA, La.

**Cost Estimate:** \$35 million

**Timeframe:** 1–2 years

**Link to Injury:** The NWR and WMA received direct oiling from the spill.

**Benefits and Rationale:** The Mississippi River Bird's-Foot Delta is the largest area of deltaic marsh on the Gulf of Mexico and is vital habitat to millions of ducks, herons, egrets, ibis, spoonbills, pelicans and migratory shorebirds. Shoaling of the main pass feeding the two large delta lobes encompassed by the refuge and management area has cut them off from vital sediment supplies, leading to shrinking habitat. Oil affected many of the marshes on the flanks of the lobes. The project would restore the movement of sediment into the rapidly subsiding sub-delta lobes and crevasse splays.

**Other:** The project should be contingent on a formal agreement between OCPR and the U.S. Army Corps of Engineers to discontinue the practice of enforced shoaling of Pass a Loutre by dumping of hopper dredges into the channel.

## 21. Freshwater Bayou Belle Isle Canal to Lock

**Proposed Restoration Project:** This project would stabilize the bankline of the area from Belle Isle to Freshwater Bayou Lock.

**Likely Implementing Entity or Partnership:** OCPR, Louisiana Department of Wildlife and Fisheries (LDWF), NOAA, DOI, other groups with appropriate resources

**Location of Project:** Freshwater Bayou, La.

**Cost Estimate:** \$38 million with 25 percent contingency built in

**Timeframe:** TBD

**Link to Injury:** The project focuses on coastal and estuarine habitats, including wetlands and marshes and a variety of species dependent on those habitats.

**Benefits and Rationale:** The project would prevent loss of 529 acres from direct shoreline erosion of intermediate emergent marsh by stabilization of the bankline of Freshwater Bayou, which will protect an additional 4,915 acres from future loss. The state of Louisiana has identified the Freshwater Bayou navigation channel as one of the three most detrimental navigation channels in Louisiana, due to breaches in the banks that allow deterioration of interior marshes.

Goals of this project include improving local hydrology, halting bank erosion, reducing shoreline erosion and protecting interior marshes from erosion.

## 22. State Wildlife Chenier and Marsh Creation

**Proposed Restoration Project:** Shield Cutoff Bayou to reestablish the peninsula and maintain the shoreline diversion between North Lake and Vermilion Bay.

**Likely Implementing Entity or Partnership:** OCPR, LDWF, NOAA, DOI, other groups with appropriate resources

**Location of Project:** Vermillion Parish, La.

**Cost Estimate:** \$14 million

**Timeframe:** TBD

**Link to Injury:** The link to injury is indirect; the project provides new and enhanced marsh for use by multiple native species and migratory birds.

**Benefits and Rationale:** The project will reduce shoreline erosion, protect approximately 43 acres of marsh from direct loss and create approximately 250 new acres of wetlands.

## 23. Louisiana Oyster Reef Restoration

**Proposed Restoration Project:** The Nature Conservancy has proposed to create 70 miles of oyster reefs using living shoreline techniques in Cameron, Terrebonne and St. Bernard parishes, La. Approximately 85 percent of the world's natural oyster reefs have been lost, while the remaining natural reefs are considered the most imperiled marine habitat on earth. Although oyster reefs in the Gulf of Mexico are characterized as being in "fair" condition (50 to 89 percent lost), the loss of ecosystem services has nonetheless been significant. Complete elimination of oyster reefs, or reduction of height and structural integrity of remaining oyster reefs, has contributed to increased wave energy and shoreline loss in many of Louisiana's productive bays. Additionally, the loss of structurally complex oyster reefs has significantly reduced available habitat used for foraging and refuge of a number of recreationally and commercially important fish and invertebrate species. This living shoreline project will create 70 miles of substrate upon which oyster larvae can attach, grow and reproduce. These reefs will be created in three locations: Rabbit Island in southern Calcasieu Lake, the site of one of the nation's largest waterbird nesting colonies; the eroding land bridge at Caillou Lake; and the Biloxi Marshes in St. Bernard Parish. These living shoreline projects apply natural principles and construction elements that create habitat and provide other services important for estuarine functioning. They provide substrate for oyster larvae to settle and colonize, creating structural and foraging habitat for economically important estuarine fishes, vertebrates and invertebrates. Other benefits include increased light penetration for seagrass and decreased wave energy and shoreline erosion.

In Louisiana, The Nature Conservancy has installed 2 miles of living shorelines and is currently building an additional 2 miles along coastal shoreline as part of three proof-of-concept projects. These projects, located in Vermilion and Barataria bays and the Biloxi Marshes, began in 2010 with the goals of demonstrating oyster reef viability, coastline protection and accretion, fisheries response and cost effectiveness. These projects are rigorously monitored with a standard protocol that allows for cross-project comparison. These constructed living shorelines are growing oysters and reducing wave energy reaching the shoreline; initial observations indicate that sediment is beginning to accrete between the reefs and shoreline. The requested funding would allow for construction of 70 additional miles of living shorelines, which would enhance estuarine productivity and protect hundreds of acres of coastal marshes. Given that we will be using proven technologies and contractors have significant unused capacity to take on projects of this scale, actual deployment of reef structures could begin within six months of notification of funding. Existing reef monitoring programs could be expanded to include a subset of reefs constructed through this funding.

**Likely Implementing Entity or Partnership:** LDWF, NOAA or both

**Location of Project:** Cameron, Terrebonne and St. Bernard parishes, La.

**Cost Estimate:** \$70 million

**Link to Injury:** Consistent with Section 1006 of the Oil Pollution Act, this project will achieve the following:

- Contribute to making the environment and the public whole by constructing and installing 70 miles of oyster reef. The Louisiana oyster reef restoration project seeks to place engineered oyster reef structures at strategically located sites along Louisiana’s coastline.
- Address impacts of the *Deepwater Horizon* oil spill on oyster reefs and associated ecosystem services, including sustainable harvest; fish production; water filtration; nitrogen removal; protection of shorelines and marshland; nursery habitat for commercially and recreationally important fishes and invertebrate species; and food sources for a variety of species, including coastal birds.
- Contribute to meeting Louisiana and Gulfwide oyster reef restoration priorities while protecting areas of vulnerable coastline.
- Apply recently deployed technologies to create living shorelines – proven to protect eroding coastal habitats and cost effective when compared with traditional solutions involving rock riprap

**Benefit and Rationale:** Oyster reefs were one of the nearshore marine resources most affected by the spill. This project proposes to significantly increase the amount of oyster reef habitat while simultaneously providing important marsh and fisheries benefits. The Calcasieu Lake portion will protect Rabbit Island, which is owned by the state of Louisiana and supports some of the largest nesting colonies of herons, egrets, ibis, spoonbills, gulls, terns and pelicans in the Gulf of Mexico. The Caillou Lake portion will protect a land bridge that separates the lake from the open Gulf. The lake is home to one of Louisiana’s most productive public seed grounds for oysters; if the land bridge is lost, the subsequent increase in the lake’s salinity will negatively impact the production of those oysters. The Biloxi Marsh portion is proposed as a significant expansion of the Conservancy’s existing reef restoration project and will protect strategically important coastal islands that serve as a first line of defense for interior marshes in St. Bernard Parish.

**Other:** Current living shorelines projects led by the Conservancy are supported by the city of Grand Isle; Vermilion, Jefferson and St. Bernard parishes; LDWF; Louisiana State University AgCenter; the National Audubon Society; NFWF; U.S. Geological Survey; and NOAA. These partners are either funders of the projects, participants in their success or beneficiaries of the success of the projects.

Construction of living shorelines is labor intensive, a trait that provides significant potential to further develop Louisiana’s Green Jobs industry. As an example, the Conservancy’s Grand Isle and Biloxi Marsh reef project has already sustained or created 71 jobs – and the project is only about one-third completed. This particular project was funded by an ARRA grant and is ultimately intended to provide nearly 62,000 hours of employment.

## TEXAS

### 24. **Sundown Island**

**Proposed Restoration Project:** The project would build an erosion control structure using dredged spoil to minimize effects of erosion on Sundown Island, thus improving and enhancing the island’s footprint, maintaining it as a vital nesting site for colonial birds and slowing the current erosion rate.

**Likely Implementing Entity or Partnership:** State of Texas, NOAA, DOI, others with resources to implement the project

**Location of Project:** Sundown Island, Matagora Bay area, Texas

**Cost Estimate:** \$15 million

**Timeframe:** Approval and construction: 1–3 years; implementation: TBD

**Link to Injury:** The link to injury is indirect; the project increases the footprint of the barrier island, providing habitat improvements for vital coastal nesting bird populations.

**Benefits and Rationale:** Barrier islands are the major nesting sites for most of the gulls, terns, skimmers, pelicans and several other birds that breed around the Gulf of Mexico. The shallow waters surrounding these islands support distinctive ecosystems and sustain fish of economic value; in addition, the islands are important storm barriers. They are extremely vulnerable to damage and loss from natural causes such as hurricanes as well as navigation and other channeling. Rising sea level makes long-term planning for replenishment and creation of additional barrier islands an important priority for preserving the coastal avifauna.

Based on the National Audubon Society's Survey of Important Bird Areas, the most urgent priority for barrier island intervention in Texas is Sundown Island, in the Matagorda Bay system. In the 1960s the U.S. Army Corps of Engineers created this 200-acre island using sand spoil from dredging the Matagorda ship channel outside of Port O'Connor. In 2010, the island was used by an estimated 14,233 pairs of 16 species, including many of conservation concern (e.g., gull-billed, royal, Forster's and sandwich terns; black skimmers; reddish egrets; and roseate spoonbills).

Today it is only 64 acres – and the rate of loss grows exponentially. Beginning in 2007, Sundown lost its source of supplemental dredge spoil material because the Corps of Engineers decided to realign the Intracoastal Waterway.

## 25. Texas Chenier Plain Refuge Complex Expansion and Protection

**Proposed Restoration Project:** In May 2008, the USFWS completed its final recommendation to expand the boundary of the Texas Chenier Plain Refuge Complex by 64,260 acres, bringing the total allowed acreage within the complex administrative boundary to 169,928 acres. The refuge complex consists of four NWRs – Anahuac, McFaddin, Texas Point and Moody – located along the Upper Gulf Coast of Texas within the East Galveston Bay and Sabine Lake watersheds. The expansion of the refuge complex is a high priority for the USFWS to support the wide diversity of fresh- and saltwater habitats and the hundreds of species of birds, fish, shellfish and endangered and threatened species that use these areas.

**Likely Implementing Entity or Partnership:** DOI USFWS. The Conservation Fund will work with USFWS to identify and acquire properties that are the highest priorities of USFWS, based on those lands identified in the final environmental impact statement for refuge expansion. Upon acquisition, the properties would be conveyed to USFWS to become part of the refuge complex. Other partners in the proposed project are the Texas General Land Office and Houston Audubon Society.

**Location of Project:** The refuge complex consists of four NWRs: Anahuac, McFaddin, Texas Point and Moody, located along Upper Gulf Coast of Texas (in Galveston, Chambers and Jefferson counties).

**Watershed or Basin:** East Galveston Bay and Sabine Lake, Texas

**Affected Area (acres):** 200,000

**Cost Estimate:** \$90 million

**Timeframe:** Time to implementation: 7–12 months; time to completion: 1–5 years. Project planning and design are in progress and the project is included in the Chenier Plain Coastal Refuge Complex Expansion Plan and designated as a Shorebird Site of International Importance.

**Link to Injury:** The project focuses on coastal and estuarine ecosystems, fresh- and saltwater habitat and shore birds and sea birds. Expansion of the refuge complex would provide protected fresh- and saltwater habitat for the species that were affected and injured by oil contamination in the Gulf. In addition, these habitats sustain a multitude of commercially important fish and shellfish species that were affected elsewhere in the Gulf and thus may contribute to a Gulfwide economic and environmental recovery.

**Benefits and Rationale:** The Texas Chenier Plain Refuge Complex currently includes more than 105,000 acres of public land managed by USFWS and encompasses an area unique in terms of the diversity of its habitats and the wildlife it supports. These areas host a multitude of plant, invertebrate and vertebrate species, including more than 300 bird species, 75 species of freshwater fish and 400 species of salt- and brackish-water fish and shellfish. The complex provides habitat for 17 state or federally listed threatened or endangered species, ranging from five species of sea turtle to piping plover to American swallow-tailed kite. Texas' Upper Gulf Coast is nationally and internationally recognized for its abundance and diversity of birds, in particular shorebirds. The Texas Chenier Plain region's coastal wetlands provide wintering, migration, nesting and brood-rearing habitat for waterfowl, shorebirds, marsh and wading birds and other wetland-dependent migratory birds, as well as habitat for other native fish and wildlife. Specifically, threatened and endangered species utilizing refuge complex habitats include the brown pelican and piping plover, among the most vulnerable bird species combating the effects of the oil spill.

## 26. Half Moon Reef Oyster Restoration, Phase 3

**Proposed Restoration Project:** The Half Moon Reef project will assist in the recovery of oyster reef habitat in the Gulf of Mexico while significantly contributing to much-needed applied restoration science. More specifically, this project will create a three-dimensional subtidal reef over a 30-acre area located within the historical footprint of the Half Moon Reef in Matagorda Bay, complementing an ongoing 40-acre restoration effort (phases 1 and 2, currently being undertaken with public and private funding). All previous planning and environmental assessment work and interagency collaborative effort can be easily exported and leveraged for additional phases of the project. With NRDA funding, the total project scope through all three phases could be close to 70 acres of restoration, representing nearly 18 percent of the original extent of Half Moon Reef at the turn of the 20th century.

**Likely Implementing Entity or Partnership:** Texas Parks and Wildlife Department, DOI USFWS, NOAA or a combination of these agencies

**Location of Project:** Matagorda Bay, Matagorda County, Texas

**Cost Estimate:** \$3.8 million over 2 years; current investments: \$1.6 million (phase 1) and \$3.8 million (phase 2)

**Link to Injury:** Consistent with Section 1006 of the Oil Pollution Act, this project will achieve the following:

- Contribute to making the environment and the public whole by restoring a once historically productive and biologically diverse reef at Half Moon Reef in Matagorda Bay, Texas

- Address impacts of the *Deepwater Horizon* oil spill on oyster reefs and associated ecosystem services, including sustainable harvest; fish production; water filtration; nitrogen removal; protection of shorelines and marshland; nursery habitat for commercially and recreationally important fishes and invertebrate species; and food sources for a variety of species, including coastal birds.
- Apply in a consistent manner to the Gulf Recovery Plan of the Gulf Coast Ecosystem Restoration Task Force in restoring valuable and viable oyster reef habitats in the Gulf coast.

**Benefit and Rationale:** The project will result in direct restoration of 30 acres of subtidal oyster reef and its linked marine biodiversity that has been degraded or lost due to the BP incident. The constructed project will create a vertical relief and associated segmented reef design currently nonexistent in most of the Gulf of Mexico. This particular restoration design approach will greatly enhance the biodiversity and productivity of essential fish habitat and contribute to the overall fishery resources in the nearby bay and offshore waters through marine species recruitment. It is also anticipated that light attenuation within the water column near the reef will improve significantly leading to adjacent colonization and increased production of submerged aquatic vegetation (e.g., seagrasses) and afterwards further stabilize unconsolidated bay-bottom sediments, leading to reduced turbidity in the water column. Finally, reefs are known to contribute a host of ecosystem benefits that include improved water quality, increased recreational fishing opportunities and abatement of shoreline erosion and wave energy.

**Other:** This project has been previously endorsed or supported by several conservation partners, including USFWS, Texas Coastal Program; U.S. Army Corps of Engineers; Texas Water Development Board; Texas Parks and Wildlife Department; NOAA's NMFS; Texas A&M University–Corpus Christi; Texas General Land Office; Coastal Conservation Association; Matagorda County Commissioners; Port of Bay City Authority; and Port of Palacios. Private funding for the phase 1 project was provided by several corporations and foundations that endorse the merits of restoring Half Moon Reef.

The design and construction phases of this project are expected to take two years and involve 15 people on a full- or part-time basis. Recreational fisheries and nutrient cycling–related services provided by oyster reef habitat deliver an estimated value of \$1,194 per hectare a year to citizens. In the long term, this project may deliver as much as \$7,248 per acre a year to citizens.

## 27. Shamrock Island Restoration Project, Phase 2

**Proposed Restoration Project:** The Nature Conservancy has proposed to create and protect 52.66 acres of seagrasses, 4.41 acres of intertidal salt marsh, 13.65 acres of mangroves and vegetated tidal flats, 10.44 acres of upland rookery habitat and 1.16 acres of subtidal reefs to protect colonial waterbird nesting habitat on Shamrock Island Preserve. The Conservancy's phase 2 restoration for the island has proposed a four-pronged approach: (1) The Breakwater Project would complete an earlier project that constructed 11 rock breakwaters to protect the island's west side from erosion. Another 14 breakwaters are needed to fill in the gaps between the existing breakwaters. These rock buffers not only reduce erosion but also allow shoal grass to grow again in the shallows between the rocks and the shore. Aerial photos have confirmed that shoal grass has returned to the areas currently protected by breakwaters. (2) The Feeder Beach Project would replenish the sand along beaches on the island's west and south sides. In brief, workers would dredge sand from the bay bottom and pipe it to a "feeder beach" on the island's west side. The prevailing currents, over time, would move some of this sand from the feeder beach to restore beach habitat around the island's south end. This strategy gives a boost to the natural movement of sand in this island ecosystem. These beaches provide prime nesting areas for royal terns, brown pelicans, black skimmers and other birds. (3) The Breach Project would repair a ridge on the island's west side where the waves

have broken through. As sea water flows through the gap, it alters the salinity of island lagoons that served as important feeding areas for certain bird species. The increased salinity changes the vegetation in and around these lagoons and the bird species that feed there, which in turn reduces the biological diversity of this microenvironment. One of Shamrock Island's greatest assets – and a key reason it supports such a massive array of birds – is the diversity of its topography, landscape and vegetation. (4) A monitoring protocol will be established and performed through contractual arrangement with a qualifying biological consulting firm to assess long-term project benefits and assist with adaptive management strategies.

**Likely Implementing Entity or Partnership:** Texas Parks and Wildlife Department, DOI USFWS, NOAA or a combination of these agencies

**Location of Project:** Nueces County, Texas

**Cost Estimate:** \$3 million over 2 years; current investment \$2.5 million (phase 1).

**Link to Injury:** Consistent with Section 1006 of the Oil Pollution Act, this project will achieve the following:

- Contribute to making the environment and the public whole by creating and protecting 52 acres of seagrasses. This will stabilize beach shorelines, protect both high marsh and low marsh habitats, enhance and protect existing mangroves and oyster reefs and otherwise preserve the critical ecological functioning of an important habitat for colonial waterbirds nesting in the western Gulf of Mexico. This project seeks to construct an additional 14 permanent rock breakwaters around Shamrock Island. The project's design, engineering and purpose have already received public scrutiny through a public notice process, resulting in U.S. Army Corps of Engineers approval.
- Address the delivery of public goods and services provided by healthy marine and nesting island habitats in the Gulf bays and estuaries that were damaged by the oil spill in 2010 in other parts of the Gulf of Mexico
- Address impacts of the *Deepwater Horizon* oil spill on oyster reefs and associated ecosystem services, including sustainable harvest; fish production; water filtration; nitrogen removal; protection of shorelines and marshland; nursery habitat for commercially and recreationally important fishes and invertebrate species; and food sources for a variety of species, including Texas coastal birds
- Apply in a consistent manner the best conservation and restoration science developed by both The Nature Conservancy and other restoration practitioners to implement critically important estuarine restoration projects in the coastal zone. The Nature Conservancy uses this information for project site selection and for employing proven restoration practices.

**Benefit and Rationale:** The project will result in direct restoration of important coastal and marine habitats such as oyster reefs, mangroves, intertidal salt marshes, vegetated tidal flats, bird nesting uplands, seagrasses and beach nesting sites. This particular multipronged restoration approach will greatly enhance the biodiversity and productivity of critically important essential fish habitat and contribute to the overall fishery resources in the nearby bay and offshore waters through marine species recruitment. Improved water quality, increased recreational fishing opportunities and other ecosystem benefits are anticipated with a completed project. It is also anticipated that light attenuation within the water column near Shamrock Island will improve significantly, leading to colonization and increased production of submerged aquatic vegetation (e.g., seagrasses) and afterwards further stabilize unconsolidated bay-bottom sediments, leading to reduced turbidity in the water column.



**Other:** Conservation partners include USFWS, Texas Coastal Program; U.S. Army Corps of Engineers; Texas Parks and Wildlife Department; NOAA's NMFS; Texas A&M University–Corpus Christi; University of Texas Marine Science Institute; Texas General Land Office; and Nueces County Commissioners.

It is expected that 34 people will be involved full or part time in developing and constructing this project. While the bulk of employment opportunities will be during the construction phases, other employment will be provided to environmental and engineering staff, restoration specialists, grants specialists, natural resource specialists and administrative and legal assistants. In addition, over 12,000 jobs are directly related to tourism, making this sector the second largest private employer in the area. The total economic impact of tourism is estimated to be \$1.1 billion, with spending by nature visitors accounting for \$337 million annually.

## **GULFWIDE AND MARINE**

### **28. Sea Turtle Nesting Beach Conservation in Texas**

**Proposed Restoration Project:** Five species of sea turtles are found in the Gulf of Mexico, all of which are either endangered or threatened. The most endangered species of sea turtle in the world is the Kemp's ridley (*Lepidochelys kempii*), which is also the most common species found in the waters off of Texas. Protection and management of key turtle nesting grounds along the Texas coast will be an important strategy in sustaining viable populations of sea turtles. This project proposes to use the recovery actions identified in the second revision of the Kemp's Ridley Sea Turtle Plan in two ways (1) to actively protect known nesting habitat and the waters adjacent to the nesting beach and (2) to eliminate mortality from incidental catch in commercial shrimping through use of turtle excluder devices. These actions will help to attain a goal population of at least 10,000 females nesting in a season (in 2003, 7,000 females were counted along the Gulf). Funding for this project is required for monitoring of turtle nesting, protection of eggs, care and re-release of hatchlings and rehabilitation and care of injured sea turtles.

**Likely Implementing Entity or Partnership:** Texas Parks and Wildlife Department, NOAA or both, in partnership with The Nature Conservancy, Texas A&M University–Galveston and the Houston Zoo

**Location of Project:** 10 major nesting beaches along the 370 miles of Texas coast

**Affected Area (acres):** 200,000

**Cost Estimate:** \$5 million

**Timeframe:** Time to implementation: 7–12 months; time to completion: 1–5 years. Project planning and design are in progress and the project is included in NOAA-NMFS Recovery Plan of Kemp's Ridley Sea Turtle (and other recovery plans for Gulf sea turtles).

**Link to Injury:** All five of the endangered or threatened Gulf species of sea turtles were impacted by the oil spill. While it is not possible to ascertain the full injury to the types of sea turtle populations, evidence of injury is presented by the need to recover and rehabilitate oil-covered turtles and relocate turtle nesting sites and eggs to oil-free beaches. In addition, there has been an increase in the number of dead turtles found on Gulf beaches.

**Benefits and Rationale:** In Texas, the Sea Turtle Facility of NOAA's NMFS has played an important role in the conservation and recovery of the Kemp's ridley species through ongoing research,

science-based management actions and the support of international conservation efforts. This project will combine the expertise and experience of all of its partners to enhance protection and conservation of the endangered and threatened sea turtle populations that depend on the Texas coast for survival.

## 29. **BP *Deepwater Horizon* Oil Spill Restoration Evaluation and Monitoring Program**

**Proposed Restoration Project:** The project will establish a restoration, evaluation and monitoring program to achieve the following restoration science objectives: (1) evaluate the effectiveness of early restoration projects; (2) track the recovery of specific injured natural resources or lost or reduced services; and (3) report to the public on the status of injured resources, lost services and progress toward restoration.

**Likely Implementing Entity or Partnership:** NOAA's NMFS and DOI in cooperation with Gulf Coast state trustees

**Location of Project:** Gulfwide

**Cost Estimate:** TBD

**Timeframe:** Before first wave of restoration projects is implemented

**Link to Injury:** The project targets all injured resources and services. NRDA regulations state that final restoration plans should include a monitoring component so that the effectiveness of restoration measures implemented for injured natural resources and lost services can be evaluated. The ecosystem scale and multi-jurisdictional nature of the BP oil disaster necessitates a Gulfwide monitoring program that gathers, integrates and synthesizes information across geopolitical boundaries.

**Benefit and Rationale:** Government agencies developing the BP *Deepwater Horizon* restoration program on the public's behalf will need to track injury and recovery at the species level, engage in research and monitoring at the ecosystem scale, understand factors limiting recovery and evaluate the effectiveness of restoration measures. To this end, early restoration funds should be used to establish a restoration evaluation and monitoring program, which can be adapted as restoration needs change and transition into a longer-term program.

**Other:** There is precedent for funding monitoring activities before an oil spill restoration plan is final. Before a restoration plan was complete, the *Exxon Valdez* Oil Spill Trustee Council invested funds in tracking injury and recovery at the species level, as well as research and monitoring at the ecosystem scale, to identify restoration opportunities, understand factors limiting recovery and evaluate the effectiveness of restoration measures.

## 30. **Enhancements to Marine Recreational Fishing Surveys**

**Proposed Restoration Project:** The project will make enhancements to the marine private recreational fishing survey and the charter boat telephone survey to improve timeliness and spatial resolution of catch and fishing effort data for better management.

**Likely Implementing Entity or Partnership:** Marine Recreational Information Program of NMFS and Gulf States Marine Fisheries Commission

**Location of Project:** Gulfwide

**Cost Estimate:** TBD

**Timeframe:** TBD

**Link to Injury:** Private recreational anglers lost access to a considerable portion of federal and state waters in the northern Gulf that were closed to fishing during the BP oil disaster. Members of the public who hire charter boats to fish offshore also lost access because of the closures. Charter boats provide access to offshore fishery resources for members of the public who do not own vessels themselves. Therefore, the angling public must be compensated for lost access to fishing as a service.

**Benefit and Rationale:** Improving the private recreational and charter boat surveys in the Gulf of Mexico will help keep fishery resources healthy and available to anglers. Specifically, improving the timeliness and spatial resolution of catch and effort data can help fishery managers keep total catch within prescribed fishing limits and prevent the private recreational and charter boat sectors from exceeding their quotas and incurring penalties. For example, the primary method used by fishery managers to collect charter boat fishing effort, which helps track quota usage, is a telephone survey. Making enhancements to the telephone survey, such as increasing frequency and sample size, would result in more effective monitoring of fishing effort, improved management and possibly longer fishing seasons. Better data from enhanced charter boat telephone surveys would help fishery managers be more responsive and adaptive in their management of fishery species exposed to oil.

**Other:** This project could be compensatory in nature if a reduction in fishing that anglers experienced in 2010 due to oil-related fishery closures is offset in the future by extending fishing seasons made possible through better (more accurate and precise) data on fishing effort. For example, an enhanced charter boat telephone survey in the summer of 2010 increased the precision of catch and effort estimates and was thereby in part responsible for the fall reopening of the red snapper fishery after a summer closure.

## 31. **Electronic Video Monitoring of Fisheries in the Gulf of Mexico**

**Proposed Restoration Project:** The project will improve records of fish retained or discarded and of wildlife-vessel interactions by supporting an electronic video monitoring pilot project in commercial reef fish fisheries.

**Likely Implementing Entity or Partnership:** NOAA in partnership with Gulf of Mexico Reef Fish Shareholders Alliance

**Location of Project:** Fishing ports in Texas, Louisiana and Florida

**Cost Estimate:** \$1 million (for 40 vessels)

**Link to Injury:** Many finfish and wildlife species, such as sea turtles, were exposed to BP oil and the chemical dispersants used in the response effort. Fish populations and other marine wildlife affected by the disaster will need to be monitored closely in the years ahead for oil-related impacts.

**Benefit and Rationale:** Electronic video monitoring (EVM) can improve understanding of fishing-related impacts on the Gulf ecosystem, thereby improving management of fishery species. A secondary benefit of EVM is better documentation of bycatch. EVM uses cameras to record fish species retained or discarded and wildlife interactions in an unbiased, consistent manner. Better

capturing of both the number of fish caught commercially from the Gulf and the location of these catches can dramatically improve fishery stock assessments and the ability to successfully manage Gulf fisheries using the best available information. EVM can provide a more complete set of records of wildlife-vessel interactions and bycatch, which in turn can improve estimates of bycatch mortality and lead to strategies designed to reduce these interactions.

## 32. Bird-Friendly Lighting on Oil and Gas Platforms in the Gulf

**Proposed Restoration Project:** This project will replace white (tube) and orange (sodium high-pressure) lighting on oil and gas platforms with lights low in spectral red.

**Likely Implementing Entity or Partnership:** DOI USFWS in cooperation with industry

**Location of Projects:** Gulfwide

**Cost Estimate:** TBD

**Link to Injury:** Thousands of visibly oiled dead and live birds representing dozens of species were documented in the BP oil disaster impact area.

**Benefit and Rationale:** Bird species impacted by the BP oil disaster are also among those that are vulnerable to the lighting generated by oil and gas platforms. In particular, tubenoses (e.g., petrels, shearwaters) and migratory birds are susceptible to platform lighting and the mortalities that can result from direct collisions with those platforms. An estimated 200,000 bird collision deaths may occur each year in the Gulf due to changes in flying behavior influenced in part by platform lighting. Reducing bird-platform collisions by replacing existing lighting with bird-friendlier lighting could have an immediate effect in reducing mortalities and help the recovery of species affected by the oil disaster.

**Other:** Scientists believe that the sphere of light created by platform lighting effectively traps birds, resulting in nocturnal circulations and expenditure of energy that puts them at risk of collision with the platform or with each other. Scientists studying this phenomenon on platforms in the North Sea found that replacing lighting significantly reduced negative impacts on birds. The type of replacement lighting suitable for Gulf platforms should be independently confirmed.

## 33. Voluntary Pelagic Longline Vessel and Permit Buyback

**Proposed Restoration Project:** The project will establish a voluntary vessel, gear and permit buyback program for fishermen participating in the Gulf of Mexico pelagic longline fishery.

**Likely Implementing Entity or Partnership:** NOAA's National Marine Fishery Service

**Location of Project:** Gulfwide

**Cost Estimate:** TBD

**Timeframe:** TBD

**Link to Injury:** Bluefin tuna and sea turtles are among the many marine species exposed to or impacted by BP oil or chemical dispersants used to break up the oil. Bluefin tuna had recently

spawned when the oil disaster occurred, exposing fragile fish eggs and larvae to a mixture of oil and dispersants. Many visibly oiled live and dead sea turtles were also retrieved from the impact area.

**Benefits and Rationale:** Bluefin tuna, sea turtles and other marine species are also among those that are caught incidentally in the pelagic longline fishery. Therefore, allowing pelagic longline fishermen in the Gulf to exit the fishery through a buyback program would reduce pelagic longline fishing effort and bycatch of species affected by the oil disaster, thereby contributing to the recovery of impacted species. For example, a fleetwide buyback in the Gulf of Mexico could result in an estimated 423 fewer bluefin tuna mortalities annually based on historical data provided by NMFS.

**Other:** Many of the fishermen who may wish to participate in this project are members of the Vietnamese fishing community based in Louisiana; approximately two dozen fishermen have expressed active, positive interest in a buyback program.

### 34. Orphan Wells Removal in Coastal Louisiana Waters

**Proposed Restoration Project:** This project will plug or remove nonproducing oil and gas wells in Louisiana's coastal zone.

**Likely Implementing Entity or Partnership:** Louisiana Department of Natural Resources, NOAA's NMFS

**Location of Project:** Louisiana coast or waters

**Cost Estimate:** \$31 million

**Link to Injury:** Coastal and marine habitats such as oyster reefs, marshes, seagrasses, sargassum and intertidal areas, as well as the water column and associated fish, birds and wildlife, were affected by the BP oil disaster.

**Benefit and Rationale:** Plugging or removing the approximately 320 nonproducing oil and gas wells in coastal Louisiana, 225 of which are located in nearshore waters, would lower the risk of future oil spill occurrence and natural resource damage. Removing orphan wells would decrease the risk of future accidents and oil spills caused by vessel strikes, for example, as well as potential injuries to coastal and nearshore habitats and species that would result from such oil spills.

**Other:** The plugging and removal of orphan wells needs to be conducted in a manner that does not further degrade Louisiana's coastal habitats.

### 35. Kemp's Ridley Sea Turtle Restoration

**Proposed Restoration Project:** This project will locate and protect additional Kemp's ridley nests through enhanced nest detection and protection activities and construction of two base camps that would support this work.

**Likely Implementing Entity or Partnership:** Texas Parks and Wildlife

**Location of Project:** Texas, specifically at Padre Island National Seashore and along the upper Texas coast from Sargent Beach to Bolivar Peninsula

**Cost Estimate:** \$10 million

**Link to Injury:** The Kemp's ridley sea turtle was one of several sea turtles injured by the BP oil disaster, as evidenced through retrievals of oiled dead and live turtles.

**Benefit and Rationale:** This project would help restore the population of Kemp's ridley sea turtles. Kemp's ridley is the most endangered sea turtle species in the world and currently appears to be the sea turtle species most affected by the *Deepwater Horizon* oil disaster. The Kemp's ridley life cycle is tied more closely to the Gulf of Mexico than is that of any other sea turtle species. Gulf of Mexico waters provide important foraging and migratory habitat for this species. Some Kemp's ridley turtles likely never leave the Gulf of Mexico. Most adults occur in the Gulf of Mexico and virtually all reproduction occurs on Gulf beaches. This project would help protect Kemp's ridley sea turtles at nesting beaches and in the marine environment in the Gulf of Mexico and address high priorities in the Kemp's Ridley Sea Turtle Recovery Plan.

**Other:** A binational, multiagency program has been ongoing at Padre Island since 1978 to form a secondary nesting colony for this native species at this protected beach in the U.S. as a safeguard against extinction. In 2009, 117 Kemp's ridley nests were found at Padre Island National Seashore. Another 13 nests were detected along the upper Texas coast in 2009. The proposed project would build on these positive developments and contribute to Kemp's ridley recovery by locating and protecting additional nests.

### **36. Upgrades to the Electronic Logbook Program for the Offshore and Inshore Commercial Shrimp Fishery**

**Proposed Restoration Project:** This project will upgrade the electronic logbook (ELB) program to improve the precision of shrimp fishing effort and estimates of red snapper and sea turtle bycatch in the shrimp fishery. Specifically, the upgrades would include purchasing new ELB units and making program enhancements necessary to expand ELB coverage in both the offshore and inshore shrimp fleets.

**Likely Implementing Entity or Partnership:** NOAA's NMFS

**Location of Project:** Gulfwide

**Cost Estimate:** \$1 million to \$5 million

**Timeframe:** 6 months to 1 year to initiate

**Link to Injury:** In 2010, the estuarine and offshore waters on which shrimp species depend were oiled, offshore and nearshore shrimp fisheries were closed and visibly oiled sea turtles were collected alive and dead from the northern Gulf. Sharp declines in shrimp catch in southeast Louisiana in 2011 may be related to habitat damage or adult or post-larval mortality caused by exposure to BP oil or the chemical dispersants used to break up oil. In addition, red snapper with lesions and other signs of a compromised immune system have been documented in the oil spill impact area, though cause and effect are not yet established.

**Benefit and Rationale:** A simple ELB that records spatiotemporal fishing effort is in use by a portion of the federally permitted shrimp fleet. Researchers have found these devices to be a reliable method of estimating spatial fishing effort, sea turtle interactions and red snapper bycatch mortality in the Gulf offshore shrimp fishery. Upgrading ELBs and expanding coverage to offshore and inshore shrimp boats will generate additional data that can be used to help sea turtle and red snapper populations recover from oil spill impacts.

ELB data help identify sea turtle and shrimp fishery interaction hot spots, enabling managers to reduce these interactions and related sea turtle mortalities at a finer scale without broader management measures, such as fishery closures. Shrimp fishing effort data recorded by ELBs are also proxies for estimating red snapper bycatch mortality in the offshore shrimp fishery. Bycatch mortality estimates will help determine whether additional management measures are needed to facilitate recovery of red snapper populations.

The long-term effects of oil and chemical dispersants on shrimp species or their habitat remain unknown. Tracking the location and catch per unit of effort of shrimp can help scientists and fishery managers better understand trends in abundance and possible relationships between areas of low catch and oiled estuarine habitats.

### **37. Gulf of Mexico Ecosystem Assessment: The Role of and Possible Oil Spill Impacts on Menhaden as a Keystone Species**

**Proposed Restoration Project:** This multi-year, interdisciplinary research project would aim to clarify questions about the role of Gulf menhaden in the ecosystem and whether and how their population and ecosystem were affected by BP *Deepwater Horizon* oil. The resulting models and information could improve estimates of menhaden productivity and guide fisheries' management decisions that bear on recovery of menhaden from any oil-related injuries.

**Likely Implementing Entity or Partnership:** Many possible partners (e.g., federal and state agencies and commissions, marine research consortia)

**Location of Project:** Gulf of Mexico

**Cost Estimate:** TBD, but could be \$2 million per year or more

**Timeframe:** 5 years (based on a similar project in Alaska in the 1990s)

**Link to Injury:** Menhaden's offshore spawning and subsequent egg and larval drift into the estuaries in the northern Gulf coincided with the *Deepwater Horizon* oil disaster. Juvenile menhaden and oil would have been in the estuary at the same time. Therefore, it is likely that menhaden in one or more lifecycle stage were exposed to the oil or chemical dispersants. Brown pelican and other species whose diets include menhaden were also injured.

**Benefit and Rationale:** An ecosystem assessment is needed to better understand the role and productivity of menhaden in the Gulf of Mexico and to what extent *Deepwater Horizon* oil may affect the future health and ecological role of their population. Gulf menhaden are a significant part of the Gulf of Mexico's base food web. Menhaden eggs, larvae and young-of-the-year are a major forage source for many economically important finfish. Upwards of 95 percent of the brown pelican's diet can be Gulf menhaden. The revenue generated by this fishery is of great economic importance to the Gulf of Mexico, especially to Louisiana.

Recommendations made in an October 2011 stock assessment of Gulf menhaden provide an excellent starting point for the types of research needed for an ecosystem assessment. For example, the stock assessment recommends research to examine menhaden reproductive biology, predator-prey relations, genetics and natural mortality through tagging studies. These studies are important components of an ecosystem assessment.

**Other:** The *Exxon Valdez* oil spill injured Pacific herring and pink salmon in Prince William Sound and likely contributed to the long-term collapse of the herring population in that region. As a result, the Sound Ecosystem Assessment (SEA) project was designed to determine the root causes of population decline and elucidate the factors that drive the species' productivity. Between 1994 and 1999, the SEA program yielded an ecosystem-level understanding of factors influencing juvenile pink salmon and Pacific herring survival in Prince William Sound. Multiple models were developed that better explained the relationships between such elements as the environment, predation and the associated food webs.

### **38. Five-Year Increase in Gulf of Mexico Fishery Observer Coverage for Monitoring Marine Mammals, Sea Turtles and Bluefin Tuna**

**Proposed Restoration Project:** This project will temporarily increase vessel coverage for Gulf of Mexico shrimp trawl, shark gillnet and pelagic longline observer programs to quantify the extent to which marine mammal, sea turtle and bluefin tuna bycatch mortality is a source of stress on injured populations. Going forward, these data will shed light on whether bycatch mortality is limiting recovery from injury related to the BP oil disaster and help managers identify restoration measures that can be implemented to shorten recovery times.

**Location of Project:** Gulfwide

**Likely Implementing Entity or Partnership:** NOAA's NMFS

**Cost Estimate:** \$6.5 million per year (based on amount allocated to southeast regional observer program in fiscal year 2009)

**Timeframe:** Time to implementation: less than 1 year; duration: minimum of 5 years

**Link to Injury:** A variety of marine mammal and sea turtle species and bluefin tuna were exposed to BP oil from the *Deepwater Horizon* disaster; visibly oiled dead and live marine mammals of at least four species and sea turtles of four species were recovered. About 5 percent of bluefin tuna spawning habitat in the Gulf overlapped with the known distribution of *Deepwater Horizon* oil, increasing risk of injury to eggs and larvae. Since marine mammals, sea turtles and bluefin tuna are long-lived, additional impacts may become evident over a period of many years.

**Benefit and Rationale:** A temporary but significant increase in observer coverage in the shrimp trawl, shark gillnet and pelagic longline fisheries is needed to improve estimates of marine mammal, sea turtle and bluefin tuna bycatch rates and mortality in these fisheries. Additional observer coverage and the resulting observational data will help scientists determine to what extent bycatch is a source of mortality and stress that limits recovery from *Deepwater Horizon* oil spill injuries.

Additional biological samples gathered through observers could reveal lingering sublethal injuries resulting from oil exposure and help scientists detect impacts on marine mammal, sea turtle or bluefin tuna populations still recovering from the *Deepwater Horizon* oil disaster. In fishery observer programs around the country, biological samples (organs, tissue, etc.) are collected from marine mammals and sea turtles incidentally taken in commercial fisheries. An increase in observer coverage in the Gulf would likely mean an increase in the number of samples available for analysis of hydrocarbon and chemical dispersant signatures. These data would help scientists track effects at the genetic and population level and provide valuable information to guide restoration efforts.

Together, bycatch and biological data will help inform additional restoration measures needed to help the recovery of affected species. A Gulf of Mexico fisheries observer program already exists,



providing the organizational structure for additional monitoring of fishery interactions with marine mammals and sea turtles.

### **39. Addressing Marine Debris to Expedite Recovery Along the Gulf Coast**

**Proposed Restoration Project:** The significant and long-term negative impacts along the Gulf Coast resulting from the *Deepwater Horizon* oil spill will require a suite of restoration projects. In addition to physical marsh restoration and other activities to restore resources, the entire Gulf region will significantly benefit from a targeted, sustained outreach and education campaign to improve the health of impacted resources.

Specifically, this project will effectively coordinate and execute a two-year, intense outreach and education campaign that will result in lasting changes after the project is complete. Hosted at the NOAA Disaster Response Center in Mobile, Ala., and coordinated as a NOAA partnership project with the NOAA Marine Debris Program as lead coordinator, this project will engage all five Gulf states, maintain and improve partnerships with state and local organizations and strengthen public engagement across the Gulf. This project is specifically targeted to involve and educate Gulf Coast communities in how marine mammals, sea turtles and habitat will all directly benefit from debris prevention and removal. The project will also identify targeted areas for debris removal that will have the most impact toward improving the ecological health of the Gulf.

**Likely Implementing Entity or Partnership:** NOAA, Sea Grant

**Location of Project:** Gulfwide

**Watershed or Basin:** Gulfwide

**Cost Estimate:** \$10 million

**Timeframe:** Time to implementation: 0–3 months; time to completion: 1–5 years

**Link to Injury:** The project addresses marine mammals, sea turtles and Gulfwide habitat.

**Benefits and Rationale:** This type of restoration project, conducted as part of NRDA in the past, will reduce future injury to protected species – both marine mammals and sea turtles – and their habitats through reduction of existing marine debris as well as prevention of future introduction of hazards. By averting preventable future injuries, this project will enhance the capacity for species and habitat recovery and shorten the time from impact to recovery. Enhancing nearshore and shoreline habitats through reducing impacts of marine debris will aid in the long-term, sustainable recovery of the Gulf Coast at an accelerated rate.

**Other:** Key contacts associated with this project already have strong professional working relationships across the region. As has been successfully demonstrated in previous projects in the Gulf of Mexico, Sea Grant extension agents have a unique capacity to strengthen community involvement – including that of selected communities where English is not the first language – and broaden awareness through effective beach cleanups, fish rodeos and the like. This project will incorporate powerful public service announcements, print materials and technology to effectively raise awareness across the Gulf states that a sustained outreach campaign focused on debris prevention and removal will benefit livelihoods in the entire region in both the short and long terms.

## Project Matrix

### Notes

- 1) Projects are assigned to one or more rows that best capture the core rationale and secondary beneficiaries of the project.
- 2) Every restoration project is tallied in the restoration focal area summaries (p. 56).
- 3) In addition, each project is placed in at least one additional column: either Gulfwide (only a few) or one of the individual states.

Restoration Focal Area														
	Location	Gulfwide		Texas		Louisiana		Mississippi		Alabama		Florida		
	Impact	Primary	Secondary	Primary	Secondary	Primary	Secondary	Primary	Secondary	Primary	Secondary	Primary	Secondary	
Impacted Resource and Ecosystem Services	Gulf Ecosystem	29, 31, 33, 37, 38, 39		24, 25, 26, 27		20a1, 20a2, 20a3, 20a4, 20b1, 20b2, 20c1, 20d, 21, 22, 23, 34		14, 15, 16, 17, 18, 19		10, 11, 12, 13, 14		1, 2, 3, 4, 5, 6, 7, 8, 9		
	Air		29								10			
	Water Column & Sediment		29		26, 27		34			17, 19	12	10, 14	1, 7, 8	3, 4
	Shorelines/beaches		29		24, 27		20a1, 20a2, 20a3, 20a4, 20b1, 20b2, 20c1, 20d, 23		15, 16, 17, 19	18	12		3, 6	9
	Shorelines/wetlands		29		25, 26, 27	24	20a1, 20a2, 20a3, 20a4, 20b1, 20b2, 20c1, 20d, 21, 22, 23		15, 16, 17, 14, 18, 19		10, 11, 12, 16		1, 2, 3, 4, 6, 7, 8	

Restoration Focal Area													
Impacted Resource and Ecosystem Services	Location	Gulfwide		Texas		Louisiana		Mississippi		Alabama		Florida	
	Impact	Primary	Secondary	Primary	Secondary	Primary	Secondary	Primary	Secondary	Primary	Secondary	Primary	Secondary
	Sea grasses		29	25, 27	26		20b2, 34			10, 11,	12, 14	5	8
	Sargassum		29, 34										
	Nearshore Fish	30, 31	29, 36, 37	25	26, 27		20a1, 20a2, 20a3, 20a4, 20b1, 20b2, 20c1, 20d, 21, 22, 23, 34		15, 16, 17, 18, 19	13	10, 11, 12, 14		1, 3, 4, 6, 7, 8, 9
	Offshore Fish	30, 31, 33, 38	29, 36, 37										
	Oysters		29	26, 27		20b1, 23	20a2, 34	16, 14, 18, 19	15, 16	10	12, 14	6	1, 2, 3, 7, 8
	Shrimp	36, 38	29, 34		25, 26, 27		20a1, 20a2, 20a3, 20a4, 20b1, 20b2, 20c1, 20d, 21, 22, 23, 34		15, 16, 17, 18, 19		10, 11, 12, 14		1, 8
	Crabs		29, 34		25, 26, 27		20a1, 20a2, 20a3, 20a4, 20b1, 20b2, 20c1, 20d, 21, 22, 23, 34		15, 16, 17, 18, 19		10, 11, 12, 16		1, 8
	Corals, Shallow and		29									9	

Restoration Focal Area													
	Location	Gulfwide		Texas		Louisiana		Mississippi		Alabama		Florida	
	Impact	Primary	Secondary	Primary	Secondary	Primary	Secondary	Primary	Secondary	Primary	Secondary	Primary	Secondary
Impacted Resource and Ecosystem Services	Deep												
	Marine Mammals	39, 38	29										
	Sea Turtles	28, 35, 38, 39	8, 29, 31, 33, 36	28, 35	25		20b2, 34						8
	Birds	32	29, 33, 34, 37	24, 25, 27		20a2, 20a3, 20b2, 20c1	20a1, 20a4, 20b1, 20d, 21, 22, 23, 34	16, 17, 18		10, 12, 14			1, 2, 3, 4, 6, 8
	Terrestrial Species (e.g., alligators, terrapins)									13, 14			2, 4, 8
	Commercial Fishing	31, 33, 38	29, 30, 36, 37		25, 26, 27		20a1, 20a2, 20a3, 20a4, 20b1, 20b2, 20c1, 20d, 21, 22, 23, 34		15, 16, 17, 18, 19		10, 11, 12, 13, 14		6, 8
	Recreational Fishing	30	29, 33, 36, 37, 38		25, 26, 27		20a1, 20a2, 20a3, 20a4, 20b1, 20b2, 20c1, 20d, 21, 22, 23, 34		19		10, 11, 12, 13, 14		6, 8
	Subsistence		29										
	Public Beaches & Parks		29		25		20b2, 20d, 34			14			
	Ecotourism (e.g., bird watching)		29		24, 25, 27		20b2, 20d		18, 19	14	10, 12		1, 2, 3, 4, 6, 8



		Restoration Focal Area Summaries			
Location		Marine		Coastal/Estuarine	
Impact		Primary	Secondary	Primary	Secondary
Impacted Resource and Ecosystem Services	Gulf Ecosystem	5 projects	n/a	40 projects	n/a
	Air	n/a	1 project	n/a	2 project
	Water Column & Sediment	n/a	1 project	5 projects	9 projects
	Shorelines/beaches	n/a	1 project	18 projects	3 projects
	Shorelines/wetlands	n/a	1 project	31 projects	2 projects
	Sea grasses	n/a	1 project	5 projects	7 projects
	Sargassum	n/a	1 project	n/a	2 projects
	Nearshore Fish	2 projects	3 projects	4 projects	32 projects
	Offshore Fish	4 projects	3 projects	2 projects	3 projects
	Oysters	n/a	1 project	10 projects	12 projects
	Shrimp	2 projects	1 project	2 project	28 projects
	Crabs	n/a	1 project	n/a	31 projects
	Corals, Shallow and Deep	n/a	1 project	2 projects	n/a
	Marine Mammals	1 project	1 project	1 project	1 project
	Sea Turtles	3 projects	5 projects	5 projects	7 projects
	Birds	1 project	3 projects	7 projects	23 projects
	Terrestrial Species (e.g. alligators, terrapins)	n/a	n/a	n/a	5 projects
	Commercial Fishing	3 projects	4 projects	1 project	31 projects
	Recreational Fishing	1 project	4 projects	1 project	26 projects
	Subsistence	n/a	1 project	n/a	1 project
Public Beaches & Parks	n/a	1 project	1 project	5 projects	
Ecotourism (e.g. bird watching)	n/a	1 project	1 project	16 projects	

## Appendix A: Acronyms

ADCNR	Alabama Department of Conservation and Natural Resources
ARRA	American Recovery and Reinvestment Act of 2009
DOI	U.S. Department of Interior
DOL	U.S. Department of Labor
ELB	electronic logbook
ESA	Endangered Species Act
EVM	electronic video monitoring
FFWCC	Florida Fish and Wildlife Conservation Commission
LACPRA	Louisiana Coastal Protection and Restoration Authority
LCA	Louisiana Coastal Area
LDWF	Louisiana Department of Wildlife and Fisheries
MRGO	Mississippi River Gulf Outlet
MSCIP	Mississippi Coastal Improvement Plan
MSDMR	Mississippi Department of Marine Resources
NAO	NOAA Administrative Order
NAVD	North American vertical datum
NEPA	National Environmental Policy Act
NEG	National Emergency Grant
NFWF	National Fish and Wildlife Foundation
NMFS	National Marine Fisheries Service
NOAA	National Oceanic and Atmospheric Administration
NRDA	Natural Resource Damage Assessment
NWR	National Wildlife Refuge
OCPR	Office of Coastal Protection and Restoration
SEA	Sound Ecosystem Assessment
USACE	U.S. Army Corps of Engineers
USFWS	U.S. Fish and Wildlife Service
WMA	Wildlife Management Area